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PHYSIOTHERAPY

SECOND YEAR

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Intermediate Vocational Course

- Paper I : Medical And Surgical Conditions
- Paper II : Orthopaedics And Neurology
- **Paper III** : Electrotherapy



STATE INSTITUTE OF VOCATIONAL EDUCATION

BOARD OF INTERMEDIATE EDUCATION, A.P.

Text Book Development Committee

Paper - I Medical And Surgical Conditions

AUTHOR

Dr. B. Srikanth MPT. Ortho., Junior Lecturer in PT

Govt Vocational Junior College, VISAKHAPATNAM

Paper-II Orthopaedics And Neurology

AUTHOR

Dr. Priya Darshini, PDS, MPT, Neuro Junior Lecturer in PT Govt Vocational Junior College, VISAKHAPATNAM

Paper-III Electrotherapy

AUTHOR

Dr. Priya Darshini, PDS, MPT, Neuro Junior Lecturer in PT Govt Vocational Junior College, VISAKHAPATNAM

EDITOR

Dr. P. Ramakrishna Professor, VIMS. College of Physiotherapt VIJAYAWADA

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TEXT BOOK DEVELOPMENT COMMITTEE

S.No	Name	Designation	Signature
1	Dr.P.Ramakrishna		
	Professor,	Editor	
	VIMS. College of		
	Physiotherapt		
	VIJAYAWADA		
2	DrB. Srikanth		
	Junior Lecturer in PT	Author	
	Govt Vocational Junior		
	College,		
	VISAKHAPATNAM		
3	Dr. Priya Darshini		
	Junior Lecturer in PT	Author	
	Govt Vocational Junior		
	College,		
	VISAKHAPATNAM		
4.	Dr. Priya Darshini		
	Junior Lecturer in PT	Author	
	Govt Vocational Junior		
	College,		
	VISAKHAPATNAM		



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Lecturer State Institute of Vocational Education Commissioner of Intermediate Education, Guntur

<u>DTP</u>

Thuraka Ravi Kumar BA, B.Ed., PGDCA

PHYSIOTHERAPY

Paper – I

Medical And Surgical Conditions

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NUTRITIONAL DISORDERS

Structure:

- 1.1 Nutrition Vitamins
- 1.2 Protein Energy Malnutrition
- 1.3 Rickets
- 1.4 Scurvy
- 1.5 Osteomalacia
- 1.6 Osteoporosis

1.1 NUTRITION – VITAMINS

Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes food intake, absorption, assimilation, biosynthesis, catabolism, and excretion. A **balanced diet** is an **eating** plan that is affordable and which allows the body to obtain all the substances it needs to function optimally. From a **nutrition** perspective, there are six main components of a **balanced diet**: carbohydrates, fats, protein, vitamins, minerals, and water.

VITAMINS

A vitamin is one of a group of organic substances that is present in minute amounts in natural foodstuffs. Vitamins are essential to normal metabolism. If we do not take enough of any kind of vitamin, certain medical conditions can result.

A vitamin is both:

- an organic compound, which means it contains carbon
- an essential nutrient that body cannot produce enough of and which it needs to get from food

There are currently 13 recognized vitamins.

Vitamins are either fat-soluble or water-soluble.

Fat-soluble vitamins

Fat-soluble vitamins are stored in the fatty tissues of the body and the liver. Vitamins A, D, E, and K are fat-soluble. These are easier to store than water-soluble vitamins, and they can stay in the body as reserves for days, and sometimes months.

Fat-soluble vitamins are absorbed through the intestinal tract with the help of fats, or lipids.

Water-soluble vitamins

Water-soluble vitamins do not stay in the body for long. The body cannot store them, and they are soon excreted in urine. Because of this, water-soluble vitamins need to be replaced more often than fat-soluble ones.

Vitamin C and all the B vitamins are water soluble.

FAT SOLUBLE VITAMINS

Vitamin A

Chemical names: Retinol, retinal, and four carotenoids, including beta carotene.

- It is fat soluble.
- **Deficiency** may cause night-blindness and keratomalacia, an eye disorder that result in a dry cornea.
- **Good sources** include: Liver, cod liver oil, carrots, broccoli, sweet potato, butter, kale, spinach, pumpkin, collard greens, some cheeses, egg, apricot, cantaloupe melon, and milk.

Vitamin D

Chemical names: Ergocalciferol, cholecalciferol.

- It is fat soluble.
- **Deficiency** may cause rickets and osteomalacia, or softening of the bones.
- Good sources: Exposure to ultraviolet B (UVB) through sunlight or other sources causes vitamin D to be produced in the skin. Also found in fatty fish, eggs, beef liver, and mushrooms.

➢ Vitamin E

Chemical names: Tocopherols, tocotrienols

- It is fat soluble.
- **Deficiency** is uncommon, but it may cause hemolytic anemia in newborns. This is a condition where blood cells are destroyed and removed from the blood too early.

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• **Good sources** include: Kiwi fruit, almonds, avocado, eggs, milk, nuts, leafy green vegetables, unheated vegetable oils, wheat germ, and whole-grains.

Vitamin K

Chemical names: Phylloquinone, menaquinones

- It is fat soluble.
- **Deficiency** may cause bleeding diathesis, an unusual susceptibility to bleeding.
- **Good sources** include: leafy green vegetables, avocado, kiwi fruit. Parsley contains a lot of vitamin K.

WATER SOLUBLE VITAMINS

Vitamin B

Chemical name: Thiamine.

- It is water soluble.
- **Deficiency** may cause beriberi and Wernicke-Korsakoff syndrome.
- **Good sources** include: yeast, pork, cereal grains, sunflower seeds, brown rice, whole-grain rye, asparagus, kale, cauliflower, potatoes, oranges, liver, and eggs.

> Vitamin B2

Chemical name: Riboflavin

- It is water soluble
- **Deficiency** may cause ariboflavinosis
- **Good sources** include: asparagus, bananas, persimmons, okra, chard, cottage cheese, milk, yogurt, meat, eggs, fish, and green beans

Vitamin B3

Chemical names: Niacin, niacinamide

- It is water soluble.
- **Deficiency** may cause pellagra, with symptoms of diarrhea, dermatitis, and mental disturbance.

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• **Good sources** include: liver, heart, kidney, chicken, beef, fish (tuna, salmon), milk, eggs, avocados, dates, tomatoes, leafy vegetables, broccoli, carrots, sweet potatoes, asparagus, nuts, whole-grains, legumes, mushrooms, and brewer's yeast.

Vitamin B5

Chemical name: Pantothenic acid

- It is water soluble.
- Deficiency may cause paresthesia, or "pins and needles."
- **Good sources** include: meats, whole-grains (milling may remove it), broccoli, avocados, royal jelly, and fish ovaries.

Vitamin B6

Chemical names: Pyridoxine, pyridoxamine, pyridoxal

- It is water soluble.
- **Deficiency** may cause anemia, peripheral neuropathy, or damage to parts of the nervous system other than the brain and spinal cord.
- **Good sources** include: meats, bananas, whole-grains, vegetables, and nuts. When milk is dried, it loses about half of its B6. Freezing and canning can also reduce content.

Vitamin B7

Chemical name: Biotin

- It is water soluble.
- **Deficiency** may cause dermatitis or enteritis, or inflammation of the intestine.
- Good sources include: egg yolk, liver, some vegetables.

Vitamin B9

Chemical names: Folic acid, folinic acid

- It is water soluble.
- **Deficiency** during pregnancy is linked to birth defects. Pregnant women are encouraged to supplement folic acid for the entire year before becoming pregnant.
- **Good sources** include: leafy vegetables, legumes, liver, baker's yeast, some fortified grain products, and sunflower seeds. Several fruits have moderate amounts, as doe's beer.

Vitamin B12

Chemical names: Cyanocobalamin, hydroxocobalamin, methylcobalamin

- It is water soluble.
- **Deficiency** may cause megaloblastic anemia, a condition where bone marrow produces unusually large, abnormal, immature red blood cells.
- **Good sources** include: fish, shellfish, meat, poultry, eggs, milk and dairy products, some fortified cereals and soy products, as well as fortified nutritional yeast.

Vitamin C

Chemical name: Ascorbic acid

- It is water soluble.
- **Deficiency** may cause megaloblastic anemia.
- **Good sources** include: fruit and vegetables. The Kakadu plum and the camu camu fruit have the highest vitamin C contents of all foods. Liver also has high levels. Cooking destroys vitamin C.

1.2 PROTEIN-ENERGY MALNUTRITION

Definition: The lack of sufficient energy or protein to meet the body's metabolic demands, as a result of either an inadequate dietary intake of protein, intake of poor quality dietary protein, increased demands due to disease, or increased nutrient losses.

Causes:

The major causes of protein-energy malnutrition include

 Economic and Social Factors – One of the major and most common causes of Protein Energy Malnutrition (PEM) are the economic and social factors which affect several poor people in most developing countries. Extreme poverty causes unhygienic living conditions, limited availability of food and no or very little child care; all of which result in Protein-Energy Malnutrition (PEM). Reduced breast feeding and poor weaning practices are also some of the contributing causes of Protein-Energy Malnutrition (PEM).

- Environmental Factors There are several environmental factors that can also lead to Protein-Energy Malnutrition (PEM). Infections such as diarrhoea often develop due to unsanitary conditions while other factors such as floods, earthquakes, drought and improper agricultural patterns lead to scarcity of food. Inadequate storage conditions can also aggravate the problem. Gastrointestinal condition and other infections resulting from poor sanitation are one of the commonest causes of protein-energy malnutrition among infants and young children.
- Age As infants and young children grow their nutritional requirements also increase quite rapidly. When this requirement is not met properly, it often becomes one of the causes of protein-energy malnutrition which is most common in infants and children below 18 months of age. Poor families with more number of children are unable to meet the nutritional demands of growing children, resulting in malnutrition and causing Protein-Energy Malnutrition (PEM).
- **Biological Factors** If a woman undergoes maternal malnutrition both during her pregnancy and before it, chances are that she will give birth to a weak and underweight baby who will also be malnourished. Infectious diseases such as measles and diarrhoea which are commonly prevalent in developing countries also cause a negative energy and protein balance in the body and can cause protein-energy malnutrition.

Clinical features:

There are several forms of Protein-Energy Malnutrition (PEM) which can affect a child or an infant. The symptoms of protein-energy malnutrition depend on the form which has affected the child. The different symptoms for different forms are mentioned below:

• **Kwashiorkor** – The common symptoms in this form of Protein-Energy Malnutrition (PEM) is failure in growth, mental changes, wasting of muscles. The feet along with the lower legs experience edema which soon affects the face, thighs and hands too. Other symptoms include a fatty and enlarged liver, moon face, appetite loss, diarrhea and vomiting. Changes in hair, anemia and characteristic changes in the skin are also associated symptoms of protein-energy malnutrition.

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- **Marasmus** In this form, common symptoms of Protein-Energy Malnutrition (PEM) include extreme retardation of growth, loss of fat from the body and excess wasting of muscles. The body looks shrivelled, wrinkled and bones become visible.
- Marasmic Kwashiorkor In this form, the features and symptoms of both Kwashiorkor and Marasmus are noticed in the patient suffering from protein-energy malnutrition.
- Underweight Children suffering from this form of Protein-Energy Malnutrition (PEM) are below normal as far as their weight for both age and height is concerned. Also, such children are at a greater risk for gastric and respiratory infection.
- Stunting Also known as nutritional dwarfing, the child shows symptoms of proteinenergy malnutrition, as reduced height and weight thereby looking normal though they aren't so.

Diagnosis:

- A thorough **physicalexamination** and a health history that probes eating habits a nd weight changes, focuses on bodyfat composition and muscle strength,
- Assesses gastrointestinal symptoms, underlying illness, and nutritional status isof ten as accurate as blood tests and urin analysis used to detect and document abnormalities.

Treatment of Protein-Energy Malnutrition

The treatment plan for protein-energy malnutrition can be divided in three main stages which include:

• Hospitalization – If the child affected by Protein-Energy Malnutrition (PEM) is also suffering from severe conditions such as hypoglycemia, dehydration, infection, hypothermia, anemia,

vitamin or mineral deficiency and electrolyte imbalance, hospitalization is required. Treatment of Protein-Energy Malnutrition (PEM) in this case is based on the complaints and is aimed at treating the cause, improving the symptoms and restoring energy.

 Restoring Nutritional Status – At this stage, the treatment of Protein-Energy Malnutrition (PEM) includes giving locally available and affordable food items which digest easily. They must be well distributed throughout the day to restore the nutritional

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- status quickly and effectively. The number of feedings to the child is gradually increased along with improvised food quality.
- **Rehabilitation** Nutritional rehabilitation, a main part of treatment of protein-energy malnutrition, is achieved by giving practical training to the mother of the patient. During this training, she is taught how to feed her child with local and nutritious food items and bring back good health.

Prevention of Protein-Energy Malnutrition

The following measures can help in the prevention of protein-energy malnutrition to a large extent and allow the infant or pre-school child to grow up in a healthy manner.

- Promoting breast feeding
- Educating the mother about nutrition and correct feeding practice
- Developing low cost weaning
- Fortification of food
- Proper immunization of the infant from time to time
- Early diagnoses and appropriate treatment
- Emphasizing on the importance of family planning and spacing between births

1.3 RICKETS

Rickets is a skeletal disorder that's caused by a lack of vitamin D, calcium, or phosphate. These nutrients are important for the development of strong, healthy bones. People with rickets may have weak and soft bones, stunted growth, and, in severe cases, skeletal deformities.

Vitamin D helps the body absorb calcium and phosphate from the intestines. Vitamin D can get from various food products, including milk, eggs, and fish. Our body also produces the vitamin when we exposed to sunlight.

A vitamin D deficiency makes it difficult for the body to maintain sufficient levels of calcium and phosphate. When this occurs, the body produces hormones that cause calcium and phosphate to be released from the bones. When the bones lack these minerals, they become weak and soft.

Rickets is most common in children who are between 6 and 36 months old. Children are at the highest risk of rickets because they're still growing. Children might not get enough

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vitamin D if they live in a region with little sunlight, follow a vegetarian diet, or don't drink milk products. In some cases, the condition is hereditary.

Causes:

Some of the contributing factors and causes of rickets include

- Not enough exposure of the skin to sunlight
- Skin colour the skin pigment in children with naturally dark skin tends to absorb less sunlight than fair skin
- Lack of vitamin D or calcium in the diet
- Exclusive breastfeeding (without vitamin D supplements) of infants whose mothers have vitamin D deficiency
- Disorders of the intestine, liver or kidneys that prevent the body from absorbing vitamin D or converting it into its active form
- Disorders that reduce digestion or absorption of fats, as vitamin D is a fat-soluble vitamin.
 Clinical features:
 - pain or tenderness in the bones of the arms, legs, pelvis, or spine
 - stunted growth and short stature
 - bone fractures
 - muscle cramps
 - teeth deformities, such as:
 - o delayed tooth formation
 - holes in the enamel
 - \circ abscesses
 - defects in the tooth structure
 - o an increased number of cavities
 - skeletal deformities, including:
 - an oddly shaped skull
 - bowlegs, or legs that bow out
 - bumps in the ribcage
 - o a protruding breastbone
 - o a curved spine
 - pelvic deformities



Diagnosis

The following tests may help diagnose rickets:

- Arterial blood gases
- Blood tests (serum calcium)
- Bone biopsy (rarely done)
- Bone x-rays
- Serum alkaline phosphatase (ALP)
- Serum phosphorus

Treatment

Treatment options for rickets include:

- Improved sunlight exposure
- Improved diet that includes adequate intake of calcium and vitamin D
- Oral vitamin D supplements these may need to be taken for about three months
- Special forms of vitamin D supplements for people whose bodies can't convert vitamin D into its active form
- Treatment for any underlying disorder

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• Surgery to correct bone deformities.

Complications

Left untreated, rickets can lead to:

- Failure to grow
- Abnormally curved spine
- Skeletal deformities
- Dental defects
- Seizures

1.4 SCURVY

Scurvy also called **vitamin C deficiency**, one of the oldest-known nutritional disorders of humankind, caused by a dietary lack of vitamin C (ascorbic acid), a nutrient found in many fresh fruits and vegetables, particularly the citrus fruits. It plays a **role** in the development and functioning of several bodily structures and processes, including:

- The proper formation of collagen, the protein that helps give the body's connective tissues structure and stability
- cholesterol and protein metabolism
- iron absorption
- antioxidant action
- wound healing
- creation of neurotransmitters like dopamine and epinephrine

Causes and Risk factors:

The main cause is an insufficient intake of vitamin C, or ascorbic acid.

Risk factors for malnutrition and scurvy include:

- being a child or 65 years of age and over
- daily alcohol consumption
- use of illegal drugs
- living alone
- restrictive or specified diets
- low income, reduced access to nutritious foods
- being homeless or a refugee
- living in areas with limited access to fresh fruits and vegetables

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- neurological conditions
- disabilities
- forms of inflammatory bowel disease (IBD), including irritable bowel syndrome (IBS), Crohn's disease, or ulcerative colitis
- digestive or metabolic conditions
- immune conditions
- living in a place where the cultural diet consists almost entirely of carbohydrates like breads, pastas, and corn
- chronic diarrhea
- dehydration
- smoking
- chemotherapy and radiation therapy
- dialysis and kidney failure

Clinical features:

Vitamin C plays many different roles in the body. A deficiency in the vitamin causes widespread symptoms.

Typically signs of scurvy begin after at least four weeks of severe, continual vitamin C

deficiency. Generally, however, it takes three months or more for symptoms to develop.

Early warning signs

Early warning signs and symptoms of scurvy include:

- weakness
- unexplained exhaustion
- reduced appetite
- irritability
- aching legs
- low-grade fever

Symptoms after one to three months

Common symptoms of untreated scurvy after one to three months include:

- anaemia, when the blood lacks enough red blood cells or haemoglobin
- gingivitis, or red, soft, and tender gums that bleed easily
- skin hemorrhages, or bleeding under the skin

- bruise-like raised bumps at hair follicles, often on the shins, with central hairs that appear corkscrewed, or twisted, and break easily
- large areas of reddish-blue to black bruising, often on the legs and feet
- tooth decay
- tender, swollen joints
- shortness of breath
- chest pain
- eye dryness, irritation, and hemorrhaging in the whites of the eyes (conjunctiva) or optic nerve
- reduced wound healing and immune health
- light sensitivity
- blurred vision
- mood swings, often irritability and depression
- gastrointestinal bleeding
- headache

Left untreated, scurvy can cause life-threatening conditions.

Diagnosis

Diet history is a crucial piece of the diagnostic work-up. Scurvy can be diagnosed based on symptoms and diet history consistent Vitamin C deficiency without lab work. The blood test will be used to check the levels of vitamin C in blood serum. Generally, people with scurvy have blood serum levels of vitamin C less than 11 µmol/L.

Treatment

Treatment involves administering vitamin C supplements by mouth or by injection.

The recommended dosage is:

- 1 to 2 grams (g) per day for 2 to 3 days
- 500 milligrams (mg) for the next 7 days
- 100 mg for 1 to 3 months

Within 24 hours, patients can expect to see an improvement in fatigue, lethargy, pain, anorexia, and confusion. Bruising, bleeding, and weakness start to resolve within 1 to 2 weeks.

After 3 months, a complete recovery is possible. Long-term effects are unlikely, except in the case of severe dental damage.

1.5 OSTEOMALACIA

Osteomalacia means simply bone softening .It is a metabolic bone disease characterised by incomplete mineralisation of the underlying mature organic bone matrix (osteoid) following growth plate closure in adults

Bone is a living, active tissue that's continually being removed and replaced. This process is known as bone turnover. Bone consists of a hard outer shell (the cortex) made up of minerals, mainly calcium and phosphorus, and a softer inner mesh (the matrix) made up of collagen fibres.

When normal bone is formed, these fibres are coated with mineral. This process is called mineralisation. The strength of the new bone depends on the amount of mineral covering the collagen matrix. The more mineral laid down, the stronger the bone.

Osteomalacia happens if mineralisation doesn't take place properly. In osteomalacia more and more bone is made up of collagen matrix without a mineral covering, so the bones become soft. These softened bones may bend and crack and this can be very painful.



Causes:

A lack of the proper amount of calcium leads to weak and soft bones.

Vitamin D is absorbed from food or produced by the skin when exposed to sunlight. Lack of

vitamin D produced by the skin may occur in people who:

- Live in climates with little exposure to sunlight
- Must stay indoors
- Work indoors during the daylight hours
- Wear clothes that cover most of their skin
- Have dark skin pigmentation
- Use very strong sunscreen

Person may not get enough vitamin D from diet if he or she:

- Are lactose intolerant (have trouble digesting milk products)
- Do not eat or drink milk products (more common in older adults)
- Follow a vegetarian diet
- Are not able to absorb vitamin D well in the intestines, such as after gastric bypass surgery

Other conditions that may cause osteomalacia include:

- Cancer
- Kidney failure and acidosis
- Lack of enough phosphates in the diet
- Liver disease, and therefore cannot convert vitamin D to its active form
- Side effects of medicines used to treat seizures

Clinical features:

Symptoms include:

- Bone fractures that happen without a real injury
- Muscle weakness
- Widespread bone pain, especially in the hips

Symptoms may also occur due to low calcium level. These include:

- Numbness around the mouth
- Numbness or tingling of the arms and legs
- Spasms or cramps of the hands or feet

Diagnosis:

Blood tests to measure the level of vitamin D in the body

X-rays

Bone mineral density scans to test the amount of calcium and phosphate in the bones

Treatment:

Fortunately, getting enough vitamin D through oral supplements for several weeks to months can cure osteomalacia. Maintaining normal blood levels of vitamin D usually requires continuing to take the supplements.

Health care provider might also recommend that to increase calcium or phosphorus intake, either through supplements or diet. Treating conditions that affect vitamin D metabolism, such as kidney and liver disease or low phosphate levels, often helps improve the signs and symptoms of osteomalacia.

1.6 OSTEOPOROSIS

Osteoporosis is a condition that weakens bones, making them fragile and more likely to break. It develops slowly over several years and is often only diagnosed when a minor fall or sudden impact causes a bone fracture. It's also called as a silent disease.

The most common injuries in people with osteoporosis are:

- wrist fractures
- hip fractures
- fractures of the spinal bones (vertebrae)

However, they can also occur in other bones, such as in the arm or pelvis. Sometimes a cough or sneeze can cause a rib fracture or the partial collapse of one of the bones of the spine. Osteoporosis isn't usually painful until a fracture occurs, but spinal fractures are a common cause of long-term (chronic) pain.

Although a fracture is the first sign of osteoporosis, some older people develop the characteristic stooped (bent forward) posture. It happens when the bones in the spine have fractured, making it difficult to support the weight of the body.

Causes:

• Losing bone is a normal part of the ageing process, but some people lose bone density much faster than normal. This can lead to osteoporosis and an increased risk of fractures.

- Women also lose bone rapidly in the first few years after the menopause (when monthly periods stop and the ovaries stop producing an egg). Women are more at risk of osteoporosis than men, particularly if the menopause begins early (before the age of 45).
- Many other factors can also increase the risk of developing osteoporosis, including:
 - long-term use of high-dose oral corticosteroids
 - o ther medical conditions such as inflammatory conditions, hormonerelated conditions, or malabsorption problems
 - a family history of osteoporosis particularly history of a hip fracture in a parent
 - long-term use of certain medications which can affect bone strength or hormone levels
 - having a low body mass index (BMI)
 - heavy drinking and smoking



OSTEOPOROSIS

Clinical features:

There typically are no symptoms in the early stages of bone loss. But once bones have been weakened by osteoporosis, he or she may have signs and symptoms that include:

- Back pain, caused by a fractured or collapsed vertebra
- Loss of height over time
- A stooped posture
- A bone fracture that occurs much more easily than expected

Diagnosis

Bone density can be measured by a machine that uses low levels of X-rays to determine the proportion of mineral in the bones.

Treatment

Aims to:

- slow or prevent the development of osteoporosis
- maintain healthy bone mineral density and bone mass
- prevent fractures
- reduce pain
- maximize the person's ability to continue with their daily life
- This is done through preventive lifestyle measure and the use of supplements and some drugs.

Prevention

This may include:

- taking regular exercise
- healthy eating including foods rich in calcium and vitamin D
- taking a daily supplement containing 10 micrograms of vitamin D
- making lifestyle changes such as giving up smoking and reducing alcohol consumption

QUESTIONS:

2 marks:

- 1. Define nutrition?
- 2. Define balanced diet?
- 3. What are vitamins and mention the types?
- 4. Write the clinical features of PEM?
- 5. What are the clinical features of rickets?
- 6. Define scurvy and write clinical features?
- 7. Define osteomalacia?
- 8. Mention the causes of osteomalacia?
- 9. Mention the clinical features of osteomalacia?
- 10. Define osteoporosis and writhe the causes?

6 marks:

- 1. Write about Vitamins in detail?
- 2. Write in detail about PEM?
- 3. Write in detail about Rickets?
- 4. Write in detail about Osteoporosis?

Ψ



COMMON HEALTH PROBLEMS

Structure:

2.1 Fever	2.5 Dermatitis
2.2 Common cold	2.6 Anaemia
2.3 Cough	2.7 First Aid management
2.4 Conjuctivitis	

2.1 FEVER

A **fever** is a body temperature that is higher than normal. Normal temperature can vary from person to person, but it is usually around 36–37° Centigrade or (98–100° Fahrenheit). A **fever** is not a disease. It is usually a sign that the body is trying to fight an illness or infection. Infections cause most **fevers**. One gets a fever because their body is trying to kill the virus or bacteria that caused the infection. Most of those bacteria and viruses do well when the body is at the normal temperature. Fever also activates the body's immune system. Various types of fevers:

> VIRAL FEVER:

Viral fevers can range in temperature from 99°F to over 103°F (39°C), depending on the underlying virus.

Causes:

- Inhalation. If someone with a viral infection sneezes or coughs near you, you can breathe in droplets containing the virus. Examples of viral infections from inhalation include the flu or common cold.
- **Ingestion.** Food and drinks can be contaminated with viruses. If you eat them, you can develop an infection. Examples of viral infections from ingestion include norovirus and enteroviruses.

- **Bites.** Insects and other animals can carry viruses. If they bite you, you can develop an infection. Examples of viral infections that result from bites include dengue fever and rabies.
- **Bodily fluids.** Exchanging bodily fluids with someone who has a viral infection can transfer the illness. Examples of this type of viral infection include Hepatitis B and HIV.

Clinical features:

- chills
- sweating
- dehydration
- headache
- muscle aches and pains
- a feeling of weakness
- loss of appetite

These symptoms usually only last for a few days at most.

Treatment:

There are no antibiotics for virus infection. The doctor may give fever reducers. He may also prescribe antibiotics; however, those are to counter any secondary infections that may catch while sick. If a doctor prescribes antibiotics, it is highly necessary to complete the full course. If you stop taking the antibiotics midway, your body will create antibiotic-resistant bacteria. So, in future, if you are prescribed antibiotics for any illness, some of them might not work for you due to the presence of the resistant bacteria's in your body.

> MALARIA

Malaria is a life-threatening disease. It's typically transmitted through the bite of an infected *Anopheles* mosquito. Infected mosquitoes carry the *Plasmodium* parasite. When this mosquito bites the parasite is released into the bloodstream.

Once the parasites are inside the body, they travel to the liver, where they mature. After several days, the mature parasites enter the bloodstream and begin to infect red blood cells. Within 48 to 72 hours, the parasites inside the red blood cells multiply, causing the infected cells to burst open.

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The parasites continue to infect red blood cells, resulting in symptoms that occur in cycles that last two to three days at a time.

Causes: there are four kinds of malaria parasites that can infect humans: Plasmodium

vivax, P. ovale, P. malariae, and P. falciparum.

Clinical features:

Common symptoms of malaria include:

- shaking chills that can range from moderate to severe
- high fever
- profuse sweating
- headache
- nausea
- vomiting
- abdominal pain
- diarrhea
- anemia
- muscle pain
- convulsions
- coma
- bloody stools

Treatment:

Anti-Malaria Medications: The most common medications used to treat malaria infection are:

- Chloroquine
- Quinine
- Primaquine
- Doxycycline
- Hydroxychloroquine

> TYPHOID (ENTERIC FEVER)

Typhoid fever is caused by Salmonella typhi bacteria.

Typhoid fever spreads through contaminated food and water or through close contact with someone who's infected.

Clinical features:

- Fever that starts low and increases daily, possibly reaching as high as 104.9 F (40.5 C)
- Headache
- Weakness and fatigue
- Muscle aches
- Sweating
- Dry cough
- Loss of appetite and weight loss
- Abdominal pain
- Diarrhoea or constipation
- Rash
- Extremely swollen abdomen

Treatment:

Treatment for diarrhoea. Plenty of fluids to prevent dehydration. **Oral rehydration** drinks to replace lost salts and minerals. **Intravenous** replacement of fluids in severe cases. **Medications** such as **antibiotics** and anti-**nausea** drugs and anti-diarrhoeal **medications**.

> DENGUE

Dengue fever is a mosquito-borne tropical disease caused by the **dengue virus**. Symptoms typically begin three to fourteen days after infection.

Symptoms generally last for about 10 days and can include:

- sudden, high fever (up to 106 degrees Fahrenheit)
- severe headache
- swollen lymph glands
- severe joint and muscle pains
- skin rash (appearing between two and five days after the initial fever)

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- mild to severe nausea
- mild to severe vomiting
- mild bleeding from the nose or gums
- mild bruising on the skin
- febrile convulsions

Treatment:

Because dengue is caused by a virus, there is no specific medicine or antibiotic to treat it, the only treatment is to treat the symptoms. For typical dengue, the treatment is purely concerned with relief of the symptoms (symptomatic). Rest and fluid intake for adequate hydration is important.

COMMON COLD

The common cold is a viral infection of nose and throat (upper respiratory tract). It is usually harmless, although it might not feel that way. Many types of viruses can cause a common cold.

Children younger than six are at greatest risk of colds, but healthy adults can also expect to have two or three colds annually.

Most people recover from a common cold in a week or 10 days. Symptoms might last longer in people who smoke.

Causes:

Although many types of viruses can cause a common cold, rhinoviruses are the most common culprit. A cold virus enters your body through your mouth, eyes or nose. The virus can spread through droplets in the air when someone who is sick coughs, sneezes or talks. It also spreads by hand-to-hand contact with someone who has a cold or by sharing contaminated objects, such as utensils, towels, toys or telephones.

Clinical features:

Symptoms of a common cold usually appear one to three days after exposure to a coldcausing virus. Signs and symptoms, which can vary from person to person, might include:

- Runny or stuffy nose
- Sore throat

- Cough
- Congestion
- Slight body aches or a mild headache
- Sneezing
- Low-grade fever
- Generally feeling unwell (malaise)

The discharge from the nose may become thicker and yellow or green in colour as a common cold runs its course. This isn't an indication of a bacterial infection.

Treatment:

The common cold is treated symptomatically. Antibiotics are not effective in children or adults. Products that improve symptoms in children include vapor rub, zinc sulphate, and Prophylactic probiotics, zinc sulphate, nasal saline irrigation, and the herbal preparation etc. For adults, antihistamines, intranasal corticosteroids, nasal saline irrigation and steam inhalation. Hand hygiene reduces the spread of viruses that cause cold illnesses. Prophylactic vitamin C modestly reduces cold symptom duration in adults and children.

2.3 COUGH

A cough is the body's way of responding when something irritates the throat or airways. An irritant stimulates nerves that send a message to the brain. The brain then tells muscles in the chest and abdomen to push air out of lungs to force out the irritant.

An occasional cough is normal and healthy. A cough that persists for several weeks or one that brings up discoloured or bloody mucus may indicate a condition that needs medical attention.

Causes:

Acute:

- Common cold
- Influenza (flu)
- Inhaling an irritant
- Pneumonia
- Whooping cough
- Chronic:
- Allergies
- Asthma (most common in children)
- Bronchitis

- Gastroesophageal reflux disease (GERD)
- Postnasal drip
- Others
- Acute sinusitis (sinus infection)
- Bronchiectasis (a chronic lung condition in which abnormal widening of bronchial tubes inhibits mucus clearing)
- Bronchiolitis (especially in young children)
- Choking: First aid (especially in children)
- Chronic sinusitis
- COPD (chronic obstructive pulmonary disease)
- Cystic fibrosis
- Emphysema
- Heart failure
- Lung cancer
- Neuromuscular diseases, such as parkinsonism
- Tuberculosis

Clinical features:

- Cough dry or productive
- Haemoptysis
- Chest pain
- Dyspnea
- Pleural effusion
- Loss of weight
- Clubbing of the fingers
- Hoarseness of voice
- Dysphagia

Treatment:

Treatment isn't always necessary for short-term coughs because it's likely to be a viral infection that will get better on its own within a few weeks. You can look after yourself at home by resting, drinking plenty of fluids, and taking painkillers and warm water gargling.

2.4 CONJUNCTIVITIS

Conjunctivitis, also known as pinkeye, is an inflammation of the conjunctiva. The conjunctiva is the thin clear tissue that lies over the white part of the eye and lines the inside of the eyelid. Children get it a lot. It can be highly contagious (it spreads rapidly in schools and day cares), but it's rarely serious. It's very unlikely to damage the vision, especially if you find it and treat it quickly.

Causes:

- Viruses, including the kind that causes the common cold
- Bacteria
- Irritants such as shampoos, dirt, smoke, and pool chlorine
- A reaction to eye drops
- An allergic reaction to things like pollen, dust, or smoke. Or it could be due to a special type of allergy that affects some people who wear contact lenses.
- Fungi, amoebas, and parasites

Clinical features:

- Redness in the white of the eye or inner eyelid
- Swollen conjunctiva
- More tears than usual
- Green or white discharge from the eye
- Itchy eyes
- Burning eyes
- Blurred vision
- More sensitive to light
- Swollen lymph nodes (often from a viral infection)

Treatment:

Treatment isn't usually needed for conjunctivitis, because the symptoms often clear up within a couple of weeks. If treatment is needed, the type of treatment will depend on the cause. In severe cases, antibiotic eye drops can be used to clear the infection.

2.5 DERMATITIS

Dermatitis is an inflammation of the skin. The word "dermatitis" is used to describe a number of different skin rashes that are caused by infections, allergies, and irritating substances. The rashes range from mild to severe and can cause the many skin conditions, depending on their cause: However, not every rash is called dermatitis.

Causes:

The causes of dermatitis vary depending on the type.

Some types, like dyshidrotic eczema, neurodermatitis, and nummular dermatitis, may have unknown causes.

MEDICAL AND SURGICAL CONDITIONS

- Contact dermatitis: Contact dermatitis occurs when you come in direct contact with an irritant or allergen. Common materials that cause allergic reactions include detergents, cosmetics, nickel, poison ivy, and oak.
- Eczema: Eczema is caused by a combination of factors like dry skin, environmental setting, and bacteria on the skin. It's often genetic, as people with eczema often have a family history of eczema, allergies, or asthma.
- Seborrheic dermatitis: Seborrheic dermatitis is likely caused by a fungus in the oil glands. It tends to get worse in the spring and winter. This type of dermatitis also appears to be genetic for some people.
- Stasis dermatitis: Stasis dermatitis occurs due to poor circulation in the body, most commonly the lower legs and feet.

Clinical features:

- rashes
- blisters
- dry, cracked skin
- itchy skin
- painful skin, with stinging or burning
- redness
- swelling

Treatment:

The treatment for dermatitis varies, depending on the cause and each person's experience of the condition. In addition to the lifestyle and home remedies recommendations below, most dermatitis treatment plans include one or more of the following:

- Applying corticosteroid creams.
- Applying certain creams or lotions that affect your immune system (calcineurin inhibitors).
- Exposing the affected area to controlled amounts of natural or artificial light (phototherapy).

2.6 ANAEMIA

Anaemia is a condition that develops when your blood lacks enough healthy red blood cells or haemoglobin. Haemoglobin is a main part of red blood cells and binds oxygen. If you have too

few or abnormal red blood cells, or your haemoglobin is abnormal or low, the cells in your body will not get enough oxygen.

Causes:

Different types of anemia and their causes include:

- Iron deficiency anemia. This is the most common type of anaemia worldwide. Iron
 deficiency anaemia is caused by a shortage of iron in the body. The bone marrow needs
 iron to make haemoglobin. Without adequate iron, body can't produce enough
 hemoglobin for red blood cells.
- Vitamin deficiency anemia. In addition to iron, body needs folate and vitamin B-12 to produce enough healthy red blood cells. A diet lacking in these and other key nutrients can cause decreased red blood cell production.
- Anemia of chronic disease. Certain diseases such as cancer, HIV/AIDS, rheumatoid arthritis, kidney disease, Crohn's disease and other chronic inflammatory diseases — can interfere with the production of red blood cells.
- Aplastic anemia. This rare, life-threatening anemia occurs when body doesn't produce enough red blood cells. Causes of aplastic anemia include infections, certain medicines, autoimmune diseases and exposure to toxic chemicals.
- Anemias associated with bone marrow disease. A variety of diseases, such as leukemia and myelofibrosis, can cause anemia by affecting blood production in the bone marrow. The effects of these types of cancer and cancer-like disorders vary from mild to lifethreatening.
- Hemolytic anemias. This group of anemias develops when red blood cells are destroyed faster than bone marrow can replace them. Certain blood diseases increase red blood cell destruction.
- Sickle cell anemia. It's caused by a defective form of hemoglobin that forces red blood cells to assume an abnormal crescent (sickle) shape. These irregular blood cells die prematurely, resulting in a chronic shortage of red blood cells.
- Other anemias. There are several other forms of anemia, such as thalassemia and malarial anemia.

Other causes like:

- Menstruation
- Pregnancy
- Family history. If a family has a history of an inherited anaemia, such as sickle cell anaemia, they also may be at increased risk of the condition.
- Other factors. A history of certain infections, blood diseases and autoimmune disorders, alcoholism, exposure to toxic chemicals, and the use of some medications can affect red blood cell production and lead to anemia.
- Age. People over age 65 are at increased risk of anemia.

Clinical features:

Anemia signs and symptoms vary depending on the cause of your anemia. They may include:

- Fatigue
- Weakness
- Pale or yellowish skin
- Irregular heartbeats
- Shortness of breath
- Dizziness or light headedness
- Chest pain
- Cold hands and feet
- Headache

Treatment:

Symptomatic treatment:

Eat a vitamin-rich diet: Many types of anemia can't be prevented. But iron deficiency anemia and vitamin deficiency anemias can be avoided by having a diet that includes a variety of vitamins and nutrients, including:

- **Iron.** Iron-rich foods include beef and other meats, beans, lentils, iron-fortified cereals, dark green leafy vegetables, and dried fruit.
- Folate. This nutrient, and its synthetic form folic acid, can be found in fruits and fruit juices, dark green leafy vegetables, green peas, kidney beans, peanuts, and enriched grain products, such as bread, cereal, pasta and rice.

- Vitamin B-12. Foods rich in vitamin B-12 include meat, dairy products, and fortified cereal and soy products.
- Vitamin C. Foods rich in vitamin C include citrus fruits and juices, peppers, broccoli, tomatoes, melons and strawberries. These items help increase iron absorption

2.7 FIRST AID MANAGEMENT

First aid definition - is emergency care or treatment given to an ill or injured person before regular medical aid can be obtained.

Aims of first aid:

The primary goal of first aid is to prevent death or serious injury from worsening. The key aims of first aid can be summarized in three key points, sometimes known as 'the three P's.

- **P**reserve life stop the person from dying
- Prevent further injury stop the person from being injured even more. If possible, an injured person should not be moved. First aid can include how to safely move injured people or move them anyway with less harm if there is no choice.
- **P**romote recovery try to help the person heal their injuries

First aid kit:

Common first aid kits should contain the following items:

- Gauze pads (at least 4 by 4 inches)
- Two large gauze pads (at least 8 by 10 inches)
- A box of adhesive bandages
- One gauze roller bandage
- Two triangular bandages
- Wound cleaning agent
- Scissors
- At least one blanket
- Tweezers
- Adhesive tape
- Latex gloves
- Resuscitation equipment (such as resuscitation bag, or airway or pocket mask)
- Two elastic wraps
- A splint
- Directions for requesting emergency assistance
Conditions that often required first aid:

- Altitude sickness, which can begin in susceptible people at altitudes as low as 5,000 feet, can cause potentially fatal swelling of the brain or lungs.
- Anaphylaxis, a life-threatening condition in which the airway can become constricted and the patient may go into shock.
- Battlefield first aid This protocol refers to treating shrapnel, gunshot wounds, burns, bone fractures.
- Bone fracture, a break in a bone initially treated by stabilizing the fracture with a splint.
- Burns, which can result in damage to tissues and loss of body fluids through the burn site.
- Cardiac Arrest, which will lead to death unless CPR preferably combined with an AED is started within minutes.
- Choking, blockage of the airway which can quickly result in death due to lack of oxygen if the patient's trachea is not cleared,
- Childbirth.
- Cramps in muscles due to lactic acid build up caused either by inadequate oxygenation of muscle or lack of water or salt.
- Diving disorders, drowning or asphyxiation.
- Heart attack, or inadequate blood flow to the blood vessels supplying the heart muscle.
- Heat stroke, also known as sunstroke or hyperthermia
- Hair tourniquet a condition where a hair or other thread becomes tied around a toe or finger tightly enough to cut off blood flow.
- Heavy bleeding, treated by applying pressure (manually and later with a pressure bandage) to the wound site and elevating the limb if possible.
- Hyperglycemia (diabetic coma) and Hypoglycemia (insulin shock).
- Insect and animal bites and stings.
- Joint dislocation.
- Poisoning, which can occur by injection, inhalation, absorption, or ingestion.
- Seizures
- Muscle strains and Sprains, a temporary dislocation of a joint that immediately reduces automatically but may result in ligament damage.
- Stroke, a temporary loss of blood supply to the brain.

• Many accidents can happen at home, office, schools, laboratories etc. which require immediate attention before the patient is attended by the doctor.

First aid management for fractures:

A fracture is a broken bone. It requires medical attention. If the broken bone is the result of major trauma or injury, call to local emergency number.

Also call for emergency help if:

- The person is unresponsive, isn't breathing or isn't moving. Begin CPR if there's no breathing or heartbeat.
- There is heavy bleeding.
- Even gentle pressure or movement causes pain.
- The limb or joint appears deformed.
- The bone has pierced the skin.
- The extremity of the injured arm or leg, such as a toe or finger, is numb or bluish at the tip.
- Suspect a bone is broken in the neck, head or back.

Don't move the person except if necessary to avoid further injury. Take these actions immediately while waiting for medical help:

- **Stop any bleeding.** Apply pressure to the wound with a sterile bandage, a clean cloth or a clean piece of clothing.
- **Immobilize the injured area.** Don't try to realign the bone or push a bone that's sticking out back in. If you've been trained in how to splint and professional help isn't readily available, apply a splint to the area above and below the fracture sites. Padding the splints can help reduce discomfort.
- Apply ice packs to limit swelling and help relieve pain. Don't apply ice directly to the skin. Wrap the ice in a towel, piece of cloth or some other material.
- **Treat for shock.** If the person feels faint or is breathing in short, rapid breaths lay the person down with the head slightly lower than the trunk and, if possible, elevate the legs.

QUESTIONS:

2 marks:

- 1. What is fever and the various types of fevers?
- 2. Write the causes and clinical features of viral fever?
- 3. Write the causes and clinical features of typhoid fever?
- 4. Write the causes and clinical features of dengue fever?
- 5. Write the causes and clinical features of malaria fever?
- 6. Write the causes and clinical features of common cold?
- 7. Define cough and write the causes?
- 8. What is conjunctivitis and mention the causes?
- 9. Write the clinical features of conjunctivitis?
- 10. What is dermatitis and mention the types of dermatitis?
- 11. Define anaemia and write the types?
- 12. Write the treatment for anaemia?
- 13. Define first aid and write its aims?
- 14. Mention the components of first aid kit?
- 15. Mention any four conditions that often required first aid?

Ψ

UNIT



RESPIRATORY DISORDERS

Structure:

- 3.1 Asthma
- 3.2 Bronchitis
- 3.3 Bronchiectasis
- 3.4 Emphysema
- 3.5 Tuberculosis

Respiratory disorder, or respiratory disease, is a term that encompasses a variety of pathogenic conditions that affect respiration in living organisms. Respiration makes gas exchange possible in higher organisms. The gas exchange involves taking oxygen into the body and expelling carbon dioxide. Respiratory disease occurs in the respiratory tract, which includes the alveoli, bronchi, bronchioles, pleura, pleural cavity, trachea and the nerves and muscles of breathing.

Common Respiratory Disorders Include: Chronic Obstructive Pulmonary Disease (COPD) -Irritation of the lungs can lead to asthma, emphysema, and chronic bronchitis and people can develop two or three of these together.

3.1 ASTHMA

A condition in which a person's airways become inflamed, narrow and swell and produce extra mucus, which makes it difficult to breathe. Asthma causes recurring periods of wheezing (a whistling sound when you breathe), chest tightness, shortness of breath, and coughing. The coughing often occurs at night or early in the morning.

- Asthma affects people of all ages, but it most often starts during childhood.
- To understand asthma, the airways are tubes that carry air into and out of the lungs. People who have asthma have inflamed airways. The inflammation makes the airways swollen and very sensitive. The airways tend to react strongly to certain inhaled substances.

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- When the airways react, the muscles around them tighten. This narrows the airways, causing less air to flow into the lungs. The swelling also can worsen, making the airways even narrower. Cells in the airways might make more mucus than usual. Mucus is a sticky, thick liquid that can further narrow the air ways. Sometimes asthma symptoms are mild and go away on their own or after minimal treatment with asthma medicine. Other times, symptoms continue to get worse.
- When symptoms get more intense and/or more symptoms occur, the patient having asthma attack. Asthma attacks also are called flare ups or exacerbations.

Causes:

No single cause has been identified for asthma. Instead, researchers believe that the breathing condition is caused by a variety of factors. These factors include:

- Genetics. If a parent has asthma, the more likely to develop it.
- **History of viral infections.** People with a history of viral infections during childhood are more likely to develop the condition.
- **Hygiene hypothesis.** This hypothesis proposes that babies aren't exposed to enough bacteria in their early months and years. Therefore, their immune systems don't become strong enough to fight off asthma and other conditions.
- Early allergen exposure. Frequent contact with possible allergens and irritants may increase risk for developing asthma.

Asthma triggers:

Certain conditions and environments may also trigger symptoms of asthma. These triggers include:

- Illness. Respiratory illnesses such as the flu and pneumonia can trigger asthma attacks.
- Exercise. Increased movement may make breathing more difficult.
- Irritants in the air. People with asthma may be sensitive to irritants such as chemical fumes, strong odors, and smoke.
- Allergens. Animal dander, dust mites, and pollen are just a few examples of allergens that can trigger symptoms.
- Extreme weather conditions. Conditions such as very high humidity or low temperatures may trigger asthma.
- Emotions. Shouting, laughing, and crying may trigger an attack.



Clinical features:

- Cough: Cough can be productive or dry, and is especially seen in early morning and at night.
- Breathlessness: Difficulty in breathing due to mucous plugging and airway spasm is worse by any physical activity like climbing stairs.
- Chest tightness: Tightness of chest or pain in chest is present along with other symptoms of asthma.
- Wheezing: Wheezing is an abnormal whistling sound due to difficult respiration.
 Wheezing is more commonly seen in children than adults.
- Bluish discoloration of lips and face with nasal flaring
- Rapid pulse
- Sweating
- Decreased level of consciousness

Diagnosis:

• Personal and medical history: This includes any current physical problems. Shortness of breath, wheezing, coughing and tightness in chest may show asthma. This also includes all previous medical conditions. A history of allergies or eczema increases the chance of asthma. A family history of asthma, allergies or eczema increases the chance of having asthma, too.

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- Physical exam: They will look at the ears, eyes, nose, throat, skin, chest and lungs. This exam may include a lung function test to detect how well the patient exhale air from his lungs. An X-ray of lungs or sinuses.
- Lung function tests. To confirm asthma, these tests measure breathing. Lung function tests are often done before and after inhaling a medicine known as a bronchodilator, which opens the airways. If the lung function improves a lot with use of a bronchodilator, he probably has asthma. The doctor may also prescribe a trial with asthma medicine to see if it helps. Common lung function tests used to diagnose asthma include: Spirometry, Peak airflow, Provocation tests

Medical Management:

Oxygen therapy - this helps improve oxygen intake when breathing is difficult.

Medications will be prescribed that keep the airways open and reduce swelling, so air can move in and out of the lungs more easily. Patient will be given a pill as well as an inhaler. The most important thing about controlling asthma is that he must take the medicine exactly as instructed by doctor. Most asthma medication is available in the form of a powder or mist for oral administration with an inhaler. An inhaler is a device that "mists" the medicine, promoting more efficient and direct delivery to the lungs.

Short-acting (relief or rescue) bronchodilators, Such as albuterol or levalbuterol, relax the muscles around your airways.

Long-acting medicines (controllers) include inhaled corticosteroids (e.g. beclomethasone, budesonide, ciclesonide, flunisolide, fluticasone, mometasone) or inhaled corticosteroids in combination with long-acting bronchodilators (e.g. **formoterol or salmeterol**). These medications must be taken on a regular basis and are designed to keep your airways open over time. Inhaled corticosteroids decrease the swelling in the airways, so that they are less likely to be irritated by triggers. Long acting bronchodilators are never used alone as a controller in asthma, inhaled bronchodilators is to be taken at the same time as corticosteroids, often both are in the same inhaler.

Delivery of Medication

- Metered-dose inhaler (MDI); Spacer/holding chamber/face mask
- Dry-powder inhaler (DPI)
- Nebulizer
- Oral Medication
- Tablets, Liquids
- Intravenous Medication
- IV Corticosteroids, IV Aminophylline

Inhaler technique

When drugs are administered by aerosol/inhaler it is important that the patient be taught how to use the device correctly. The use of various inhaler devices requires some skill on the part of the patient and teaching the correct method of use is an essential part of the prescription of such treatment. Failure to master a metered-dose inhaler occurs in many patients of all ages. The technique for a metered-dose inhaler in which the drug is suspended in a propellant is as follows.

- i. 1 Shake the inhaler.
- ii. Hold the inhaler upright and direct into the mouth
- iii. Start inspiration and press the activating mechanism.
- iv. Breathe in slowly through the mouth.
- v. Hold the breath at maximum inspiration for 5-10 seconds.
- vi. Relax and allow easy expiration.

Physiotherapy management

- To relieve any bronchospasm and to facilitate the removal of secretions
- To improve breathing control and the control of dyspnoea during attacks
- To teach local relaxation, improve posture and help allay fear and anxiety
- To increase knowledge of the lung condition and control of symptoms
- To improve exercise tolerance and ensure a long term commitment to exercise
- To give advice about self-management.

The management of asthmatic patients should include maintenance of a good general fitness, and a vital part of asthma management is to educate the patient.

MEDICAL AND SURGICAL CONDITIONS

- Patient education: All asthmatic patients and their close relatives should be aware of how to manage their asthma, and the physiotherapist is integral is the education process. Prevention of infection is important. The patient should have plenty of fresh air, avoid smoky atmospheres and keep away from people with infections such as bronchitis and influenza. Stress or anxiety must be minimised as these can precipitate an attack. Patients must know what therapy to take and how to take it and where they should go to seek further help. All this should be carefully planned beforehand and incorporated into a written action plan and self-management strategy
- Removal of secretions: Some patients, especially children, have constant excessive secretions and may require postural drainage with the ACBT on a daily basis. It may be essential to teach forced expiration technique for clearing secretions without increasing bronchospasm.
- Relaxation: If the patient is able to practice relaxation it may be possible to ward off an attack when there has been exposure to an allergen. The onset of an attack is often preceded by a 'tickle' in the throat or a sensation of tightness in the chest. Relaxation and breathing control in an appropriate position may prevent an attack developing. Appropriate position' depends on where the patient is and may have to be against a wall or the back of a chair.
- Breathing control: Encouraging a longer expiratory phase is helpful, but neither inspiration nor expiration should be forced. This may be helped by counting (e.g. 'in 1-2, out 1-2-3') and by manual pressure just under the xiphisternum to encourage diaphragmatic excretion. The patient must breathe at a rate and rhythm that suits him or her. Children may be taught to breathe to a nursery rhyme.
- Avoid asthma triggers: Knowing what triggers the asthma is a necessary first step. Common triggers include pet dander, dust-mites, cockroaches, pollen, mold, and viruses. Exercise, cold air, and pollution trigger symptoms. Avoid these triggers to escape from asthma attacks.

3.2 BRONCHITIS

Bronchitis is an inflammation or swelling of the bronchial tubes (bronchi), the air passages between the mouth and nose and the lungs. More specifically, bronchitis describes a condition where the lining of the bronchial tubes becomes inflamed. Individuals with bronchitis have a reduced ability to breathe air and oxygen into their lungs; also they cannot clear heavy mucus or phlegm from their airways.

Types of bronchitis:

- Acute Bronchitis: lasts for a shorter duration and commonly occurs after a cold or viral infection, such as the flu. It causes cough with mucus, fever, headache, and chest discomfort. It can last from three to four days to up to three to four weeks. Acute bronchitis is contagious.
- Chronic Bronchitis: is a persistent form of bronchitis that can last for up to three months or even up to two years. It is caused by repeated irritation and damage of the lung and airway tissue and is caused by air pollution, dust and fumes.

Causes

The causes of acute bronchitis include:

- Viruses, that causes colds and flu.
- Exposure to substances that irritate the lungs, such as tobacco smoke, dust, fumes, vapours, and air pollution.
- bacterial infection

The causes of chronic bronchitis include:

- chronic smoking
- long-term exposure to air pollution, dust and fumes
- Repeated irritation and damage to the lung and airway tissue caused by smoking or pollution.

Clinical features:

The symptoms of bronchitis include:

- a persistent cough with mucus
- body aches
- breathlessness

- headache
- wheezing
- fever
- chest tightening and discomfort
- a sore throat
- blocked nose and sinuses



Complications:

- dyspnea
- pneumothorax
- polycythemia
- emphysema
- respiratory failure
- pneumonia
- cor pulmonale (alteration in the structure of the right ventricle in the heart)
- chronic advancement of the disease

Diagnosis:

Doctor will perform a quick medical exam with a stethoscope to listen for any abnormal sounds in the lungs.

Based on the severity of the condition the doctor may recommend:

- X-ray of the chest: to determine pneumonia
- Sputum test: to confirm whooping cough
- Pulmonary function test: to check the condition of the lungs

Treatment:

People suffering from bronchitis are usually instructed to rest, drink fluids, breath warm and moist air, and take OTC cough suppressants and pain relievers to manage symptoms and ease breathing.

To keep bronchitis symptoms under control and relieve symptoms, doctors might prescribe:

- Cough medicine although coughing should not be completely suppressed as this is an important way to bring up mucus and remove irritants from the lungs.
- Bronchodilators these open the bronchial tubes and clear out mucus.
- Mucolytics these thin or loosen mucus in the airways, making it easier to cough up sputum.
- Anti-inflammatory medicines and glucocortico steroids these are for more persistent symptoms to help decrease chronic inflammation that may cause tissue damage.
- Oxygen therapy this helps improve oxygen intake when breathing is difficult.
- Antibiotics these are effective for bacterial infections, but not for viral infections. They may also prevent secondary infections.

Physiotherapy management:

Postural drainage: This can be exercised at an angle of 45° in prone and inside lying. This must first be cleared with the institution as necessary, as well as considering possible contra-indications such as a head injury

- Manual techniques: Percussions, shaking and vibrations can be used to mobilize secretions and aid expectoration. Once again, precautions and contra-indications are to be observed.
- Breathing exercises: Teaching relaxed breathing techniques as well as diaphragmatic breathing to aid oxygenation and prevent respiratory distress. Full thoracic expansion must be emphasized which will aid oxygenation. The patient should be encouraged to aid the mobilization of secretions through coughing and deep breathing during the day. The patient, and family, should be advised that the patient needs to rest and avoid bronchial irritants where possible. This, however, does not exempt the patient from partaking in physiotherapeutic activities.
- Patient Education: Teaching the importance of nose blowing into a tissue and not swallowing the secretions as well as discarding the tissue safely after blowing their nose is important, as this will prevent the spread of infection. The patient and family/caregiver should be advised that a dry cough may persist after the bronchitis has resolved due to irritation of the respiratory passages. A humidifier at the bedside may be useful in combating the negative after-effects as it will saturate the air that is breathed in.

3.3 BRONCHIECTASIS

Bronchiectasis is a form of chronic obstructive pulmonary disease (COPD) in which the large airways of the lungs (bronchi) become damaged and widened. Mucous can collect in these dilated airways, allowing bacteria to grow and cause recurrent lung infections. The disease may be localized to one area of a lung, or generalized throughout both lungs.

Causes:

- Severe pneumonia
- Whooping cough or measles
- Tuberculosis
- Fungal infections
- Cystic fibrosis.
- Immunodeficiency disorders, such HIV and AIDS.
- Allergic bronchopulmonary aspergillosis -this is an allergic reaction to a fungus called aspergillus. The reaction causes swelling in the airways.

- Disorders that affect cilia function- such as primary ciliary dyskinesia. Cilia are small, hair-like structures that line the airways. They help clear mucus (a slimy substance) out of the airways.
- Chronic (ongoing) pulmonary aspiration -this is a condition in which you inhale food, liquids, saliva, or vomited stomach contents into the lungs.
- Connective tissue diseases, such as rheumatoid arthritis



Bronchiectasis

Clinical features:

- A daily cough that occurs over months or years
- Daily production of large amounts of sputum
- Shortness of breath and wheezing
- Chest pain
- Clubbing (the flesh under the fingernails and toenails gets thicker)

Diagnosis:

- Chest CT Scan
- Chest X Ray
- Blood tests.
- A sputum culture...
- Lung function tests...
- A sweat test or other tests for cystic fibrosis.
- Bronchoscopy

Treatment:

There is no cure for bronchiectasis, but early and effective treatment can help to:

- reduce complications
- prevent infections and exacerbations
- control secretions
- relieve obstructions in the airway
- improve quality of life
- stop the disease from progressing

Medical management

- Antibiotics: Antibiotics are the main treatment for the repeated lung infections that causes bronchiectasis. Oral antibiotics often are used to treat these infections. For hard-to-treat infections, the doctor may prescribe intravenous (IV) antibiotics. These medicines are given through an IV line inserted into the arm.
- Expectorants and Mucus-Thinning Medicines: Expectorants help loosen the mucus in the lungs. They often are combined with decongestants, which may provide extra relief. Mucus thinners, such as acetylcysteine, loosen the mucus to make it easier to cough up.
- Hydration: Drinking plenty of fluid, especially water, helps prevent airway mucus from becoming thick and sticky. Good hydration helps keep airway mucus moist and slippery, which makes it easier to cough up.
- Bronchodilators: Bronchodilators relax the muscles around the airways. This helps open the airways and makes breathing easier. Most bronchodilators are inhaled medicines. You will use an inhaler or a nebulizer to breathe in a fine mist of medicine.

Inhaled bronchodilators work quickly because the medicine goes straight to the lungs. The doctor may recommend that you use a bronchodilator right before you do CPT.

• Oxygen Therapy: Oxygen therapy can help raise low blood oxygen levels. For this treatment, you'll receive oxygen through nasal prongs or a mask. Oxygen therapy can be done at home, in a hospital, or in another health facility. (For more information, go to the Health Topics Oxygen Therapy article.)

- Lung surgery: If bronchiectasis affects only one lung or a limited area, or if damage is severe and there are frequent infections, surgery may be appropriate.
- Sometimes, a person with advanced bronchiectasis and cystic fibrosis may need lung transplantation.

Physical therapy:

Physiotherapy has a very valuable role in aiding with symptoms of bronchiectasis. Since mucociliary clearance is reduced to about 15% of normal, patients tend to cough more. Physiotherapy treatments are aimed at aiding secretion clearance; managing fatigue induced by the effort of ineffective clearance and increased coughing. The most common and effective treatments are:

Active Cycle of Breathing Technique (ACBT) is a commonly taught technique and is often used with Postural drainage and manual drainage. Its purpose is to loosen and clear excess pulmonary secretions, improve the effectiveness of a cough and to improve lung ventilation and function. It consists of 3 main stages:

- a) Breathing Control
- b) Huffing or Forced Expiratory Technique (FET)
- c) Manual Therapy

a) Breathing Control

Breathing control is used to relax the airways and relieve the symptoms of wheezing and tightness which normally occur after coughing or breathlessness. Breathing should be performed gently through the nose using as little effort as possible. If this is not possible then breathing should be done by mouth. If it is necessary to breathe out through the mouth this should be done with **'pursed lips breathing'**. While performing this technique it is important to encourage the patient use it as an opportunity to reduce any tension they may have, encouraging the patient to close their eyes while performing Breath Control can also be beneficial in helping to promote relaxation.

b) Forced expiration technique sometimes referred to as a huff. It is part of the breathing technique, but can be used alone. A huff is very effective at clearing secretions especially when combined with other airway clearance techniques

MEDICAL AND SURGICAL CONDITIONS

- c) Manual Therapy is a popular treatment technique and is often used when the patient is fatigue or experiencing an exacerbation of symptoms. It describes techniques that involve external forces to the chest wall to loosen mucus and includes any combination of percussion, shaking, rib springing, and vibrations and over pressure. Because of the nature of the technique it is contraindicated in patients that are taking anticoagulants or that have osteoporosis. The aim of treatment is to:
 - Loosen secretions
 - Reduce fatigue
 - > Increase the effectiveness of other treatment techniques

Complications

Complications of bronchiectasis include:

- repeat infections
- bleeding in the lungs
- respiratory failure, leading to low oxygen levels
- atelectasis, or a collapsed lung, which makes it difficult to breathe
- heart failure due to low oxygen levels

3.4 EMPHYSEMA

Emphysema is a condition of the lung characterised by Permanent dilation of the air spaces distal to the terminal bronchioles with destruction of the walls of these airways". It is always associated with chronic bronchitis and is difficult to distinguish the two conditions during life.

Causes:

- Cigarette smoking is the number one cause of emphysema. Smoking is responsible for 80% to 90% of chronic obstructive pulmonary disease (COPD) cases, including emphysema. Being exposed to secondhand smoke also increases the risk of developing emphysema.
- Infections of the respiratory tract can also destroy lung tissue and thus contribute to the development or worsening of emphysema. Likewise, having emphysema increases the likelihood of infection.
- Heredity is occasionally a factor in emphysema

- Aging naturally brings changes to the lungs and air sacs even in non-smokers. The loss of elasticity can eventually become severe enough to be classified as emphysema.
- Air pollution can also irritate the lungs and cause emphysema, although pollution alone is rarely the cause.

Types of emphysema:

Emphysema is usually of two types: 1. Centrilobular emphysema 2.Panacinar emphysema **1. Centrilobular emphysema-** In centrilobular emphysema the upper zones of the lung is usually affected. This causes gross disturbance of the ventilation /perfusion relationship since there is a relatively well-preserved blood supply to the alveoli, but the amount of oxygen reaching the capillary is decreased owing to the damage to airways proximal to the alveoli.

2. Panacinar emphysema-Predominantly affects the lower lobes and lower lobe involvement is more common in individuals with alfa1-antitrypsin deficiency. This has a less drastic effect on the ventilation/perfusion relationship, since the blood supply in the damaged areas is decreased in proportion to the decreased ventilation in those areas.

Clinical features:

- Progressive dyspnea Shortness of breath occurs initially on exertion, but as the disease progresses it will gradually occur after less and less activity and finally at rest.
- Respiratory pattern The patient has a 'fishlike' inspiratory gasp, which is followed by prolonged, forced expiration usually against 'pursed lips'.
- Cough with sputum-This will be present if the disease is associated with chronic bronchitis or if there is infection.
- Chest shape -The chest becomes barrel-shaped and fixed in inspiration, with widening of the intercostals spaces.
- Poor postures -There may be a thoracic kyphosis plus elevated and protracted shoulder girdle.
- Polycythemia This may develop in response to prolonged decrease in pao₂ owing to the ventilation/perfusion imbalance.
- Core pulmonale -This occurs in advanced stages of the disease.
- Lung function -The FEV1/FVC ratio is usually below 70per cent. RV is increased and lung volume may exceed the predicted total lung capacity (TLC).



Investigations:

- X-rays: X-rays are generally not useful for detecting early stages of emphysema. However, X-rays can help diagnose moderate or severe cases.
- Pulse oximetry: This test is also known as an oxygen saturation test. Pulse oximetry is used to measure the oxygen content of the blood. This is done by attaching the monitor to a person's finger, forehead, or earlobe.
- Spirometry and pulmonary function tests (PFT)
- Arterial blood gas:
- Electrocardiogram (ECG): ECGs check heart function and are used to rule out heart disease as a cause of shortness of breath.

Treatment:

Because emphysema can worsen over time and there is no known cure, treatment is focused on slowing the speed of decline. The type of treatment will depend on the severity of the disease.

- Quitting smoking: This is the most important to protect the lungs. It is never too late to quit. Doctor can help you find the best smoking quitting method for you.
- Bronchodilator medications: These medicines relax the muscles around the airways. They are often used to treat asthma. Bronchodilators, given through hand-held inhalants, produce more immediate results and have fewer side effects than oral medications.

- Anti-inflammatory medication: These medications reduce inflammation in the airways. However, long-term side effects of these drugs include osteoporosis, hypertension, high blood sugar, and fat redistribution.
- Oxygen therapy: Oxygen therapy is prescribed for patients whose lungs are not getting enough oxygen to the blood (hypoxemia). These patients can't absorb enough oxygen from the outside air and need to get more oxygen through a machine (a nasal catheter or a facemask).
- Lung volume reduction surgery: Lung volume reduction surgery involves removing a portion of diseased lung tissue, then joining together the remaining tissue. Doing this may relieve pressure on the breathing muscles and help improve lung elasticity (or stretch). The results of the surgery have been very promising. Not all patients with emphysema are candidates for this surgery.

Physiotherapy management:

- To remove excess bronchial secretion and reduce the airflow obstruction.
- To establish the coordinated pattern of breathing
- To promote relaxation and improve posture
- To improve the mobility of thorax, shoulder girdle and neck
- To increase the exercise tolerance
- To encourage a full and active life style.
- Postural drainage: In case of emphysema, postural drainage is not necessary but in an infection episode, where sputum may be present PD may be needed. The optimum position must be established with individual and advice for postural drainage at home. Clapping and Shaking are effective over the affected lung segments and help to loosen and move the secretions to central airways during expiration. Then ask the patient to take 2-3 coughs to remove the secretions out.
- Active cycle of breathing teqnique: The Active Cycle of Breathing Techniques (ACBT) is an active breathing technique performed by the patient to help clear their sputum the lungs. The ACBT is a group of techniques which use breathing exercises to improve the effectiveness of a cough, loosen and clear secretions and improve ventilation.

ACBT consists of three main phases:

- a. Breathing Control
- b. Deep Breathing Exercises or thoracic expansion exercises
- c. Huffing OR Forced Expiratory Technique (F.E.T)

Additionally, a manual technique (MT) or positive pressure can be added if and when indicated, to create a more complex cycle to help improve removal of secretions on the lungs.

A. Breathing Control

breathing control is used to relax the airways and relieve the symptoms of wheezing and tightness which normally occur after coughing or breathlessness. Breathing should be performed gently through the nose using as little effort as possible. If this is not possible then breathing should be done by mouth. If it is necessary to breathe out through the mouth this should be done with **'pursed lips breathing'**. While performing this technique it is important to encourage the patient use it as an opportunity to reduce any tension they may have, encouraging the patient to close their eyes while performing Breath Control can also be beneficial in helping to promote relaxation.

When using this technique with a patient as part of the ACBT the patient should be instructed to usually 6 breaths. Instructions to patient: Rest one hand on the stomach and keep the shoulders relaxed to drop down. Feel the stomach rise as you breathe in and fall when you breathe out.

B. Deep breathing Exercises

• Deep breathing is used to get air behind the sputum stuck in small airways and relax the upper chest.

Technique:

- Breathe in slowly and deeply.
- ▶ Breathe out gently until the lungs are empty don't force the air out.
- Repeat 3 4 times, if the patient feels light headed then it is important that they revert back to the Breathing Control portion of the cycle.
- At the end of the breath in, hold the air in the lungs for 3 seconds (this is known as an inspiratory hold).
- Deep breathing/thoracic expansion exercises recruit the collateral ventilator system assisting, the movement of air distal to mucus plugs in the peripheral airways.
- Deep breaths to utilise collateral channels and get air behind sputum to mobilise it towards larger airways and towards the mouth.

Instructions to patient:

- Relax the shoulders.
- Place both hands on either side of ribs.
- Breathe in deeply feeling as the ribs expand.
- Breathe out gently as far as you can until the lungs feel empty.
- Deep breathing/thoracic expansion is usually repeated 4 times.

C. Huffing or FET (FORCE EXPIRATORY TECNIC)

The FET is an integral part of the ACBT described by Pryor and Webber.

A huff is exhaling through an open mouth and throat instead of coughing. Huffing
moves sputum from the small airways to the larger airways, from where they are
removed by coughing. Coughing alone does not remove sputum from small airways.

Take a small-medium sized breath in

- Squeeze the breath out by contracting the tummy muscles and keep the mouth and throat open to perform a huff. This small-medium sized huff helps with the removal of sputum in the lower reaches of the lungs.
- To remove sputum in the higher portions of the lungs take a large breath in.
- Squeeze the air out as before to perform a huff.
- Cough and expectorate any sputum. If no sputum is produced with 1 or 2 coughs, try to stop coughing by encouraging the patient to use Breathing Control, the main technique used in between the more active stages of the as ACBT.
- Allow the breathing to settle with breathing control and then repeat the cycle until the chest feels clear. Small long huffs move sputum from low down into chest whereas big short huffs moves sputum from higher up into chest, so use this huff when it feels ready to come out, but not before; huffs work via dynamic compression.
- Posture correction Patient should be taught to attain maximal relaxation of the upper chest as well as movements of lower chest. The main emphasis is on relaxed and controlled diaphragmatic breathing. For maintaining posture the patient should not be kept with forward head and rounded shoulder.

- Thoracic mobility exercises are given along with shoulder girdle movements. Free active exercises for whole spine to prevent kyphosis and fixed inspiration.
- In daily life style patient should avoid smoking and encouraged to keep fit and eat sensibly. For gaining relaxation, swimming helps very much. Jerky and quick movements should be strictly avoided.

Prevention:

- Avoid second-hand smoke.
- Avoid air pollution as much as possible.
- Exercise when possible
- Use air conditioning with a filter and humidity control.
- Avoid allergic "triggers" that can aggravate emphysema if asthma coexists.
- Avoid cold air, which can cause the lungs to spasm
- Avoid high altitudes.
- Wash the hands and brush the teeth frequently to avoid infections.

3.5 TUBERCULOSIS (TB)

Tuberculosis is a disease caused by bacteria called Mycobacterium tuberculosis. The bacteria usually attack the lungs, but they can also damage other parts of the body. TB spreads through the air when a person with TB of the lungs or throat coughs, sneezes, or talks.

Causes:

The Mycobacterium tuberculosis bacterium causes TB. It is spread through the air when a person with TB (whose lungs are affected) coughs, sneezes, spits, laughs, or talks.

Types of tuberculosis infection: Latent and Active.

Latent TB - the bacteria remain in the body in an inactive state. They cause no symptoms and are not contagious, but they can become active.

Active TB - the bacteria do cause symptoms and can be transmitted to others.

About one-third of the world's population is believed to have latent TB. There is a 10 percent chance of latent TB becoming active, but this risk is much higher in people who have compromised immune systems, i.e., people living with HIV or malnutrition, or people who smoke.TB affects all age groups and all parts of the world. However, the disease mostly affects young adults and people living in developing countries.

Clinical features:

- A bad cough that lasts 3 weeks or longer
- Weight loss
- Loss of appetite
- Coughing up blood or mucus
- Weakness or fatigue
- Fever
- Night sweats

Diagnosis

- **Physical exam**, doctor will check lymph nodes for swelling and use a stethoscope to listen carefully to the sounds of lungs while breathing.
- Simple skin test a small amount of a substance called PPD tuberculin is injected just below the skin of forearm. Within 48 to 72 hours, a health care professional will check fore arm for swelling at the injection site. A hard, raised red bump means likely to have TB infection. The size of the bump determines whether the test results are significant.
- Blood tests
- Imaging tests -chest X-ray or a CT scan
- **Sputum tests** samples of sputum or the mucus that comes up while cough are tested for TB bacteria.

Treatment

The majority of TB cases can be cured when the right medication is available and administered correctly. The precise type and length of antibiotic treatment depend on a person's age, overall health, potential resistance to drugs, whether the TB is latent or active, and the location of infection (i.e., the lungs, brain, kidneys).

People with latent TB may need just one kind of TB antibiotics, whereas people with active TB (particularly MDR-TB) will often require a prescription of multiple drugs.

MEDICAL AND SURGICAL CONDITIONS

Antibiotics are usually required to be taken for a relatively long time. The standard length of time for a course of TB antibiotics is about 6 months.

- Isoniazid
- Rifampin (Rifadin, Rimactane)
- Ethambutol (Myambutol)
- Pyrazinamide

TB medication can be toxic to the liver, and although side effects are uncommon, when they do occur, they can be quite serious. Potential **side effects** should be reported to a doctor and include: Dark urine, Fever, Jaundice, Loss of appetite, Nausea and vomiting

Complications

If left untreated, TB can be fatal. Although it mostly affects the lungs, it can also spread through the blood, causing complications, such as:

- Meningitis: swelling of the membranes that cover the brain.
- Spinal pain.
- Joint damage.
- Damage to the liver or kidneys.

Physiotherapy management

People with pulmonary TB are typically not treated in physical therapy because medications are vital for curing TB. However, therapists are able to provide percussion and postural drainage to clear secretions out of the lung.

Once the infection was controlled, the patient should continue the physiotherapy treatment to achieve the following:

- To establish the coordinated pattern of breathing
- To promote relaxation and improve posture
- To improve the mobility of thorax, shoulder girdle and neck
- To increase the exercise tolerance
- To encourage a full and active life style.

QUESTIONS:

2 marks:

- 1. Define COPD?
- 2. Define asthma?
- 3. Define bronchitis and write the types?
- 4. Define bronchiectasis?
- 5. Define emphysema and write the types?
- 6. Define tuberculosis and write the types?
- 7. Mention the names of TB antibiotics?

6 marks:

- 1. Explain Asthma in detail along with its PT management?
- 2. Explain Bronchitis in detail along with its PT management?
- 3. Explain Bronchiectasis in detail along with its PT management?
- 4. Explain Emphysema in detail along with its PT management?
- 5. Explain TB in detail along with its PT management?

Ψ



CARDIO-VASCULAR DISORDERS

Structure:

- 4.1 Coronary artery disease
- 4.2 Hypertension
- 4.3 Cardiac arrest

4.1 CORONARY ARTERY DISEASE (CAD)

Coronary artery disease is characterized by disease within the arteries that supply the heart muscle. The disease typically develops due to atherosclerosis (hardening) and plaques (sections of calcified material) within the blood vessels. As a result, the coronary arteries often cannot carry blood as efficiently as they should and may even become completely obstructed (blocked off). Because the heart muscle requires a continuous supply of oxygen and nutrients to survive, obstruction of a coronary artery rapidly leads to significant problems, such as heart attacks and strokes.

Causes

- Development of atherosclerosis
- Coronary artery disease is thought to begin with damage or injury to the inner layer of a coronary artery, sometimes as early as childhood. The damage may be caused by various factors, including:
 - > Smoking
 - High blood pressure
 - High cholesterol
 - Diabetes or insulin resistance
 - Sedentary lifestyle

ATHEROSCLEROSIS



Clinical features:

The most common symptom is angina, or chest pain.

Angina can be described as a:

- Heaviness
- Pressure
- Aching
- Burning
- Numbness
- Fullness
- Squeezing
- Painful feeling

It can be mistaken for indigestion or heartburn.

Angina is usually felt in the chest, but may also be felt in the:

- Shoulder
- Arms
- Neck
- Back
- Jaw

Other symptoms that can occur with coronary artery disease include:

- Shortness of breath
- Palpitations (irregular heartbeats, skipped beats, or a "flip-flop" feeling in your chest)
- A faster heartbeat
- Weakness or dizziness
- Nausea
- Sweating

Diagnosis:

Diagnosing CAD requires a review of medical history, a physical examination, and other medical testing. These tests include:

- Electrocardiogram
- Echocardiogram
- Stress test:
- Cardiac catheterization
- Heart CT scan

Treatment:

The treatment of CAD requires a multi-pronged strategy that includes addressing lifestyle factors as necessary, taking prescription medications, and, often, surgical or specialized interventions to repair a severely diseased artery.

- Lifestyle factors: If you smoke, quitting is the most effective way to prevent CAD from worsening, and smoking cessation can reverse disease for some people with CAD. Obesity, lack of exercise, an unhealthy diet, and excessive stress all contribute to CAD as well.
- **Medications:** Cholesterol-lowering medications are available by prescription and can help reduce atherosclerotic disease and the build-up of plaque. Medications to control diabetes can help to prevent worsening of CAD. Those that lower high blood pressure and prevent blood clots may be necessary to lower the risk of a heart attack or stroke if you have CAD. And, if you have experienced a heart attack as a result of CAD, prescription medications can help alleviate some of the consequences of a heart attack, such as heart failure (a weak heart) and arrhythmias (irregular heart rhythm).
- Surgery and special procedures: Arteries can be repaired and replaced with surgical interventions or minimally invasive procedures.
 - Coronary artery bypass graft (CABG) is a surgical procedure in which a healthy artery is used to create a bypass (new pathway) for blood to flow to the heart muscle.
 - An endarterectomy is a procedure in which a coronary artery is surgically "cleaned" of a plaque.
 - A stent is an artificial "tunnel" that is placed into a diseased artery.

• A balloon catheterization is a procedure in which a device is inflated in the narrow area of a coronary artery to open it up and allow blood to flow.

Physiotherapy management:

Physiotherapy is important in the management of coronary heart disease. The cornerstone of physiotherapy management is cardiac rehabilitation. In patients undergoing heart surgery, physiotherapy can also help with recovery after surgery. Physiotherapist may see the patient before and after surgery to help to prevent a chest infection and regain mobility and walking as soon as possible

There are three types of cardiac rehabilitation.

Phase I: In the Hospital

Exercise rehabilitation can begin as soon as patients are medically stable. Breathing exercises and leg exercises get patients to use their muscles, and these exercises help to re-establish the patient's confidence that it will be safe to become active again. As the patient heals, assisted walking and light

physical therapy can be added. By day four, patients are usually able to walk for 5 to 10 minutes in the corridors 3 to 4 times/day.

Phase II: After Discharge

Following discharge from the coronary care unit, a reconditioning program is begun. This usually includes having the patient walk indoors on a level floor at a speed that does not raise the patient's pulse >20 beats/minute above its resting rate. Patients should be reassured that they may fatigue easily.

Over 4 to 6 weeks, patients who are recovering well should be encouraged to increase gradually the total distance they walk until they are walking a total of 3 miles/day. Patients are asked to keep a diary of their daily exercise and the occurrences of any problems, and the physical therapist checks the diary regularly.

Phase III: Supervised Exercise Program

When they have been medically cleared by their physician, patients can begin a 6- to 12month program of regular, supervised exercise. Often, the physician will perform a symptomlimited stress test to establish the patient's initial exercise capacity for the exercise program. One commonly followed rehabilitation plan offers supervised exercise programs in 8-week sessions of 2 to 5 classes per week. The intensity of exercise is increased slowly over the sessions.

The main cardiac rehabilitation exercises are aerobic (walking on treadmills, stationary bicycling)—and the intensity of exercise is limited by the patient's heart rate or feeling of fatigue (perceived exertion). Exercising to 60% to 75% of their maximum heart rate is a typical goal for cardiac patients. (A rough calculation of maximum heart rate is 220 minus the patient's age.)

Each session begins with 5 to 15 minutes of gentle exercise to decrease peripheral vascular resistance. Patients then undertake 5 to 30 minutes of aerobic exercise. On their physician's advice, some patients should have ECG monitoring during the exercises. Classes end with a 10-minute cool down period.

4.2 HYPERTENSION

Hypertension which is chronically high blood pressure is one of the most common medical problems. Hypertension does not usually cause any symptoms, and it is not always diagnosed in the early stages. It is a leading cause of heart attack, stroke, kidney disease, and other serious medical problems. Because hypertension is so common and consequential, it is important for everyone to have their blood pressure checked periodically.

Causes:

There are two types of high blood pressure.

Primary (essential) hypertension: For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

Secondary hypertension: Some people have high blood pressure caused by an underlying condition. This type of high blood pressure, called secondary hypertension, tends to appear suddenly and cause higher blood pressure than does primary hypertension. Various conditions and medications can lead to secondary hypertension, including:

- Obstructive sleep apnea
- Kidney problems
- Adrenal gland tumors

- Thyroid problems
- Certain defects you're born with (congenital) in blood vessels
- Certain medications, such as birth control pills, cold remedies, decongestants, overthe-counter pain relievers and some prescription drugs
- Illegal drugs, such as cocaine and amphetamines

Clinical features:

Hypertension is generally a silent condition. Many people won't experience any symptoms. It may take years or even decades for the condition to reach levels severe enough that symptoms become obvious. Even then, these symptoms may be attributed to other issues. Symptoms of severe hypertension can include:

- headache
- shortness of breath
- nosebleeds
- flushing
- dizziness
- chest pain
- visual changes
- blood in the urine

These symptoms require immediate medical attention. They don't occur in everyone with hypertension, but waiting for a symptom of this condition to appear could be fatal.

Diagnosis:

The best way to know the hypertension is to get regular blood pressure readings. Most doctors' offices take a blood pressure reading at every appointment. In addition to measuring blood pressure, doctor will ask about the past medical history (whether you've had heart problems before), assess risk factors (whether you smoke, have high cholesterol, diabetes, etc.), and talk about your family history (whether any members of your family have had high blood pressure or heart disease).

The doctor will also conduct a physical exam. As part of this exam, he or she may use a stethoscope to listen to the heart for any abnormal sounds or "murmurs" that could indicate a

problem with the valves of the heart. The doctor will also listen for a whooshing or swishing sound that could indicate your arteries are blocked. The doctor may also check the pulses in arm and ankle to determine if they are weak or even absent.

Treatment:

While blood pressure is best regulated through the diet before it reaches the stage of hypertension, there is a range of treatment options.

Lifestyle adjustments are the standard first-line treatment for hypertension.

Stress reduction

Avoiding stress, or developing strategies for managing unavoidable stress, can help with blood pressure control. Using alcohol, drugs, smoking, and unhealthy eating to cope with stress will add to hypertensive problems. These should be avoided. Smoking can raise blood pressure. Giving up smoking reduces the risk of hypertension, heart conditions, and other health issues.

Medications

People with blood pressure higher than 130 over 80 may use medication to treat hypertension.

Drugs are usually started one at a time at a low dose. Side effects associated with antihypertensive drugs are usually minor.

Eventually, a combination of at least two antihypertensive drugs is usually required.

A range of drug types are available to help lower blood pressure, including:

- diuretics, including thiazides, chlorthalidone, and indapamide
- beta-blockers and alpha-blockers
- calcium-channel blockers
- central agonists
- peripheral adrenergic inhibitor
- vasodilators
- angiotensin-converting enzyme (ACE) inhibitors
- angiotensin receptor blockers

MEDICAL AND SURGICAL CONDITIONS

The choice of drug depends on the individual and any other conditions they may have. Anyone taking antihypertensive medications should be sure to carefully read labels, especially before taking any over-the-counter (OTC) medications, such as decongestants. These may interact with medications used to lower blood pressure.

Physiotherapy Management:

The role of physio in hypertension is to advice patient that

- Losing weight through proper diet and physical activity.
- Decreasing stress in the form of yoga, meditation, playing games participating in social activities.
- Practising general relaxation and breathing exercises.
- **Regular physical exercise:** Those patients with hypertension engage in 30 minutes of moderate-intensity, dynamic, aerobic exercise. This can include walking, jogging, cycling, or swimming on 5 to 7 days of the week.

4.3 CARDIAC ARREST

Cardiac arrest is a sudden loss of blood flow resulting from the failure of the heart to effectively pump. Symptoms include loss of consciousness and breathing. Some individuals may experience chest pain, shortness of breath, or nausea before cardiac arrest .If not treated within minutes, it typically leads to death.

Causes

The immediate cause of most sudden cardiac arrests is an abnormal heart rhythm. The heart's electrical activity becomes chaotic, and it can't pump blood to the rest of the body. Conditions that can trigger sudden cardiac arrest include:

Heart-related causes

- coronary heart disease
- heart attack
- cardiomyopathy and some inherited heart conditions
- congenital heart disease
- heart valve disease
- acute myocarditis (inflammation of the heart muscle)

Other causes

- electrocution
- drug overdose
- severe haemorrhage losing a large amount of blood
- Drowning.
- trauma
- bleeding (such as gastrointestinal bleeding, aortic rupture, or intracranial hemorrhage),
- pulmonary embolism
- Cardiac arrest can also be caused by poisoning (for example, by the stings of certain jellyfish).

Clinical features:

Sudden cardiac arrest signs and symptoms are immediate and drastic and include:

- Sudden collapse
- No pulse
- No breathing
- Loss of consciousness
- Sometimes other signs and symptoms occur before sudden cardiac arrest. These might include:
 - Chest discomfort
 - Shortness of breath
 - Weakness
 - Palpitations
 - But sudden cardiac arrest often occurs with no warning.
- Risk factors
 - smoking
 - sedentary lifestyle
 - high blood pressure

- obesity
- family history of heart disease
- history of a previous heart attack
- age over 45 for men, or over 55 for women
- male gender
- substance abuse
- low potassium or magnesium

Diagnosis

- Checking of pulse.
- Electrocardiogram
- Echocardiography
- MUGA Test or Cardiac MRI
- Cardiac Catheterization
- Electrophysiology Study
- Blood Tests

Treatment

Cardiopulmonary resuscitation (CPR) is one form of emergency treatment for cardiac arrest. Defibrillation is another. These treatments get the heart beating again once it has stopped.

If anyone survives with a cardiac arrest, the doctor may start one or more treatments to reduce the risk of another attack.

- Medication can lower high blood pressure and cholesterol.
- Surgery can repair damaged blood vessels or heart valves. It can also bypass or remove blockages in the arteries.
- Exercise may improve cardiovascular fitness.
- Dietary changes can help you lower cholesterol.

Physiotherapy management:

In patients undergoing heart surgery, physiotherapy can also help with recovery after surgery. There are three types of cardiac rehabilitation.
Phase I: In the Hospital

Exercise rehabilitation can begin as soon as patients are medically stable. Breathing exercises and leg exercises get patients to use their muscles, and these exercises help to re-establish the patient's confidence that it will be safe to become active again. As the patient heals, assisted walking and light physical therapy can be added. By day four, patients are usually able to walk for 5 to 10 minutes in the corridors 3 to 4 times/day.

Phase II: After Discharge

Following discharge from the coronary care unit, a reconditioning program is begun. This usually includes having the patient walk indoors on a level floor at a speed that does not raise the patient's pulse >20 beats/minute above its resting rate. Patients should be reassured that they may fatigue easily.

Over 4 to 6 weeks, patients who are recovering well should be encouraged to increase gradually the total distance they walk until they are walking a total of 3 miles/day. Patients are asked to keep a diary of their daily exercise and the occurrences of any problems, and the physical therapist checks the diary regularly.

Phase III: Supervised Exercise Program

When they have been medically cleared by their physician, patients can begin a 6- to 12month program of regular, supervised exercise. Often, the physician will perform a symptomlimited stress test to establish the patient's initial exercise capacity for the exercise program. One commonly followed rehabilitation plan offers supervised exercise programs in 8-week sessions of 2 to 5 classes per week. The intensity of exercise is increased slowly over the sessions.

The main cardiac rehabilitation exercises are aerobic (walking on treadmills, stationary bicycling)—and the intensity of exercise is limited by the patient's heart rate or feeling of fatigue (perceived exertion). Exercising to 60% to 75% of their maximum heart rate is a typical goal for cardiac patients. (A rough calculation of maximum heart rate is 220 minus the patient's age.)

Each session begins with 5 to 15 minutes of gentle exercise to decrease peripheral vascular resistance. Patients then undertake 5 to 30 minutes of aerobic exercise. On their physician's advice, some patients should have ECG monitoring during the exercises. Classes end with a 10-minute cool down period.

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QUESTIONS:

2 marks:

- 1. What are the causes and clinical features of coronary artery diseases?
- 2. What is hyper tension and write the types?
- 3. Mention the causes of hypertension?
- 4. What is cardiac arrest?
- 5. Write the causes and clinical features of cardiac arrest?

6 marks:

- 1. Explain in detail about Coronary artery diseases along with its management?
- 2. Explain in detail about Hypertension along with its management?
- 3. Explain in detail about Cardiac arrest along with its management?

Ψ



ENDOCRINAL DISORDERS

Structure:

- 5.1 Hyperthyroidism
- 5.2 Hypothyroidism
- 5.3 Diabetes Mellitus

5.1 HYPERTHYROIDISM

Hyperthyroidism is a condition in which the thyroid gland is overactive and makes excessive amounts of thyroid hormone. The thyroid gland is an organ located in the front of the neck and releases hormones that control metabolism (the way our body uses energy), breathing, heart rate, nervous system, weight, body temperature, and many other functions in the body. When the thyroid gland is overactive (hyperthyroidism) the body's processes speed up and person may experience nervousness, anxiety, rapid heartbeat, hand tremor, excessive sweating, weight loss, and sleep problems, among other symptoms.

Causes:

A variety of conditions can cause hyper thyroidism. Graves' disease, an autoimmune disorder, is the most common cause of hyperthyroidism. It causes antibodies to stimulate the thyroid to secrete too much hormone. Graves' disease occurs more often in women than in men. It tends to run in families, which suggests a genetic link.

Other causes of hyperthyroidism include:

- excess iodine, a key ingredient in T4 and T3
- thyroiditis, or inflammation of the thyroid, which causes T4 and T3 to leak out of the gland
- tumors of the ovaries or testes
- benign tumors of the thyroid or pituitary gland
- large amounts of tetraiodothyronine taken through dietary supplements or medication



Thyroid and Parathyroid Glands

Clinical features:

The symptoms of hyperthyroidism include the following:

- fatigue or muscle weakness
- hand tremors
- mood swings
- nervousness or anxiety
- rapid heartbeat
- heart palpitations or irregular heartbeat
- skin dryness
- trouble sleeping
- weight loss
- increased frequency of bowel movements
- Light periods or skipping periods.

Diagnosis:

Complete medical history and physical exam. This can reveal these common signs of hyperthyroidism:

- ➤ weight loss
- ➤ rapid pulse
- elevated blood pressure
- protruding eyes
- enlarged thyroid gland

Other tests may be performed to further evaluate your diagnosis. These include:

- Cholesterol test
- T4, free T4, T3
- .Thyroid stimulating hormone level test
- Triglyceride test
- Thyroid scan and uptake
- Ultrasound
- CT or MRI scans

TREATMENT

Medication

- Antithyroid medications -such as methimazole (Tapazole) are a common treatment.
- Radioactive

Surgery

A section or all of the thyroid gland may be surgically removed. Patient have to take thyroid hormone supplements to prevent hypothyroidism, which occurs when patient have an underactive thyroid that secretes too little hormone. Also, beta-blockers such as propranolol can help control rapid pulse, sweating, anxiety, and high blood pressure. Most people respond well to this treatment.

Physiotherapy management:

- To improve muscle performance
- To improve joint mobility, motor function, muscle performance, and ROM associated with connective tissue dysfunction.
- To improve joint mobility, motor function, muscle performance, and ROM associated with localized inflammation.
- To improve aerobic capacity/endurance associated with deconditioning.

Physiotherapy according to symptoms:

 Chronic periarthritis and calcific tendinitis are also associated with hyperthyroidism. They both tend to occur in the shoulder, causing limitations in a person's ROM, which may progress and lead to adhesive capsulitis. Therapeutic interventions using ultrasound,

joint mobilizations, stretching, and strengthening may be performed once the thyroid gland is regulated.

Hyperthyroidism develops proximal muscle weakness as a result of treatment, most often affecting the pelvis and thigh muscles. Strengthening and ROM exercises can help to improve the condition.

5.2 HYPOTHYROIDISM

Hypothyroidism is a condition in which the body's thyroid gland is underactive. Meaning, the thyroid gland fails to produce enough of the thyroid hormones, Tri-iodothyronine (T3), and Thyroxine (T4).Hypothyroidism may not cause noticeable symptoms in the early stages. Over time, untreated hypothyroidism can cause a number of health problems, such as obesity, joint pain, infertility and heart disease.

Causes:

Hypothyroidism can be caused by a number of factors such as:

- Hashimoto's Thyroiditis: This is a condition in which the thyroid gland gets inflamed. Also known as Thyroiditis, this occurs when the body's immune system attacks the thyroid gland and destroys it.
- Iodine Deficiency: The thyroid gland needs iodine to be able to produce T3 and T4 hormones. Since our bodies do not produce iodine, we are dependent on the foods we consume to provide the required amount of iodine to the body. Foods that are rich in iodine include milk and milk-based products, saltwater fishes, eggs, bananas, yoghurt, strawberries, cranberries, green beans, and white bread.
- Pregnancy: During pregnancy, some women tend to develop an inflamed thyroid. This condition is also known as postpartum thyroiditis. Though the cause for it is unknown, after a certain time span, the thyroid hormone levels return to normal in these women.
- Radiation Therapy: Radiation given to the thyroid gland can reduce its production of hormones.

MED

- Certain medications: Some medicines can interfere with normal production of thyroid hormone. Lithium, for example, is one of the most common medicines that cause hypothyroidism.
- Growths in the thyroid: Thyroid nodules are abnormal overgrowths of tissue in the thyroid gland that are most often benign—but may be cancerous in some people. There are a few disorders that can cause these growths an example of which is the autoimmune disorder known as sarcoidosis. In sarcoidosis, inflamed tissue forms throughout the body. The

inflamed tissue replaces the healthy thyroid tissue, which results in inhibiting thyroid hormone production. As a result, hypothyroidism occurs.

- Genetic Causes: Damaged genes can also cause hypothyroidism. The causes are generally detected during infancy.
- Problem with the Hypothalamus: Hypothalamic dysfunction caused by surgery, traumatic brain injury, tumours, and radiation can, in turn, can cause hypothyroidism. The hypothalamus controls the pituitary gland, which in turn controls the thyroid gland among others. Therefore, any abnormality in the hypothalamus can cause the thyroid gland to dysfunction.
- Pituitary Gland Disorder: The pituitary gland turn controls the thyroid gland among others. Therefore, any abnormal functioning of the pituitary gland affects the thyroid gland.

Clinical features:

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The signs and symptoms of hypothyroidism vary, depending on the severity of the hormone deficiency. Problems tend to develop slowly, often over a number of years.

- Fatigue
- Increased sensitivity to cold
- Constipation
- Dry skin
- Weight gain
- Puffy face
- Hoarseness
- Muscle weakness

MEDICAL AND SURGICAL CONDITIONS

- Elevated blood cholesterol level
- Muscle aches, tenderness and stiffness
- Pain, stiffness or swelling in your joints
- Heavier than normal or irregular menstrual periods
- Thinning hair
- Slowed heart rate
- Depression
- Impaired memory
- Enlarged thyroid gland (goiter)

Diagnosis:

- Physical exam and medical history. They'll check for physical signs of hypothyroidism, including:
 - ➤ dry skin
 - slowed reflexes
 - ➤ swelling
 - > a slower heart rate
- Experiencing, such as fatigue, depression, constipation, or feeling constantly cold.
- Have a known family history of thyroid conditions
- Blood tests are the only way to reliably confirm a diagnosis of hypothyroidism.
- A thyroid-stimulating hormone (TSH) test measures how much TSH pituitary gland is creating:
- A thyroxine (T4) level test is also useful in diagnosing hypothyroidism...

Treatment:

- Hypothyroidism is treated with replacement doses of thyroid hormones.
- Synthetic forms of these hormones are used: including levothyroxine (Synthroid, Levoxyl and other brand names), liothyronine (Cytomel) or liotrix (Thyrolar).

- Anyone taking thyroid medication has to have a blood test periodically to make sure the dose he or she is taking is maintaining the right levels of thyroid hormones in the body.
- It is especially important for people with hypothyroidism to be monitored during pregnancy, because the need for thyroid hormone may go up.
- Also some foods and medications can lower the amount of active thyroid hormone available to the body's cells. For example, iron can interfere with the absorption of thyroid medication inside the intestine, and oral estrogen tends to make more circulating thyroid bind to proteins in the blood, so less free thyroid hormone is available to the body's cells.

Physiotherapy management:

Regular exercise plays a vital role in hypothyroidism management plan.

- It helps to rebuild activity tolerance, increase muscle strength, and reduce apathy secondary to the decreased metabolism caused by the disorder.
- To improve Muscle Performance.
- To improve Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Connective Tissue Dysfunction.
- To improve Joint Mobility, Motor Function, Muscle Performance and Range of Motion Associated with Localized Inflammation.
- To improve Joint Mobility, Motor Function, Muscle Performance, Range of Motion and Reflex Integrity Associated with Spinal Disorders.
- To improve Aerobic Capacity/Endurance associated with deconditioning.
- Primary Prevention/Risk reduction for Integumentary Disorders.
- Increasing the patient's exercise tolerance can also be extremely helpful for patients who are severely constipated from the disorder.
- Increasing aerobic activity can have benefits on the cardiovascular health of the patient and reduce risk factors for cardiac events.

5.3 DIABETES MELLITUS

Diabetes mellitus is a chronic disease caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Such a deficiency results in increased concentrations of glucose in the blood, which in turn damage many of the body's systems, in particular the blood vessels and nerves.

Types of Diabetes

There are two main types of diabetes: type 1 and type 2:

• Type 1 diabetes –

Occurs because the insulin-producing cells of the pancreas (beta cells) are damaged. In type 1 diabetes, the pancreas makes little or no insulin, so sugar cannot get into the body's cells for use as energy. People with type 1 diabetes must use insulin injections to control their blood glucose. Insulin is usually given through injections under the skin, normally two to four times a day. This form was previously referred to as "Insulin-Dependent Diabetes Mellitus" (IDDM) or "Juvenile Diabetes. Type 1 is the most common form of diabetes in people who are under age 30, but it can occur at any age. Ten percent of people with diabetes are diagnosed with type 1.

• Type 2 diabetes (adult onset diabetes) :

The pancreas makes insulin, but it either doesn't produce enough, or the insulin does not work properly. Nine out of 10 people with diabetes have type 2. This type occurs most often in people who are over 40 years old but can occur even in childhood if there are risk factors present. This form was previously referred to as non insulindependent diabetes mellitus (NIDDM) or "adult-onset diabetes". Type 2 diabetes may sometimes be controlled with a

combination of diet, weight management and exercise. However, treatment also may include oral glucose-lowering medications (taken by mouth) or insulin injections (shots).



DIABETES MELLITUS

Causes:

The causes of diabetes are not known. The following risk factors may increase the chance of getting diabetes:

- Family history of diabetes
- Being overweight
- Physical stress (such as surgery or illness)
- Use of certain medications, including steroids
- Injury to the pancreas (such as infection, tumor, surgery or accident)
- Autoimmune disease
- High blood pressure
- Abnormal blood cholesterol or triglyceride levels
- Age (risk increases with age)
- Smoking
- History of gestational diabetes

It is important to note that sugar itself does not cause diabetes. Eating a lot of sugar can lead to tooth decay, but it does not cause diabetes.

Clinical features:

Diabetes symptoms vary depending on how much the blood sugar is elevated. Some people, especially those with prediabetes or type 2 diabetes, may not experience symptoms initially. In type 1 diabetes, symptoms tend to come on quickly and be more severe. Some of the signs and symptoms of type 1 and type 2 diabetes are:

- Increased thirst
- Frequent urination
- Extreme hunger
- Unexplained weight loss
- Presence of ketones in the urine (ketones are by product of the breakdown of muscle and fat that happens when there's not enough available insulin)
- Fatigue
- Irritability
- Blurred vision
- Slow-healing sores
- Frequent infections, such as gums or skin infections and vaginal infections

Type 1 diabetes can develop at any age, though it often appears during childhood or adolescence. Type 2 diabetes, the more common type, can develop at any age, though it's more common in people older than 40.

Diagnosis:

The clinical diagnosis of diabetics is often prompted by symptoms such as increased thirst and urination and recurrent infections.

Blood Tests – Fasting plasma glucose, two-hour postprandial test and oral glucose tolerance test are done to know blood glucose levels.

Glycated Haemoglobin (HbA1c) may be used to diagnose diabetes (if facilities are easily available).

Diabetes can be diagnosed by blood glucose and HBA1c levels:

Treatment:

Diabetes type 1 and type 2 definition and facts

- Controlling blood sugar (glucose) levels is the major goal of diabetes treatment, in order to prevent complications of the disease.
- Type 1 diabetes is managed with insulin as well as dietary changes and exercise.

- Type 2 diabetes may be managed with non-insulin medications, insulin, weight reduction, or dietary changes.
- Medications for type 2 diabetes can work in different ways to reduce blood glucose levels. They may:
 - increase insulin sensitivity,
 - increase glucose excretion,
 - o decrease absorption of carbohydrates from the digestive tract, or
 - Work through other mechanisms.
- Medications for type 2 diabetes are often used in combination.
- Different methods of delivering insulin include:
 - syringes,
 - pre-filled pens, and
 - The insulin pump.
- Proper nutrition is a part of any diabetes care plan. There is no one specific "diabetic diet" that is recommended for all individuals.
- Pancreas transplantation is an area of active study for the treatment of diabetes.

Prediabetes and treatment: Prediabetes is the term used to describe elevated blood sugar (glucose) that has not yet reached the level for a type 2 diabetes diagnosis. It can be treated by lifestyle changes such as consuming a healthy diet, weight loss, and regular exercise.

Physiotherapy management:

Benefits of exercises for diabetics:

Exercises for diabetics can significantly reduce the risk of developing Type 2 diabetes. In patients, exercise can help to reduce insulin requirements in two ways. It increases the body's sensitivity to insulin and it enhances the more efficient utilization of glucose. Exercise helps lower blood sugar levels. Therefore it can help to maintain overall diabetic control.

Aerobic exercises:

- Aerobic exercise is the exercise which improves oxygen consumption and increases the functioning of the cardiovascular and respiratory systems.
- Aerobic exercises comprise of swimming, cycling, and treadmill, walking, rowing, running and jumping rope.

- Moderate aerobic exercise leads to maintenance of the blood pressure in diabetic neuropathy patients.
- High-volume aerobic exercise produced weight loss with significant improvement in insulin sensitivity.
- Aerobic exercise improves the physiological parameters, including glycemic control, fasting blood-glucose level and lipid profile.

Resistance exercises:

- Resistance exercise leads to develop proper glucose control and less insulin resistance among T2DM. Resistance exercises are exercises that have to be performed against the resistance. Examples of resistance exercises include the weight lifting.
- Resistance training has been reported to enhance insulin sensitivity, daily energy expenditure and quality of life.
- Furthermore, resistance training has the potential for increasing muscle strength, lean muscle mass, and bone mineral density, which could enhance functional status and glycemic control and assist in the prevention of sarcopenia and osteoporosis.

Other types of exercises:

- Other types of exercise which act complementary regimes in chronic diseases like insulin resistance diabetes mellitus include endurance-type and passive exercise.
- Endurance exercise involves the use of several large groups of muscles, which depends on the delivery of oxygen to the muscles by the cardiovascular system.
- Passive exercise needs to include another person or outside force, or produced by voluntary effort of another segment of the patient's own body.

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QUESTIONS:

2 marks:

- 1. Define hyperthyroidism and write its causes?
- 2. Define hypothyroidism and write its clinical features?
- 3. Define diabetes mellitus and write its types?
- 4. Write the clinical features of diabetes mellitus?

6 marks:

- 1. Explain in detail about Hyperthyroidism along with its management?
- 2. Explain in detail about Hypothyroidism along with its management?
- 3. Explain in detail about Diabetes mellitus along with its management?

Ψ

CARDIOPULMONARY RESUSCITATION

UNIT

Structure:

- 6.1 Introduction to CPR
- 6.2 Basic Life Support
- 6.3 Advanced Life Support and Prolonged Life Support

6.1 CARDIOPULMONARY RESUSCITATION (CPR)

Cardiopulmonary resuscitation (CPR) is a procedure to support and maintain breathing and circulation for an infant, child, or adolescent who has stopped breathing (respiratory arrest) and/or whose heart has stopped (cardiac arrest).

Purpose of CPR

CPR is performed to restore and maintain breathing and circulation and to provide oxygen and blood flow to the heart, brain, and other vital organs. CPR can be performed by trained laypeople or healthcare professionals on infants, children, adolescents, and adults. CPR should be performed if an infant, child, or adolescent is unconscious and not breathing. Respiratory failure and cardiac arrest can be caused by allergic reactions, an ineffective heartbeat, asphyxiation, breathing passages that are blocked, choking, drowning, drug reactions or overdoses, electric shock, exposure to cold, severe shock, or trauma. In newborns, the most common cause of cardiopulmonary arrest is respiratory failure caused by sudden infant death syndrome (SIDS), airway obstruction (usually from inhalation of a foreign body), sepsis, neurologic disease, or drowning. Cardiac arrest in children over one year of age is most commonly caused by shock and/or respiratory failure resulting from an accident or injury.

Before starting CPR, check:

- Is the environment safe for the person?
- Is the person conscious or unconscious?
- If the person appears unconscious, tap or shake his or her shoulder and ask loudly, "Are you OK?"

- If the person doesn't respond and two people are available, have one person call 108 or the local emergency number and get the automated external defibrillator (AED), if one is available, and have the other person begin CPR.
- If you are alone and have immediate access to a telephone, call 108 or your local emergency number before beginning CPR. Get the AED, if one is available.
- As soon as an AED is available, deliver one shock if instructed by the device, then begin CPR.

Procedure:

Remember to spell C-A-B



Chest compressions



open the airway



Rescue breathing

The letters C-A-B — compressions, airway, breathing — to help people remember the order to perform the steps of CPR.

Compressions: Restore blood circulation

- 1. Put the person on his or her back on a firm surface.
- 2. Kneel next to the person's neck and shoulders.
- Place the heel of one hand over the centre of the person's chest, between the nipples.
 Place your other hand on top of the first hand. Keep your elbows straight and position your shoulders directly above your hands.
- 4. Use your upper body weight (not just your arms) as you push straight down on (compress) the chest at least 2 inches (approximately 5 centimeters) but not greater than

2.4 inches (approximately 6 centimeters). Push hard at a rate of 100 to 120 compressions a minute.

5. If you haven't been trained in CPR, continue chest compressions until there are signs of movement or until emergency medical personnel take over. If you have been trained in CPR, go on to opening the airway and rescue breathing.

Airway: Open the airway

• If you're trained in CPR and you've performed 30 chest compressions, open the person's airway using the head-tilt, chin-lift maneuver. Put your palm on the person's forehead and gently tilt the head back. Then with the other hand, gently lift the chin forward to open the airway.

Breathing: Breathe for the person

Rescue breathing can be mouth-to-mouth breathing or mouth-to-nose breathing if the mouth is seriously injured or can't be opened.

- 1. With the airway open (using the head-tilt, chin-lift maneuver), pinch the nostrils shut for mouth-to-mouth breathing and cover the person's mouth with yours, making a seal.
- 2. Prepare to give two rescue breaths. Give the first rescue breath lasting one second and watch to see if the chest rises. If it does rise, give the second breath. If the chest doesn't rise, repeat the head-tilt, chin-lift maneuver and then give the second breath. Thirty chest compressions followed by two rescue breaths is considered one cycle. Be careful not to provide too many breaths or to breathe with too much force.
- 3. Resume chest compressions to restore circulation.
- 4. As soon as an automated external defibrillator (AED) is available, apply it and follow the prompts. Administer one shock, and then resume CPR starting with chest compressions for two more minutes before administering a second shock. If you're not trained to use an AED, a 108 or other emergency medical operator may be able to guide you in its use. If an AED isn't available, go to step 5 below.
- 5. Continue CPR until there are signs of movement or emergency medical personnel take over.

Chain of Survival:



When someone suffers an out of hospital Cardiac arrest, if certain things happen in a certain order, their chances of survival are hugely increased. This concept is known as the 'Chain of Survival'.

The Chain of Survival is made up of four links

- 1. Early access & recognition
- 2. Early CPR
- 3. Early defibrillation
- 4. Early advanced care

6.2 BASIC LIFE SUPPORT

Basic Life Support, or BLS, generally refers to the type of care that first-responders, healthcare providers and public safety professionals provide to anyone who is experiencing cardiac arrest, respiratory distress or an obstructed airway. It requires knowledge and skills in cardiopulmonary resuscitation (CPR), using automated external defibrillators (AED) and relieving airway obstructions in patients of every age.

Keys for BLS:

- Quickly start the Chain of Survival.
- Deliver high-quality chest compressions to circulate oxygen to the brain and vital organs.
- Know when and how to use an Automatic External Defibrillator (AED).
- Provide rescue breathing.
- Understand how to work with other rescuers as part of a team.
- Know how to treat choking.

MEDICAL AND SURGICAL CONDITIONS

BLS would be needed include choking, cardiac arrest, or a near-drowning. There are three main components that someone would want to check when performing BLS. These are circulation, airway, and breathing. First, the patient's circulation would need to be checked by making sure their heart is beating properly so that blood can pump to the organs. In some cases, chest compressions may need to be performed to ensure that blood is circulating throughout the body. Their airway also should be checked for any foreign objects, sputum, or vomit to make sure that they are able to get air to breathe. And finally, breathing should be checked to ensure that the patient is getting vital oxygen into the lungs and the body.

6.3 ADVANCED LIFE SUPPORT (ALS)

Advanced Life Support (ALS) is a set of life-saving protocols and skills that extend Basic Life Support to further support the circulation and provide an open airway and adequate ventilation (breathing).

These include:

- Tracheal intubation
- Rapid sequence induction
- Cardiac monitoring
- Cardiac defibrillation
- Transcutaneous pacing
- Intravenous cannulation (IV)
- Intraosseous (IO) access and intraosseous infusion
- Surgical cricothyrotomy
- Needle cricothyrotomy
- Needle decompression of tension pneumothorax
- Advanced Cardiac Life Support (ACLS)
- Pediatric Advanced Life Support (PALS) or Pediatric Education for Pre-Hospital Providers (PEPP)
- Pre-Hospital Trauma Life Support (PHTLS), Basic Trauma Life Support (BTLS) or International Trauma Life Support (ITLS)

Prolonged life support (PLS)

When patients and their families are forced to make decisions concerning life support as a form of end-of-life or emergency treatment, ethical dilemmas often arise. When a patient is terminally ill or seriously injured, medical interventions can save or prolong the life of the patient.

QUESTIONS:

2 marks:

- 1. Define CPR?
- 2. What is BLS?
- 3. What is ALS?
- 4. What is chain of survival?

6 Marks

1. Explain in detail about CPR?

Ψ



OBESITY

Structure:

- 7.1 Introduction
- 7.2 BMI
- 7.3 Body fat distribution
- 7.4 Management

7.1 INTRODUCTION

The Obesity Medicine Association's definition of obesity is "a chronic, relapsing, multifactorial, neurobehavioral disease, where an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences."

Obesity is a medical condition in which excess body fat has accumulated to an extent that it may have a negative effect on health.

Causes:

Eating more calories than burn in daily activity and exercise (on a long-term basis) causes obesity. Over time, these extra calories add up and cause to gain weight.

Common specific causes of obesity include:

- eating a poor diet of foods high in fats and calories
- having a sedentary (inactive) lifestyle
- not sleeping enough, which can lead to hormonal changes that make you feel hungrier and crave certain high-calorie foods
- genetics
- growing older, which can lead to less muscle mass and a slower metabolic rate, making it easier to gain weight
- pregnancy
- Certain medical conditions may also lead to weight gain. These include:
 - polycystic ovary syndrome (PCOS)
 - Prader-Willi syndrome
 - Cushing syndrome
 - ➢ osteoarthritis

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Risk Factors for Obesity:

The following are considered risk factors:

- Genetics: Various genes may impact on the development of obesity.
- Food intake: Overeating and consumption of fatty foods plays a role in the development of obesity. The home environment and finances can influence which foods are eaten.
- Lack of exercise: This lowers energy expenditure and promotes weight gain. Lifestyle changes over recent decades to more sedentary lifestyles are a key contributing factor to the rise in the rates of obesity.
- Excess alcohol consumption

Clinical features:

- Trouble sleeping
- Sleep apnea.
- Shortness of breath
- Varicose veins
- Skin problems caused by moisture that accumulates in the folds of your skin
- Gallstones
- Osteoarthritis in weight-bearing joints, especially the knees
- High blood pressure,
- High levels of blood sugar (diabetes)
- High cholesterol
- High triglycerides levels

Complications:

Obesity has been linked to a number of health complications, some of which are lifethreatening:

- type 2 diabetes
- heart disease
- high blood pressure
- certain cancers (breast, colon, and endometrial)
- stroke

- gallbladder disease
- fatty liver disease
- high cholesterol
- sleep apnea and other breathing problems
- arthritis
- infertility

7.2 BODY MASS INDEX

Body mass index is a measurement used to estimate body fat and classify persons as being underweight, overweight, or normal: it is calculated by dividing weight (in kilograms) by the square of height (in meters).

IDEAL BMI

A **BMI** of less than 18.5 means that a person is underweight. A **BMI** of between 18.5 and 24.9 is **ideal**. A **BMI** of between 25 and 29.9 is overweight. A **BMI** over 30 indicates obesity.

BMI formula

Formula is $BMI = kg/m^2$ where kg is a person's weight in kilograms and m² is their height in metres squared.



7.3 BODY FAT DISTRIBUTION

Adipose tissue accumulation is referred to as body fat distribution. There are two main forms of distribution, android and gynoid.

Android Fat Distribution

An 'Android' distribution is most commonly seen in men. This is what many call the 'apple' body shape. In this pattern, waist circumference is greater than hip circumference." Fat is centered around the abdominal area. This leads to an increased risk for coronary artery disease, stroke, diabetes, and high cholesterol and triglyceride levels.

Gynoid Fat Distribution

A 'gynoid' distribution is most commonly seen in women. This is what many call the 'pear' body shape. In this pattern, hip circumference is greater than waist circumference."

Diagnosis:

- Obesity is defined as having a BMI of 30 or more. Body mass index is a rough calculation of a person's weight in relation to their height.
- Other more accurate measures of body fat and body fat distribution include skin fold thickness, waist-to-hip comparisons, and screening tests such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) scans.
- The doctor may also order certain tests to help diagnose obesity as well as obesityrelated health risks. These may include blood tests to examine cholesterol and glucose levels, liver function tests, diabetes screen, thyroid tests, and heart tests, such as an electrocardiogram.
- A measurement of the fat around the waist is also a good predictor of risk for obesityrelated diseases.

7.4 MANAGEMENT

Medical management: Drugs may be used to help reduce weight such as Xenical (Orlistat) or Sibutramine (Reductil). These drugs work by either suppressing appetite (e.g. Sibutramine) or by reducing the absorption of fats to help weight loss (e.g. Orlistat). However, many of

these drugs have nasty side effects (such as diarrhoea) and are still being investigated in clinical trials.

Cognitive behavioural therapy (CBT)

CBT is another treatment that may be used. This involves group therapy to help you understand the reasons behind the eating patterns and how one can change their thinking and behaviour to overcome them. This type of treatment is often performed by a trained psychologist.

Surgical treatments

Surgery is usually considered when other therapies have repeatedly failed or when obesity is very severe (i.e. greater then 40kg overweight or if associated health problems are present). **Banding of the stomach (**gastric banding**)** is the preferred approach.

Gastric banding is a restrictive surgery where an adjustable silicone band is placed around the stomach. This reduces the amount of food that needs to be eaten before you feel full. Other surgical treatments include the old fashioned **gastric stapling** (also a restrictive procedure), **gastrectomy** (removing part of the stomach) or **gastric bypass**.

Lifestyle modification

- Treatment focuses on lifestyle modifications which aim to lower energy intake and increase energy expenditure. Lifestyle modification is the single most important factor in the treatment of obesity, as other treatments are often not successful without modifying lifestyle. In addition, the following should be avoided:
 - Excess alcohol consumption
 - > Stress
 - > Depression
 - Boredom and frustration
 - > Poor eating habits (eating habits of women, eating habits of men)
 - > Sedentary lifestyle.
- Reduce consumption of food that is high in fat and sugar. A nutritionally balanced diet, high in vegetables and fruits, where energy intake is lower than expenditure (through physical activity) is recommended. A dietician can develop an individualised nutrition plan.

• Ideal diet should avoid sweets, sugary drinks, foods rich in saturated and Tran's fats and be low of sodium (salt). Reducing the temptation to overeat may include avoiding situations that lead to overeating, eating slowly, eating small and healthy meals, drinking adequate amounts of water, avoiding alcohol etc.

Physiotherapy Management:

- For an average adult at least 30 minutes of moderate physical activity is recommended on 5 or more days a week to lose weight and maintain the weight loss.
- Moderate activity usually means activities that make the person feel warm and raises their heart rate and breathing rate. These are termed cardio-exercises and prevent development of diabetes and heart disease.
- Most obese individuals however need to target a 45 to 60 minutes of moderate activity a day to stop them gaining weight.
- After losing the weight, 60 to 90 minutes a day of moderate activity is needed to prevent putting on the weight again. This activity can be in a single session or several lasting 10 minutes or more.
- Children should do 60 minutes of moderate activity each day. Activities suggested include cycling, brisk walking, climbing stairs, gardening, swimming or exercises in gyms.
- Apart from improving physical activity, obese and overweight individuals need to reduce the time spent sitting down and inactive. This includes idle time before the television or the computer.
- Perform aerobic exercise for at least 30 minutes a day, 3 times a week and try to increase physical activity in general by walking rather than driving, and climbing stairs rather than using an elevator or escalator.
- Studies show that aerobic exercise can be an effective method of weight loss in the absence of diet.
- Aerobic exercise (walking, running, treadmill, cycling) caused weight loss, decreased insulin resistance, increased aerobic capacity, decreased lipids, decreased systolic blood pressure, and decreased inflammation.
- Aerobics combined with resistance training not only caused significant weight loss but improved fitness, preserved lean mass, decreased high density lipoprotein (HDL) cholesterol, and decreased total and abdominal fat (independent of weight loss).

QUESTIONS

2 marks:

- 1. Define obesity and mention the causes?
- 2. What are the clinical features of obesity?
- 3. What is BMI?
- 4. Write about body fat distribution?

6 marks:

1. Write in detail about Obesity along with its management?

Ψ

INCISIONS, ANAESTHESIA AND BURNS

UNIT 8

Structure:

- 8.1 Incisions
- 8.2 Anaesthesia
- 8.3 Burns

8.1 INCISIONS

An incision is a cut made into the tissues of the body to expose the underlying tissue, bone or organ so that a surgical procedure can be performed. An incision is typically made with a sharp instrument, such as a scalpel, that is extremely sharp and leaves the skin and tissues with clean edges that are able to heal well.

Incisions can also be made with an electrocautery tool, which uses heat to both cut and cauterize at the same time, which can dramatically minimize bleeding during a procedure.

Classification of incisions:

The incisions used for exploring the abdominal cavity, chest, head and neck can be classified as:

(A) Vertical incision: These may be

(i) Midline incision

(ii) Paramedian incisions

(B) Transverse and oblique incisions:

(i) Kocher's sub costal Incision

a. Chevron (Roof top Modification)

b. Mercedes Benz Modification

- (ii) Transverse Muscle dividing incision
- (iii) Mc Burney's Grid iron or muscle splitting incision
- (iv) Oblique Muscle cutting incision
- (v) Pfannenstiel incision
- (vi) Maylard Transverse Muscle cutting Incision

(C) Abdomino thoracic incisions

- (D) Chest
 - i. Median sternotomy
 - ii. Thoracotomy

(E) Head and neck

i. Wilde's incision



Indications:

- mastoiditis drainage
- cardiac procedures
- lung procedures
- kidney transplantation
- abdominal procedures
- appendectomy
- ceasarians

8.2 ANAESTHESIA

Anaesthesia means "loss of sensation". Medications that cause anaesthesia are called anaesthetics. Anaesthetics are used during tests and surgical operations to numb sensation in certain areas of the body or induce sleep. This prevents pain and discomfort, and enables a wide range of medical procedures to be carried out.

How anaesthetics work: Anaesthetics work by stopping the nerve signals which are reaching the brain. During this state of induced sleep, procedures can be carried out without feeling anything. After the anaesthetic has worn off, the nerve signals will be able to reach the brain, and consciousness and feeling will return.

An anaesthetic can be given in a number of ways:

- as an ointment, spray or drops
- as an injection into a vein
- as a gas you breathe in

Anaesthetists

Anaesthetists are doctors who have received specialist training in anaesthesia. They'll give anaesthetic and be responsible for the safety and wellbeing during procedure.

The most common anaesthetic drugs are:

- Barbiturates. : amobarbital (trade name: amytal) methohexital (trade name: brevital) thiamylal (trade name: surital).
- Benzodiazepines. : Diazepam. Lorazepam. Midazolam.
- Etomidate.

- Ketamine.
- Propofol.

Types of AnaesthesiaThere are three major types of anaesthesia: local, general and regional. They can be used individually or in combination as deemed appropriate in order to provide the best possible pain relief and surgical outcome.

1. Local Anaesthesia: Local anaesthesia is applied through an injection under the skin of the proposed surgical site. It is a very effective method in dealing with small surgeries such as simple fractures, dislocations of fingers or small lacerations. It can also be used in minor elective procedures such as the release of trigger fingers or removal of skin lesions.

Advantages:

- Minimal side effects
- Fast procedure
- can go home on the same day, often not long after the procedure is complete
- Pain relief may last for a few hours following the surgery
- It can be administered by the doctor themselves, there is no need of for an anaesthetist to be present
- Administration doesn't require hospital admission, it can be administered in the clinic or the emergency room

Disadvantages:

- It has limited applications in terms of what surgeries it can be used with
- The initial injection can sting for the first few seconds after it is administered
- Only the site where the anaesthetic is injected is numb
- 2. General Anaesthesia: General anaesthesia is administered intravenously and by inhalation. This type of anaesthesia works on the brain, leaving the person in a deep sleep. Usually application of a general anaesthesia starts in the anesthetic bay where the anaesthetist, along with their technician, connect you to several monitors and insert one or more intravenous access points into your limbs through which medications will be given that will make you drowsy. An oxygen mask is applied to the face and asked to take a deep breath. You may notice a funny smell in the mask, don't be alarmed this is only the anaesthetic. Once you are asleep the anesthetist will insert a tube into your throat and hook this tube to the ventilator.

Advantages:

- Person will be asleep during the procedure
- There is no time limit for how long general anaesthesia can be administered which makes it ideal for extensive surgical procedures which require a lot of time in the operating theatre
- General anaesthesia works on the whole body which allows for the possibility of operating on multiple parts of the body at the same time
- Allows proper muscle relaxation for prolonged periods of time
- Can be administered rapidly and is reversible

Disadvantages:

- General anaesthesia is not appropriate for every patient
- Increased risk of deep vein thrombosis
- It may cause more blood loss
- It increases the risk of deep vein thrombosis
- Sore throat and hoarse voice for a few days following surgery
- Other side effects such as headache, nausea and drowsiness are also common following surgery
- 3. **Regional Anaesthesia: Regional** anaesthesia involves numbing a specific area of the body, without affecting the brain or breathing. It requires the injection of local anaesthetic to major nerve bundles which supply a particular area of the body such as the leg, forearm, hand, shoulder or abdomen. With this type patient may remain awake and have the choice to watch the surgery on the monitor screen such as in case of knee.

There are a number of different types of regional anaesthesia. The most common are spinal, epidural and plexus block anaesthesia. Spinal and epidural anaesthesia are commonly used for joint replacement surgery of the hip and the knee. Plexus blocks are commonly used for upper limb surgeries.

Advantages:

- Decreased blood loss during the surgery
- Decreased chance of lung problems
- Fewer complications associated with blood clotting following surgery

Disadvantages:

- Its affects don't last as long as general anaesthesia and thus cannot be used for long, extensive surgeries
- Requires a more technically demanding procedure of application
- need a urinary catheter inserted during the surgery as he/she may have difficulty urinating until the effect of anaesthesia wears off
- Other minor side effects like headache nausea and drowsiness can occur following surgery

Side effects:

Some common side effects that can occur after a general anaesthetic or some regional anaesthetics include:

- feeling or being sick
- dizziness and feeling faint
- feeling cold or shivering
- headaches
- itchiness
- bruising and soreness
- difficulty peeing
- aches and pains

8.3 BURNS

A burn is damage to the body's tissues caused by heat, chemicals, electricity, sunlight, or radiation. Scalds from hot liquids and steam, building fires and flammable liquids and gases are the most common causes of burns. Another kind is an inhalation injury, caused by breathing smoke.

Classification

- Erythema: The skin remains intact, the erythema lasts for a few days, and the patient does not normally seek medical help unless the problem is extensive, as can occur with sunburn.
- Superficial: The tissue damage results in seepage of fluid in between the layers of epidermis, causing a blister, which is surrounded by a dark red erythema. Movement of the burned areas can be very painful. Blisters will continue to appear over the first 24 hours after burning.

- Partial thickness: In a superficial partial-thickness burn the epidermis is destroyed. In a deep dermal burn both the epidermis and part of the dermis are destroyed. There are blisters, patches of white destroyed tissue, and red areas .Sensation varies according to the depth of dermal damage and the sensory nerve endings involved.
- Full-thickness: The epidermis, dermis and other underlying tissues are destroyed. The presenting surface may be black, white or yellow. It is inelastic and unable to stretch.

Causes:

The most common causes of injury are by fire, by chemicals, by scalding, by electricity and by inhalation.

- **Fire burns**. These occur when the patient is caught by fire. Because the clothes ignite, the burns are often partial-or full-thickness. Flash flames tend to cause partial-thickness burns.
- **Chemical burns**. Caustic substances can cause deep burns. The depth of tissue involved can be limited by prompt action.
- Scalding. Hot water is the most common cause of scalds. It may be as a hot drink, or by boiling fluid from a pan or kettle. Scalds are common in the elderly, often caused when climbing into a hot bath and being unable to climb out again. These burns will vary in depth relative to the exposure time.
- **Electrical burns**. Burns will appear on the skin where there has been contact with a live wire. There will be a burn at the entry and exit site of the electric current. Neither the depth nor the size of the burn is predictable. There can be extensive damage to deep structures with little external evidence. Often this type of injury is complicated by cardiac and respiratory arrest.
- Inhalation burns. Direct thermal injury can be sustained by inhalation of flames, hot gases or steam. This places a major threat to the upper airway, causing oedema of the larynx, pharynx and trachea. Early diagnosis of an inhalation injury is essential. The patient must be intubated before the oedema becomes extensive, as this will prevent the passing of the endotrachael tube.

Complications:

- Heart problems
- Inhalation injuries
- Pneumonia
- Adult respiratory distress syndrome ARDS (shock lung)
- Infection of the wound site
- Infection of the urinary tract

- Septicaemia
- Renal and liver failure
- Joint effusion and periarticular swelling
- Calcification of periarticular tissues
- Contraction of scar tissue causing joint deformity
- Psychological trauma to the patient

Prevention of Burns:

A large number of burns result from domestic accidents in the home, young children and the elderly being particularly vulnerable.

It is essential to ensure that:

- Kettles and hot pans are out of the reach of children
- Electrical sockets have shutters, and electrical cables are secure with the insulation intact
- Circuit breakers are in use with external appliances
- Matches and cigarette lighters are stored safely
- Thermostatic valves are fitted to bathroom taps
- Smoke alarms are fitted
- Clothes, especially children's, are flameproof.

Diagnosis:

A diagnosis is usually formed based on burn depth. However, the severity might also be influenced by the extent of damage to the body.

The extent of a burn is usually based on the "rule of nines" - each arm is considered 9% of the body surface area, each leg is 18%, the back and front of the torso are each considered to be 18%, the head and neck are 9%, and the genital region is 1% of the surface area. Using these classifications, a physician can make a clear diagnosis.



Management of burns:

First Aid

A friend, relative or stranger may rescue the victim of a serious burn accident. The decisions made and the treatment given at the scene of the accident.

- **Flame burns** must be smothered. Cold water applied continuously over the burnt area relieves pain and limits the depth of the burn, because heat is conducted to the deeper tissues for several minutes after the flames have been extinguished.
- Chemical burns, contaminated clothing must be removed and copious quantities of running water applied to the area. Neutralizing agents need to be identified and applied accordingly.
- Scalds, thorough and continuous pouring of cold water can limit the extent of the damage and reduce the pain.
- Electrical burns, the patient may require CPR before attention can be paid to the injury. Unlike heat burns, these injuries do not spread and it is sufficient to cover the area with a clean cloth that has been soaked in clean cold water.
- **Minor burns,** These are defined as less than 10% surface area in a child or less than 15% in an adult. If the injury is noncomplex these injuries are cleaned with chlorhexidine and covered with a bactericidal non-stick dressing. The patient can rest at home and, depending on local circumstances, the dressings are changed every 2-3 days by a district nurse or at the hospital dressing's clinic.
- **Major Burns,** These are injuries that involve 10% or more of the body surface area in children and 15% or more in an adult. If the injury is complex the patient will be admitted to the burns unit or intensive care unit.

Medical Management:

Early hospital management (including the shock phase). This involves:

- Maintenance of a clear airway
- Pain relief
- Maintenance of fluid balance
- Removal of adherent clothing and covering of the burns with sterile cotton dressings
- Application of neutralizing agents for chemical burns
- Reassurance and explanation to the patient
- Transfer to a burns unit or admission to an intensive care unit.

Whether the person is sent to the operating theatre for saving of burns and grafting depends on the depth of the burns, the age of the patient and whether the patient is fit for surgery.

Surgical and other procedures:

• **Breathing assistance**. If the burn is on the face or neck, throat may swell shut. If that appears likely, doctor may insert a tube down windpipe (trachea) to keep oxygen supplied to the lungs.

- **Feeding tube**. People with extensive burns or who are undernourished may need nutritional support. Doctor may thread a feeding tube through nose to stomach.
- Easing blood flow around the wound. If a burn scab (eschar) goes completely around a limb, it can tighten and cut off the blood circulation. An eschar that goes completely around the chest can make it difficult to breathe. Doctor may cut the eschar to relieve this pressure.

• Skin Grafts

Skin grafts may be used for any part of the body in areas where there has been damage by burns, lacerated wounds, ulceration, pressure sores, skin cancers or healed contracted scars. A graft is used only when the recipient site is vascular (i.e. soft-tissue injuries). Types of skin graft are split-skin grafts and full-thickness grafts.

Split-skin grafts: Split-skin (Thiersch) grafts consist of a very thin layer of epidermis or thicker, up to the whole epidermis and part dermis. These grafts are transferred without blood supply.

Full-thickness grafts: 'Full thickness' consists of the skin down to but excluding superficial fascia. This type of graft has little tendency to contract and it has the appearance similar to that of normal skin. Because of this these grafts are commonly used on the face or the hand

• **Plastic surgery**. Plastic surgery (reconstruction) can improve the appearance of burn scars and increase the flexibility of joints affected by scarring.

Physiotherapy management:

The aims of physiotherapy are to:

- achieve a clear airway and so prevent respiratory
- complications
- maintain joint range of movement, and prevent
- contractures or deformities
- maintain soft-tissue length
- maintain muscle strength
- regain maximum function
- minimise scarring
- help the patient to gain independence and return to
- An active lifestyle.

Respiratory Care

Shaking, clapping, postural drainage, coughing and suction can be used to clear secretions. If it is very uncomfortable for the patient to have hand pressure applied to a chest burn, then a piece of foam may be used under the hands.

Tipping is contraindicated if there is facial oedema but the patient may lie supine or on either side. A ventilated patient usually requires suction and humidification.
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A little treatment, often, is the most effective. Humidification may be necessary forthe nonventilated patient especially when there has been inhalation of smoke or fumes. Breathing (expansion) exercises are also important to maintain ventilation of all lung areas.

Intensive respiratory care is required in the following situations:

- \circ for the elderly patient
- \circ $\,$ for burns affecting face, mouth and respiratory passages $\,$
- for immobile patients
- \circ where there is a history of a chronic respiratory condition
- o pre- and postoperatively
- For patients with a full-thickness burn to the chest to keep the eschar mobile.

Joint Range of Movement

Positioning, splinting and exercise are used for maintaining and improving joint range.

Positioning

The position of comfort for the patient is usually that of joint flexion. Unfortunately this allows scar tissue to contract and cause deformities. Therefore, it is essential that joints be held in the correct position during recovery.

The correct positions to be maintained are described below.

Head and neck

A small roll (towel) behind the neck and/or a pillow under the shoulders will help to maintain extension of the cervical spine. The patient may be in lying (chest and leg burns) or in half-lying with facial burns (because of facial oedema).

Upper limbs

The upper limbs should be elevated on pillows with the shoulder in abduction and slight flexion, the elbows and wrists in extension and the hands with metacarpophalangeal joints in flexion, interphalangeal joints in extension, and thumb in palmar abduction. The joints of the hand are held in position by static splints.

Lower limbs

The lower limbs are rested with the hip joints in extension and slight abduction, knees in extension and ankles in 90-degree dorsiflexion (in a foot drop splint). Elevation is obtained by raising the end of the bed, not by placing pillows under the legs, which would put the hips into flexion.

Splinting

Splints may be static or dynamic.

Static splints: Static splints are used when it is essential to maintain a certain joint position until movement can start or to maintain a satisfactory resting position between exercises. These are designed and made to individual requirements using thermoplastics and modified as the patient recovers, such as after passive stretching. Splinting may be required at night only to prevent soft tissue tightening whilst the patient is asleep. Nearly all patients will require hand-resting splints and foot-drop splints.

Dynamic splints: Dynamic splints can permit controlled movement of various joints. For example, an MCP extension splint to all four fingers allows some flexion of the fingers, thus allowing damaged extensor tendons to move in a limited range but not to be overstretched.

Exercises

- Every joint should, where possible, be moved through full range of movement each day. An active exercise programme must be devised to achieve this. Assisted active exercises or passive movements are necessary for the damaged limbs and free active exercise for undamaged areas. If the patient is sedated and unable to perform exercises, passive movements must be carried out at regular intervals.
- Movement should be performed frequently to reduce oedema and resultant joint stiffness. All joints should be moved individually through full range and composite movements carried out, either actively or passively.
- The exercise programme can be started on the day of the burn and must take place daily.
- The physiotherapist may take the opportunity to mobilise restricted joints whilst the patient is under anaesthetic in the operating theatre. This is an ideal forum because the surgeon will be able to assess the need for release of scar tissue if this is causing the limited range. The range of movement gained during treatment will be controlled by the patient's tolerance level of pain and the limitations of movement of the burnt tissues.
- As soon as possible the patient must be encouraged to be independent in self-care and activities of daily living.

Muscle strengthening

Where joints can be moved, the patient must work the muscles for each joint through full range at least twice a day. Muscles working over joints, which are fixed, can be worked isometrically. The use of small weights, graded rubber exercise bands and springs can increase muscle strength. An exercise programme can be advised for the patient to carry out during the day. Where possible, an exercise circuit in the physiotherapy gym should be commenced.

Regaining maximum function

Goals should be set, such as so many minutes on an exercise bike, so many repetitions without rest on skipping, jumping a height, or reaching grip strength by a given time (in weeks).

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MEDICAL AND SURGICAL CONDITIONS

QUESTIONS

2 marks:

- 1. Define incision and mention the indications?
- 2. Write the types of incisions?
- 3. Define anaesthesia and write the types?
- 4. What are the side effects of anaesthesia?
- 5. Define burns and write the classification?
- 6. Write the causes of burns?
- 7. Mention the complications of burns?

6 marks:

- 1. Explain in detail about Anaesthesia?
- 2. Explain in detail about Burns along with its management?

Ψ



PAEDIATRICS

Structure:

- 9.1 Developmental mile stones
- 9.2 Cerebral palsy
- 9.3 Poliomyelitis

9.1 DEVELOPMENTAL MILESTONES

Developmental milestones are physical or behavioral signs of development of infants and children. Rolling over, crawling, walking, and talking is considered developmental milestones and provides important information regarding your child's early development.

The milestones are different for each age range. These milestones are behaviors that emerge over time, forming the building blocks for growth and continued learning. Some of the categories of behavior include:

- Cognition: Thinking, reasoning, problem-solving, understanding
- Motor coordination: Gross/fine motor skills, jumping, hopping, throwing/catching, drawing, stacking
- Social interaction: Initiating peer contact, group play
- Adaptive: Dressing, eating, washing

Milestones between 2 months and 2 years:

> 2 MONTHS

Social and Emotional

- Begins to smile at people
- Can briefly calm herself (may bring hands to mouth and suck on hand)
- Tries to look at parent

- Coos, makes gurgling sounds
- Turns head toward sounds

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MEDICAL AND SURGICAL CONDITIONS

Cognitive (learning, thinking, problem-solving)

- Pays attention to faces
- Begins to follow things with eyes and recognize people at a distance
- Begins to act bored (cries, fussy) if activity doesn't change



Movement/Physical Development

- Can hold head up and begins to push up when lying on tummy
- Makes smoother movements with arms and legs

➤ 4 MONTHS

Social and Emotional

- Smiles spontaneously, especially at people
- Likes to play with people and might cry when playing stops
- Copies some movements and facial expressions, like smiling or frowning

- Begins to babble
- Babbles with expression and copies sounds he hears
- Cries in different ways to show hunger, pain, or being tired



Cognitive (learning, thinking, problem-solving)

- Lets you know if he is happy or sad
- Responds to affection
- Reaches for toy with one hand
- Follows moving things with eyes from side to side
- Watches faces closely
- Recognizes familiar people and things at a distance

Movement/Physical Development

- Holds head steady, unsupported
- Pushes down on legs when feet are on a hard surface
- May be able to roll over from tummy to back
- Can hold a toy and shake it and swing at dangling toys
- Brings hands to mouth
- When lying on stomach, pushes up to elbows

➢ 6 MONTHS

Social and Emotional

- Knows familiar faces and begins to know if someone is a stranger
- Likes to play with others, especially parents
- Likes to look at self in a mirror

- Responds to sounds by making sounds
- Strings vowels together when babbling ("ah," "eh," "oh") and likes taking turns with parent while making sounds
- Responds to own name
- Makes sounds to show joy and displeasure
- Begins to say consonant sounds (jabbering with "m," "b")



Cognitive (learning, thinking, problem-solving)

- Looks around at things nearby
- Brings things to mouth
- Shows curiosity about things and tries to get things that are out of reach
- Begins to pass things from one hand to the other

Movement/Physical Development

- Rolls over in both directions (front to back, back to front)
- Begins to sit without support
- When standing, supports weight on legs and might bounce

> 9 MONTHS

Social and Emotional

- May be afraid of strangers
- May be clingy with familiar adults
- Has favorite toys

Language/Communication

- Understands "no"
- Makes a lot of different sounds like "mama mama" and "bababababa"
- Copies sounds and gestures of others
- Uses fingers to point at things

Cognitive (learning, thinking, problem-solving)

- Watches the path of something as it falls
- Plays peek-a-boo
- Puts things in his mouth
- Moves things smoothly from one hand to the other

Movement/Physical Development

- Stands, holding on
- Can get into sitting position
- Sits without support
- Pulls to stand
- Crawls

> 1 YEAR

Social and Emotional

- Is shy or nervous with strangers
- Cries when mom or dad leaves
- Has favorite things and people
- Shows fear in some situations
- Hands you a book when he wants to hear a story
- Repeats sounds or actions to get attention
- Puts out arm or leg to help with dressing
- Plays games such as "peek-a-boo" and "pat-a-cake"

Language/Communication

- Responds to simple spoken requests
- Uses simple gestures, like shaking head "no" or waving "bye-bye"
- Makes sounds with changes in tone (sounds more like speech)
- Says "mama" and "dada" and exclamations like "uh-oh!"
- Tries to say words you say



Cognitive (learning, thinking, problem-solving)

- Explores things in different ways, like shaking, banging, throwing
- Finds hidden things easily
- Looks at the right picture or thing when it's named

- Copies gestures
- Starts to use things correctly; for example, drinks from a cup, brushes hair
- Bangs two things together
- Puts things in a container, takes things out of a container
- Lets things go without help
- Pokes with index (pointer) finger
- Follows simple directions like "pick up the toy"

Movement/Physical Development

- Gets to a sitting position without help
- Pulls up to stand, walks holding on to furniture ("cruising")
- May take a few steps without holding on
- May stand alone

> 18 MONTHS

Social and Emotional

- Likes to hand things to others as play
- May have temper tantrums
- May be afraid of strangers
- Shows affection to familiar people
- Plays simple pretend, such as feeding a doll
- May cling to caregivers in new situations
- Points to show others something interesting
- Explores alone but with parent close by



- Says several single words
- Says and shakes head "no"
- Points to show someone what he wants

Cognitive (learning, thinking, problem-solving)

- Knows what ordinary things are for; for example, telephone, brush, spoon
- Points to get the attention of others
- Shows interest in a doll or stuffed animal by pretending to feed
- Points to one body part
- Scribbles on his own
- Can follow 1-step verbal commands without any gestures; for example, sits when you say "sit down"

Movement/Physical Development

- Walks alone
- May walk up steps and run
- Pulls toys while walking
- Can help undress herself
- Drinks from a cup
- Eats with a spoon

> 2 YEARS

Social and Emotional

- Copies others, especially adults and older children
- Gets excited when with other children
- Shows more and more independence
- Shows defiant behavior (doing what he has been told not to)
- Plays mainly beside other children, but is beginning to include other children, such as in chase games

- Points to things or pictures when they are named
- Knows names of familiar people and body parts
- Says sentences with 2 to 4 words
- Follows simple instructions
- Repeats words overheard in conversation
- Points to things in a book



Cognitive (learning, thinking, problem-solving)

- Finds things even when hidden under two or three covers
- Begins to sort shapes and colors
- Completes sentences and rhymes in familiar books
- Plays simple make-believe games
- Builds towers of 4 or more blocks
- Might use one hand more than the other
- Follows two-step instructions such as "Pick up your shoes and put them in the closet."
- Names items in a picture book such as a cat, bird, or dog

Movement/Physical Development

- Stands on tiptoe
- Kicks a ball
- Begins to run
- Climbs onto and down from furniture without help
- Walks up and down stairs holding on
- Throws ball overhand
- Makes or copies straight lines and circles

9.2 CEREBRAL PALSY

Cerebral palsy (CP) refers to a group of disorders that affect muscle movement and coordination. In many cases, vision, hearing, and sensation are also affected.

The word "cerebral" means having to do with the brain. The word "palsy" means weakness or problems with body movement.

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MEDICAL AND SURGICAL CONDITIONS

CP is the most common cause of motor disabilities in childhood. According to the Centers for Disease Control and Prevention (CDC), it affects at least 1.5 to 4 out of every 1,000 children worldwide.

Causes:

Abnormal brain development or injury to the developing brain can cause CP. The damage affects the part of the brain that controls body movement, coordination, and posture.

The brain damage usually occurs before birth, but it can also happen during birth or the first years of life. In most cases, the exact cause of CP isn't known. Some of the possible causes include:

- asphyxia neonatorum, or a lack of oxygen to the brain during labour and delivery
- gene mutations that result in abnormal brain development
- severe jaundice in the infant
- maternal infections, such German measles and herpes simplex
- brain infections, such as encephalitis and meningitis
- intracranial hemorrhage, or bleeding into the brain
- head injuries as a result of a car accident, a fall, or child abuse

Clinical features:

The symptoms of CP vary from person-to-person and range from mild to severe. Some people with CP may have difficulty walking and sitting. Other people with CP can have trouble grasping objects. The symptoms can become more severe or less severe over time. They also vary depending on the part of the brain that was affected.

Some of the more common signs include:

- delays in reaching motor skill milestones, such as rolling over, sitting up alone, or crawling
- variations in muscle tone, such as being too floppy or too stiff
- delays in speech development and difficulty speaking
- spasticity, or stiff muscles and exaggerated reflexes
- ataxia, or a lack of muscle coordination
- tremors or involuntary movements

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- excessive drooling and problems with swallowing
- difficulty walking
- favouring one side of the body, such as reaching with one hand
- neurological problems, such as seizures, intellectual disabilities, and blindness

Most children are born with CP, but they may not show signs of a disorder until months or years later. Symptoms usually appear before a child reaches age 3 or 4.

Types of cerebral palsy:

There are different types of CP that affect various parts of the brain. Each type causes specific movement disorders. The types of CP are:

1. Spastic cerebral palsy:

Spastic CP is the most common type of CP, affecting approximately 80 percent of people with CP. It causes stiff muscles and exaggerated reflexes, making it difficult to walk. Many people with spastic CP have walking abnormalities, such as crossing their knees or making scissor like movements with their legs while walking. Muscle weakness and paralysis may also be present. The symptoms can affect the entire body or just one side of the body.

2. Dyskinetic cerebral palsy: People with dyskinetic CP have trouble controlling their body movements. The disorder causes involuntary, abnormal movements in the arms, legs, and hands. In some cases, the face and tongue are also affected. The movements can be slow and writhing or rapid and jerky. They can make it difficult for the affected person to walk, sit, swallow, or talk.

3. Hypotonic cerebral palsy: Hypotonic CP causes diminished muscle tone and overly relaxed muscles. The arms and legs move very easily and appear floppy, like a rag doll. Babies with this type of CP have little control over their head and may have trouble breathing. As they grow older, they may struggle to sit up straight as a result of their weakened muscles. They can also have difficulty speaking, poor reflexes, and walking abnormalities.

4. Ataxic cerebral palsy: Ataxic CP is the least common type of CP. Ataxic CP is characterized by voluntary muscle movements that often appear disorganized, clumsy, or jerky. People with this form of CP usually have problems with balance and coordination. They may have difficulty walking and performing fine motor functions, such as grasping objects and writing.

5. Mixed cerebral palsy: Some people have a combination of symptoms from the different types of CP. This is called mixed CP. In most cases of mixed CP, people experience a mix of spastic and dyskinetic CP.



Diagnosis:

Doctor will diagnose CP by taking a complete medical history, performing a physical exam that includes a detailed neurological exam, and evaluating the symptoms. Additional testing can also be performed:

- An electroencephalogram (EEG) is used to evaluate the electrical activity in the brain. It may be ordered when someone is showing signs of epilepsy, which causes seizures.
- An MRI scans uses to identify any abnormalities or injuries in the brain.
- A CT scan can also reveal any brain damage.
- A cranial ultrasound is to get basic images of the brain in young infants.
- A sample of blood may be taken and tested to rule out other possible conditions, such as bleeding disorders.

Test for neurological problems that are often associated with the disorder. These tests may detect:

- vision loss and impairment, such as blurred vision in one or both eyes
- deafness
- speech delays
- intellectual disabilities
- movement disorders

Treatment:

The goal of treatment is to improve limitations and prevent complications. Treatment may include assistive aids, medications, and surgery.

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Assistive aids

Assistive aids include:

- eyeglasses
- hearing aids
- walking aids
- body braces
- wheelchairs

Counselling:

Early counselling of parents is important and difficult. Professionals must explain their plans based on assessment and taking into account the problems and prospects as seen by the family

Medications

Oral anticonvulsants and muscle relaxants are commonly used as first-line treatments for CP. Your doctor might prescribe:

- diazepam (Valium)
- dantrolene (Dantrium)
- baclofen
- tizanidine (Zanaflex)

Surgery

Orthopedic surgery may be used to relieve pain and improve mobility. It may also be needed to release tight muscles or to correct bone abnormalities caused by spasticity.

Selective dorsal rhizotomy (SDR) might be recommended as a last resort to reduce chronic pain or spasticity. It involves cutting nerves near the base of the spinal column.

Physiotherapy management:

Physical therapy is the rehabilitation of physical impairments by training and strengthening a patient's large muscles – those in the arms, legs, and abdomen. The goal of physical therapy is to maximize functional control of the body, or increase gross motor function.

The goal of physical therapy is to help individuals:

- develop coordination
- build strength

- improve balance
- maintain flexibility
- optimize physical functioning levels
- maximize independence

Exercises in supine position

- Normalizing tone of the muscles: For cases with hypo tonicity slow passive movements, sustained stretch, cryotherapy over the muscle for 15 to 20 minutes, stimulation of antagonist movement and vibrations are used. On the contrary, for cases with hypotinicity weight bearing, joint compression, rhythmic stabilization, vibrations, cryotherapy in brisk manner and taping can be used.
- Weight bearing exercises: Weight bearing exercises are necessary to promote development of tone in muscles and also to maintain the absorption of calciuminto the bones. Thus the patient should be given activities like bridging, supine on elbows, sitting with weight bearing on the affected arm, and standing should be given as soon as possible within the limitation of the patient's general medical status.

Skillful TAPING gives a tactile feedback which helps in faster development of tone in the muscles. Weight bearing exercises for the involved upper limb has also been found to be beneficial in preventing this.

- Bridging Exercises: The child lies on supine position. Therapist flexed his both the knees and then helps him to lift his back from the mid area so that weight bear on his legs. This should be done in 10 -15 repetitions. Then do bridging on 1 leg and then another.
- Stretching and Mobility: The muscles should be maintained at the appropriate physiological length for normal muscle control and normal postural adjustment. In CP because of delay or absence of normal movement muscles are usually in a shortened position hence stretching of the muscles is essential to increase the neuromuscular control. Length of the muscles should be maintained not only through stretching but also through various functional activities.
 - In supine position, the therapist holds an object so that the child grasp that object by moving his body, in this rolling activity plays an important role. The child rolls right and left to grasp the object sometimes lifting his back and limbs too.
 - The therapists do some exercises in vestibular ball so that child balance and coordination improves and this is the best spine stretching activity.

• Good neck control and developing trunk control by using vestibular ball, he lied down in ball and doing movements that extend his spine and head is looking in upward direction.

Exercises in sitting: The therapist should hold and support the child in sitting position. Time should be noted daily.

- Exercises on vestibular ball: To correct the balance. Sit on the vestibular ball and then shift the weight from right side to left side by rolling the ball.
- Reaching far objects: As the child sitting in the ball then the therapist should stand in front of him and tell him to reach the object that the therapist holds.
- Sit to stand activities and kneeling activities, sit on the toes, sitting by cross leg by maximize wide base of support.

Exercises in standing:

- Standing in both the legs: The therapist should hold his knees while standing as the child flex his knees and forward trunk to avoid standing.
- Squatting: The therapist should try and help the child to do some squats about 5 to 10 daily to increase the muscle power and strength.
- Walking: with the help of therapist or a cane and use a tilt board for balancing exercises.
- Standing on the side of vestibular ball and do reaching objects so that the child lifts his head in upward position for increasing the extension of neck i.e. neck control.

Equipment

Physical therapists use a range of mobility aids to make therapy more effective. Braces, casts, splints and shoe inserts are types of orthotic equipment used to help with walking, posture and joint mobility.

Physical therapy also often includes the following tools:

- Exercise balls
- Resistance bands
- Free weights
- Swimming pools
- Hot and cold packs
- Electric muscle stimulation

In some cases, electric stimulation is used to improve gait and upper limb function. This therapy uses small electrodes to stimulate certain muscles.

Developing postural reaction:

Postural adjustments are essential if the child is move to move freely and to adjust to various environmental demands rapidly. Motor milestones can be best achieved by good postural reactions. Postural reactions consists of righting reactions, protective extension and

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equilibrium reactions. Initially children first develop righting reactions. Righting reactions allow the child to orient his head in space so that the eyes and mouth are horizontal regardless of the position of the body. It also helps in maintaining the proper alignment of the head with respect to the body.

Oromotor control training:

Oromotor function depends on good head control. Common Oromotor problems are: drooling, problems in sucking, swallowing, body movements associated with speech, jaw, hyper or hyposensitivity and inadequate tongue movements. Hence the therapy should consist of good neck control, developing good trunk control, use of brush to decrease drooling.

• Both massage therapy and physiotherapy benefit some people with CP by helping them relax tense muscles, strengthen muscles and keep joint flexible.

Splints, Casts & Calipers:

- Specially designed shoes, AFO and calipers may be required to provide stability to the joints in a child who is learning to stand and walk.
- AFO are useful in children with spastic diplegia who have spasticity with tendoachilles tightening.
- Lightweight splints may at times be required to maintain normal postures.
- Splints and casts should not be used for prolonged periods of time as they may lead to disuse atrophy of the muscles.

Speech & Language Therapy:

- Children with problems in speech and hearing require the services of an audiologist and a speech therapist.
- Communication skills may mean talking, using sign language, or using communication aid.

Occupational therapy:

- An occupational therapist trains the child for daily activities and for sensoryperceptual-motor coordination.
- They usually work with children on better ways to use their arms, hands and upper body.

Recreational Therapy:

- Recreational therapists help kids with cerebral palsy have fun.
- They work with children on sports skills or other leisure activities like dancing etc.

9.3 POLIO MYELITIS

Polio is a viral disease that can affect nerves and can lead to partial or full paralysis. The medical name for polio is poliomyelitis.

Causes

Polio is a disease caused by infection with the poliovirus. There are 3 types of polio virus.

- Type 1 (also known as Brunhilde)
- Type 2(Lansing)
- Type 3 (Leon)

The virus spreads by:

- Direct person-to-person contact
- Contact with infected mucus or phlegm from the nose or mouth
- Contact with infected faeces
- The virus enters through the mouth and nose, multiplies in the throat and intestinal tract, and then is absorbed and spread through the blood and lymph system. The time from being infected with the virus to developing symptoms of disease (incubation) ranges from 5 to 35 days (average 7 to 14 days). Most people do not develop symptoms.
- Risks factors include:
- Lack of immunization against polio
- Travel to an area that has had a polio outbreak
- As a result of a global vaccination campaign over the past 25 years, polio has largely been eliminated. The disease still exists in some countries in Africa and Asia, with outbreaks occurring in groups of people who have not been vaccinated.

Clinical features:

About 90 to 95 percent of people who do get infected with polio have no symptoms at all. Of those who do get the infection, 2 percent or fewer may develop paralytic disease. Symptoms may vary depending on the kind of polio and vary child-to-child.

The symptoms are seen the following stages:

Stage 1: Acute stage of paralysis: It begins with fever and headache, followed by neck stiffness and meningitis. Muscles are painful and tender. Paralysis soon follows and reaches its maximum in 2-3 days. Limbs are weak and there may be difficulty with breathing and swallowing. If the patient does not succumb to respiratory failure, pain and pyrexia subsides after 7-10 days and the patient enters the convalescent stage.

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MEDICAL AND SURGICAL CONDITIONS

Stage 2: Recovery / **Convalescent stage:** This stage is prolonged. The return of muscle power is most noticeable during the first 6 months, but there may be continuing improvement for up to 2 years.

Stage 3: Residual paralysis: Some cases do not progress beyond the early stage of meningeal irritation. In others, however recovery is incomplete and the patient is left with some degree of asymmetric flaccid paralysis or muscle weakness.

Complications

Health problems that may result from polio include:

- Aspiration pneumonia
- Cor pulmonale (a form of heart failure found on the right side of the circulation system)
- Lack of movement
- Lung problems
- Myocarditis (inflammation of the heart muscle)
- Paralytic ileus (loss of intestinal function)
- Permanent muscle paralysis, disability, deformity
- Pulmonary edema (abnormal build up of fluid in the lungs)
- Shock
- Urinary tract infections

MUSCLES COMMONLY WEAKENED BY POLIO



Post-polio syndrome is a complication that develops in some people, usually 30 or more years after they are first infected. Muscles that were already weak may get weaker. Weakness may also develop in muscles that were not affected before.

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Diagnosis:

During a physical examination, the health care provider may find:

- Abnormal reflexes
- Back stiffness
- Difficulty lifting the head or legs when lying flat on the back
- Stiff neck
- Trouble bending the neck

Tests that may be done include:

- Cultures of throat washings, stools, or spinal fluid
- Spinal tap and examination of the spinal fluid (CSF examination) using polymerase chain reaction (PCR)
- Test for levels of antibodies to the polio virus

Treatment:

The goal of treatment is to control symptoms while the infection runs its course. There is no specific treatment for this viral infection.

People with severe cases may need lifesaving measures, especially help with breathing.

Symptoms are treated based on how severe they are. Treatment may include:

- Antibiotics for urinary tract infections
- Moist heat (heating pads, warm towels) to reduce muscle pain and spasms
- Painkillers to reduce headache, muscle pain, and spasms (narcotics are not usually given because they increase the risk of breathing trouble)

Surgical management:

- Release of joint contractures
- Reestablishment of muscle balance around the joint to prevent deformities
- Muscle transplantation to replace a paralyzed muscle
- Stabilization of a relaxed or flail joint by means of (a) tenodesis, (b) fixation of ligaments, or (c) construction of artificial check ligaments
- Arthrodesis
- Osteotomies
- Limb lengthening, Ilizarov techniques
- Joint replacement surgery

Physiotherapy management

> In the acute stage of muscle paralysis:

It involves meticulous attention to intensive care during the acute paralytic phase.

- Feeding by nasogastric tube in those with bulbar dysfunction.
- Endotracheal intubation and ventilation should be instituted in case of respiratory muscle failure or bulbar and laryngeal muscle paralysis.
- Pulmonary atelactasis and infection are treated with antibiotics and regular physiotherapy intervention.
- Rest on a firm mattress with back supported on a lumbar board. Avoid forceful exercise as this may increase paralysis. Avoid massage.
- Moist hot packs to the affected muscles produce considerable relief from the pain. Analgesics can also be used to relief pain.
- Feet to be supported by rigid boards at 90° angle. Early spinal bracing for the back if it is weak.
- Hip and knees should be positioned as straight as possible and arms in abduction with mild support.
- Passive range of motion for the joints to avoid contracture formation.
- Position the patient with face down and hip extended every 2 hourly to prevent pressure sores and deformities.

> In the recovery or convalescent stage

- Sitting up can be encouraged if the paralysis is not severe.
- As soon as the fever drops, exercises should be started to prevent contractures and return strength.
- Passive, active assisted to active resisted/ strengthening exercises, sitting balance training, standing balance training in parallel bars, gait training should be started.
- Crutches, leg braces (callipers) and other aids may help the child to move better and may prevent contractures or deformities.
- Whenever possible make exercises fun. Active games, swimming and other activities to keep limb moving as much as they can are important throughout the child's rehabilitation.

Stage of residual paralysis

- Strengthening of all the innervated muscles.
- Preventing contractures and deformities.
- Making the patient as independent as possible.
- Emotional and psychological support.

Orthotic prescription

Before prescribing orthosis it is necessary to assess:-

- Strength of hip abductors and hip extensors
- Knee extensor

- Hip, knee and ankle stability
- Strength of upper limb
- Limb length measurement and gait pattern
- Contractures and derformities

A child with foot drop can be given an ankle foot orthosis of plastic or metal. A child with weak knee may need a long-leg brace of plastic or metal. It may be with or without a knee joint that locks straight for walking and bends for sitting. Child with weak trunk may require long leg braces attached to a body brace or body jacket.

Prevention

Polio immunization (vaccine) Two types of vaccine protect against polio, oral poliovirus vaccine (OPV) and inactivated poliovirus vaccine (IPV) (given as an injection in the leg or arm, depending on the patient's age). Effectively prevents poliomyelitis in most people (immunization is over 90% effective).

QUESTIONS:

2 marks:

- 1. What are developmental mile stones?
- 2. Define cerebral palsy and write the causes?
- 3. Mention the types of CP?
- 4. Define poliomyelitis and write the causes?
- 5. Mention the stages of polio?

6 marks:

- 6. Explain in detail about Developmental mile stones?
- 7. Explain in detail about Cerebral palsy along with its PT management?
- 8. Explain in detail about Poliomyelitis along with its PT management?

Ψ

PHYSIOTHERAPY Paper – II ORTHOPAEDICS AND NEUROLOGY

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FRACTURES, SPRAIN, STRAIN AND DISLOCATION

1

UNIT

Structure:

- 1.1 Fractures
- 1.2 Sprains
- 1.3 Strains
- 1.4 Dislocations

Orthopaedics is a branch of medicine concerned with the correction or prevention of deformities, disorders, or injuries of the skeleton and associated structures (such as tendons and ligaments) often by surgery.

Neurology is a branch of medicine dealing with disorders of the nervous system. Neurology deals with the diagnosis and treatment of all categories of conditions and disease involving the central and peripheral nervous systems (and their subdivisions, the autonomic and somatic nervous systems), including their coverings, blood vessels, and all effector tissue, such as muscles.

1.1 FRACTURES

Definition: fracture is a break in the continuity of the bone which may be a complete or incomplete. It is a medical term for a broken bone.

Causes:

Common causes of fractures include:

- falls from height
- direct strike to the body
- traumatic events, such as car accidents or gunshot wounds
- injuries from sports

Risk factors:

- older age
- having osteoporosis
- having endocrine or intestinal disorders
- who are taking corticosteroids
- who are physically inactive
- who drink alcohol
- who smoke

Types of fractures:

- Avulsion fracture a muscle or ligament pulls on the bone, fracturing it.
- Comminuted fracture the bone is shattered into many pieces.

- Compression (crush) fracture generally occurs in the spongy bone in the spine. For example, the front portion of a vertebra in the spine may collapse due to osteoporosis.
- Fracture dislocation a joint becomes dislocated, and one of the bones of the joint has a fracture.
- Greenstick fracture the bone partly fractures on one side, but does not break completely because the rest of the bone can bend. This is more common among children, whose bones are softer and more elastic.
- Hairline fracture a partial fracture of the bone. Sometimes this type of fracture is harder to detect with routine x-rays.
- Impacted fracture when the bone is fractured, one fragment of bone goes into another.
- Intra articular fracture where the break extends into the surface of a joint.
- Longitudinal fracture the break is along the length of the bone.
- Oblique fracture a fracture that is diagonal to a bone's long axis.
- Pathological fracture when an underlying disease or condition has already weakened the bone, resulting in a fracture.
- Spiral fracture a fracture where at least one part of the bone has been twisted.
- Stress fracture more common among athletes. A bone breaks because of repeated stresses and strains.
- Torus (buckle) fracture bone deforms but does not crack. More common in children. It is painful but stable.
- Transverse fracture a straight break right across a bone



Clinical features: They vary depending on the cause and nature of injury. They may vary from slight pain to unconsciousness. Generally they are

- 1) Shock: It may vary according to extent of injury, position of fracture, age of patient etc.
- 2) Pain: This also varies according to nature of fracture.

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3)	Oedema: It occurs immediately after injury and then gradually becomes generalised.
4)	Local tenderness
5)	Muscle spasm.
6)	Abnormal movements and crepitus.
7)	Deformity: It occurs when there are displaced bony segments.
Investigations:	

- X-ray: A diagnostic test which uses invisible electromagnetic energy beams to make pictures of internal tissues, bones, and organs on film.
- Magnetic resonance imaging (MRI): An imaging test that uses large magnets, radiofrequencies, and a computer to produce detailed pictures of structures within the body.
- Computed tomography scan (CT scan): This is an imaging test that uses X-rays and a computer to make detailed images of the body. A CT scan shows details of the bones, muscles, fat, and organs.
- Routine blood investigations

Fracture healing:

The bone healing process has three overlapping stages: Inflammation, Bone production and Bone remodelling.

• **Inflammation** starts immediately after the bone is fractured and lasts for several days. When the bone is fractured, there is bleeding into the area, leading to inflammation and clotting of blood at the fracture site. This provides the initial structural stability and framework for producing new bone.



Inflammation

• **Bone production** begins when the clotted blood formed by inflammation is replaced with fibrous tissue and cartilage (known as soft callus). As healing progresses, the soft callus is replaced with hard bone (known as hard callus), which is visible on x-rays several weeks after the fracture.



Bone production

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• **Bone remodelling** the final phase of bone healing, goes on for several months. In remodelling, bone continues to form and becomes compact, returning to its original shape. In addition, blood circulation in the area improves. Once adequate bone healing has occurred, weight bearing (such as standing or walking) encourages bone remodelling.



Bone remodeling

Bone generally takes 6 to 12 weeks to heal to a significant degree. In general, children's bones heal faster than those of adults. Bone healing will depend on the location and severity of the fracture, the type of surgical procedure performed and other considerations.

Complications of fractures:

- Infection
- Non union.
- A vascular necrosis
- Mal- union
- Non union
- delayed union
- Adhesions
- Injury to large vessels
- Injury to muscle
- Injury to nerve

Treatment:

It is divided to:

1. Conservative management/ non surgical 2. Surgical management

- 1. Conservative management
 - a) A closed reduction of fracture by manipulation under general anaesthesia
 - b) Maintenance of reduction

The various conservative methods for maintenance of reduction are:

- Plaster of Paris (POP) cast
- Straps & bandages
- Arm slings
- Traction

The duration of immobilisation may vary from 3-8 weeks depending up to age, type of fracture, complications and site of fracture.

- 2. Surgical management: Open Reduction
 - Internal fixation (ORIF) using steel screws, rod, plates, pins or K-wires to hold the broken bones in the correct position.
 - External Fixation which attaches a metal framework outside the limb.

Physiotherapy management:

Physiotherapy should start immediately after the fracture has been immobilised. Physiotherapy during fracture healing will concentrate on:

During immobilization: The aims during this period are:

- 1. Reduce edema: It is very important to do this as early as possible to prevent adhesion formation, and to decrease pain.
- 2. Assist the maintenance of the circulation to the area.
- 3. Maintain muscle function by active or static muscle contractions
- 4. Maintain joint ROM
- 5. Maintain function as allowed by the fracture and the fixation.
- 6. Teach the patient to use crutches, sticks, frames.
- Swelling should be reduced by elevating the limb and by active or static contractions of muscles thus minimizing the formation of adhesions and consequent stiff joints.
- Active exercises by static or isotonic muscle activity will help to maintain a good blood supply to the soft tissues and aid in the reduction of swelling and prevent the formation of adhesions.
- Muscles that cannot produce movement of a joint because of the fixation and do not work statically will waste very rapidly. Isometric or isotonic contractions performed correctly and repeated often enough will prevent excessive wasting.
- Maintaining range of movement of the affected and surrounding joints prevent wasting.
- Encouraging functional activity when possible also helps reduce the rehabilitation time after removal of fixation.
- Patients must understand the importance of their treatment and physiotherapists must understand the problems and requirements of each patient.

During mobilization: Aims of treatment:

- 1. To reduce any swelling.
- 2. To regain full range of joint movement.
- 3. To regain full muscle power.
- 4. To re-educate full function.

1) Swelling

• Swelling should not be a great problem if exercises and general activities have been carried out during the immobilization period.

- It may be a problem in the lower limb if the muscles are very weak and there is a loss of joint range as both factors will prevent an adequate pumping action on the veins.
- Application of ice, passive or active movements and elevation of limb can prevent formation of swelling.

2) Range of joint movement: Passive and active movements will help in gaining the joint its full range of motion.

Range of movement exercises can:

- Increase movement at a joint
- Increase the function of a joint and the whole limb
- Improve movement efficiency
- Increase independence
- Decrease pain
- Improve and maintain joint integrity

3) Muscle power

- The building of muscle power will depend on gaining maximal activity of the muscles and using them in all actions and associated movements with other muscle groups.
- Isometric exercises and isotonic exercises with weights may help in gaining muscle power.

4) Full function

- In preparing a patient to return to work it is important to understand that the patient may have to work all day and know what type of work is involved-heavy labouring, industrial work on a production bench requiring repetitive movements of the hand or foot or both, or office work which can require a variety of different activities.
- Similarly home and leisure activities must be considered so that the patient is fully rehabilitated.
- Home exercises, orthotic devices and regular intervals in between the working periods for few more weeks may help to gain a good functional activity level.

Post Surgical physiotherapy management

Physiotherapy after surgery should begin immediately in hospital; however it is important to continue physiotherapy to achieve the best possible recovery. The physiotherapist will encourage patient to carry out a range of exercises to strengthen and mobilise any affected joints and muscles and this will also help to improve circulatory or respiratory problems that may have developed in hospital.

Other benefits include:

- Effective management of pain
- Help patient to return to activities of daily living
- Strengthening of weak muscles
- Stretching of muscles that may have become stiff
- Help getting back to the previous level

- Improving posture
- Regain independence
- Reduce any anxiety that he or she may have and regain confidence
- Mobilisation exercises to improve circulation and range of movement
- Help clear any secretions, improve lung volumes and prevent chest infections
- Advise on effective positioning to increase comfort and reduce the risk of pressure sores

1.2 SPRAIN

Sprain, also known as a torn ligament, is damage to one or more ligaments in a joint, often caused by trauma or the joint being taken beyond its functional range of motion. The severity of sprain ranges from a minor injury which resolves in a few days to a major rupture of one or more ligaments requiring surgical fixation and a period of immobilization. Sprains can occur in any joint but are most common in the ankle and wrist.

Causes:

The most common causes of sprains are falling, twisting, or experiencing trauma to the joint. These types of injuries may cause the joint to move out of its normal range of movement, tearing or stretching the ligament as this happens.

Situations that may result in a sprain include:

- walking or running on an uneven surface
- twisting or pivoting suddenly
- falling and landing on the wrist or hand
- playing racquet sports
- injuries from contact sports

Degrees of Sprain:

- 1. First degree sprain (mild) the fibres of the ligament are stretched but intact
- 2. Second degree sprain (moderate) is a tear of part of a ligament, from a third to almost all its fibres.
- 3. Third degree sprain (severe) is a complete rupture of the ligament, sometimes avulsing a piece of bone.

Joints involved:

Although any joint can experience a sprain, some of the more common include:

- The ankle. It is the most common, and has been said that sprains such as serious ankle sprains are more painful and take longer to heal than actually breaking the bones in that area.
- The knee. One of the more talked about sprains is that to the anterior cruciate ligament (ACL) of the knee.
- Ligaments between the spinal vertebrae
- The fingers.
- The wrist.
- The toes
- •

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ANKLE SPRAIN

An Ankle sprain is actually an injury to the ligaments of the ankle joint, which are elastic, band-like structures that hold the bones of the ankle joint together and prevent excess turning and twisting of the joint. In normal movement, the ligaments can stretch slightly and then retract back to their normal shape and size. A sprain results when the ligaments of the ankle have been stretched beyond their limits. In severe sprains, the ligaments may be partially or completely torn.

The ankle joint is fairly unstable and largely depends on the ligaments for its stability. The ankle sprain is of two types-

- 1-Pronation or Eversion type.
- 2-Supination and inversion type.

The most common type is the inversion ankle sprain (85%), in which the ankle rolls over on the outside. In the sprained ankle the most common damage is done to the talo-fibula ligament (if the ankle sprain is worse, the calcaneo-fibula ligament can also be damaged) - sometimes the tendons also get damaged.



Causes:

Foot can twist unexpectedly during many different activities, such as:

- Walking or exercising on an uneven surface
- Falling down
- Participating in sports that require cutting actions or rolling and twisting of the foot—such as trail running, basketball, tennis, football, and soccer
- During sports activities

Grades of Ankle Sprains

Sprains are graded based on how much damage has occurred to the ligaments.

Grade 1 Sprain (Mild) -

- Slight stretching and microscopic tearing of the ligament fibers
- Mild tenderness and swelling around the ankle

Grade 2 Sprain (Moderate) -

- Partial tearing of the ligament
- Moderate tenderness and swelling around the ankle
- If the doctor moves the ankle in certain ways, there is an abnormal looseness of the ankle joint

Grade 3 Sprain (Severe) -

- Complete tear of the ligament
- Significant tenderness and swelling around the ankle
- If the doctor pulls or pushes on the ankle joint in certain movements, substantial instability occurs

Clinical features:

A sprained ankle is painful. Other symptoms may include:

- Swelling
- pain
- Bruising
- Tenderness to touch
- Instability of the ankle—this may occur when there has been complete tearing of the ligament or a complete dislocation of the ankle joint.

If there is severe tearing of the ligaments, you might also hear or feel a "pop" when the sprain occurs. Symptoms of a severe sprain are similar to those of a broken bone and require prompt medical evaluation.

Diagnosis:

- Anterior drawer test
- Talar tilt test

- X-rays. These scans are taken while the ankle is being pushed in different directions. Stress x-rays help to show whether the ankle is moving abnormally because of injured ligaments.
- Magnetic resonance imaging (MRI) scan
- Ultrasound

Treatment:

For milder sprains, your doctor may recommend simple home treatment. The RICE protocol. Follow the RICE protocol as soon as possible after the injury:

- **Rest** the ankle by not walking on it.
- Ice should be immediately applied to keep the swelling down. It can be used for 20 to 30 minutes, three or four times daily. Do not apply ice directly to your skin.
- **Compression dressings**, bandages or ace-wraps will immobilize and support the injured ankle.
- Elevate the ankle above the level of the heart as often as possible during the first 48 hours.

Medication: Nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and naproxen can help control pain and swelling. Because they improve function by both reducing swelling and controlling pain, they are a better option for mild sprains than narcotic pain medicines.

Nonsurgical Treatment

- Some sprains will require treatment in addition to the RICE protocol and medications.
- Crutches: In most cases, swelling and pain will last from 2 to 3 days. Walking may be difficult during this time and doctor may recommend to use crutches as needed.
- Immobilization: During the early phase of healing, it is important to support the ankle and protect it from sudden movements. For a Grade 2 sprain, a removable plastic device such as a cast-boot or air stirrup-type brace can provide support. Grade 3 sprains may require a short leg cast or cast-brace for 2 to 3 weeks.

Surgical Treatment: Surgical treatment for ankle sprains is rare. Surgery is reserved for injuries that fail to respond to nonsurgical treatment, and for patients who experience persistent ankle instability after months of rehabilitation and nonsurgical treatment.

Surgical options may include: Arthroscopy and Reconstruction.

Physiotherapy management:

Aims in Acute Stage: Decrease pain and swelling, increase pain free range of motion, begin strengthening, begin non-weight bearing proprioceptive training and provide protective support as needed.

> Modalities to decrease pain and swelling

- Ice and contrast baths
- Electrical stimulation (high-voltage galvanic or interferential)
- Ultrasound
- Cross-friction massage(gently)

> Weight bearing :

Progress weight bearing as symptoms permit. Partial weight bearing to full weight bearing if no signs of antalgic gait is present.

➢ Exercises :

- Active range of motion exercises- Dorsiflexion, inversion, foot circle, plantarflexion, eversion, alphabet.
- Strength exercises- Isometrics in pain free range, toe curls with towel (place weight on towel to increase resistance). Pick up objects with toes (tissue, marble).
- **Proprioceptive training** with Wobble board. Ankle disc.
- **stretching** Passive ROM- only dorsi flexion and plantar flexion in pain free range

Rehabilitative Stage:

Aims: Increase pain-free ROM, Progress strengthening, Progress proprioceptive training, Increase pain-free activities of daily living, Pain-free full weight bearing and uncompensated gait.

> Therapeutic exercises for ankle sprain

- Stretching- of gastrocnemius and soleus with increased intensity.
- Strengthening- Weight bearing exercises. Heel raises. Toe raises. Stair steps. Quarter squats.

- Concentric/Eccentric and isotonic (theraband and weight cuff exercises) for inversion, eversion, plantar flexion, dorsi flexion, peroneal strengthening.
- Proprioceptive training like Single leg balance activities
- Continue modalities as needed, specifically after exercise to prevent re occurrence of pain and swelling.
- > Taping, Bracing and orthotics used as needed. To avoid re injury.

Return to Activity stage:

Aims: Regain full strength. Normalbiomechanics. Return to participation. Protection and strengthening of any mild residual joint instability.

- Therapeutic exercises : Continue progression of ROM and strengthening exercises. Sports specific strengthening and training.
- Running progression
 - Unloaded jogging. Unloaded running. Alternate jog-walk-jog on smooth straight surfaces. Alternate sprint-jog-sprint on smooth straight surfaces. Figure of eight drills. Zig-zag cutting.
 - Agility drills like back pedalling, side stepping,
 - Progress weight bearing multi directional balance exercises and movement activities

1.3 STRAIN

A strain (also known as a pulled muscle or torn muscle) is an acute or chronic soft tissue injury that occurs to a muscle, tendon, or both (contractile components).

Causes:

A strain can occur as a result of improper body mechanics with any activity (e.g., contact sports, lifting heavy objects, overstretching) that can induce mechanical trauma or injury. Generally, the muscle or tendon overstretches and is placed under more physical stress than it can exert.

Strains commonly result in a partial or complete tear of a tendon or muscle, or they can be severe in the form of a complete tendon rupture. The most common body location for strains to occur is in the foot, leg.

- Acute strains are more closely associated with recent mechanical trauma or injury.
- Chronic strains typically result from repetitive movement of the muscles and tendons over a long period of time.
ORTHOPAEDICS AND NEUROLOGY

Degrees of Strain (as classified by the American College of Sports Medicine):

- First degree (mildest) little tissue tearing, mild tenderness, pain with full range of motion.
- Second degree torn muscle or tendon tissues, painful, limited motion; possibly some swelling or depression at the spot of the injury.
- Third degree (most severe) complete muscle tear. limited or no movement, pain will be severe at first, but may be painless after the initial injury



MUSCLE STRAINS

Clinical features:

- pain,
- functional loss of the involved structure,
- muscle weakness,
- contusion, and
- localized inflammation

A strain can range from mild annoyance to very painful, depending on the extent of injury.

Diagnosis:

A diagnosis of a sprain can often be made with a good degree of certainty by physical examination based on the clinical presentation and method of injury. In some cases, X-rays are obtained to ensure that there is no fracture. In some cases, particularly if the injury is prolonged or does not appear to be resolving as expected, magnetic resonance imaging (MRI) is performed to look at surrounding soft tissues and the ligament.

Treatment:

The first-line treatment for a muscular strain in the acute phase include five steps commonly known as <u>P.R.I.C.E.</u>

- Protection: Apply soft padding to minimize impact with objects.
- Rest: Rest is necessary to accelerate healing and reduce the potential for re-injury.
- Ice: Apply ice to induce vasoconstriction, which will reduce blood flow to the site of injury. Never ice for more than 20 minutes at a time.
- Compression: Wrap the strained area with a soft-wrapped bandage to reduce further diapedesis and promote lymphatic drainage.
- Elevation: Keep the strained area as close to the level of the heart as is possible in order to promote venous blood return to the systemic circulation.

Immediate treatment is usually an adjunctive therapy of NSAIDs and Cold compression therapy. Controlling the inflammation is critical to the healing process. Cold compression therapy acts to reduce swelling and pain by reducing leukocyte extra vasation into the injured area.

NSAIDs such as Ibuprofen/ paracetamol work to reduce the immediate inflammation.

After the bleeding has stopped, NSAIDs can be used with some effectiveness to reduce inflammation and pain.

A new treatment for acute strains is the use of platelet rich plasma (PRP) injections which have been shown to accelerate recovery from non surgical muscular injuries.

1.4 DISLOCATION

A joint dislocation is a complete separation of two articulating bony surfaces, often caused by a sudden impact to the joint. A partial or incomplete dislocation is called a subluxation. Dislocations are often caused by sudden trauma on the joint like an impact or fall. Although any joint may become dislocated, common sites include the shoulder, finger, patella, elbow, and dislocation hip. А joint can cause damage to the surrounding ligaments, tendons, muscles, and nerves. The most common joint dislocation is a shoulder dislocation.

Causes

Trauma that forces a joint out of place causes a dislocation. Car accidents, falls, and contact sports such as football are common causes of this injury.

Dislocations also occur during regular activities when the muscles and tendons surrounding the joint are weak. These injuries happen more often in older people who have weaker muscles and balance issues

Clinical features:

- Intense pain
- Joint instability
- Deformity of the joint area
- Reduced muscle strength
- Bruising or redness of joint area
- Difficulty moving joint
- Stiffness.

RECURRENT DISLOCATION OF SHOULDER

The shoulder joint is the most frequently dislocated joint of the body. Because it moves in several directions, the shoulder can dislocate forward, backward or downward. The most common variety is a forward (anterior) dislocation.

Anterior Dislocation:

- Arm held in an abducted and external rotation position
- Loss of normal contour of the deltoid and acromion prominent posteriorly and laterally
- Humeral head palpable anteriorly
- All movements limited and painful
- Palpable fullness below the coracoid process and towards the axilla

Posterior Dislocation:

- Arm is abducted and internal rotation position
- May or may not lose deltoid contour
- May notice posterior prominence head of humerus
- Tear of subscapularis muscle (weak or cannot internally rotate)



Normal anatomy

Posterior dislocation

dislocation

Causes and risk factors:

- Traumatic injury, such as a fall, sports injury, or car accident
- Overuse/repetitive strain: from sports such as tennis, golf, swimming, volleyball
- Loose capsular ligaments:
- Multi-directional instability

Clinical features:

- Deformity
- Swelling
- Numbness
- Weakness
- Bruising

Diagnosis:

- During the physical exam, doctor will inspect the affected area for tenderness, swelling or deformity.
- An X-ray of shoulder joint will show the dislocation and may reveal broken bones or other damage to the shoulder joint.

Treatment:

The treatment invariably is surgical. The following two operations are performed commonly

- 1- Bankarts operation
- 2- putti-platt operation

Physiotherapy following surgery:

0 - 2 Weeks:

- Sling allowed as needed for comfort only, first 5 7 days, taking arm out often 5 7 times a day for elbow ROM
- Posture education and postural exercises
- Ball or putty squeezing throughout the day
- Icing every two hours for 15 20 minutes first 5 7 days, 3 times a day thereafter
- Soft tissue mobilization focused on periscapular musculature, cervical spine, and rotator cuff
- Scapular mobilization
- Passive and active assisted ROM manually and using pulley at home going for full motion as soon as able without increased irritability

2 - 4 Weeks:

- Full passive range of motion should be achieved by 2 4 weeks
- Scapular and glenohumeral joint mobilization as indicated
- Begin rotator cuff retraining and strengthening
- shoulder pulley, finger ladder are advised
- Continued icing 3 times per day

4 - 8 Weeks:

- Progressive strength training
- Shoulder wheel, thera band exercises are preferred.
- Development of independent home and gym program
- swimming

8 - 10 Weeks:

• Progression into normal activity and exercise program

QUESTIONS:

2 marks:

- 1. Define Orthopaedics?
- 2. Define Neurology?
- 3. Define fracture and write the types?
- 4. Write the complications of fractures?
- 5. Define sprain and write the causes?
- 6. Explain the degrees of sprain injuries?
- 7. Define strain and write the causes?
- 8. Mention the clinical features of strain?
- 9. Define dislocation and subluxation?
- 10. Mention the clinical features of dislocation?

6 marks:

- 1. Explain in detail about Fractures along with physiotherapy treatment?
- 2. Explain in detail about Ankle sprain along with physiotherapy treatment?
- 3. Explain in detail about recurrent dislocation of shoulder along with physiotherapy treatment?

UPPER LIMB CONDITIONS

UNIT

Structure:

- 2.1 Periarthritis of shoulder
- 2.2 Tennis elbow
- 2.3 Dequerevain disease
- 2.4 Trigger finger
- 2.5 Carpal tunnel syndrome

2.1 PERIARTHRITIS OF SHOULDER

Periarthritis or Adhesive capsulitis (also known as **frozen shoulder**) is a painful and disabling disorder of unclear cause in which the shoulder capsule, the connective tissue surrounding the glenohumeral joint of the shoulder, becomes inflamed and stiff, greatly restricting motion and causing chronic pain. Pain is usually constant, worse at night, and with cold weather. Certain movements or bumps can provoke episodes of tremendous pain and cramping. The condition is thought to be caused by injury or trauma to the area and may have an autoimmune component.

The condition is frequently defined as loss of more than 25% of normal shoulder range of motion in at least two directions, particularly abduction and external rotation. In frozen shoulder, the shoulder capsule thickens and becomes stiff and tight. Thick bands of tissue called adhesion develop. In many cases, there is less synovial fluid in the joint. The hallmark signs of this condition are severe pain and being unable to move the shoulder either by own or with the help of someone else.

Causes:

The causes of frozen shoulder are not fully understood. There is no clear connection to arm dominance or occupation. A few factors may put you more at risk for developing frozen shoulder.

- Diabetes
- hypothyroidism,
- hyperthyroidism,
- Parkinson's disease
- Cardiac disease.
- Immobilization due to surgery, a fracture, or other injury

Clinical features:

Patients presenting with adhesive capsulitis will often report an insidious onset with a progressive increase in pain, and gradual decrease in active and passive range of motion. Patients frequently have

difficulty with grooming, performing overhead activities, dressing, and particularly fastening items behind the back. Adhesive capsulitis is considered to be a self-limiting disease with sources stating symptom resolution as early as 6 months up to 11 years. Unfortunately symptoms may never fully subside in many patients.



Frozen shoulder progresses through three overlapping clinical phases:

- 1 Acute/freezing/painful phase: Pain increases gradually, making shoulder motion harder and harder. Pain tends to be worse at night. This stage can last from 6 weeks to 9 months.
- 2 Adhesive/frozen/stiffening phase: Pain does not worsen, and it may decrease at this stage. The shoulder remains stiff. It can last from 4 to 6 months, and movement may be restricted.
- 3 **Resolution/thawing phase:** Movement gets easier and may eventually return to normal. Pain may fade but occasionally recur. This takes between 6 months and 2 years.

A frozen shoulder normally recovers, but it can take 3 years.

Diagnosis:

The diagnose of frozen shoulder based on signs, symptoms, and a physical exam, paying close attention to the arms and shoulders. Structural problems can only be identified with the help of imaging tests, such as an X-ray or Magnetic Resonance Imaging (MRI).

Treatment:

Frozen shoulder generally gets better over time, although it may take up to 3 years. The focus of treatment is to control pain and restore motion and strength through physical therapy.

Nonsurgical Treatment:

- Most people with frozen shoulder improve with relatively simple treatments to control pain and restore motion.
- Non-steroidal anti-inflammatory medicines: Drugs like aspirin and ibuprofen reduce pain and swelling.
- Steroid injections. Cortisone is a powerful anti-inflammatory medicine that is injected directly into the shoulder joint.
- Hot or cold compression packs: These can help reduce pain and swelling. Alternating between the two may help

Physiotherapy for non surgical condition:

Freezing phase

- Pain is often most severe during the freezing phase and patients in this phase would benefit from learning pain-relieving techniques.
- These exercises include gentle shoulder mobilisation exercises within the tolerated range (e.g. pendulum exercise, passive supine forward elevation, passive external rotation, and active assisted range of motion in extension, horizontal adduction, and internal rotation).
- A heat or ice pack can be applied as a modality to relieve pain before the start of these exercises.
- Ultrasound therapy to the shoulder capsule helps in reducing pain.
- TENS & IFT helps in reducing pain and improving muscle strength
- The application of moist heat in conjunction with stretching has been shown to improve muscle extensibility.
- Certain patients might also find it useful to take analgesics before physical therapy.
- Patients should begin with short-duration (1–5 seconds) range of motion exercises, which should be in a relatively pain-free range.
- Pendulum exercises can be used in flexion or abduction or circular motion.
- Wand exercises, active assisted exercises, pully exercises are useful in improving ROM
- Patients can also try pulley exercises, as tolerated, and neck or scapular muscle releases.
- It is important not to aggravate a frozen shoulder, as aggressive stretching beyond the pain threshold can result in inferior outcomes, particularly in the early phase of the condition
- patients should avoid a forward shoulder posture as it may cause a loss of glenohumeral flexion and abduction.

Frozen phase

- Similar to the freezing phase, a heat or ice pack can be applied during the frozen phase to relieve pain before commencing exercises.
- In particular, stretching exercises for the chest muscles and muscles at the back of the shoulder should be maintained.
- Rotation before elevation exercises, such as an external rotation stretch, are also recommended to avoid increasing pain and inflammation
- At this stage, strengthening exercises are added to maintain muscle strength.
- Isometric or static contractions are exercises that require no joint movement and can be done without worrying about increasing pain in the shoulder.
- The scapular retraction exercises gently stretch the chest muscles and serve as basic strengthening for the scapular muscles.
- Isometric shoulder external rotation can also be used for flexion or abduction, within the available range, but care should still be taken to avoid introducing aggressive exercises, as overenthusiastic treatment could aggravate the capsular synovitis and subsequently cause pain.

Thawing phase

- In the thawing phase, the patient experiences a gradual return of range of motion.
- It is crucial to get the shoulder back to normal as quickly as possible by regaining full movement and strength.
- Strengthening exercises are important, as the shoulder is considerably weakened after a few months of little movement.
- Exercise using exercise band, weight cuffs etc. helps in improving shoulder girdle strength
- Compared to the frozen phase, the patient can perform more mobility exercises and stretches with a longer holding duration, within tolerated boundaries.
- Strengthening exercises can also progress from isometric or static contractions, to exercises using a resistance band, and eventually to free weights or weight machines.
- Rotator cuff exercises, as well as posture exercises and exercises for the deltoid and chest muscles, can be included in the treatment as well.

Surgical Treatment

- Manipulation under anaesthesia: During this procedure, you are put to sleep. Doctor will force your shoulder to move which causes the capsule and scar tissue to stretch or tear. This releases the tightening and increases range of motion.
- Shoulder arthroscopy: In this procedure, doctor will cut through tight portions of the joint capsule. This is done using pencil-sized instruments inserted through small incisions around the shoulder

Physiotherapy following surgery:

0 - 2 Weeks:

- Sling allowed as needed for comfort only, first 5 7 days, taking arm out often 5 7 times a day for elbow ROM
- Posture education and postural exercises
- Ball or putty squeezing throughout the day
- Icing every two hours for 15 20 minutes first 5 7 days, 3 times a day thereafter
- Soft tissue mobilization focused on periscapular musculature, cervical spine, and rotator cuff
- Scapular mobilization
- Passive and active assisted ROM manually and using pulley at home going for full motion as soon as able without increased irritability
- Cardiovascular training program can include bike, treadmill
- Core stabilization program

2 - 4 Weeks:

- Full passive range of motion should be achieved by 2 4 weeks
- Scapular and glenohumeral joint mobilization as indicated
- Begin rotator cuff retraining and strengthening
- Continued cardiovascular and core strength training
- Continued icing 3 times per day

4 - 8 Weeks:

- Progressive strength training
- Development of independent home and gym program
- swimming

8 - 10 Weeks:

Progression into normal activity and exercise program
2.2 TENNIS ELBOW

Tennis elbow, also known as lateral epicondylitis, is a condition in which the outer part of the elbow becomes painful and tender due to inflammation of the lateral epicondyle. It involves the muscles and tendons of the forearm which attach on the lateral epicondyle that extends the wrist and the fingers. The tendon usually involved in tennis elbow is called the Extensor Carpi Radialis Brevis (ECRB). Onset of symptoms is generally gradual.



Causes:

- Playing racquet sports such as tennis, badminton or squash
- Throwing sports such as the javelin or disc
- Using shears while gardening
- Using a paintbrush or roller while decorating
- Manual work such as plumbing or bricklaying
- Activities that involve fine, repetitive hand and wrist movements such as using scissors or typing
- Other activities that involve repeatedly bending the elbow such as playing the violin
- Age : most people who get tennis elbow are between the ages of 30 and 50

Clinical features:

- Diffuse achiness.
- Morning stiffness.
- Occasional night pain.
- Dropping of objects/ weak grip strength.
- Pain with palpation of lateral epicondyle.
- Pain with active or resisted extension.
- Pain with grasping objects with the effected hand.
- Pain or tenderness on the outer side of the elbow.
- Pain when you straighten or raise your wrist and hand.
- Pain made worse by lifting a heavy object.
- Pain when you make a fist, grip an object, shake hands, or turn door handles.
- Pain that shoots from the elbow down into the forearm or up into the upper arm.

Diagnosis:

- X-rays.
- MRI.
- EMG.
- Special test Cozen's test or Resistive tennis elbow test: The patient sits with the examiner stabilizing the involved elbow while palpating the lateral epicondyle with a closed fist, the patient pronates and radially deviates the forearm and extends the wrist against the examiner's resistance. A positive result would be if there is pain along the lateral epicondyle or objective muscle weakness.

Treatment:

Non surgical treatment:

- Medication: Anti-inflammatory medication helps to reduce pain.
- Steroid injection: Steroids, such as cortisone, are very effective anti-inflammatory medicines.
- Rest: A period of rest is most important to allow the injury a chance to heal. Avoid heavy lifting or carrying opening doors or repeatedly shaking hands.
- Ice: Apply cold to your elbow three times a day for 20 to 30 minutes at a time in the early painful stage and for 20 minutes after active use of arm. Protect skin by putting a towel between elbow and the ice bag.
- Brace: Wearing a tennis elbow brace can help to protect the tendon. This type of brace gives compression to the forearm muscle and helps lessen the force that the muscle transmits to the tendon.

Physiotherapy for non surgical treatment:

Physiotherapy has been shown to be effective in the short and long-term management of tennis elbow

Pain Relief: For pain relief therapist may use following

- Ultrasound therapy.
- Ice
- Cryotherapy.
- Laser therapy.
- Acupuncture.
- Deep tendon friction massage

Exercises:

- Stretching exercises :
 - ➢ Wrist extensor stretch

Straighten your arm fully. Relax your wrist so that you leave your hand hanging. With your other hand, gently push against the back of your hand so it bends towards you. Feel a stretch along the top of your arm. Relax.

> Wrist flexor stretch

Straighten your arm fully. Relax your wrist. Use your other hand to gently pull your fin-gers towards you. Feel a stretch in your wrist muscles

Handshake Stretch

Holding the weight or can with your thumb pointing up. (Imagine you are going to shake hands with someone.) Move the can or weight up and down slowly. Keep your arm still by resting it on the table and only move your wrist.

- Strengthning exercises
 - Wrist flexion strengthening: Holding a soup can or hammer handle with your palm up, slowly bend your wrist up. Slowly lower the weight and return to the starting position. Repeat 10 times. Do 3 sets. Gradually increase the weight of the can you are holding.
 - Wrist extension strengthening: Holding a soup can or hammer handle with your palm down, gently bend your wrist up. Slowly lower the weight and return to the starting position. Repeat 10 times. Do 3 sets. Gradually increase the weight of the can you are holding.
 - Wrist radial deviation strengthening: Hold your wrist in the sideways position with your thumb up. Holding a can of soup or hammer handle, gently bend your wrist up with your thumb reaching towards the ceiling. Slowly lower to the starting position. Do not move your forearm throughout this exercise. Repeat 10 times. Do 3 sets.
 - Forearm pronation and supination: Hold a soup can or hammer handle in your hand, with your elbow bent 90 degrees. Slowly rotate your hand with palm upward and then palm down. Repeat 10 times. Do 3 sets.
 - Wrist Curls: Hold a light hand weight or can of beans. Rest your forearm on a table, palm facing up. Hang your wrist and hand off the edge. Moving only your wrist, gently raise the weight. Hold here for 5 seconds. Gently lower the weight. Repeat x10.

- Wrist Rotations: Hold the weight or can in your hand with your thumb pointing up. Turn the wrist inward as far as possible. Hold for 2 seconds. Then turn the wrist outward as far as possible. Hold for 2 seconds. Repeat as many times as you can.
- Ball squeeze: Hold a tennis ball. Make a fist around it and squeeze. Hold the squeeze for 5 seconds. Relax. Repeat x10.
- Bicep Curl: Hold a light weight or can of beans. Secure your injured elbow with your other hand or by sitting in a chair and resting it on your thigh. Slowly curl the weight up towards your chest and down again. Repeat this x10.

Surgical Treatment

If the symptoms do not respond after 6 to 12 months of nonsurgical treatments, doctor may recommend surgery.

Most surgical procedures for tennis elbow involve removing diseased muscle and reattaching healthy muscle back to bone.

Open surgery. The most common approach to tennis elbow repair is open surgery. This involves making an incision over the elbow.

Arthroscopic surgery. Tennis elbow can also be repaired using miniature instruments and small incisions.

Physical therapy following surgery:

Rehabilitation: Following surgery, your arm may be immobilized temporarily with a splint. About 1 week later, the sutures and splint are removed.

After the splint is removed, exercises are started to stretch the elbow and restore flexibility. Light, gradual strengthening exercises are started about 2 months after surgery.

2.3 DE QUERVAIN DISEASE

It is an inflammation of two tendons (Abductor pollicis longus and Extensor policies brevis) that control movement of the thumb and their tendon sheath. This results in pain at the outside of the wrist. Pain is typically increased with gripping or rotating the wrist. The thumb may also be difficult to move smoothly. Onset of symptoms is gradual.

ORTHOPAEDICS AND NEUROLOGY

Causes

- Injury or hit to the thumb or wrist
- Gaming
- Playing racket sports
- Playing an instrument
- Rheumatoid arthritis
- Using or holding a cell phone for long periods of time
- Typing a lot, using a mouse, or a computer often
- Lifting a baby or carrying a child a lot
- Being pregnant, de Quervain's happens just after pregnancy
- Age, de Quervain's is most common between 30 and 50 years of age
- Gender, women are more likely to get de Quervain's



Clinical features:

- Difficulty moving the thumb and wrist during activities involving pinching and grasping
- Difficulty gripping, holding, or grasping objects
- Pain in thumb that travels up the forearm
- Pain with direct pressure to the affected area of the thumb and wrist
- Inflammation and swelling
- Pain along the top of the thumb

Diagnosis:

De Quervain disease is diagnosed clinically, based on history and physical examination, though diagnostic imaging such as x-ray may be used to rule out fracture, arthritis, or other causes.

Finkelstein's test is a physical exam maneuver used to diagnose de Quervain disease. To perform the test, the examiner grasps the thumb and sharply deviates the hand toward the little finger side. If sharp pain occurs at the base of the thumb, the test is positive.

Treatment:

The goal in treating de Quervain's tendinosis is to relieve the pain caused by irritation and swelling.

Nonsurgical Treatment:

- Splints. Thumb-Spica Splint may be used to rest the thumb and wrist.
- Anti-inflammatory medication (NSAIDs). These medications can be taken by mouth or injected into a tendon compartment. This may help reduce swelling and relieve pain.
- Avoiding activities that cause pain and swelling. This may allow the symptoms to go away on their own.
- Avoid repetitive hand motions, such as heavy grasping, wringing, or turning and twisting movements of the wrist
- Take frequent breaks when doing repeated hand and thumb actions.
- Corticosteroids. Injection of corticosteroids into the tendon sheath may help reduce swelling and pain.

Surgical Treatment:

Surgery may be recommended if symptoms are severe or do not improve. The goal of surgery is to open the thumb compartment (covering) to make more room for the irritated tendons.

Physiotherapy for non surgical conditions:

This focuses on reducing pain, improving your range of motion, and reducing swelling. Depending on your individual needs, physical therapy for De Quervain's Tenosynovitis can include:

- Ice or heat packs: Heat can help relax and loosen tight musculature, and ice can be used to help relieve inflammation of the extensor sheath.
- Ultrasound improves the treatment outcome
- Massage: Deep tissue massage at the thenar eminence can help relax tight musculature that causes pain
- Stretching :Stretching the thenar eminence muscles into thumb extension and abduction can relax and lengthen this tight musculature that causes pain
- Increasing strength:
 - o Resisted finger and thumb extension
 - Palm up position for thumb extension and abduction strength
 - Thumb up position for thumb extension and abduction strength
 - Resisted radial deviation
 - \circ $\,$ In thumb up position $\,$
 - Resisted supination
 - In thumb up position
 - Resisted thumb opposition

- In thumb up position
- Hand spring
- Improving range of motion: **Stretching** as explained above can be used to improve range of motion. Ice/Heat packs can relax tight musculature so that you can attain a bigger range of motion.

Physical therapy following surgery:

Therapist will begin by doing active hand movements and range-of-motion exercises and also use ice packs, soft-tissue massage, and hands-on stretching to help with the range of motion.

When the stitches are removed, therapist starts carefully strengthening the hand and thumb by squeezing and stretching putty.

Physiotherapists also use a series of gentle stretches to encourage the thumb tendons to glide easily within.

2.4 TRIGGER FINGER

Trigger finger is a painful condition in which a finger or thumb clicks or locks as it is bent towards the palm.

Causes:

- A repeated movement or forceful use of the finger or thumb.
- Rheumatoid arthritis
- Gout
- Diabetes
- Grasping something, such as a power tool, with firm grip for a long time



Clinical features:

Symptoms of trigger finger may progress from mild to severe and include:

• Finger stiffness, particularly in the morning

- A popping or clicking sensation when moving the finger
- Tenderness or a bump (nodule) in the palm at the base of the affected finger
- Finger catching or locking in a bent position, which suddenly pops straight
- Finger locked in a bent position, and unable to straighten

Trigger finger can affect any finger, including the thumb. More than one finger may be affected at a time, and both hands might be involved. Triggering is usually more pronounced in the morning, while firmly grasping an object or when straightening the finger.

Diagnosis:

Physical exam of hand and fingers- The finger may be swollen, stiff, and painful. Patients have a bump over the joint in the palm. Or it could be locked in a bent position. There are no X-rays or lab tests to diagnose trigger finger.

Treatment:

Nonsurgical Treatment -

- **Rest**. Resting the hand and avoiding activities that make it worse may be enough to resolve the problem.
- **Splinting.** Wearing a splint at night to keep the affected finger or thumb in a straight position which is also helpful in sleeping.
- **Medications.** Medications such as acetaminophen and nonsteroidal antiinflammatory drugs (NSAIDs) can help relieve pain and inflammation.
- **Steroid injections**: Corticosteroid, or cortisone, is an anti-inflammatory agent that can be injected into the tendon sheath at the base of the trigger finger.

Surgical Treatment -

If the finger does not get better with nonsurgical treatment, patient may wish to consider surgery. The surgical procedure for trigger finger is called "tenolysis" or "trigger finger release."

Physiotherapy for non surgical conditions:

Physiotherapy treatment will help to reduce swelling, relieve pain and stiffness and regain functional movement of the finger, so that you can get back to the daily tasks as soon as possible.

Physiotherapy treatments may include:

- **Massaging** the affected knuckle on the palm will facilitate blood flow to the area, which will lubricate the joint and prepare it for movement. With your affected finger in a comfortable position, begin to gently rub across the knuckle then rub in a circular motion. Continue the self-massage for two to three minutes and follow with range-of-motion exercises.
- **Modalities** such as heat/ice, ultrasound, electric stimulation, massage, stretching, and joint motion (active and passive) can have some positive effects on trigger finger
- **Stretching** and **strengthening exercises** like Finger extensor stretch, Finger abduction, Finger spread, Palm presses, Object pickups, Paper or towel grasp, Finger and hand openers, Finger stretches need to be done regularly. Exercises will restore the movement and maintain the adequate strength of the hand grip.
- Joint movement and mobilisations increase joint and soft tissue mobility via a slow, passive therapeutic traction and translational gliding.

Physical therapy following surgery -

Physiotherapy after surgery will begin with gentle range-of-motion exercises.

Physiotherapist apply a special brace to get the finger or thumb to straighten it and also apply heat treatments, soft-tissue massage, and hands-on stretching to help with the range of motion. Some exercises help to strengthen and stabilize the muscles and joints in the hand. Physiotherapist trains the patient to improve fine motor control and dexterity.

2.5 CARPAL TUNNEL SYNDROME

Carpal tunnel syndrome is a common condition that causes pain, numbness, and tingling in the hand and arm. The condition occurs when one of the major nerves to the hand (the median nerve) is squeezed or compressed as it travels through the wrist. In most patients, carpal tunnel syndrome gets worse over time, so early diagnosis and treatment are important. Early on, symptoms can often be relieved with simple measures like wearing a wrist splint or avoiding certain activities.

Causes:

People most at risk are those with jobs or activities that involve repetitive finger use, especially those associated with high force, long-term use, extreme wrist motions, and vibration. Other things that contribute to the development of carpal tunnel syndrome include:

- Heredity (smaller carpal tunnels can run in families).
- Pregnancy.
- Haemodialysis.
- Wrist fracture and dislocation.

- Hand or wrist deformity.
- Arthritic diseases such as rheumatoid arthritis and gout.
- Thyroid gland hormone imbalance (hypothyroidism).
- Diabetes.
- Alcoholism.
- A mass (tumour) in the carpal tunnel.
- Older age.



Clinical features:

- Numbness, tingling, burning, and pain—primarily in the thumb and index, middle, and ring fingers.
- Occasional shock-like sensations that radiate to the thumb and index, middle, and ring fingers.
- Pain or tingling that may travel up the forearm toward the shoulder
- Weakness and clumsiness in the hand—this may make it difficult to perform fine movements such as buttoning clothes.
- Dropping things—due to weakness, numbness, or a loss of proprioception (awareness of where your hand is in space).
- Night-time symptoms are very common. Because many people sleep with their wrists bent, symptoms may awaken from sleep.
- During the day, symptoms often occur when holding something for a prolonged period of time with the wrist bent forward or backward, such as when using a phone, driving, or reading a book.
- Many patients find that moving or shaking their hands helps relieve their symptoms.

Diagnosis:

- **Tinel's sign**. In this test, the doctor taps over the median nerve at the wrist to see if it produces a tingling sensation in the fingers.
- Wrist flexion test (or Phalen test). In this test, the patient rests his or her elbows on a table and allows the wrist to fall forward freely. Individuals with carpal tunnel syndrome will experience numbress and tingling in the fingers within 60 seconds. The more quickly symptoms appear, the more severe the carpal tunnel syndrome.
- X-rays
- Electromyography (EMG) and nerve conduction studies.

Treatment:

- **Conservative** /**Non-surgical treatment**: comprises oral steroids, corticosteroid injections, NSAID, diuretics, vitamin B6 and wrist splinting.
- **Surgical treatment** seems to be more effective than splinting and antiinflammatory drugs plus hand therapy in the midterm and long term to treat CTS. The two main manners to decompress the median nerve by surgery are the open carpal tunnel release (OCTR) and the endoscopic carpal tunnel release (ECTR)

Physiotherapy for non surgical condition:

- Education regarding:
 - changing wrist positions (i.e., avoiding prolonged bent wrist positions)
 - proper neck and upper back posture (i.e., avoiding forward head or slouching)
 - safe use of sharp utensils, tools, or other implements, if sensory changes are identified
- Exercises to increase the strength of the muscles in your hand, fingers, and forearm like Wrist bend(forward and back), Wrist lift (against resistance), Wrist flex(against resistance), Finger bend, Wrist stretch with weight, Hand Squeezes for Grip Strength Wrist Stretches
- Stretching exercises to improve the flexibility of the wrist, hand, and fingers.
- Use of heat/cold treatments to relieve pain.
- Use of a night splint to reduce discomfort.
- Increasing the size of tool and utensil handles by adding extra material for a more comfortable grip.

- Anti-vibration gloves or anti-vibration wraps around tool handles, if vibration is a factor at the workplace.
- Heat, ultrasound, paraffin wax also be used to decrease pain.

The goals of physical therapy are to reduce the symptoms without the need for surgery, to enable to be as active and functional as possible, and to help to resume normal work, home, and leisure activities.

Physiotherapy following surgery:

Physiotherapy treatment is important after surgery to help restore strength to the wrist and to learn to modify habits that may have led to symptoms in the first place. Physiotherapy treatment may include:

- Therapist will begin with soft tissue massage and ice to combat swelling.
- Because there may still be stitches in the wound, exercises will focus on improving range of motion in the fingers and hand.
- In this initial stage of rehabilitation, exercises include bending the fingers, opening and closing the hand and, eventually, slowly rotating the wrist.
- Assisted stretches are also used to increase flexibility.
- Heat, ultrasound, paraffin wax and electrical stimulation may also be used.

QUESTIONS

2 marks

- 1. Define periarthritis and write the causes?
- 2. Mention clinical features of Periarthritis of shoulder?
- 3. Define tennis elbow and write the causes?
- 4. Mention clinical features of tennis elbow?
- 5. Write about Cozen's test or Resistive tennis elbow test?
- 6. Define de quervain disease and write the causes?
- 7. Define trigger finger and its clinical features?
- 8. Define carpal tunnel syndrome and write its causes?
- 9. Mention clinical features of carpal tunnel syndrome?

6 marks

- 1. Explain about Periarthritis of shoulder in detail along with its physiotherapy treatment?
- 2. Explain about Tennis elbow in detail along with its physiotherapy treatment?
- 3. Explain about De quervain disease in detail along with its physiotherapy treatment?
- 4. Explain about Trigger finger in detail along with its physiotherapy treatment?
- 5. Explain about Carpal tunnel syndrome in detail along with its physiotherapy treatment?

Ψ

LOWER LIMB CONDITIONS

UNIT

Structure:

- 3.1 Osteoarthritis of knee
- 3.2 Chondromalacia Patella
- 3.3 Meniscal injury
- 3.4 Plantar faciitis

3.1 OSTEOARTHRITIS OF KNEE

Definition: It is a degenerative disease of joint affecting the joint cartilage. It is uncommon in non weight joints like the shoulder and elbow.

Causes:

The most common cause of osteoarthritis of the knee is age. Almost everyone will eventually develop some degree of osteoarthritis. However, several factors increase the risk of developing significant arthritis at an earlier age.

- Age. The ability of cartilage to heal decreases as a person gets older.
- Weight. Weight increases pressure on all the joints, especially the knees
- Heredity. This includes genetic mutations that might make a person more likely to develop osteoarthritis of the knee.
- **Gender**. Women ages 55 and older are more likely than men to develop osteoarthritis of the knee.
- **Repetitive stress injuries**. These are usually a result of the type of job a person has. People with certain occupations that include a lot of activity that can stress the joint, such as kneeling, squatting, or lifting heavy weights (55 pounds or more), are more likely to develop osteoarthritis of the knee because of the constant pressure on the joint.
- Athletics. Athletes involved in soccer, tennis, or long-distance running may be at higher risk for developing osteoarthritis of the knee.
- **Other illnesses**. People with rheumatoid arthritis, the second most common type of arthritis, are also more likely to develop osteoarthritis.
- People with certain metabolic disorders, such as iron overload or excess growth hormone, also run a higher risk of osteoarthritis.

Osteoarthritis is a degenerative condition of the joint. It is broadly grouped as

1) **Primary osteoarthritis**: Osteoarthritis without any previous pathology is termed as primary osteoarthritis. It is due to the wear and tear changes occurring in old age. Most often it occurs in the weight bearing joints that is knee and hip. The main predisposing factor is obesity

2) **Secondary osteoarthritis**: It occurs as a secondary to some pathology. Such as disease and injury.

Pathology: The structure involved in the joint is articular cartilage. During loading articular surface undergoes fatigue, leading to fragmentation of surface. Later on the cartilage gets completely eroded exposing the bone. As a result there will be osteophyte formation in the edges. There will be inflammatory changes in synovial with hyperaemia resulting in thickening.



Clinical features: They are as following.

- Pain.
- Tenderness.
- Swelling of the joint.
- Limitation of range of motion.
- Crepitations felt on movement.
- Deformity in late cases commonly genu varum
- feeling of warmth in the joint
- stiffness in the knee, especially in the morning or when you have been sitting for a while
- decrease in mobility of the knee, making it difficult to get in and out of chairs or cars, use the stairs, or walk
- creaking, crackly sound that is heard when the knee moves

Diagnosis:

Physical Examination

During the physical examination, doctor will look for:

- Joint swelling, warmth, or redness
- Tenderness about the knee
- Range of passive (assisted) and active (self-directed) motion

- Instability of the joint
- Crepitus (a grating sensation inside the joint) with movement
- Pain when weight is placed on the knee
- Gait (the way patient walk)
- Any signs of injury to the muscles, tendons, and ligaments surrounding the knee
- Involvement of other joints (an indication of rheumatoid arthritis)

Imaging Tests

- X-rays. These imaging tests create detailed pictures of dense structures, like bone. They can help distinguish among various forms of arthritis. X-rays of an arthritic knee may show a narrowing of the joint space, changes in the bone and the formation of bone spurs (osteophytes).
- Other tests. Occasionally, a magnetic resonance imaging (MRI) scan, a computed tomography (CT) scan, or a bone scan may be needed to determine the condition of the bone and soft tissues of the knee.

Laboratory Tests

• Doctor may also recommend blood tests to determine which type of arthritis it is. With some types of arthritis, including rheumatoid arthritis, blood tests will help with a proper diagnosis.

Treatment:

Drugs

- Painkillers (analgesics) help with pain and stiffness but they don't affect the arthritis itself and won't repair the damage to your joint. Ex: Paracetamol, Combined painkillers.
- Non-steroidal anti-inflammatory drugs (NSAIDs), for example ibuprofen or naproxen, may be recommended if inflammation is contributing to decrease pain and stiffness.
- Non-steroidal anti-inflammatory creams and gels are a good option if he/she has trouble taking NSAID tablets.
- Capsaicin cream is made from the pepper plant (capsicum) and is an effective and well-tolerated painkiller.
- Stronger painkillers, for example opioids/anti-inflammatories, may be prescribed if you have severe pain and other medications don't work well enough.
- Steroid injections are sometimes given directly into a particularly painful knee joint.

Physiotherapy management:

Exercise can help:

Prevent the disability that results from inactivity. It promotes the health and normal function of muscles and bones. Exercise keeps the muscles toned and increases bone mineral density, which reduces the risk of osteoporosis and fractures. It also promotes cardiovascular health, which decreases the risk of heart disease. In addition, there are also psycho social benefits to exercise, including an improved sense of well-being and the relief of depression.

KNEE BRACES: are becoming more popular and more evidence to support and their use for osteoarthritis is emerging. There are several types that can help to stabilise the kneecap and make it move correctly.

STRENGTHENING EXERCISES: help increase muscle strength. Strong muscles help to support the joints, making the joints more stable, and helping a person move more easily and with less pain. The two types of strengthening exercises are isometric and isotonic. Isometric exercises involve tightening the muscles, without moving the joints. These exercises are especially useful when joint motion is impaired. Isotonic exercises involve strengthening the muscles by moving the joints.

RANGE-OF-MOTION EXERCISES are gentle stretching exercises which move each joint as far as possible in all directions. These exercises need to be done daily to help keep joints fully mobile and prevent stiffness and deformities.ROM (range-of-motion) exercises are especially important for arthritis patients, who because of intense inflammatory pain tend not to want to move painful joints.

STRETCHING THE MUSCLES that supports the knee is important in preventing injury. Flexible muscles are not as easily injured as tight muscles. Tightness of muscles connected to the knee can also pull the knee out of alignment. When doing stretching knee exercises, be careful to go slowly and not to overstretch.

WALKING: Start with about 5 minutes of slower paced walking to warm up. Walk at a medium pace for about another 10 minutes per day and gradually build up to 30 - 60 minutes by adding a few minutes each time you walk. End your walk with 5 minutes of slower paced walking. After you get into better shape you can start walking at a faster pace to increase the intensity of your walks.

STATIONARY BIKE: Make sure your seat is high enough so that your knees are not bent beyond a 90-degree angle. Your knee should be slightly bent when your pedal is furthest away. An upright stationary bike (looks like a regular bike) gives you a higher intensity work out than a recumbent bike.

HEAT AND COLD THERAPIES: Applying heat and cold to arthritic joints can help to control symptoms such as pain and stiffness.

• Heat therapy: Heat relieves pain and stiffness in arthritic joints. Heat can be applied to the joints with hot packs, hot water bottles, heating pads, or electrically heated

mittens. Heating pads should be set on a timer and used for no more than 20 minutes at a time. The heating pad can be reapplied after 20 minutes of no use.

• Cold therapy: Cold relieves pain in arthritic joints and reduces muscle spasms. Cold can be applied for short periods using ice packs or topical coolant sprays. People with certain medical conditions, such as the Raynaud phenomenon, should not use cold therapy.

TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) can be used for pain relief; A TENS machine is a small electronic device that sends pulses to the nerve endings via pads placed on the skin. The device produces a tingling sensation which is thought to modify the pain messages sent to the brain.

HYDROTHERAPY has also helped a lot of people with knee osteoarthritis. This is a form of exercising in warm water under the supervision of a physiotherapist.

OTHER HEAT THERAPIES includes I.F.T, S.W.D, Wax Bath, Hot Packs; Ultrasound can be applied according to patient condition.

Surgical treatment:

Doctor may recommend surgery if pain from arthritis causes disability and is not relieved with nonsurgical treatment. As with all surgeries, there are some risks and possible complications with different knee procedures. Doctor will discuss the possible complications with you before the operation.

- Arthroscopy: During arthroscopy, doctors use all incisions and thin instruments to diagnose and treat joint problems. Arthroscopic surgery is not often used to treat arthritis of the knee. In Cases where osteoarthritis is accompanied by a degenerative meniscal tear, arthroscopic surgery may be recommended to treat the torn meniscus.
- Cartilage grafting: Normal, healthy cartilage tissue may be taken from another part of the knee or from a tissue bank to fill a hole in the articular cartilage. This procedure is typically considered only for younger patients who have small areas of cartilage damage.
- Synovectomy. The joint lining damaged by rheumatoid arthritis is removed to reduce pain and swelling.
- Osteotomy : In a knee osteotomy, either the tibia (shinbone) or femur (thighbone) is cut and then reshaped to relieve pressure on the knee joint. Knee osteotomy is used when you have early-stage osteoarthritis that has damaged just one side of the knee joint. By shifting your weight off the damaged side of the joint, an osteotomy can relieve pain and significantly improve function in your arthritic knee.

• Total or partial knee replacement (arthroplasty) : The doctor will remove the damaged cartilage and bone, and then position new metal or plastic joint surfaces to restore the function of the knee.

Post-Surgical Knee Rehabilitation

Exercise Schedule

It's not what most people would call a workout. But PT after knee surgery will make you stronger. You can expect to do 20-30 minutes of PT two or three times a day. You also may need to walk for half an hour at least a couple of times daily.

Day 1: At the hospital, a physical therapist will guide the patient to get out of bed and put weight on the new knee for the first time. Patient might even take a few steps with a walker.

The therapist also will help him with bedside exercises. An example is to tighten the thigh muscles, hold for 5-10 seconds, release, and repeat 10 times, ankle "pumps" by moving patient's foot up and down to tighten the shin and calf muscles.

Day 2: Patient will keep doing exercises to strengthen the muscles that support the knee. He will practice bending and straightening knees, as well as flexing and relaxing his thigh muscles. He will also walk farther, either with a walker or crutches.

Days 3-5: He might still be in the hospital, or discharged to a rehab centre or back home. Patient continues with as much PT as you can handle. With help, he might even climb some stair steps.

Day 5-week 4: He slowly ramp up his exercises as his knee gets stronger. During this time, he may:

- Walk farther with walker or crutches.
- Need only a cane or a single crutch to walk. He can do this once he can stand for more than 10 minutes.
- Use an exercise bike. At first, pedal backward only. He can pedal forward when his knee is strong enough.

After 4 weeks, the physical therapist may suggest him add light weights to add resistance. He should stick with all recommended exercises for at least 2 full months after the surgery.

Back to Regular Life

Patient might drive again as soon as 3 weeks after the surgery. But most people need 4-6 weeks before they can bend their knee to get in and out of the car.

In 3-6 weeks, he could shop for groceries, get up from a chair, and do other things that were difficult before the surgery. Just remember that he might not be 100% pain-free. Let the doctor know about any pain that bothers him.

The new knee could last more than 15 years, but it will eventually wear out. It'll last longer if he avoids putting stress on it with activities like:

- Running
- Skiing
- Tennis
- Sports that involve jumping

The good news is that it's easy to stay fit with your artificial knee. He can:

- Walk
- Swim
- Golf
- Go on light hikes
- Bike
- Dance

Life style changes:

- Reduce the weight.
- Try to reduce loading time of the joint.
- Avoid squatting, walking on inclined planes and constant assumption of one posture.
- Consuming good nutrition food.

3.2 CHONDROMALACIA PATELLA

Chondromalacia patellae, also known as "runner's knee," is a condition where the cartilage on the under surface of the patella (kneecap) deteriorates and softens. It is a cause of pain in front of the knee (anterior knee pain). **Chondromalacia patella** is one of the most common causes of chronic knee pain. This condition is common among young, athletic individuals, but may also occur in older adults who have arthritis of the knee.

Causes:

Improper kneecap movement may result from:

- poor alignment due to a congenital condition
- weak hamstrings and quadriceps
- muscle imbalance between the adductors and abductors of hip
- repeated stress to the knee joints, such as running, skiing, or jumping
- a direct blow or trauma to the kneecap

Risk factors:

- Those who are overweight
- People who have had an injury, fracture, or dislocation related to the kneecap
- Runners, soccer players, bicyclists, and other people who exercise often
- Teenagers and healthy young adults, more often females
- Flat feet



A view of the knee joints from below

Clinical features:

Dull, aching pain that is felt:

- Behind the kneecap
- Below the kneecap
- On the sides of the kneecap

A feeling of grinding when the knee is flexed may occur. This can happen:

- Doing knee bends
- Going down stairs
- Running down hill
- Standing up after sitting for awhile

Pain may worsen after sitting for a prolonged period of time or during activities that apply extreme pressure to the knees, such as standing for an extended period or exercising.

Diagnosis:

- X-rays to show bone damage or signs of misalignment or arthritis.
- Magnetic resonance imaging (MRI) to view cartilage wear and tear.
- Arthroscopic exam,

Treatment

Conservative : The most common way to treat symptoms of chondromalacia patella is to rest the knee. Other ways to treat the symptoms include:

- Placing of an ice or cold pack to the area for 15-20 minutes, four times daily, for several days. Do not apply ice directly to the skin. Wrap the ice or cold pack with a towel.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) for pain relief—these include ibuprofen, naproxen, and aspirin.
- Topical pain medication— these include creams or patches that are applied to the skin to help with soft tissue pain.
- Prescription pain relievers.

Physiotherapy management:

- **Isometric quadriceps strengthening and stretching exercises**. Restoration of adequate quadriceps strength and function is an essential factor in achieving good recovery. The most effective exercises are isometric and isotonic in the inner range.
- **Isotonic exercises** through a full range of motion will only lead to increased pain and even joint effusion. Stretching of the vastus lateralis and strengthening of the vastus medialis is often recommended, but they are difficult to isolate due to shared innervation and insertion.
- Ice medication Ice may be useful for reducing pain in an acute flare up, but not as a long term treatment protocol
- Short-wave diathermy can help to relieve pain and to increase the blood supply to the area, improving nutrition supply to the articular cartilage
- Hip strength and stability training, as hip positioning and strength has a significant influence on anterior knee pain.
- **Hip abductor strengthening** as an increased hip adduction angle is associated with weakened hip abductors
- **Foot orthoses** are another option for pain relief, but only in cases where a lower limb mechanics is deemed to be contributing to the knee pain, which may be due to: poor pronation control, excessive lower limb internal rotation during weight bearing and an increased Q-angle.
- Foam Roller can be useful for relieving tight musculature and reducing pressure over the patella
- Hamstring stretching exercises
- Temporary modification of activity
- Patellar taping
- Patellar realignment brace

SURGERY

Chondrectomy: also known as shaving. This treatment includes shaving down the damaged cartilage to the non damaged cartilage underneath. The success of this treatment depends on the severity of the cartilage damage.

Drilling is also a method that is frequently used to heal damaged cartilage. However, this procedure has not so far been proven to be effective. More localised degeneration might respond better to drilling small holes through the damaged cartilage. This facilitates the growth of the healthy tissue through the holes from the layers underneath.

Full patellectomy: This is the most severe surgical treatment. This method is only used when no other procedures were helpful, but a significant consequence is that the quadriceps will become weak.

POST SURGICAL PHYSIOTHERAPY

Rehabilitation will be slower with a realignment or restorative procedure as the bone and cartilage needs more time to heal before too much strain can be put on the knee. First few appointments of PHYSIO will focus on helping to control the pain and swelling from the surgery.

- Icing the knee frequently will assist with the inflammation and relieve a great deal of the pain. Using electrical modalities such as ultrasound or interferential current to decrease the pain and inflammation.
- Massage, particularly for the quadriceps muscle, may also be helpful in the early stages after surgery.
- One of the first exercises will be some gentle range of motion exercises for knee to gradually regain full movement. This should be done within a pain free range of motion; however, movement will be encouraged even if it causes a slight bit of discomfort as the movement itself can greatly assist with dispersing any inflammation as well as improving the overall level of pain.
- A stationary bicycle can be very useful in the initial stages of gaining range of motion in the knee. Even if you are unable to fully rotate the pedals, the back and forth motion on the bike is an excellent method of slowly encouraging the knee to regain its full range of motion.
- Physiotherapist will begin to add some gentle strengthening exercises for knee. Initially these may only involve isometric exercises, where the patient tighten and hold the quadriceps muscle without actually moving the knee itself. Gradually the strengthening exercises will be advanced.
- As the patient recover from the direct effects of the surgery, physiotherapist will begin to add in exercises to your program similar to that listed under non-surgical rehabilitation.

Tips to prevent chondromalacia patellae:

- Avoid repeated stress to your kneecaps. Wear kneepads if you have to spend time on your knees.
- Create muscle balance by strengthening your quadriceps, hamstrings, abductors, and adductors.
- Wear shoe inserts that correct flat feet by increasing your arch. This will decrease the amount of pressure placed on your knees and may realign the kneecap.
- Maintaining a healthy body weight can help take pressure off the knees and other joints.

Other treatments or self-care include:

- Changing the way you exercise
- Doing exercises to both stretch and strengthen the quadriceps and hamstring muscles
- Losing weight (if you need to)
- Using special shoe inserts and support devices
- Taping to realign the kneecap
- Wearing the right kind of sport or running shoes

3.3 MENISCAL INJURIES

There are a number of injuries that can cause extreme **pain in the knee**, and one of those injuries is a meniscus tear. This happens when the cartilage is torn, usually due to a twisting movement in the knee while it has weight on it. There are two types of meniscus tears, partial and total.

The meniscus is a very small piece of c-shaped cartilage and there are three that protect and cushion the knee joint: one between the thigh bone and shin bone (femur and tibia), one on the outside of the knee (known as the lateral meniscus), and the other on the inside of the knee (the medial meniscus).

Causes:

- Degenerative conditions (like osteo arthritis). Most of the time, these injuries occur when the knee is bent and then twists, which tends to occur often during sports.
- Sports injuries
- Over rotation of the knee due to planting or cutting on the leg too aggressively
- Rapid stepping or squatting on an uneven surface
- Unexpected, quick force can lead the knee joint to flex too far back and tear the meniscus



Clinical features:

When a meniscus tear occurs, you may hear a popping sound around the knee joint. Afterward, you may experience:

- pain, especially when the area is tender
- swelling
- difficulty in moving the knee or inability to move it in a full range of motion
- the feeling of the knee locking or catching
- the feeling that knee is giving way or unable to support
- fluid accumulation within the knee joint
- pain after rest
- Experience a slipping or popping sensation, which is usually an indication that a piece of cartilage has become loose and is blocking the knee joint.

Diagnosis:

Physical exam: One of the main tests for meniscus tears is the McMurray test. Doctor will bend the knee, then straighten and rotate it. This puts tension on a torn meniscus. If you have a meniscus tear, this movement will cause a clicking sound. Your knee will click each time your doctor does the test.

Imaging tests: X-rays. Although x-rays do not show meniscus tears, they may show other causes of knee pain, such as osteoarthritis Magnetic resonance imaging (MRI). This study can create better images of the soft tissues of knee joint, like a meniscus.

TREATMENT:

Nonsurgical treatment:

If tear is small and on the outer edge of the meniscus, it may not require surgical repair. As long as your symptoms do not persist and your knee is stable, nonsurgical treatment may be all you need.

- **RICE protocol** is effective for most sports-related injuries. RICE stands
 - (1) Rest

(2) Icing -At Regular Intervals,

(3) Compressing T-he Knee with a Compression Wrap, and (

(4) Elevating -The Injured Knee. This initial approach will help keep the swelling at bay in the first few hours and days following the injury.

- Anti-inflammatory medication a type of non-steroidal anti-inflammatory medication (NSAID), such as ibuprofen (E.g. Advil), may be given to reduce swelling shortly after the injury.
- Injections Corticosteroid injections into the knee joint may be used in order to relieve pain or inflammation in the soft tissue of the knee.

If the tear is severe, of if the patient has suffered multiple or repeated knee injuries, surgical intervention to either remove or repair the damaged tissues of the injured menisci may be recommended.

Physiotherapy management:

- The physical therapy consists mainly of RICE (Rest, Ice, Compression, Elevation) when surgery isn't necessary.
- Strengthening and stretch exercises for quadriceps and hamstrings are important.
- Isometric exercises for strengthening the quadriceps
- Isometric exercises for strengthening the hamstrings
- Non-weight-bearing isotonic exercises to quadriceps and hamstrings
- Weight-bearing resistive exercises (When the patient is able to carry weight on the injured knee)
- Reciprocal training: training on a stationary bike.
- Platform leg press, wall squats, plié, lunge, step-up, step-down, lateral step-ups.
- Flexibility exercises and joint mobilization are techniques who improve the range of motion and the flexibility.
- These exercises can be active or passive. The techniques, who are used, depend on the type of tissue.
- Active stretches for quadriceps and hamstrings are also important.
- Joint mobilization is important for the following joints like Superior Tibiofibular joint, Patellofemoral joint and Tibiofemoral joint
- Balance and agility exercises begin with double-support weight-bearing activities and progress to single-limb static balancing on a stable surface.

Surgical treatment:

The most common types of surgery for meniscal tears include:

- **Meniscectomy.** In this procedure, the damaged portion of the meniscus will be removed and then sutures will be used to reaffix the disc together. This is referred to as a partial meniscectomy. In a full meniscectomy, the entirety of the meniscus is removed.
- **Repair.** If at all possible, particularly in younger patients, doctors usually prefer a meniscal repair to a meniscectomy. In this procedure, the damaged area is then repaired with the use of surgical sutures.

Post-surgical physiotherapy management

- After surgery, tell the patient to be on crutches for at least three weeks.
- Full recovery, using a comprehensive rehabilitation program will generally take between 3-4 months, and athletes involved in high level sports can be back on the field around 6-8 months post-operative.
- This timeline does not take into account if other structures (e.g. the ACL), are also involved.
- The rehabilitative treatment consists of ice-ultrasound therapy, friction massage, joint mobilization, calf raises, steps-ups, extensor exercise, and bicycle ergometry.

3.4 PLANTAR FASCIITIS

Pain and inflammation in the plantar fascia is termed as plantar fasciitis.

Plantar fasciitis is the most common cause of heel pain. The plantar fascia is the flat band of tissue (ligament) that connects the heel bone to the toes. It supports the arch of the foot. If it
is strained it gets weak, swollen, and irritated. Then the heel or the bottom of the foot hurts when stand or walk.

Plantar fasciitis is common in middle-aged people. It also occurs in younger people who are on their feet a lot, like athletes or soldiers. It can happen in one foot or both feet.

Causes:

Plantar fasciitis is caused by straining the ligament that supports the arch. Repeated strain can cause tiny tears in the ligament. These can lead to pain and swelling. This is more likely to happen if:

- With high arches or flat feet.
- People who walk, stand, or run for long periods of time, especially on hard surfaces.
- With overweight.
- Wearing shoes that don't fit well or are worn out.
- Tight Achilles tendons or calf muscles.



Clinical features:

- Sharp heel pain. A sharp pain at the inside of the heel (just behind the arch of the foot) is a hallmark of plantar fascia.
- **Pain after prolonged rest.** The pain is typically most noticeable when getting out of bed in the morning or getting out of a chair after sitting down for a long period of time. This pain occurs because the plantar fascia shortens when the foot is at rest. Walking and standing a short while usually elongates the plantar fascia, causing the heel pain to lessen or go away.
- **Pain after prolonged activity.** Just as prolonged rest can cause the fascia to tighten, prolonged activity can strain the fascia and cause it to weaken, resulting in pain.
- Heel tenderness. Pressing the bottom of the heel is painful.
- **Pain when flexing.** Flexing the foot and toes upward, toward the shin (dorsiflexion), may be uncomfortable or painful. This symptom may be worse if the person also has a tight Achilles tendon.
- **Foot tingling or burning.** Occasionally people report a tingling or burning sensation in the affected foot, possibly indicating a nerve is being irritated or squeezed.
- Limping. A person may try to avoid putting weight on the affected heel while walking.

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Diagnosis:

X-RAY and physical symptoms

Treatment:

No single treatment works best for everyone with plantar fasciitis. But there are some steps which help to relieve pain:

- Rest your feet by decreasing the activities.
- Do not walk or run on hard surfaces.
- To reduce pain and swelling, keep ice on your heel.
- Take an over-the-counter pain reliever like ibuprofen, naproxen or aspirin.
- Before getting out from bed do toe, calf stretches.
- Check your shoes regularly; it should have good arch support and a cushioned sole.
- Use them in both shoes, even if only one foot hurts.

Physiotherapy management:

- Stretching and strengthening exercises can help the plantar ligament become more flexible and can strengthen muscles that support the arch, in turn reducing stress on the ligament.
- Exercises for plantar fasciitis-when combined with other steps such as resting, avoiding activities that make heel pain worse, using shoe inserts, icing, or taking pain relievers-usually succeed in relieving heel pain.
- Exercises for plantar fasciitis may be especially helpful for reducing heel pain when you first get out of bed.
- Strengthening exercises to the muscles of the foot and ankle. Eg Towel curls, marble pickups etc.
- After exercise apply ice to heel to help relieve pain and inflammation.
- Stretching exercises should create a pulling feeling. They should not cause pain. It's best to do each exercise two or three times during the day, but you do not need to do them all at once.
- Stretching exercises:
 - Use a rolling pin or tennis ball. While seated, roll the rolling pin or ball with the arch of your foot. If you are able to, progress to doing this exercise while you are standing up.
 - Toe stretch
 - Towel stretch
 - \circ Calf stretch
- Wearing the night splint will keep the plantar fascia and Achilles tendon in slight stretched position.
- Massaging the width of plantar fascia before getting out of bed will give pain relief.

QUESTIONS:

2 marks

- 1. Write the causes and clinical features of OA knee?
- 2. What is meant by chondromalacia patella and write its causes?
- 3. Mention the causes and clinical features of meniscal injuries?
- 4. Define plantar fasciitis and write the causes?
- 5. Mention the clinical features of plantar fasciitis ?

6 marks

- 1. Explain about Osteoarthritis of knee in detail along with its physiotherapy treatment?
- 2. Explain about Chondromalacia of patella in detail along with its physiotherapy treatment?
- 3. Explain about Meniscal injuries in detail along with its physiotherapy treatment?
- 4. Explain about Plantar fasciitis in detail along with its physiotherapy treatment?

SPINAL CONDITIONS

UNIT

Structure:

- 4.1 Cervical spondylosis
- 4.2 IVDP

4.1 CERVICAL SPONDYLOSIS

Cervical spondylosis is a condition that causes deterioration of the vertebrae, discs, and ligaments in the neck or cervical spine. Other names are arthritis of the neck, cervical osteoarthritis, or degenerative osteoarthritis.

The cervical spine refers to the seven small vertebrae that form the neck. They start at the base of the skull. In cervical spondylosis, the edges of the vertebrae often develop bone spurs called osteophytes. Over time, the discs get thinner, and their ability to absorb shock is lost, increasing the risk of symptoms. Swollen neck joints, called facet joints, can press or pinch nearby nerve roots or the spinal cord itself, resulting in tingling or "pins and needles" in the extremities and sometimes even pain in the limbs. In some cases, there may be a loss of feeling and coordination. Some people may have difficulty walking. Most people experience degenerative changes as they get older

Causes:

The bones and protective cartilage in the neck are prone to wear and tear that can lead to cervical spondylosis. Possible causes of the condition include:

- Bone spurs: These overgrowths of bone are the result of the body trying to grow extra bone to make the spine stronger. However, the extra bone can press on delicate areas of the spine, such as the spinal cord and nerves, resulting in pain.
- Dehydrated spinal discs: spinal bones have discs between them, which are thick, pad like cushions that absorb the shock of lifting, twisting, and other activities. The gellike material inside these discs can dry out over time. This causes spinal vertebrae to rub together more, which can be painful. This process can begin to happen in 30s.
- Herniated discs: Spinal discs can develop cracks, which allow leakage of the internal cushioning material. This material can press on the spinal cord and nerves, resulting in symptoms such as arm numbness as well as pain that radiates down an arm.

- Injury: Injury to neck (during a fall or car accident, for example), can accelerate the aging process.
- Ligament stiffness: The tough cords that connect spinal bones to each other can become even stiffer over time, which affects neck movement and makes the neck feel tight.
- Overuse: Some occupations or hobbies involve repetitive movements or heavy lifting (such as construction work). This can put extra pressure on the spine, resulting in early wear and tear.



Clinical features:

Most people with cervical spondylosis don't have significant symptoms.

If symptoms do occur, they can range from mild to severe and may develop gradually or occur suddenly.

One common symptom is pain around the shoulder blade. Some complain of pain along the arm and in the fingers. The pain might increase when: standing, sitting, sneezing, coughing, tilting your neck backward

Another common symptom is muscle weakness. Muscle weakness makes it hard to lift the arms or grasp objects firmly.

Other common signs include:

- a stiff neck that becomes worse
- headaches that mostly occur in the back of the head
- Tingling or numbress that mainly affects the shoulders and arms, although it can also occur in the legs.

Symptoms that occur less frequently often include a loss of balance and a loss of bladder or bowel control. These symptoms warrant immediate medical attention.

Diagnosis:

Physical exam: Typical exams include testing your reflexes, checking for muscle weakness or sensory deficits, and testing the range of motion of the neck.

Imaging tests

- X-rays can be used to check for bone spurs and other abnormalities.
- A CT scan can provide more detailed images of neck.
- An MRI scan, which produces images using radio waves and a magnetic field, helps to locate pinched nerves.
- Myelogram
- Electromyogram (EMG) : This test measures your nerves' electrical activity.
- A nerve conduction study checks the speed and strength of the signals a nerve sends.

Treatment:

Treatments for cervical spondylosis focus on providing pain relief, lowering the risk of permanent damage, and helping to lead a normal life.

Nonsurgical methods are usually very effective.

Medications

These include:

- muscle relaxants, such as cyclobenzaprine (Fexmid), to treat muscle spasms
- narcotics, such as hydrocodone (Norco), for pain relief
- anti-epileptic drugs, such as gabapentin (Neurontin), to relieve pain caused by nerve damage
- steroid injections, such as prednisone, to reduce tissue inflammation and subsequently lessen pain
- Prescription nonsteroidal anti-inflammatory drugs (NSAIDs), such as diclofenac (Voltaren-XR), to reduce inflammation.

Surgery

Sometimes, the symptoms of pain and stiffness continue to get worse, and nerve problems

can occur.

Surgery may be an option if the person experiences:

• persistent neck pain that radiates down the arm

- a loss of sensation
- muscle weakness
- a loss of bowel or bladder function
- If MRI results indicate nerve root compression or pressure on the spinal cord, known as myelopathy, the individual may benefit from surgery.

The surgery might involve:

- Removing a herniated disk or bone spurs
- Removing part of a vertebra
- Fusing a segment of the neck using bone graft and hardware

Physiotherapy management:

- Treat acute and chronic pain if not responding to pain medications and muscle relaxants
- Treat muscle spasm
- Slow down the progression of the musculoskeletal disease
- Improve neck movements
- Improve sleep pattern
- Assist in maintaining normal activities

The Goals are

- Improve neck movements
- Relieve neck pain
- Decrease intensity of pain and discomfort during daily activities
- Increase pain tolerance
- Decreases muscle stiffness
- Decrease consumption of pain medication and muscle relaxants

Techniques

- A. Heat Therapy
- B. Cold Therapy
- C. Electric Muscle Stimulation
- D. Transcutaneous Electric Muscle Stimulation (TENS)
- E. Soft Wave Diathermy
- F. Exercise Therapy

A. Heat Therapy for Cervical Spondylosis

• Local Heat Application-

- Hot towel is placed directly on neck muscles
- Hot water bag (heating pad) directly applied on neck muscles

• Goal of Treatment-

- Improves blood circulation
- Decreases nerve and muscle inflammation
- Relieves muscle spasm

B. Cold Therapy for Cervical Spondylosis

• Ice Application-

- Ice is directly applied over skin
- Ice covered by cloth or filled in a bag is placed over aching neck muscles.

• Treatment With Cooling Spray-

- Fluromethane-
 - Spray is applied over skin, causes immediate cooling
 - Acts as a counter irritant and modulates pain receptors

• Goal of Treatment-

- Decreases inflammation
- Relieves muscle spasm
- Reduces nerve irritation by reducing nerve edema

C. Electrical Muscle Stimulation

- Stimulates neck muscles, which results in muscle contraction.
- Relieves sustained spasm caused by nerve stimulation and pinched nerve.
- Relieves sustained silent spasm
- Periodic neck muscle stimulation strengthens neck muscles.
- The procedure is also considered as passive muscle training to improve tone and strength of the muscles.
- Helps to improve blood circulation within group of muscles
- Treatment helps to relax the patient once spasm is relieved and pain is decreased.

D. Transcutaneous Electric Nerve Stimulation (TENS)

- TENS unit therapy is most common therapy used in physical therapy practice.
- Helps to relieve continuous muscle spasm
- Modulates pain transmission to brain
- Decreases silent spasm of the muscles caused by nerve irritations
- Relieves muscle irritation resulting in muscle contraction and spasm.

E. Short Wave Diathermy Treatment

- Relieves muscle spasm and causes muscle relaxation
- Reduces inflammation
- Improves blood circulation

F. Exercise Therapy for Cervical Spondylosis

- Obtain detailed history of muscle and nerve pain.
- Detailed examination of skeletomuscular system.
- Plan exercise therapy.
- Evaluate muscle and neck joint flexibility.
- Evaluate entire body stability.
- Plan appropriate neck posture for exercise and daily activities.
- Evaluate range of neck movement.
- Strengthen neck muscles.
- Achieve optimum stretching of neck muscles.
- Improve range of neck movement.

Technique of Exercises:

Stretching

- > Apply Heating Pad Before Stretching- Apply heating pad to warm up muscles
- Active Stretching-
 - Patient is encouraged and advised to perform optimum flexion, extension and rotation of the neck and head.
 - The optimum position in flexion, extension or rotation is kept in hold position for a brief period as long as patient can tolerate.
 - Patient is also advised to move head without assistance in different directions as directed by physical therapist.
- Passive Stretching-
 - Physical therapist will hold the head in neutral position. Therapist will rotate the neck and head in different direction to achieve optimum flexion, extension and rotation of neck depending on provoked pain.
 - Physical therapist does the movement of the neck while holding the neck and head.

Strengthening

- Isometric Contraction-
 - The neck movement is initiated against resistance so that the joint or muscle length and angle do not change.
 - The exercise tends to tighten up the muscles and improves the strength of the muscles of upper back and neck.
 - Most beneficial exercise for pain in the joints of the neck.
- Isotonic-
 - Isotonic exercise is done using weights and machines.
 - The muscle length changes with lifting weight and joint position changes from flexion to extension or vice versa.
- > Joint movement occurs with muscle contraction.
- Cervical vertebrae strength technique exercises tend to tighten up and strengthen the upper back muscles by making them move weights.

Do's & Don'ts for Cervical Spondylosis Patients:

- Need to avoid roads in bad condition while travelling.
- While travelling use firm collars.
- Use firm mattress, butterfly shaped pillow or thin pillow.
- Avoid sitting for extended time in postures which can strain the neck muscles.
- Avoid lifting heavy weights on head.
- When getting up from a lying down posture, turn to one side.
- Do prescribed exercises regularly.
- Avoid lying flat on the stomach.

4.2 INTER VERTEBRAL DISC PROLAPSE

A prolapsed inter vertebral disc is a technical term for what is commonly called a slipped disc. These discs are placed between each of the vertebrae of the spine and pose as shock absorbers. When the fibrous outer part of the disc brakes, it allows the gel-like core to bulge outwards. The disc that is damaged then puts pressure on the spinal cord or a single nerve fibre. This means that not only will a slipped disc cause pain in the area of the disc, but also in regions that the nerve controls, such as an arm or a leg. Since the disc is unable to slip or slide, the term 'slipped disc' is a misnomer. A slipped prolapsed disc cause pain and other symptoms in the leg.

Understanding the back

The spine is made up of many bones called vertebrae. These are roughly circular and between each vertebra is a 'disc'. The discs are made of strong 'rubber-like' tissue which allows the spine to be fairly flexible. A disc has a stronger fibrous outer part, and a softer jelly-like middle part called the nucleus pulposus. The spinal cord, which contains the nerves that come from the brain, is protected by the spine. Nerves from the spinal cord come out from between the vertebrae to take and receive messages to various parts of the body. Strong ligaments attach to the vertebrae. These give extra support and strength to the spine. Various muscles also surround, and are attached to, various parts of the spine.

Anatomy of Intervertebral discs

Intervertebral Discs are soft, rubbery pads found between the hard bones (vertebrae) that make up the spinal column. The spinal canal is a hollow space in the middle of the spinal column that contains the spinal cord and other nerve roots. The discs between the vertebrae allow the back to flex or bend. Discs also act as shock absorbers. Discs in the lumbar spine (low back) are composed of a thick outer ring of cartilage (annulus fibrosus) and an inner gellike substance (nucleus pulposus). In the cervical spine (neck), the discs are similar but

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smaller in size. Two layers of cartilage which cover top and bottom aspect of each disc called a vertebral end plate. Its separate the disc from the adjacent vertebral body.

Nucleus pulposus it is semi fluid mass of mucoid material seems like toothpaste. It consists of few cartilage cells and irregular arranged collagen fibers. The fluid nature of nucleus pulposus allowed it to be deformed under pressure. The nucleus attempt to deformed and will there by transmit the applied pressure in all direction.

Annulus fibrosus the annulus fibrosus consist of collagen fibers. The collagen fibers are arranged in between 10 to 20 sheets called lamellae. These are arranged in concentric rings that surround the nucleus pulposus. They are thick in anterior and lateral portion of the annulus but posteriorly they are finer and more tightly packed. The collagen fibers lie parallel to each other. Posterior portion of annulus fibrosus is innervated by fibres of sinuvertebral nerve (branch of dorsal root ganglion). Irritation of the sinuvertebral nerve is responsible for axial back pain.

Vertebral End Plates each vertebral end plate is a layer of cartilage about 0.6-1 mm thick. Covers the area on the vertebral area encircled by the ring apophysis. Nucleus pulposus is entirely covered but annulus fibrosus is only 66% covered by the end plates.





Examples of Disc Problems

Types of herniation

- Central
- Paramedial
- Lateral

Causes

- Heavy manual labour
- Repetitive lifting and twisting
- Postural stress
- obesity
- Poor and inadequate strength of the trunk
- Sitting for long hours
- increasing age (a disc is more likely to develop a weakness with increasing age)

Clinical features:

Most herniated disks occur in lower back (lumbar spine), although they can also occur in neck (cervical spine). The most common signs and symptoms of a herniated disk are:

- Arm or leg pain. If your herniated disk is in your lower back, you'll typically feel the most intense pain in the buttocks, thigh and calf. It may also involve part of the foot. If the herniated disk is in neck, the pain will typically be most intense in the shoulder and arm. This pain may shoot into the arm or leg when you cough, sneeze or move spine into certain positions.
- **Numbness or tingling.** People who have a herniated disk often experience numbness or tingling in the body part served by the affected nerves.
- Weakness. Muscles served by the affected nerves tend to weaken. This may cause you to stumble, or impair your ability to lift or hold items.

Prevention

To prevent the occurrence of the disease, there are certain things one should take care of:

- Adopting a healthy lifestyle.
- Exercising regularly.
- Improve the posture.
- Avoiding smoking and alcohol consumption.
- Avoid activities that leave you prone to injury.
- Jobs involving a lot of lifting.

Diagnosis:

- Physical exam, doctor will check back for tenderness. He or she may ask you to lie flat and move your legs into various positions to determine the cause of your pain. he also perform a neurological exam, to check
 - Reflexes
 - Muscle strength
 - Walking ability
 - Ability to feel light touches, pinpricks or vibration
- X-rays. Plain X-rays don't detect herniated disks, but they may be performed to rule out other causes of back pain, such as an infection, tumor, spinal alignment issues or a broken bone.
- Computerized tomography (CT scan). A CT scanner takes a series of X-rays from many different directions and then combines them to create cross-sectional images of spinal column and the structures around it.
- Magnetic resonance imaging (MRI). Radio waves and a strong magnetic field are used to create images of body's internal structures. This test can be used to confirm the location of the herniated disk and to see which nerves are affected.
- Myelogram. A dye is injected into the spinal fluid, and then X-rays are taken. This test can show pressure on spinal cord or nerves due to multiple herniated disks or other conditions.
- Nerve tests Electromyograms and nerve conduction studies measure how well electrical impulses are moving along nerve tissue. This can help pinpoint the location of the nerve damage.

Treatment:

Conservative treatment

Medications:

- **Over-the-counter pain medications.** Such as ibuprofen (Advil, Motrin IB, others) or naproxen (Aleve, others).
- Narcotics. Such as codeine or an oxycodone-acetaminophen combination (Percocet, OxyContin, others), for a short time. Sedation, nausea, confusion and constipation are possible side effects from these drugs.

- Anticonvulsants. Drugs originally designed to control seizures also may be helpful in the treatment of the radiating nerve pain often associated with a herniated disk.
- **Muscle relaxers.** Muscle relaxants may be prescribed if you have muscle spasms. Sedation and dizziness are common side effects of these medications.
- **Cortisone injections.** Inflammation-suppressing corticosteroids may be given by injection directly into the area around the spinal nerves. Spinal imaging can help guide the needle more safely. Occasionally a course of oral steroids may be tried to reduce swelling and inflammation.

Surgery

Surgery may be useful when a herniated disc is causing significant pain radiating into the leg, significant leg weakness, bladder problems, or loss of bowel control

The disc is removed by following techniques.

- a. Hemilaminectomy/Partial laminectomy- Part of the lamina and ligamentum flavum on one side is removed, taking great care not to damage the facet joint.
- b. Laminectomy- Laminae on both sides with spinous process are removed. Such wide exposure is required for big, central disc producing cauda equina syndrome.
- c. Microdiscectomy- done with an operating microscope. Exposure is very limited. Morbidity and hospitalisation is less.
- d. Fenestration- Ligamentum flavum bridging the two adjacent laminae is excised and spinal canal at affected level exposed.
- e. Laminotomy- In addition to fenestration, a hole is made in the lamina for wider exposure.

Physiotherapy management:

In Acute Phase:

A. CONTROLLED REST :

• Rest is recommended and Avoid flexed postures, sitting for long duration, bending or lifting activities, asymmetric postures (flexion and rotation).

• Local support in the form of corset (lumbosacral belt), abdominal binder, tape etc. These measures will enhance healing and prevent reinjury to the healing disc.

• If symptoms are severe, bed rest (maximum for 2 days) on a hard bed is indicated with short periods of walking at regular intervals (with corset). Walking promotes

lumbar extension and stimulates fluid mechanics to help reduce swelling in the disc/connective tissues.

• If patient presents with inability to straighten up, make the patient lie prone with 2-3 pillows under the abdomen. As the pain subsides, remove the pillows and prop up the trunk by placing pillows under the thorax. By this nucleus pulposus is shifted forwards and relieves pain and gains a lordosis.

B. MODALITIES TO REDUCE PAIN AND SPASM:

- Cryotherapy: reduces muscle spasm and inflammation in acute phase.
- TENS: relieves pain in both acute and chronic phases.
- Ultrasound: as phonophoresis increases extensibility of connective tissues
- Moist heat: used as an adjunct before applying specialised techniques to decrease muscle spasm.
- SWD- pulsed SWD in acute condition and continuous SWD in chronic cases.
- IFT
- Soft tissue manipulation- to reduce local muscle spasm and induce relaxation.
- Traction- may be beneficial to relieve nerve root compression and radiculopathy or paraesthesias in the acute phase of IVDP. Traction is contraindicated in disc protrussion medial to the nerve root.

C. EXERCISES FOR HERNIATED DISC:

- Herniated disc exercises play a vital role in treatment of pain and inflammation. Extension exercises are useful in early treatment of disc related signs and symptoms.
 - (a) Posterior or posterolateral protrusion:

(i) Passive Extension: Patient is lying prone (i.e. on belly). If patient is in such extreme pain, place pillows under the abdomen for support, gradually increase the amount of extension by removing pillows.

(ii) Lateral shift correction: If patient has lateral shift, first correct lateral shift then start with extension exercises.

(b) Anterior protrusion:

(i) Correction of lateral shift: Patient stands in front of a chair and places the leg opposite to the shift on a chair so the hip is in about 90 degree of flexion. Leg on the side of lateral shift is kept extended. Patient then flexes the trunk onto the raised thigh and applies pressure by pulling on the ankle.

(ii) Passive flexion: Bring both knees to the chest and hold this position with arm around the thighs.

(c)Active range of motion exercises within pain free range to the lower limb can be done e.g. ankle toe movements, heel drag, and hip abduction/adduction.

(d) Mobilization of thoracic spine Mobilization of segments above and below the affected segmental level.

(e) Piriformis muscle stretching

- (f) Hydrotherapy exercises
- (g) Patient education-These are some movements you should try to avoid:
 - bending over to lift very heavy items

- performing squats with too much weight
- low back extensions, as they put high stress levels on discs
- running, since it can place strains on the discs
- any form of resistance training

In Subacute Phase:

- Usually the acute symptoms decrease in 4-6 days.
 - (a) Continue with the exercises done in acute phase e.g. prone press ups, nerve mobility exercises, modalities.
 - (b) Simple spinal movements in pain free ranges using gentle pelvic tilts. Pelvic rocking can be done in supine, sitting, prone lying, side lying, and standing, quadripud (cat and camel exercise). Emphasize on anterior pelvic tilt so that spine is in extension. Pelvic rolling can be added.
 - (c) Isometrics of extensors but caution against holding breath and causing valsalva.
 - (d) Encourage aerobic activities, walking, swimming with patient's tolerance.

> In Chronic Phase:

(a) Gentle active pain free range of motion exercises:

• After 3 weeks from the onset of PIVD symptoms, start side flexion and extension in standing. Progress to adding flexion only when the disc has healed.

(b) Stretching and flexibility exercises:

- Stretching of the lumbar erector spine and soft tissues posterior to the spine (knee to chest position). Following any flexion exercises, conclude with extension exercises such as prone press ups/ standing back extension.
- Hamstring stretch on wall.
- Quadriceps stretch.
- Hip adductor stretch.
- Gluteal stretch.
- Isometric hip adduction.

(c) Core stability exercises:

- Core strengthening exercises help in relieving back pain and form the base of the core stability training program. The aim of these exercises is to provide more support to your back by strengthening the muscles of the spine.
- The Bridging exercise: Strengthens several core muscle groups e.g. buttocks, back, and abs for PIVD patients. Lie flat on back; bend knees at 90-degree angle, feet flat on floor. Tighten abs. Raise buttocks off floor, keeping abs tight. Tighten buttocks. Shoulder to

knees should be in straight line. Hold for a count of five. Slowly lower buttocks to floor. Repeat five to fifteen times.

- The Plank exercise: Strengthening exercise for back, abs and neck (also strengthens arms and legs) for PIVD patients. Lie on stomach, place elbows and forearms on floor. In a push-up position, balance on your toes and elbows. Keep your back straight and legs straight. (Like a plank) Tighten abs. Hold position for 10 seconds. Relax. Repeat five to ten times. If this exercise is too difficult (as it often is for beginners), balance on your knees instead of your toes.
- The Wall Squat: Strengthening exercise for back, hips and quads in PIVD patients. Stand with your back against a wall, heels about 18 inches from the wall, feet shoulder-width apart. Tighten abs. Slide slowly down the wall into a crouch with knees bent to about 90 degrees. If this is too difficult, bend knees to 45 degrees and gradually build up from there. Count to five and slide back up the wall. Repeat 5 -10 times.
- Leg and arm raises: Strengthening exercise for back and hip muscles in PIVD patients. Lie on stomach, arms reached out past your head with palms and forehead on floor. Tighten abs. Lift one arm (as you raise your head and shoulders) and the opposite leg at the same time, stretching them away from each other. Hold for 5 seconds and then switch sides. Repeat 5 10 times.
- Leg lifts: Quad Strengthening Exercise for PIVD patients. Lie flat on back. Bend left knee at 90-degree angle, keeping foot flat on floor. Tighten abs. Keep the right leg straight and slowly lift right foot to the height of the left knee. Hold for a count of 3. Do 10 repetitions. Switch sides and repeat.

Lifestyle and home remedies

- Use heat or cold. Initially, cold packs can be used to relieve pain and inflammation. After a few days, you may switch to gentle heat to give relief and comfort.
- Avoid too much bed rest. Too much bed rest can lead to stiff joints and weak muscles

 which can complicate your recovery. Instead, rest in a position of comfort for 30 minutes, and then go for a short walk or do some work. Try to avoid activities that worsen your pain during the healing process.

QUESTIONS:

2 marks

- 1. Define cervical spondylosis and its causes?
- 2. Mention clinical features of cervical spondylosis?
- 3. What is meant by IVDP and its causes?
- 4. Mention clinical features of IVDP?

6 marks

- 1. Explain about Cervical spondylosis in detail along with physiotherapy treatment?
- 2. Explain about IVDP in detail along with physiotherapy treatment?

DEFORMITIES

UNIT

Structure:

- 5.1Spinal deformities
- 5.2 Knee deformities
- 5.3 Foot deformities

Deformity means, a permanent structural deviation from the normal shape, size, or alignment, resulting in disfigurement, due to congenital or acquired.

5.1 SPINAL DEFORMITIES

Deformity of spine is any abnormality of the formation, alignment, or shape of the vertebral column.

There are three main types of spine curvature disorders, including:

- 1. Scoliosis,
- 2. Lordosis,
- 3. Kyphosis.
- 1. SCOLIOSIS

Scoliosis is a lateral curvature of spine. It is mostly in c shape and also in s shape.

Normal spine



Deformity from scoliosis



Causes:

An estimated 65% of scoliosis cases are idiopathic, about 15% are congenital, and about 10% are secondary to a neuromuscular disease

Less common types of scoliosis may be caused by:

- Neuromuscular conditions, such as cerebral palsy or muscular dystrophy
- Birth defects affecting the development of the bones of the spine
- Injuries ,tumours or infections of the spine

Clinical features:

- Uneven shoulders
- One shoulder blade that appears more prominent than the other
- Uneven waist
- One hip higher than the other
- If a scoliosis curve gets worse, the spine will also rotate or twist, in addition to curving side to side. This causes the ribs on one side of the body to stick out farther than on the other side.

Types of scoliosis

There are three other main types of scoliosis:

 \rightarrow Functional: In this type of scoliosis, the spine is normal, but an abnormal curve develops because of a problem somewhere else in the body. This could be caused by one leg being shorter than the other or by muscle spasms in the back.

 \rightarrow Neuromuscular: In this type of scoliosis, there is a problem when the bones of the spine are formed. Either the bones of the spine fail to form completely or they fail to separate from each other during fetal development. If the curve is present at birth, it is called congenital. \rightarrow Degenerative: Unlike the other forms of scoliosis that are found in children and teens, degenerative scoliosis occurs in older adults. It is caused by changes in the spine due to arthritis known as spondylosis. Weakening of the normal ligaments and other soft tissues of the spine combined with abnormal bone spurs can lead to an abnormal curvature of the spine. The spine can also be affected by osteoporosis, vertebral compression fractures, and disc degeneration.

Diagnosis:

- X-ray
- CT scan
- Bone scan
- MRI scan

Treatment

The aim of treatment is to assess the prognosis of the curve, correction of curves and maintain the corrected position. The correction can be done by two methods

1. Conservative: physiotherapy and spinal supports like Milwaukee brace, bostan brace etc

2. Surgical: fusion of spine

Physiotherapy management:

Includes the following exercises:

- Pelvic tilt, back lying with knee flexion, tighten buttocks hold and relax
- Back extensor exercises
- Hip flexor stretching
- Hamstring stretching
- Pelvic tilt in standing position
- Modified bicycle exercises
- Deep breathing exercises
- Active ROM exercise spine
- Strengthen exercise to abdominal and spinal muscle
- Passive stretching of the muscles on the concave side of the curves is highly effective

2. LORDOSIS

Lordosis also called *swayback*. It is a condition where there is an increased inner curvature of the spine in lumbar region.



Causes:

It's also called lower cross syndrome. In which muscle surrounding the hip and the spine become tense or weak.

- Achondroplasia bones do not grow normally, leading to the short stature.
- Spondylolisthesis the vertebrae in the lower back slip forward.
- Osteoporosis vertebra become fragile and can easily be broken
- Obesity can cause lordosis
- Kyphoysis can lead to lordosis
- Discitis the inflammation of intervertebral disc
- Benign juvenile lordosis
- Tight lower back muscles
- Excessive visceral fat
- Pregnancy
- Rickets.

Clinical features:

- C-shape back when seen from a lateral aspect, with the buttocks being more prominent
- A large gap between the lower back and the floor when lying on one's back
- Pain and discomfort in the lower back
- Problems in moving in certain ways.

Diagnosis:

- X-ray
- CT scan
- Bone scan
- MRI scan

Treatment:

conservative treatment:

- Medication- NSIADS and Analgesics.
- Braces- control the curve progression.
- Vitamin D supplementation
- Reduced body weight.

Surgical treatment: spinal decompression

Physiotherapy management:

- Anterior-Posterior tilting
- Modified Ball Bridging
- Gluteal stretching

- Cat and Camel
- Hamstring stretching
- Knee to chest
- Trunk Rotation
- Abdominal crunch

3. KYPHOSIS

Kyphosis, also known as round back or hunchback, is a condition in which the spine in the upper back has an excessive curvature is an abnormally excessive convex curvature of the spine as it occurs in the thoracic and sacral regions. Kyphosis is an abnormal forward rounding (more than 50 degrees of curvature) of the spine.

Causes:

- Postural round-back
- Scheuermann's Disease
- Congenital Kyphosis
- Kyphosis associated with neuromuscular disorders
- Kyphosis secondary to trauma, tumors, infection, and arthritis



Clinical features: The signs and symptoms of kyphosis vary, depending upon the cause and severity of the curve. These may include:

- Rounded shoulders
- A visible hump on the back
- Mild back pain
- Fatigue
- Spine stiffness
- Tight hamstrings (the muscles in the back of the thigh)
- •

TYPES:-

Postural Kyphosis – it's simply related to poor posture **Structural Kyphosis** – it involves part of the spine, and deformity in vertebrae.

Diagnosis:

- X-ray
- CT scan
- Bone scan
- MRI scan

TREATMENT

Non-surgical:

- **Pain relievers.** acetaminophen (Tylenol, others), ibuprofen (Advil, Motrin IB, others) or naproxen sodium (Aleve)
- **Osteoporosis medications.** Bone-strengthening medications may help prevent additional spinal fractures that would worsen your kyphosis.

Surgical:

Recommended for severe kyphosis that is pinching the spinal cord or nerve roots. Spinal fusion is the most common procedure for reducing the degree of curvature.

Physiotherapy management:

- Cat and Camel
- Pelivc tilt
- Half butterfly
- Gluteal stretch
- Quadruped arm and leg raise
- Side plank
- Chest up
- Arm support
- Bridging
- Hamstring and tendo achilis stretching
- Joint mobilization
- Postural braces.

5.2 KNEE DEFORMITIES

Knee deformities classified as 3 types:

- 1. Genuvalgum
- 2. Genu varum
- 3. Genu recurvatum



1. GENU VALGUM

A deformity in which the legs are curved inward at the knee so that the knees are close togeth er

and strike each other as he person walks, and the ankles are widely separated. Also called kno ck- knee. This deformity is predominantly acquired it can be unilateral or bilateral. It is usually associated with flat feet.

Causes:

There are several potential causes of genu valgum, including metabolic bone disorders and genetic disorders. Most cases of genu valgum, however, are harmless. Other risk factors for genu valgum include:

- obesity
- injury or illness affecting the leg or knee
- arthritis, particularly in the knee
- deficiency of vitamin D and calcium

Clinical features:

Symptoms of genu valgum include an obvious visual separation of the ankles when the knees are together. The individual's gait is also likely to be affected as they compensate for the lack of gap between their knees.

The altered gait may cause additional symptoms, such as:

- knee pain
- a limp when walking
- pain in feet, hips, and ankles
- stiff joints
- lack of balance when standing

Diagnosis

The degree of genu valgum can be estimated by the Q angle, which is the angle formed by a line drawn from the anterior superior iliac spine through the center of the patella and a line drawn from the center of the patella to the center of the tibial tubercle. In women, the Q angle should be less than 22 degrees with the knee in extension and less than 9 degrees with the knee in 90 degrees of flexion. In men, the Q angle should be less than 18 degrees with the knee in extension and less than 8 degrees with the knee in 90 degrees of flexion. A typical Q angle is 12 degrees for men and 17 degrees for women.

Treatment:

- In young children it often corrects itself without any treatment.
- Heel correction includes wearing of boots with inner side heel raise.
- Vitamin D supplements are given.
- If it is due to changes in soft tissue structures correction is done by splinting.
- Surgical correction: Wedge osteotomy, knee replacement.

Physiotherapy management

Patients treated by splinting may be helped by some form of treatment which includes

- Relieve pain
- Strengthening exercises for the muscles around the knee.
- Re-education of gait possibly with the help of crutches and frames.
- Balance training.

ORTHOPAEDICS AND NEUROLOGY

2. GENU VARUM

Genu varum also called bow-legs is a physical deformity marked by (outward) bowing of the leg in relation to the thigh, giving the appearance of an archer's bow. Usually medial angulations of both femur and tibia is involved.

Presentation: Commonly seen in conditions with rickets and Paget's disease. It also appears with severe degree of osteo arthrits as deformity.

Causes: They are almost same as in genu valgum

- 1) Idiopathic: where the causative factor is not known.
- 2) Vit D deficiency.
- 3) Degenerative joint diseases: such as rheumatoid arthritis, osteo arthritis.
- 4) Trauma: trauma may predispose the deformity mostly it will be unilateral.
- 5) Infections: Infections such as tuberculosis knee can predispose deformity.

Clinical features:

- Pain
- Limitation of joint motion.
- Deformity

Diagnosis:

Doctor can usually make an initial diagnosis of varus knee by examining legs and watching walk. They may also order an x-ray of affected leg to get a better look of bone structure. If doctor confirms varus knee, they may also use a tool called a goniometer to measure the degree at which leg turns outward.

Treatment:

Early detection and effective treatment of the underlying cause will limit the severity of deformity. It depends on the cause and the type of the deformity when the deformity is fully developed surgery is done that is wedge osteotomy.

Physiotherapy management

- Gradual knee mobilization is the main part of the treatment.
- Some heat modalities may be given for relief of pain.
- Strengthening exercises for quadriceps, hamstrings and gluteus muscles are given.
- training is given for standing, balancing, weight transferring and walking

2. GENU RECURVATUM

Genu recurvatum is a deformity in the knee joint, so that the knee bends backwards. In this deformity, excessive extension occurs in the tibiofemoral joint. Genu recurvatum is also called knee hyperextension and back knee.

Causes:

- A defined disorder of the connective tissue
- Laxity of the knee ligaments
- Instability of the knee joint due to ligaments and joint capsule injuries
- Irregular alignment of the femur and tibia
- A deficit in the joints
- A discrepancy in lower limb length
- Certain diseases: Cerebral Palsy, Multiple Sclerosis, Muscular Dystrophy
- Birth defect/congenital defect

Clinical features:

Severe Genu recurvatum is associated with

- Plantarflexion contracture
- Spasticity of the triceps surae
- Quadriceps weakness
- Limb-length discrepancy
- Hip extensor weakness,
- Decreased ankle dorsiflexion (upward movement of the ankle)
- Equinus (tip toe walking) deformity in the foot is considered as a major factor in the Genu Recurvatum.

Diagnosis

- To diagnosis genu recurvatum the physician uses
- Magnetic resonance imaging (MRI) or
- X-rays along with gait analysis.
- Measure the patient's heel heights.

Treatment:

Treatment generally includes the following:

Sometimes pharmacologic therapy for initial disease treatment

- Use of appropriate assistive devices such as orthotics
- Surgical treatment : proximal tibial anteromedial ,anterolateral osteotomy

Physiotherapy management:

- Physiotherapy treatment like stretching the triceps surae, strengthening of hip extensor muscles, quadriceps muscle, proper co-contraction of quadriceps and hamstring muscles, stretching of iliopsoas muscle and developing efficient trunk control helps in overcoming genu recurvatum problem.
- Sometimes use of Swedish knee brace around knee joint and dynamic Ankle Foot Orthosis (AFO) helps in symmetrical weight bearing thereby reducing balance and incoordination issues.

Maintenance of arches is utmost important while managing genu recurvatum as flat foot and equino varus deformity has a direct influence on knee joint. Strengthening of dorsiflexors and evertors of ankle helps in decreasing the effects of equinovarus (inward deviated foot) deformity thereby reducing knee hyperextension.

5.3 FOOT DEFORMITIES

1. Congenital talipes equino varus:

Congenital talipes equinovarus, commonly known as club foot, is a foot deformity in which the foot is twisted inward with the toes pointing down.

This is a common deformity occurring in the ankle, subtaloid and mid tarsal joints. Position of foot: Plantar flexion in ankle, adduction and inversion at subtaloid and metatarsal joints.

Causes:

The cause of clubfoot is unknown (idiopathic), but it may be a combination of genetics and environment.

Clinical features: The following deformities are seen

1) Equinus deformity at the ankle.

- 2) Varus deformity at the subtalar joint.
- 3) Adduction deformity at tarsometatarsal joints.



Diagnosis:

- Most of the time, a baby's clubfoot is diagnosed prenatally (before birth) with ultrasound.
- physical exam, including a complete family history
- x-ray
- computerized tomography scan (CT or CAT scan)

Treatment:

The early the treatment better is the results. Usually within first few weeks of life.

The sequence of deformity correction is fore foot adduction, the inversion and last is the equinus.

Methods:

- a. Stretching and strapping.
- b. Manipulative correction and plaster casting.
- c. Surgery.

Conservative treatment varies with age; it may start from few weeks or from months. Generally early stretching's are taught to parents and done at home with supervision. Manipulations are done by surgeon under general anaesthesia. Depending on severity 4-5 manipulations are needed and after that to maintain the position a retentive shoe is used.

Surgical correction:

When conservative system fails surgery is recommended they are,

Soft tissue release and tendon transfer osteotomy is done.

Physiotherapy management:

- Parents should be taught with stretching and positioning in mild cases.
- Application of night splints are taught and its maintenance.
- Active exercises to foot are given after correction of deformity.
- Balance and equilibrium are taught during gait training.

2. FLAT FEET

Flat feet (also called pes planus or fallen arches) is a postural deformity in which the arches of the foot collapse, with the entire sole of the foot coming into contact with the ground.

Causes:

Common causes of flat feet include:

- genetic factors, as flat feet can pass from parents to children in the genes
- weak arches
- foot or ankle injury
- arthritis or rheumatoid arthritis
- damage, dysfunction, or rupture of the posterior tibial tendon
- nervous system or muscle diseases, such as cerebral palsy, muscular dystrophy, or spina bifida



Clinical features:

- Pain
- Swelling
- Difficulty walking or bearing weight on the feet
- Inability to lift the heels off the ground while attempting to rise onto the toes
- Bumps on the side of the feet

Diagnosis: X-ray

Treatment

- Rest or avoidance of high impact, repetitive bearing weight in the feet such as running
- Anti-inflammatory pain medications
- Orthotics
- Braces
- shoe modifications,
- rest
- medications

Surgery:

In some cases, when conservative methods are not successful, surgery may be recommended. These surgical options include:

- Osteotomy
- Lateral Column Lengthening
- Tendon Reconstruction
- Arthrodesis

Physiotherapy management:

To relieve pain rest is given and it responds well with heat or contrast baths.

When pain subsides active movements to the muscles supporting the foot are started. Intrinsic muscles are to be strengthened

Along with exercise faradic foot bath can be given to assist in pain relief and to relax the muscles.

Strength and mobility of the leg joints are also to be assessed and treated accordingly. Other important aspects include

- Correction of posture.
- Re-education of gait
- Using correct foot wear

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QUESTION:

2 marks

- 1. Define deformity?
- 2. Mention the spinal deformities?
- 3. Define scoliosis and its types?
- 4. Define lordosis and its causes?
- 5. Define kyphosis and its clinical features?
- 6. Define genuvalgum and its clinical features?
- 7. Define genu varum and its clinical features?
- 8. Define genu recurvatum and its clinical features?
- 9. Expand CTEV and its clinical features?
- 10. Define flat feet and its clinical features?

Ψ

CENTRAL NERVOUS SYSTEM CONDITIONS

UNIT

6

Structure:

- 6.1 Parkinsonism
- 6.2 Ataxia
- 6.3 Motor Neuron Disease

6.1 PARKINSONISM

Parkinson's disease (PD) is a long-term degenerative disorder of the central nervous system that mainly affects the motor system. The symptoms generally come on slowly over time. It affects the nerve cells in the brain that produce dopamine. It is a slowly progressive disease which produces gradual weakening of voluntary movement, muscular rigidity and possibly tremor.

Onset: over the age of 65 years.

Causes: Parkinson's disease is caused by a loss of nerve cells in the part of the brain called the substantia nigra. Nerve cells in this part of the brain are responsible for producing a chemical called dopamine. Dopamine acts as a messenger between the parts of the brain and nervous system that help control and co-ordinate body movements.

If these nerve cells die or become damaged, the amount of dopamine in the brain is reduced. This means the part of the brain controlling movement can't work as well as normal, causing movements to become slow and abnormal.

Risk factors of PD

- Age -the most important risk factor
- Positive family history
- Male gender
- Environmental exposure: Herbicide and pesticide exposure, metals (manganese, iron), well water, farming, rural residence, wood pulp mills and steel alloy industries
- Race
- Life experiences (trauma, emotional stress, personality traits such as shyness and depressiveness)

Clinical features:

- Resting tremor: Most common first symptom, usually asymmetric and most evident in one hand with the arm at rest.
- Bradykinesia: Difficulty with daily activities such as writing, shaving, using a knife and fork, and opening buttons, decreased blinking, masked face, slowed chewing and swallowing.
- Rigidity: Muscle tone increased in both flexor and extensor muscles providing a constant resistance to passive movements of the joints, stooped posture, anteroflexed head, and flexed knees and elbows.
- Postural instability: Due to loss of postural reflexes.
- Dysfunction of the autonomic nervous system: Impairedgastrointestinal motility, bladder dysfunction, , excessive head and neck sweating, and orthostatic hypotension.
- Depression: Mild to moderate depression in 50 % of patients.
- Cognitive impairment: Mild cognitive decline including impaired visual-spatial perception and attention, slowness in execution of motor tasks, and impaired concentration in most patients, at least 1/3 become demented during the course of the disease.
- Hand writing decreases in size.
- The gait becomes shuffling and festinating.
- Forward bent posture.





Investigations :

Diagnose of Parkinson's disease based on the medical history, a review of signs and symptoms, and a neurological and physical examination. The doctor may suggest a specific single-photon emission computerized tomography SPECT scan called a dopamine transporter (DAT) scan. Lab tests, such as blood tests, to rule out other conditions that may be causing the symptoms.

PAPER - II

Imaging tests — such as MRI, CT, ultrasound of the brain, and PET scans — may also be used to help rule out other disorders. Imaging tests aren't particularly helpful for diagnosing Parkinson's disease.

Management:

Medicical management :

Medication can be used to improve the main symptoms of Parkinson's disease, such as shaking (tremors) and movement problems. However, not all the medications available are useful for everyone, and the short- and long-term effects of each are different. Three main types of medication are commonly used:

•levodopa

- •dopamine agonists
- •monoamine oxidase-B inhibitors

Surgical procedures:



Surgery for Parkinson's is of three types namely;

- 1. Pallidotomy Pallidotomy surgery destroys the globus pallidus, which is a part of the brain that is believed to make the patient very rigid in movement. After Pallidtomy surgery, the patient tends to become less rigid and feels ease in symptoms like tremors and balance instability.
- 2. Thalomotomy Thalomotomy surgery brings relief from tremors. In this surgery a part of the thalamus (part of the brain) is destroyed, as it is believed to be the cause behind tremors.
- 3. Deep Brain Stimulation This is the final form of all Parkinson's treatment. Deep brain stimulation is provided when no other therapy and medications are found to work. In this surgery, doctors implant electrodes in selected areas of the brain, to control the impulses that cause Parkinson's. Another device is inserted in your chest to control the impulses emitted from the electrodes and a wire runs under your skin, connecting the device to the 'lead' in the brain.

Physiotherapy management:

The main goals of physiotherapy is

- To improve joint range and mobility
- Strengthen weak muscles
- Improve posture
- Improve balance
- Improve gait
- Reduce fatigue
- Reduce pain
- Increase aerobic capacity.

Exercise

Exercising may increase muscle strength, flexibility and balance. Exercise can also improve well-being and reduce depression or anxiety.

Exercises such as walking, swimming, gardening, dancing, water aerobics or stretching can be done with regular intervals.

Motivate the patient to actively participate in the treatment protocols.

- Rigidity can be decreased by means of general relaxation techniques. It can also be reduced by Vestibular stimulations, by means of exercises on Swiss ball, or rocking on a rocking chair.
- Active movements at all joints are encouraged to maintain mobility and flexibility of joints and soft tissues.
- Passive stretching or self stretching can prevent the dominance of flexed posture.
- Drill exercises in standing, sitting; aerobic exercises improve the cardio vascular endurance.
- Deep breathing exercises improve the breathing pattern and ventilatory Effort.
- Gait training is usually done with the help of visual cues in the form of footmarks on the floor.

Parkinson's disease can disturb the sense of balance, making it difficult to walk with a normal gait. Balance, Equilibrium and Co-Ordination Exercises improve the functional capacity of the patient. Exercise may improve balance. These suggestions may also help:

- Try not to move too quickly.
- Aim for heel to strike the floor first when walking.
- If shuffling is there, stop and check the posture. It's best to stand up straight.
- Look in front of you, not directly down, while walking.
Avoiding falls

In the later stages of the disease, patient may fall more easily. In fact, he may be thrown off balance by just a small push or bump. The following suggestions may help:

- Make a U-turn instead of pivoting your body over your feet.
- Distribute your weight evenly between both feet, and don't lean.
- Avoid carrying things while you walk.
- Avoid walking backward.

Daily living activities

Daily living activities — such as dressing, eating, bathing and writing — can be difficult for people with Parkinson's disease. An occupational therapist can show the techniques that make daily life easier.

Lifestyle and home remedies

Certain lifestyle changes also may help make living with Parkinson's disease easier.

Healthy eating: While no food or combination of foods has been proved to help in Parkinson's disease, some foods may help ease some of the symptoms. For example, eating foods high in fiber and drinking an adequate amount of fluids can help prevent constipation that is common in Parkinson's disease.

A balanced diet also provides nutrients, such as omega-3 fatty acids, that might be beneficial for people with Parkinson's disease.

6.2 ATAXIA

Ataxia is a degenerative disease of the nervous system. It is a movement disorder usually caused by damage to a part of the brain known as the cerebellum, but it can also be caused by damage to the spinal cord or other nerves.

Causes:

- Damage, degeneration or loss of nerve cells in the part of the brain that controls muscle coordination (cerebellum), results in ataxia. Cerebellum comprises two pingpong-ball-sized portions of folded tissue situated at the base of the brain near brainstem.
- The right side of the cerebellum controls coordination on the right side of the body and the left side of cerebellum controls coordination on the left.

- Diseases that damage the spinal cord and peripheral nerves that connect your cerebellum to muscles also can cause ataxia.
- Ataxia causes include: Alcohol abuse, certain medications, stroke, tumor, cerebral palsy, brain degeneration, multiple sclerosis and infections. Vitamin e, vitamin b-12 or thiamine deficiency.

Clinical features:

- Poor coordination
- Unsteady walk and a tendency to stumble
- Difficulty with fine motor tasks, such as eating, writing or buttoning a shirt
- Change in speech
- Involuntary back-and-forth eye movements (nystagmus)
- Difficulty swallowing
- Lose balance
- Lose muscle coordination in a hand, arm or leg
- difficulty in walking
- Slurred speech
- Difficulty in swallowing

Types of Ataxia by Affected Area

Ataxia is caused by damage to different areas of the central nervous system. Doctors categorize it by the specific part of the brain most affected, including:

- Cerebellar (brain)
- Sensory (nerves)
- Vestibular (ears)

Cerebellar Ataxia

Cerebellum is the part of the brain that's in charge of balance and coordination. If part of the cerebellum starts to wear away, leads to cerebellar ataxia. Sometimes it can also affect your spinal cord. It's the most common form of ataxia.

Symptoms of cerebellar ataxia include:

- Behavior or personality changes
- Changes in your voice
- Dizziness
- Fatigue
- Headaches
- Low muscle tone
- Muscle tremors
- Slurred speech
- Trouble walking
- Wide gait

Sensory Ataxia

Sensory ataxia is the result of damage to nerves in spinal cord or peripheral nervous system. That is the part of the nervous system outside of the brain and spinal cord.

Sensory ataxia causes less sensation in feet and legs from the nerve damage, so patient have less feedback from his brain telling him where the body is in relation to the ground. It's also called proprioceptive ataxia.

Symptoms of sensory ataxia include:

- Difficulty touching finger to nose with closed eyes
- Inability to sense vibrations
- Trouble walking in dim light
- Walking with a "heavy step," or stamping when walk

Vestibular Ataxia

Vestibular ataxia affects the vestibular system. This system is made up of inner ear and ear canals, which contain fluid. They sense the movements of head and help with balance and spatial orientation.

When the nerves in the vestibular system wear away, one can have the following problems:

- Blurred vision and other eye issues
- Nausea and vomiting
- Problems standing and sitting
- Staggering when you walk
- Trouble walking in a straight line
- Vertigo, or dizziness

Diagnosis:

- Physical exam : Examination of balance and coordination, hearing, vision, reflexes, and memory.
- Neurological exam: which might include an MRI or CT scan. These look at the structure of the brain for problems.
- Genetic testing.

Treatment:

Although ataxia is generally not curable, a great deal can be done to ease symptoms and improve the quality of life of the patient. Treatment for coordination and balance problems usually involves the use of adaptive devices that help the patient attain as much independence as possible. These may include the use of a cane (walking stick), crutches, walker, or a wheelchair.

- Medication: Treatment for ataxia telangiectasia includes gamma-globulin injections to boost the immune system. There are also drugs for muscle spasms and uncontrollable eye movements.
- Supplements and nutrition: If levels of vitamin E are low, supplements, a special diet, or both may help. Sensitivity to gluten can occur with ataxia, so a gluten-free diet may help.
- Counselling: Sessions can help the person manage frustration and depression that may arise when symptoms affect physical mobility and coordination.
- Speech therapy: This can help with swallowing, coughing, choking, and speech problems. If speech becomes very difficult, the speech therapist can help the person learn how to use speech aids.

Physiotherapy management:

- The goal of the physiotherapist in the rehabilitation of ataxia resulting from defects in neurological structures and effecting the functions of the patient is to improve the functional level of the patient through restorative techniques. When this is not possible, the therapist makes use of compensatory strategies to make the patient perform as independent as possible within the present functional level. The goals of restorative physical treatment can be briefly described as:
- Improving balance and postural reactions against external stimuli and gravitational changes.
- Improving and increasing postural stabilization following the development of joint stabilization.
- Developing upper extremity functions.
- Through developing independent and functional gait, improving the life quality of the patient by increasing the patient's independence while performing daily life activities.
 - > Approaches for improving proprioception:
- The aim is to increase proprioceptive input by mechanically stimulating the joint surfaces, muscles and tendons, and decreasing postural instability by improving body awareness.
- There are many approaches that can be used for this purpose. These are: Proprioceptive Neuromuscular Fascilitation (PNF), rhythmic stabilization, slow reversal techniques, resistive exercises.

- Activities for improving balance:
- Firstly, the proximal muscles and stabilization of the trunk should be improved. For this . purpose, it is appropriate to use the mat activities of the PNF techniques.
- Following the neuro-developmental order, the patient should be trained to come to the bridge position from lying on the back, onto the forearms from lying face down, to crawl, and to come onto the knees, half knees and into a sitting position, and to establish static and dynamic stability in these positions.
 - > Vestibular exercises:
- Since dizziness accompanies balance dysfunction in vestibular problems, repetitive head . movements and Cooksey exercises are of great importance.
- A vestibular exercise program consists of repetitive, progressively more difficult, eye, head and body movements designed to encourage movement and facilitate sensory substitution

Frenkel's coordination exercises were developed for this purpose.

Co-ordination exercises: These exercises are designed to improve neuro - muscular coordination in order to attain smooth, accurate, purposeful movements.

The exercises are as follows:

- 1. Equilibrium exercises
- 2. Non- equilibrium exercises
- 3. Frenkel's exercises

1. Equilibrium exercises:

- Stand with both feet together with open and closed eyes.
- Stand with heel of one feet exactly in front of toes of the other. •
- Stand on one foot. •
- Walk on a straight line sideways and backwards.
- Walk along a circle.
- Walk in a figure of eight.
- Walk on heels and toes alternatively.

2. Non - Equilibrium exercises:

- Finger to nose
- Finger to finger •
- Finger to nose to therapist finger •
- Heel to shin •
- Alternative pronation and supination •
- Tapping hand and foot •
- Drawing a circle •
- Fixation and position holding •
- Touch the examiner's finger with toe. •
- Alternatively touch knee with heel of other foot.

3. FRENKLES EXERCISES:

Exercises for lower limb

Exercises for the legs in lying position:

- Stretch the leg by the heel and place it on the table.
- Abduct and adduct the hip smoothly with the knee bent placing the heel on the table.
- Now abduct and adduct the leg with knee and hip protracted by placing the leg on table.
- Stretch and extend the hip and knee with heel.
- Stretch and extend both legs together with the heel on table.
- Stretch one leg and extend the other one.
- Now stretch and extend one leg while abduct and adduct the other one.
- Heel one limb to the other leg (toe, ankle, shine)
- Heel one limb to other knee by sliding down the crest of tibia to ankle.

Exercises for the legs in sitting position:

- Lift one leg to place the heel on the marked area, while the other one is stretched to slide the heel on the mark on floor.
- Patient is asked to stand and sit again from a sitting posture.
- Abduct and adduct the hip in sitting position.

Exercises for the legs in standing position:

- The weight of patient is transferred from one foot to another.
- Foot is moved forward and backward on a straight line.
- The patient is asked to walk along a winding strip.
- Walk between two lines.
- Walk sideways by placing the feet on a mark.
- Walk forward and come to the mark back again.
- Walk and switch the directions.

Exercises for upper limb:

The exercises performed for lower limb may be practiced for the upper limb in a way that the patient places his/her hands on the mark on the table or the board to improve coordination and movements in upper limb.

6.3. MOTOR NEURON DISEASE

The motor neuron diseases (MND) are a group of neurological disorders that selectively affect motor neurons, the cells that control voluntary muscle activity including speaking, walking, breathing, swallowing and general movement of the body. They are generally progressive in nature, and cause progressive disability and death.

Causes: The exact cause is not known. Several possibilities have been suggested like genetic, chronic virus infections, some toxins, and mineral deficiencies.

Gender: Men are more effected than women. Onset: Usually seen at the age of 50 and 70 years.

MND usually begins by affecting a single limb or aspect of motor function, becoming more generalized as the disease progresses. There is usually evidence of wasting and weakness in some muscles and fasciculation (twitching) of parts of the muscle may be visible under the skin. Fasciculation may be a sign of damage to LMN. There are many other causes of fasciculation, some less serious. Involvement of UMN results in stiffness of muscles (spasticity) and slowed movements.

TYPES:

The disease can be classified into four main types depending on the pattern of motor neurone involvement and the part of the body where the symptoms begin.

- 1. Amyotrophic lateral sclerosis (ALS)
- 2. Progressive bulbar palsy (PBP)
- 3. Progressive muscular atrophy (PMA)
- 4. Primary lateral sclerosis (PLS)

1. Amyotrophic lateral sclerosis (ALS)

- Both upper and lower motor neurons are affected
- Limb muscle weakness and wasting

2. Progressive bulbar palsy (PBP)

- Both upper and lower motor neurons are affected
- Speech and swallowing muscle weakness and wasting

3. Progressive muscular atrophy (PMA)

- Lower motor neurons are affected
- Slower rates of progression and significantly longer survival compared to ALS and PBP

4. Primary lateral sclerosis (PLS)

- Upper motor neurons are affected
- Very rare and diagnosis is often provisional

Clinical features

- Difficulty breathing
- Difficulty swallowing
 - Choking easily
 - Drooling
 - Gagging
 - Head drop due to weakness of the neck muscles
- Muscle cramps
- Muscle contractions called fasciculations
- Muscle weakness that slowly gets worse
 - Commonly involves one part of the body first, such as the arm or hand
 - Eventually leads to difficulty lifting, climbing stairs, and walking
- Paralysis
- Speech problems, such as a slow or abnormal speech pattern (slurring of words)
- Voice changes, hoarseness
- Weight loss

Diagnosis :

Tests that may be done include:

- Blood tests to rule out other conditions
- Breathing test to see if lung muscles are affected
- Cervical spine CT or MRI to be sure there is no disease or injury to the neck, which can mimic ALS
- Electromyography to see which nerves or muscles do not work properly
- Genetic testing, if there is a family history of ALS
- Head CT or MRI to rule out other conditions
- Swallowing studies
- Spinal tap (lumbar puncture)

Treatment:

There is no known cure for MND. A medicine called RILUZOLE helps slow down the symptoms and let's live longer.

Treatments to control other symptoms include:

- Baclofen or diazepam for spasticity that interferes with daily activities
- Trihexyphenidyl or amitriptyline for people with problems swallowing their own saliva.

Physiotherapy management:

Aims:

- Maintain mobility and provision of equipment for safety.
- Advise on exercise
- Advise on posture and positioning
- Maintenance of joints and muscles to prevent pain and stiffness
- Chest care
- Teaching carers manual handling techniques

Mobility:

It is important to maintain the activity of walking for many reasons:

- Independence—in and outdoors.
- Maintain activity of daily living.
- Maintain social activities.
- Psychological well-being.
- Functions of the body i.e. aid circulation, digestion and assist breathing.

The physiotherapist can issue equipment to assist walking i.e. sticks, frames and splints and therefore improve safety.

Exercise.

Exercise is important to maintain ease of movement of our limbs and body enabling us to carry out everyday tasks. If muscles and joints become stiff movement may become painful and difficult thus reducing independence. People living with MND can tire very easily and find they need to conserve energy, so strenuous exercise is not normally recommended.

The aims of Exercise are:

- Maintains muscle strength
- Increases muscle flexibility & reduces spasm
- Maintains joint range
- Improves energy levels
- Encourages deeper breaths.

Exercise can be active (performed by patient) or passive (performed by the carer) All exercise should be tailored specifically for the patient involved depending on their previous level of fitness and current condition. Short bursts of exercise may be easier and not so energy consuming.

Posture and Positioning.

Posture: maintaining a straight back and neck in sitting and standing can

- Reduce pain of misaligned joints
- Improve the ability to move limbs

- Improve functions i.e. swallowing
- Aid comfort.

Provision of equipment to assist posture may be beneficial i.e. collars, splints and specialised chairs.

Positioning: Correct positioning in bed will help prevent stiffness of joints and muscles and may ease breathing.

Chest Care.

Maintaining clear, well aerated lungs will help reduce the risk of a chest infection. This can be achieved by;

- Regular deep breathing exercises/ huff/cough
- Exercises– any that will make you take a deep breath
- Passively moving arms / shoulders.

QUESTIONS:

2 marks

- 1. Define Parkinsonism?
- 2. Mention clinical features of Parkinsonism?
- 3. Define Ataxia and its clinical features?
- 4. Mention causes and types of Ataxia?

6marks

- 5. Explain about Parkinsonism in detail along with physiotherapy treatment?
- 6. Explain about Ataxia in detail along with physiotherapy treatment?

Ψ

PNS CONDITIONS

UNIT 7

Structure:

- 7.1 Types of nerve injuries
- 7.2 Diabetic Neuropathy
- 7.3 Gullian barre syndrome
- 7.4 Facial palsy
- 7.5 Trigeminal Neuralgia
- 7.6 Foot drop

7.1 TYPES OF NERVE INJURIES

Nerve injury is the injury to the nervous tissue. Classification of peripheral nerve injury assists in prognosis and determination of treatment strategy. Seddon introduced a classification of nerve injuries based on three main types of nerve fiber injury and whether there is continuity of the nerve.

In 1943, Seddon described three basic types of peripheral nerve injury that include:

- 1. Neurapraxia (Class I)
- 2. Axonotmesis (Class II)
- 3. Neurotmesis (Class III)
- 1. Neurapraxia:

<u>Neurapraxia</u> is the least severe form of nerve injury, with complete recovery. In this case, the axon remains intact, but there is myelin damage causing an interruption in conduction of the impulse down the nerve fiber. Most commonly, this involves compression of the nerve or disruption to the blood supply (ischemia). There is a temporary loss of function which is reversible within hours to months of the injury (the average is 6–8 weeks).

2. Axonotmesis:

Axonotmesis is an injury to the peripheral nerve of one of the extremities of the body. The axons and their myelin sheath are damaged in this kind of injury, but the endoneurium, perineurium and epineurium remain intact. Axonotmesis is usually the result of a more severe crush or contusion than neurapraxia, but can also occur when the nerve is stretched (without damage to the epineurium).

This type of nerve damage may cause paralysis of the motor, sensory, and autonomic. Mainly seen in crush injury.

3. Neurotmesis:

Neurotmesis is the most severe lesion with no potential of full recovery. It occurs on severe contusion, stretch, laceration, or Local Anesthetic Toxicity. The axon and encapsulating connective tissue lose their continuity. The last (extreme) degree of neurotmesis is transection, but most neurotmetic injuries do not produce gross loss of continuity of the nerve but rather internal disruption of the architecture of the nerve sufficient to involve perineurium and endoneurium as well as axons and their covering. There is a complete loss of motor, sensory and autonomic function.

7.2 DIABETIC NEUROPATHY

Diabetic neuropathy is a nerve damage that is caused by diabetes. This occurs due to peripheral nerve damage. It is common in insulin dependent patients.

Causes:

Diabetic neuropathy is caused by high blood sugar levels sustained over a long period of time. Other factors can lead to nerve damage, such as:

- damage to the blood vessels caused by high cholesterol levels
- mechanical injury, such as injuries caused by carpal tunnel syndrome
- lifestyle factors, such as smoking or alcohol use
- Low levels of vitamin B-12 can also lead to neuropathy.

Clinical features:

Symptoms vary depending on the areas affected. Common signs and symptoms of the different types of diabetic neuropathy include:

- sensitivity to touch
- loss of sense of touch
- difficulty with coordination when walking
- numbness or pain in hands or feet
- burning sensation in feet, especially at night
- muscle weakness or wasting
- bloating or fullness
- nausea, indigestion, or vomiting
- diarrhea or constipation
- dizziness when you stand up
- excessive or decreased sweating
- bladder problems, such as incomplete bladder emptying

- vaginal dryness
- erectile dysfunction
- inability to sense low blood glucose
- vision trouble, such as double vision
- increased heart rate

The term neuropathy is used to describe several types of nerve damage. In people with diabetes, there are four main types of neuropathy.

Diagnosis:

- Electromyogram (EMG) -- a recording of electrical activity in muscles
- Nerve conduction velocity tests (NCV) -- a recording of the speed at which signals travel along nerves
- Urine and blood sugar
- SD curves

Treatment:

MEDICAL:

- Stabilization of diabetic condition by administration of suitable medications.
- Inclusions of vitamin supplements in the diet.
- Management of pain by administrating analgesics.

Physiotherapy management:

Physiotherapy has a significant role in the treatment and prevention of diabetic neuropathy. Specific exercise programme including range of motion, muscle strengthens and gait training can improve gait pattern or walking in patients with diabetic neuropathy. Evidence shows that resistant strengthening exercises lower blood glucose level. A proper physiotherapy intervention will help to alleviate from the symptoms of diabetic neuropathy and also improve overall quality of life.

- **Transcutaneous electrical nerve stimulation (TENS)** and **interferential therapy** (**IFT**) use a painless electric current and the physiological effects from low frequency electrical stimulation to relieve stiffness, improve mobility, relieve neuropathic pain, reduce oedema, and heal resistant foot ulcers.
- Gait training, and posture training, teaching these to the patients can help prevent and/or stabilize foot complications such as foot ulcers. Off-loading techniques can include the use of mobility aids (e.g. crutches) or foot splints. Gait re-training would also be beneficial for individuals who have lost limbs, due to diabetic neuropathy, and to wear prosthesis.
- **Exercise programs,** along with manual therapy, will help to prevent muscle contractures, spasms and atrophy.

- These programs may include general muscle stretching to maintain muscle length and a person's range of motion. General muscle strengthening exercises will help to maintain muscle strength and reduce muscle wasting.
- Aerobic exercise such as swimming and using a stationary bicycle can help peripheral neuropathy, but activities that place excessive pressure on the feet (e.g. walking long distances, running) may be contraindicated.
- Heat, therapeutic **ultrasound**, **hot wax** is also useful for treating diabetic neuropathy.
- Pelvic floor muscle exercises are useful.

Tight glucose control: Treatment of early manifestations of sensorimotor polyneuropathy involves improving glycemic control. Tight control of blood glucose can reverse the changes of diabetic neuropathy, but only if the neuropathy and diabetes are recent in onset. Conversely, painful symptoms of neuropathy in uncontrolled diabetics tend to subside as the disease and numbness progress.

Prognosis:

The mechanisms of diabetic neuropathy are poorly understood. At present, treatment alleviates pain and can control some associated symptoms, but the process is generally progressive.

7.3 GUILLAIN-BARRÉ SYNDROME

Guillain-Barré syndrome is a rare but serious autoimmune disorder in which the immune system attacks healthy nerve cells in your peripheral nervous system. This leads to weakness, numbness, and tingling. It can eventually cause paralysis. The cause of this condition is unknown, but it's typically triggered by an infectious illness, such as the stomach flu or a lung infection.

Causes:

About two-thirds of people with Guillain-Barré develop it soon after they've been sick with diarrhea or a respiratory infection Campylobacter jejuni infection has been associated with Guillain-Barré. Campylobacter is one of the most common bacterial causes of diarrhea. It's also the most common risk factor for Guillain-Barré. Campylobacter is often found in undercooked food, especially poultry.

- The following infections have also been associated with Guillain-Barré:
 - \rightarrow Influenza.
 - \rightarrow Cytomegalovirus, which is a strain of the herpes virus.
 - \rightarrow Epstein-Barr virus infection, or mononucleosis.

 \rightarrow Mycoplasma pneumonia, which is an atypical pneumonia caused by bacteria-like organisms.

 \rightarrow HIV or AIDS.

Clinical features:

- Tingling or prickly sensations in your fingers and toes.
- Muscle weakness in your legs that travels to your upper body and gets worse over time.
- Difficulty walking steadily.
- Difficulty moving your eyes or face, talking, chewing, or swallowing.
- Severe lower back pain.
- Loss of bladder control.
- Fast heart rate.
- Difficulty breathing.
- Paralysis.

Diagnosis:

• Spinal tap

a spinal tap involves taking a small amount of fluid from your spine in your lower back. This fluid is called cerebrospinal fluid. Your cerebrospinal fluid is then tested to detect protein levels. People with Guillain-Barré typically have higher-than-normal levels of protein in their cerebrospinal fluid. This test is also referred to as a lumbar puncture.

• Electromyography

An electromyography is a nerve function test. It reads electrical activity from the muscles to help your doctor learn if your muscle weakness is caused by nerve damage or muscle damage.

• Nerve conduction tests

Nerve conduction studies may be used to test how well your nerves and muscles respond to small electrical pulses.

Treatment:

There's no cure for Guillain-Barre syndrome. But two types of treatments can speed recovery and reduce the severity of the illness:

- Plasma exchange (plasmapheresis): The liquid portion of part of your blood (plasma) is removed and separated from your blood cells. The blood cells are then put back into your body, which manufactures more plasma to make up for what was removed. Plasmapheresis may work by ridding plasma of certain antibodies that contribute to the immune system's attack on the peripheral nerves.
- Immunoglobulin therapy: Immunoglobulin containing healthy antibodies from blood donors is given through a vein (intravenously). High doses of immunoglobulin can block the damaging antibodies that may contribute to Guillain-Barre syndrome.
- These treatments are equally effective. Mixing them or administering one after the other is no more effective than using either method alone.

• Medication can be given to relieve pain, which can be severe, Prevent blood clots, which can develop while patient immobile.

People with Guillain-Barre syndrome need physical help and therapy before and during recovery.

Physiotherapy management:

The role of physiotherapy for GBS disease can be divided into three parts -

(1) Acute phase

- (2) The middle phase of rehabilitation
- (3) Long-term, on-going rehabilitation

The important factor is communication with this multi-disciplinary approach with the aim of the team to help the flow of the treatment of the patient.

(1) The Acute Phase

 \rightarrow in the acute phase a large part of physio is for respiratory care. If it affects the intercostals muscle – the one between the ribs that lifts up the ribs as we take a breath. Equally if the diaphragm is affected – the part of the body between the abdomen and the chest – patient have the inability to take a large breath. So in acute phase regular breathing exercises are necessary.

(2) Phase of Rehabilitation

- The positioning of the patient is vital. He/she needs to be nursed so that the lungs are kept clear from side to side and if need be to be "jacked up" with the head down so allowing any secretion in the lungs to be drained out.
- Patient suffering from GBS disease often complain of severe pain, which can be managed by applying TENS, IFT and other pain relieving techniques.
- If muscles are kept in a shortened position long enough then there is an increase in the stiffness of the muscle. So there should be "passive" movements, i.e. aided through the full range at least once a day
- There are available Resting Splints for wrist/hands and for ankles which can be important in the early stages.
- The important feature at the next phase when patient gets out of bed is that his/her circulation is quite dependent on the muscles in the body.
- There will be swelling in the ankles and hands if one doesn't move around much. So a patient's blood pressure is monitored at this stage to check there is no sudden drop. Such patients wear elastic stockings to push the blood back to the heart and also to prevent blood clots. If the blood sits in the legs there is more potential for clotting.
- Some patients with weak abdominal muscles may need abdominal corsets.
- The shoulder joint particularly relies on its muscles around it. He/she may need the arms supported in the early stages of sitting up and walking.
- It is important to get good seating. If necessary one can make do with a cushion, towel or pillow to support the lumbar spine.

- Prolonged sitting with a curved spine can lead to small damage to the joints in upper
- spine, producing backache. It is similarly important to support the middle and top of the spine as well as the arms.
- Stretching the arms including the hands, legs including the feet, body (particularly by slumping), helps to rehabilitate not only the peripheral muscles but also, we believe, the associated nerves...
- Functional tasks of daily living that involve exercise tend to be beneficial. These tasks include walking, repeated sitting to standing, rolling over and moving up and down in bed, putting on and taking off clothes. These tasks help to restore the patient to normal living.

(3) Ongoing Rehabilitation:

- Hydrotherapy is fantastic as patient can float, their weight is supported and also they can exercise against the graded resistance of the water, the faster they move the harder it is, the slower the more gentle. It does not suit everyone some find the heat too much.
- It is important to watch the posture as muscle weakness can affect it. It is often the physio's role to nag and give patient advice about posture.
- The patient may need balance retraining because we know the ankles are important for balance. The patient may find the hips have to be moved to keep the balance.
- As patient progress then we begin some training in advanced skills of walking up and down slopes and stairs. As an ongoing practice it is important to have regular exercises to keep stretching
 - As an ongoing practice it is important to have regular exercises to keep stretching muscles that may be at risk of tightening up calf muscles, hamstrings, arm muscles.
- Hydrotherapy, walking, exercise bikes or anything that can get patient's heart rate up are important for ensuring that your cardiovascular and general fitness are in good condition.

7.4 FACIAL PALSY

The term facial palsy generally refers to weakness of the facial muscles, mainly resulting from temporary or permanent damage to the facial nerve.

When a facial nerve is either non-functioning or missing, the muscles in the face do not receive the necessary signals in order to function properly. This results in paralysis of the affected part of the face, which can affect movement of the eye(s) and/or the mouth, as well as other areas.

There are different degrees of facial paralysis: sometimes only the lower half of the face is affected, sometimes one whole side of the face is affected and in some cases both sides of the face are affected.

Causes:

Although the most commonly known cause of facial paralysis is Bell's palsy, there are actually many different causes of facial palsy, and treatment and prognosis vary greatly depending on the cause. Some of the main causes of facial palsy are listed below:

- Viral infections such as Bell's palsy and Ramsay Hunt syndrome.
- Surgical causes: for example during removal of acoustic neuroma or facial nerve tumour, or when operating on the parotid gland.
- Bacterial causes such as Lyme disease or following a middle ear infection.
- Neurological conditions such as Neurofibromatosis or Guillain-Barré syndrome.
- Traumatic injury such as fractures to the brain, skull or face.
- Birth trauma: for example caused by forceps or facial presentation delivery.
- Congenital conditions such as an abnormal development of the facial nerve or muscle in the womb.
- Rare genetic syndromes such as Moebius syndrome or CHARGE syndrome.
- Stroke

Functions do the facial muscles perform:

- Raising the eyebrows Frontalis
- Closing the eyes Orbicularis oculi
- Frowning Corrugator
- Open mouth smiling Zygomaticus
- Closed mouth smiling Risorius
- Pouting Orbicularis oris
- Lifting top lip Levator labii
- Pulling lower lip down Depressor labii
- Sticking bottom lip out Mentalis
- > Pulling jaw and corners of mouth gently down Platysma
- Wrinkling nose Procerus/nasalis

Clinical features:

The symptoms of facial palsy are many and vary from person to person. The symptoms will depend on the cause of facial palsy and here we discuss some of the more common symptoms experienced.

Facial palsy normally affects only one side of the face although in rare cases it may affect both sides. It does not cause weakness in the arms or legs. If you experience weakness in your arms or legs as well as weakness on one side of your face, you should seek immediate medical attention. These symptoms grouped together may indicate a stroke.

A complete facial palsy on one side of the face affects the brow, eye, cheek and mouth. This means the facial nerve signals that control movement in these muscles are not working. The face may appear flattened and movement may be lost.

- Forehead: Loss of forehead wrinkles and inability to frown
- **Eye area**: Droopy eyebrow and inability to raise eyebrow, Inability to close the eye fully or blink, Watery eye or dry eye, Inability to squint, Drooping of the lower eyelid which may make the eye appear wide, Painful eye with symptoms of grittiness or irritation, Sensitivity to light and Soreness or redness of the white of the eye.
- **Mouth**: The corner of the mouth pulls down/droops, Inability to smile on affected side, Inability to puff up your cheeks, whistle or blow, Altered taste, Tingling of the affected half of the tongue, Difficulty eating and drinking, Difficulty brushing your teeth and spitting out, Drooling from the weak corner of the mouth, Excess or reduced salivation (dry mouth), Inability to pout, Difficulty speaking because of weakness in the lips and cheek.
- Ear(s): Pain in or near the affected ear, Loss of hearing, increased sensitivity to high pitched noise.
- Nose: Nose runs or feels stuffy, Inability to flare nostril, Inability to wrinkle nose.

THE DIFFERENCE BETWEEN FACIAL PARALYSIS & BELL'S PALSY

Facial paralysis is the general term for used to describe the loss of the ability to move one side of the face, while Bell's palsy is a specific type of facial paralysis. The main difference between facial paralysis and Bell's palsy is that when a patient is diagnosed with facial paralysis, a cause for the paralysis can be identified, be it a tumor, infection, or nerve damage. In cases of Bell's palsy, the disorder appears without any reason, which can be quite troublesome for the afflicted patients. Facial paralysis, in most cases, also appears more permanent than Bell's palsy, with cases lasting for years to life if a patient doesn't seek treatment. A patient suffering from Bell's palsy may regain facial function at any time without surgical treatment, and patients usually recover without any permanent damage. People suffering from Bell's palsy have a relatively good prognosis, with approximately 90% of patients completely recovering.

Diagnosis:

- Magnetic resonance imaging (MRI) and computed tomography (CT) scan to rule out brain tumors, strokes and infections.
- Electromyography (EMG) to evaluate the nerve and muscle

Treatment:

Treatment of facial paralysis depends on many factors, including the patient's age, cause of the paralysis, severity of paralysis and duration of symptoms.

Symmetry of facial features usually can be regained, if the patient participates in facial muscle retraining and therapy. Both are critical for success.

Facial Plastic and Reconstructive Surgery Clinic treat facial paralysis by transferring muscles and repairing blood vessels and nerves

Physiotherapy management:

The first session starts with a massage exercise that lasts 10 to 15 minutes. This typically consists of circular strokes (effleurage) and kneading to both sides of the face. Then, stretching will be done to relieve the affected muscles. When the warm up is complete, do the following exercises:

- Basic movements: You will be taught specific exercises such as the forehead wrinkle, eye closure, smiling, snarling and lip pucker. These will be done at varying speeds and intensity.
- Jaw movements: Relaxing the lower jaw, exercises of the mouth and eye movements will be performed.
- Lip closure exercises: These involve filling the cheeks with differing amounts of air, along with eating and drinking exercises while keeping the eye open.
- Expression exercises: You will be guided to use your muscles to recreate common facial expressions, such as anger and astonishment.
- Modalities that can include the use of EMS (electrical muscle stimulation) to maintain muscle property and improve muscle power

7.5 TRIGEMINAL NEURALGIA

Trigeminal neuralgia is a chronic pain condition that affects the trigeminal nerve, which carries sensation from y face to brain.

It's most common in women aged over 50.

Symptoms range from mild to severe facial pain, often triggered by chewing, speaking or brushing the teeth.

The pain of typical trigeminal neuralgia usually has the following features:

- Affects one side of the face
- Can last several days or weeks, followed by a remission for months or years
- Frequency of painful attacks increases over time and may become disabling

Causes:

The cause of the pain usually is due to contact between a healthy artery or vein and the trigeminal nerve at the base of the brain. This places pressure on the nerve as it enters the brain and causes the nerve to misfire. Trigeminal neuralgia can occur as a result of aging, or it can be related to multiple sclerosis or a similar disorder that damages the myelin sheath protecting certain nerves. Trigeminal neuralgia can also be caused by a tumor compressing the trigeminal nerve.

Clinical features:

One or more of the following symptoms may occur:

- Intermittent episodes of mild pain lasting from a few seconds to several minutes.
- Severe episodes of searing, shooting, jabbing pain that feel like electric shocks.
- Sudden attacks of pain triggered by stimuli that are usually not painful, such as by touching the face, chewing, speaking, or brushing the teeth.
- Spasms of pain which last from a couple of seconds to a couple of minutes.
- Episodes of cluster attacks, which may last much longer, but between them, there may be no pain.
- Pain wherever the trigeminal nerve and its branches may reach, including the forehead, eyes, lips, gums, teeth, jaw, and cheek.
- Pain in one side of the face, or, less frequently, both sides.
- pain that is focused in one spot or spreads in a wider pattern
- attacks of pain that occur more regularly and intensely over time
- tingling or numbness in the face before pain develops
- Attacks of pain may occur hundreds of times each day in severe cases. Some patients may have no symptoms for months or years between attacks.
- Some patients will have specific points on their face that trigger pain when if touched.

Diagnosis:

The diagnosis of trigeminal neuralgia mainly based on the description of the pain, including:

- Type. Pain related to trigeminal neuralgia is sudden, shock-like and brief.
- Location. The parts of your face that are affected by pain will tell your doctor if the trigeminal nerve is involved.
- **Triggers.** Trigeminal neuralgia-related pain usually is brought on by light stimulation of your cheeks, such as from eating, talking or even encountering a cool breeze.
- A neurological examination. Touching and examining parts of the face and reflex tests can help to determine exactly where the pain is occurring.
- Magnetic resonance imaging (MRI) of head to determine if multiple sclerosis or a tumor is causing trigeminal neuralgia.

Treatment:

Trigeminal neuralgia treatment usually starts with medications, and some people don't need any additional treatment. However, over time, some people with the condition may stop responding to medications, or they may experience unpleasant side effects. For those people, injections or surgery provide other trigeminal neuralgia treatment options.

MEDICAL MANAGEMENT:

To treat trigeminal neuralgia, the doctor usually will prescribe medications to lessen or block the pain signals sent to brain.

- Anticonvulsants carbamazepine (Tegretol, Carbatrol, others)
- Antispasmodic agents. Muscle-relaxing agents such as baclofen (Gablofen, Lioresal)
- Botox injections.

SUGICAL MANAGEMENT:

- **Microvascular decompression.** This procedure involves relocating or removing blood vessels that are in contact with the trigeminal root to stop the nerve from malfunctioning.
- Brain stereotactic radiosurgery (Gamma knife). In this procedure, a surgeon directs a focused dose of radiation to the root of trigeminal nerve. This procedure uses radiation to damage the trigeminal nerve and reduce or eliminate pain.
- **Glycerol injection.** During this procedure, doctor will inject a small amount of sterile glycerol, which damages the trigeminal nerve and blocks pain signals.
- **Radiofrequency thermal lesioning.** This procedure selectively destroys nerve fibers associated with pain.

Physiotherapy management:

Physiotherapy intervention could be an effective treatment adjunct to medical management of the patients with trigeminal neuralgia symptoms.

The aims of physiotherapy management are to decrease pain and functional limitation, and to improve quality of life.

- Treatments include the use of electro-physical agents and acupuncture to relieve pain during acute onset. Manual therapy, exercise therapy for Temporomandibular Joint (TMJ) as well as self-massage for facial muscles can also help to restore patients' functions.
- Transcutaneous electrical nerve stimulation (TENS) currently is one of the most commonly used forms of electroanalgesia.
- Interferential therapy (IFT) is another electro-physical modality commonly used for pain management in clinical situations

- Manual Therapy If trigeminal neuralgia symptoms are augmented by cervical spine syndromes such as temporomandibular joint (TMJ) syndromes and facet joint problems, a trial of manual therapy for those concurrent symptoms is worth considering for the purpose of lessening the debilitating impact to patients.
- Desensitisation Exercises
- Desensitisation exercises are a way to retrain the skin and superficial tissues when there is hypersensitivity. For example, cotton wool can be stroked on the painful area for a minute a day, progressing to several times a day, as the skin and tissue adapts to the increased strength of the stimulus. After a while, the cotton wool can be replaced by a cotton cloth and eventually rougher fibers can be used.
- Self-management In addition, home-based exercise therapy for TMJ as well as selffacial massage can also be incorporated into treatment regime to improve patients' functional capability

7.6 FOOT DROP

Foot drop is a gait abnormality in which the dropping of the forefoot happens due to weakness, irritation or damage to the common fibular nerve including the sciatic nerve, or paralysis of the muscles in the anterior portion of the lower leg. It is usually a symptom of a greater problem, not a disease in itself.

Causes:

Foot drop is caused by weakness or paralysis of the muscles involved in lifting the front part of the foot. Causes of foot drop might include:

- Muscle damage
- Skeletal or anatomical abnormalities affecting the foot
- Nerve damage
- A stroke or tumor
- Parkinson's disease
- Diabetes
- Motor neuron disease
- Multiple sclerosis
- Adverse reactions to drugs or alcohol
- An injury to the foot or lower leg

Risk factors

- Crossing legs. People who habitually cross their legs can compress the peroneal nerve on their uppermost leg.
- Prolonged kneeling. Occupations that involve prolonged squatting or kneeling such as picking strawberries or laying floor tile can result in foot drop.
- Wearing a leg cast. Plaster casts that enclose the ankle and end just below the knee can exert pressure on the peroneal nerve.

Clinical features:

The most common symptom of foot drop, high steppage gait, is often characterized by raising the thigh up in an exaggerated fashion while walking, as if climbing the stairs.

High steppage gait is associated with one of the following:

- Dragging of the foot and toes
- Scraping of the toes across the ground
- Uncontrolled slapping of the toes against the ground

The affected muscles are usually used to keep the foot off the ground during the swing-through portion of walking. When these are weak, they cannot keep the foot up and foot will scrape across the ground if the foot is not picked up high.

Additional difficulties that commonly accompany foot drop include:

- The inability to raise the foot at the ankle
- The inability to point the toes upward at the body (dorsiflexion)
- Unable to walk normally in heel-to-toe fashion

Diagnosis:

Foot drop is usually diagnosed during a physical exam.

- X-rays. Plain X-rays use a low level of radiation to visualize a soft tissue mass or a bone lesion that might be causing the symptoms.
- Ultrasound. This technology, which uses sound waves to create images of internal structures, can check for cysts or tumors on the nerve or show swelling on the nerve from compression.
- **CT scan.** This combines X-ray images taken from many different angles to form cross-sectional views of structures within the body.
- **Magnetic resonance imaging (MRI).** This test uses radio waves and a strong magnetic field to create detailed images. MRI is particularly useful in visualizing soft tissue lesions that may be compressing a nerve.
- Nerve tests
- Electromyography (EMG) and nerve conduction studies measure electrical activity in the muscles and nerves. These tests can be uncomfortable, but they're useful in determining the location of the damage along the affected nerve.

Tretment :

Treatment for foot drop depends on the cause. If the cause is successfully treated, foot drop might improve or even disappear. If the cause can't be treated, foot drop can be permanent.

Treatment for foot drop might include:

Medical management:

- REST and ICE
- The use of NSAIDS (Non Steroidal Anti-Inflammatory Drugs) when inflammation is an underlying cause.
- Pain medication to reduce the discomfort and allow the patient to perform the recommended exercises

Braces or splints: A brace on your ankle and foot or splint that fits into your shoe can help hold your foot in a normal position

Surgical management:

Depending upon the cause, and if foot drop is relatively new, nerve surgery might be helpful. If foot drop is long-standing, the doctor might suggest surgery that fuses ankle or foot bones or a procedure that transfers a working tendon and attached muscle to a different part of the foot.

Physiotherapy management:

Exercises that strengthen the leg muscles and help to maintain the range of motion in the knee and ankle might improve gait problems associated with foot drop. Stretching exercises are particularly important to prevent the stiffness in the heel.

Nerve stimulation. Sometimes stimulating the nerve that lifts the foot improves foot drop.

- Manual Therapeutic Technique (MTT): hands on care including soft tissue massage, deep friction massage, manual stretching and joint mobilization by a physical therapist to regain mobility and range of motion of the foot and ankle
- Therapeutic Exercises (TE) including stretching and strengthening exercises to regain range of motion and strengthen the foot and effected muscle.
- Neuromuscular Reeducation (NMR) to restore stability, retrain the lower extremity, and improve movement technique and mechanics (for example, walking, stairs, gait training, or stepping) in daily use of the involved lower extremity.
- Modalities that can include the use of EMS (electrical muscle stimulation) ultrasound, electrical stimulation, ice, cold laser and others to decrease pain and inflammation at the foot and effected area.
- Home program that includes strengthening, stretching and stabilization exercises and instructions to help the person perform daily tasks and advance to the next functional level.
- Home exercises include Towel Stretch ,Toe to Heel Rocks, Marble Pickup, Ankle Dorsiflexion, Plantar Flexion, Ball Lift.

PAPER - II

ORTHOPAEDICS AND NEUROLOGY

QUESTIONS:

2 marks

- 1. Mention types of nerve injuries ?
- 2. What is neuropraxia?
- 3. Write the differences between axanotmesis and neurotmesis?
- 4. What is diabetic neuropathy and write its causes ?
- 5. What is GBS and write the clinical features ?
- 6. Write any four facial muscles and their functions ?
- 7. Mention the clinical features of facial palsy?
- 8. Mention the causes and clinical features of trigeminal neuralgia?
- 9. Mention the causes and clinical features of foot drop?

6 marks

- 1. Explain about Diabetic neuropathy in detail along with physiotherapy treatment?
- 2. Explain about GBS in detail along with physiotherapy treatment?
- 3. Explain about Facial palsy in detail along with physiotherapy treatment?
- 4. Explain about Trigeminal neuralgiain in detail along with physiotherapy treatment?
- 5. Explain about Foot drop in detail along with physiotherapy treatment?

Ψ

INJURIES OF BRAIN AND SPINAL CORD

UNIT

Structure:

- 8.1 Head injury
- 8.2 Coma
- 8.3 Hemiplegia
- 8.4 Paraplegia

8.1 HEAD INJURY

A head injury is any sort of injury to the brain, skull, or scalp. This can range from a mild bump or bruise to a traumatic brain injury. Common head injuries include concussions, skull fractures, and scalp wounds. The consequences and treatments vary greatly, depending on what caused the head injury and how severe it is.

Head injuries may be either closed or open. A closed head injury is any injury that doesn't break the skull. An open (penetrating) head injury is one in which something breaks the scalp and skull and enters the brain.

Causes:

Head injuries **caused** by a blow to the head are usually associated with:

- motor vehicle accidents
- falls
- physical assaults
- sports-related accidents

Types of head injury:

- **Hematoma:** A hematoma is a collection, or clotting, of blood outside the blood vessels. It can be very serious if a hematoma occurs in the brain. The clotting can lead to pressure building up inside the skull. This can cause to lose consciousness or result in permanent brain damage.
- **Hemorrhage:** A hemorrhage is uncontrolled bleeding. There can be bleeding in the space around the brain, called subarachnoid hemorrhage, or bleeding within the brain tissue,

called intracerebral hemorrhage.Subarachnoid hemorrhages often cause headaches and vomiting. The severity of intracerebral hemorrhages depends on how much bleeding there is, but over time any amount of blood can cause pressure buildup.

- **Concussion:** A concussion occurs when the impact on the head is severe enough to cause brain injury. It's thought to be the result of the brain hitting against the hard walls of skull or the forces of sudden acceleration and deceleration. Generally speaking, the loss of function associated with a concussion is temporary. However, repeated concussions can eventually lead to permanent damage.
- Edema: Any brain injury can lead to edema, or swelling. Many injuries cause swelling of the surrounding tissues, but it's more serious when it occurs in the brain.
- **Skull fracture:** Unlike most bones in the body, skull doesn't have bone marrow. This makes the skull very strong and difficult to break. A broken skull is unable to absorb the impact of a blow, making it more likely that there'll also be damage to the brain.
- **Diffuse axonal injury :** A diffuse axonal injury (sheer injury) is an injury to the brain that doesn't cause bleeding but does damage the brain cells. The damage to the brain cells results in them not being able to function. It can also result in swelling, causing more damage. Though it isn't as outwardly visible as other forms of brain injury, a diffuse axonal injury is one of the most dangerous types of head injuries. It can lead to permanent brain damage and even death.

Clinical features:

- a headache
- light headedness
- a spinning sensation
- mild confusion
- nausea
- temporary ringing in the ears
- a loss of consciousness
- seizures
- vomiting
- balance or coordination problems
- serious disorientation
- an inability to focus the eyes
- abnormal eye movements
- a loss of muscle control
- a persistent or worsening headache
- memory loss
- changes in mood
- leaking of clear fluid from the ear or the nose

Diagnosis:

- CT scan will help the doctor look for fractures, evidence of bleeding and clotting, brain swelling, and any other structural damage.
- MRI scan will usually only be ordered once the patient in stable condition

Treatment:

The treatment for head injuries depends on both the type and the severity of the injury.

With minor head injuries, there are often no symptoms other than pain at the site of the injury. In these cases, he /she may be told to take acetaminophen (Tylenol) for the pain.

Patient shouldn't take nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (Advil) or aspirin . These can make any bleeding worse. If he /she have an open cut, doctor may use sutures or staples to close it. They'll then cover it with a bandage.

The treatment for severe head injuries can include:

Medication:

If he /she had a severe brain injury, anti-seizure medication. are given. He /she may be at risk for seizures in the week following injury.

He /she may be given diuretics if the injury has caused pressure buildup in the brain. Diuretics cause patient to excrete more fluids. This can help relieve some of the pressure.

If the injury is very serious, they may be given medication to put him / her in an induced coma. This may be an appropriate treatment if blood vessels are damaged. When patient in a coma, the brain doesn't need as much oxygen and nutrients as it normally does.

Surgery :

It may be necessary to do emergency surgery to prevent further damage to the brain.

- remove a hematoma
- repair the skull
- release some of the pressure in the skull

Physiotherapy management :

- The physical therapist will work with the patient, family, and other health care providers to develop goals and an individualized treatment plan to address the challenges and functional limitations associated with the injury.
- Depending on the severity of the injury, the patient's level of consciousness, and the problems the patient has the treatment plan will widely vary.
- When a person is said to be in a vegetative state, some basic brain functions resume, such as eye-opening on a regular sleep/wake cycle, breathing, and digestive functions, but they are unaware of surrounding activity.
- During this phase, the physical therapist will help with positioning and equipment that will ensure proper posture and flexibility, reduce the likelihood of any problems, such as bed sores, and encourage the individual's responsiveness to the environment.
- When a person is said to be in a minimally conscious state, they show beginning signs of awareness (the ability to do purposeful things), but these responses are often not consistent.
- During this phase, a physical therapist will help with stretching, positioning, and equipment use while working with the individual to increase consistent responses to commands for movement and communication.

As the person becomes more conscious and is able to more actively participate in physical therapy, the physical therapist will use a combination of exercise, task-specific training, patient and family education, and different types of equipment to help the patient improve, including:

- The ability to maintain alertness and follow commands
- Muscle and joint flexibility that may be reduced after inactivity
- The ability to move around in bed, to sit without support, and to stand up
- The ability to balance safely when sitting, standing, or walking
- The ability to move by strengthening and the practicing of functional activities
- Balance and coordination
- Strength and energy, reducing any feelings of fatigue that occur from inactivity or injury to the brain itself
- A return to sports and fitness activities

If limitations prevent the return to pre injury activities, a physical therapist can help an individual improve mobility and master the use of equipment, such as an ankle brace, a walker, or a wheelchair.

8.2 COMA

A coma is a deep state of unconsciousness. It can happen as a result of a traumatic accident, such as a blow to the head, or a medical condition, for example, some types of infection.

Coma is different from sleep because the person is unable to wake up.It is not the same as brain death. The person is alive, but they cannot respond in the normal way to their environment.

Causes :

Causes or a coma vary, but they all involve some level of injury to the brain or CNS.

They include:

- **Diabetes**: If the blood sugar levels of a person with diabetes rise too much, this is known as hyperglycemia. If they become too low, this is hypoglycemia. If hyperglycemia or hypoglycemia continue for too long, a coma can result.
- **Hypoxia, or lack of oxygen**: If the supply of oxygen to the brain is reduced or cut off, for example, during a heart attack, stroke, or near drowning, a coma may result.
- **Infections**: Severe inflammation of the brain, spinal cord, or tissues surrounding the brain can result in coma. Examples include encephalitis or meningitis.
- **Toxins and drug overdose**: Exposure to carbon monoxide can result in brain damage and coma, as can some drug overdoses.
- **Traumatic brain injuries**: Road traffic accidents, sports injuries, and violent attacks that involve a blow to the head can cause coma.

Clinical features

- Closed eyes.
- Depressed brainstem reflexes, such as pupils not responding to light.
- No responses of limbs, except for reflex movements.
- No response to painful stimuli, except for reflex movements.
- Irregular breathing.

Diagnosis:

- 1. Occulomotor functions and papillary reactions are extremely informative.
- 2. "Glass Gow Coma Scale (GCS)" assess the depth of coma and level of consciousness.

The scoring is based on three responses:

- a) Best motor response
- b) Best eye opening response
- c) Best verbal response

Glasgow Coma Scale

Eye Opening Response

- Spontaneous--open with blinking at baseline **4 points**
- To verbal stimuli, command, speech **3 points**
- To pain only (not applied to face) 2 points
- No response 1 point

Verbal Response

- Oriented 5 points
- Confused conversation, but able to answer questions **4 points**
- Inappropriate words **3 points**
- Incomprehensible speech **2 points**
- No response 1 point

Motor Response

- Obeys commands for movement 6 points
- Purposeful movement to painful stimulus 5 points
- Withdraws in response to pain 4 points
- Flexion in response to pain (decorticate posturing) **3 points**
- Extension response in response to pain (decerebrate posturing) 2 points
- No response 1 point

Score	level of consciousness
12 – 15	Conscious
9 – 12	Semi – conscious
Less than 9	Unconscious

Normally, a patient by recovers second or third week. If it extends behind this time, the patient is stated to be in vegetative state. If this stage continuous for more than one year then the stage is termed as 'persistant vegetative state'.

Laboratory tests: Blood samples will be taken to check for:

- Complete blood count
- Electrolytes, glucose, thyroid, kidney and liver function
- Carbon monoxide poisoning
- Drug or alcohol overdose

Brain scans : Imaging tests help doctors pinpoint areas of brain injury. Tests may include:

- Computerized tomography (CT) scan: A CT scan uses a series of X-rays to create a detailed image of the brain. A CT scan can show a brain hemorrhage, tumors, strokes and other conditions. This test is often used to diagnose and determine the cause of a coma.
- Magnetic resonance imaging (MRI): An MRI uses powerful radio waves and magnets to create a detailed view of the brain. An MRI can detect brain tissue damaged by an ischemic stroke, brain hemorrhages and other conditions. MRI scans are particularly useful for examining the brainstem and deep brain structures.

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• Electroencephalography (EEG) :An EEG measures the electrical activity inside the brain. Doctors attach small electrodes to the scalp. Doctors send a low electrical current through the electrodes. The brain's electrical impulses are then recorded. This test can determine if seizures may be the cause of a coma

Treatment:

- A coma is a serious medical emergency.
- Health professionals will start by ensuring the immediate survival of the patient and securing their breathing and circulation to maximize the amount of oxygen that reaches the brain.
- A doctor may administer glucose or antibiotics even before the results of blood tests are ready, in case the patient is in diabetic shock or has a brain infection.
- Treatment will depend on the underlying cause of the coma, for example, kidney failure, liver disease, diabetes, poisoning, and so on.
- If there is brain swelling, surgery may be needed to relieve the pressure.

Physiotherapy management :

- The time period one spends in a coma may vary. Because comatose patients are immobile, it is imperative for them to receive some form of physical treatment on a daily basis.
- Physiotherapy for comatose patients involves moving their limbs and massage. It is important that their muscles remain strong and that atrophy does not set in.
- It is also important to keep their blood circulation going. Often, while the therapist is working with the comatose patient, he or she will talk to them, as if they can hear.
- Often times, the patient can hear as the ocular nerves are usually the last to go during a coma.
- Talking, touch, movement, massage and exercise of the limbs can help someone come out of a coma sooner than someone who is just ignored.
- In addition, those who receive physiotherapy for comatose patients will regain their strength much sooner than those who receive no therapy.

- As the muscles were continuously exercised during the coma period, the person who emerges from a coma will have a much better time beginning to walk and moving around.
- Massaging of muscles also insures that they will not experience atrophy. Postural drainage except headlow position and suctioning periodically to maintain bronchial hygiene.
- Nebulisation can be given prior to postural drainage to loosen the secretions.
- The following methods are adopted to prevent bed or pressure sores.
 - a) Use of air or water bed
 - b) Frequent Change of position
 - c) Careful inspection of risky areas
 - d) Avoid creases over the bed
 - e) Apply talcum powder to maintain dryness of the skin

8.3 HEMIPLEGIA

Hemiplegia means complete paralysis of half of the body. Hemiparesis is temporary paresis, that is, weakness of the entire left or right side of the body.

- Hemiplegia and hemipareis can be caused by different medical conditions, such as congenital causes, trauma, tumors or stroke.
- Hemiplegia is caused by damage to central nervous system (brain and spinal cord), the execution orders of movements are not transmitted to the muscles. In addition to motor problems, other functions can be altered as memory or sensitivity.



Causes :

- Cerebrovascular accidents
- Thrombosis, embolism or hemorrhage
- Transient ischemic attack (TIA)
- Migraine syndrome
- Head injury
- Brain contusion
- Subdural and epidural haematoma
- Todd's paralysis

Predisposing risk factors:

- Hypertension
- Heart disease
- Diabetes
- Smoking
- Diet
- Life style
- Personality
- Alcoholic
- Obesity
- Age

Clinical features:

- Pain. There is pain associated with brain injury and localized pain in the affected limbs.
- Aphasia. Difficulty in understanding the meaning of words they hear or read them.
- Disorders of the sphincters. Urinary incontinence or urinary retention, fecal incontinence is still.
- In some cases the lesions, arm and leg are affected, in others only the arm or only the face.
- Loss of motor skills.
- Difficulty with gait.
- Difficulty with balance while standing or walking.
- Having difficulty with motor activities like holding, grasping or pinching
- Increasing stiffness of muscles.
- Muscle spasms.
- The majority of children who develop hemiplegia also have abnormal mental development.
- Behaviour problems like anxiety, anger, irritability, lack of concentration or comprehension.
- Emotions depression.

- Shoulder pain Often associated with a loss of external rotation of the glenohumeral joint, commonly due to the increased tone of the Subscapularis muscle and Pectoralis major muscle.
- Shoulder Subluxation.
- Difficulty in swallowing.
- Trouble with vision. Blurred vision or weakness of the eyes. Speech becomes difficult .Numbness, tingling or loss of sensations on one half of the body.
- Heightened emotional sensitivity with inability to handle stressful situations.
- Memory seems poor. Unable to recall recent or past events concerning people, places and activities.
- Loss of control over bladder and bowel movements leading to an inability to hold on to stool or urine.

Diagnosis:

- Complete blood count.
- Blood biochemistry test.
- Cranial CT: a highly detailed, non-invasive, imaging procedure that combines x-rays with computer technology and allows the study of the brain from many angles.
- Cranial MRI: a non-invasive, highly sensitive procedure that uses electromagnetic properties of tissues providing detailed studies of their structures.
- An EEG (electroencephalogram): can measure the nerve activity within the brain.

Treatment:

There's no single treatment approach that works for all people. Instead, treatment is largely dependent on the cause of hemiplegia. Some treatment options include:

- Blood thinners to reduce cardiovascular blockages and decrease the chances of future strokes.
- Antibiotics, usually delivered intravenously, to combat brain infections.
- Surgery to remove swelling on the brain or objects lodged in the brain.
- Muscle relaxant drugs.
- Surgery to address secondary issues, particularly involuntary muscle contractions, spinal damage, or damage to the ligaments or tendons on the unaffected side of the body.
- Physical therapy designed to help the brain work around the injuries. Physical therapy can also strengthen the unaffected side and help you reduce the loss of muscle control and tone.
- Support groups, family education, and advocacy.
- Psychotherapy to help you deal with the psychological effects of the disease.
- Exercise therapy to help you remain healthy in spite of your disability.
Physiotherapy management:

Range-of-Motion Exercises

Range-of-motion exercises can help to prevent muscle stiffness and contractures by moving the weakened or paralyzed limb. Depending on whether the limb can voluntarily move or has to be moved by someone else, range-of-motion exercises can be passive (where someone else moves the limb for you), active-assistive (where you perform as much of the movement as possible with the help of someone else to complete the movement), or active (where you complete the movement)

> Lying on affected side:

- One or two pillows for head.
- Affected shoulder positioned comfortably.
- Place unaffected leg forward on one or two pillows.
- Place pillows in front or behind to give support.

Lying on unaffected side:

- One or two pillow for head.
- Affected arm forward and supported on pillow(s)
- Affected leg backwards on one or two pillows.
- Place pillow behind.



> Lying on back:

- Keep three pillows in a 'triangle', supporting shoulders and head.
- Keep affected arm on pillow.
- Ensure feet in a neutral position.

> Sitting in bed:

- Sitting in bed for short periods only.
- Must be upright and well supported with pillows.
- Giving extra support using pillows under arms or knees.

Loosen up your neck muscle:

- Slowly look over your right shoulder then your left shoulder.
- Touch your right ear to your right shoulder, then your left ear to your left shoulder. (Do not raise your shoulder, bend your neck.)
- Bend your head forward to bring your chin to your chest, then lift your head back to an upright position.

> Loosen up the muscles around your shoulder blade:

- Sit at the table with your elbows and forearms resting on the table, your elbows bent and your hands out in front of you. Make sure that neither the chair nor table has wheels.
- Without moving your arms on the table, bring your chest toward the table while sitting up straight and tall. Then move your chest away from the table and slouch. Continue this sequence.

> Range of motion exercises for elbow, shoulder and wrist:

- Put your affected hand in your non affected hand. Move your arms forward to straighten your elbows, keeping your hands at shoulder or chest level. Return both hands to your chest. Repeat.
- With your elbows straight and your hands together, raise your hands to shoulder or eye level. Repeat.
- Keeping your elbows straight, reach towards the floor with your arms between your knees. Repeat over your right knee, then over your left knee.
- Sit with your hands together on the same knee. Bring the back of your right hand to your right knee, then the back of your left hand to your left knee, keeping your hands together. Repeat.
- With your hands still together, bring your hands to your left shoulder by bending your elbows, then to your right knee by straightening your elbow. Then reverse and bring your hands to your right shoulder, then your left knee. Repeat
- With your forearms resting on the table, thumbs up, bend your wrists to the left and then to the right.
- With your forearm resting on the table, gently bend your fingers into your palm, and then straighten your fingers.
- Holding the base of your thumb, gently rotate your thumb in a complete circle.

Functional Electrical Stimulation (NMES)

- Functional Electrical Stimulation (FES) has been demonstrated to be beneficial to restore motor control, spasticity, and reduction of hemiplegic shoulder pain and subluxation. It is concluded that FES can enhance the upper extremity motor recovery of acute stroke patient.
- FES can significantly improve arm function, electromygraphic activity of posterior deltoid, range of motion and reduction of severity of subluxation and pain of hemiplegic shoulder.
- Biofeedback : Is a modality that facilitates the cognizant of electromyographic activity in selected muscle or awareness of joint position sense via visual or auditory cues.
- Chest physiotherapy : Can be used as a technique for bronchial hygiene clearance in hemiplegic patient.
- In hemiplegia Physical therapy consistent "reflex-inhibitory" patterns of posture in resting is encouraged to discourage physical complication of hemiplegia and to improve recovery.
 - A goal of hemiplegia Physical Therapy interventions has been to "**normalize tone to normalize movement**." Therapy modalities for reducing tone include stretching, prolonged stretching, passive manipulation by therapists, weight bearing, ice, contraction of muscles antagonistic to spastic muscles, splinting, and casting.
 - **Dorsal resting hand splints** reduced spasticity more than volar splints, but the effect on motor control is uncertain while TENS stimulation showed improvement for chronic spasticity of lower extremities.
 - **Bobath and other therapy** approaches recommend the use of sensory stimulation to promote sensory recovery of hemiplegic patients, such as icing, tapping and brushing are employed to facilitate activities.
 - **Proprioceptive neuromuscular facilitation (PNF)** patterns of movement are used in treatment and are followed in a developmental sequence.
 - Components of gait in preparation for walking. It includes
 - a) Symetrical Weight bearing training
 - b) Weight shifting
 - c) Stepping training (swinging / clearance)
 - d) Heel strike
 - e) Single leg standing
 - f) Push off / Calf rise.

8.4 PARAPLEGIA

Impairment in sensory and motor function of the lower extremities is called paraplegia.

Causes :

- Car and motorcycle accidents (38%)
- Falls (30%)
- Violence, the most common source of which is gunshot wounds (14%)
- Sports and recreational activities, with diving accidents leading the way (9%)
- Medical or surgical injuries (5%)
- strokes, the most common cause of non-traumatic paraplegia.
- Genetic disorders, such as hereditary spastic paraplegia.
- Oxygen deprivation to the brain or spinal cord due to choking, childbirth complications, and other injuries.
- Autoimmune disorders.
- Infections of the brain or spinal cord.
- Tumors, lesions, or cancer of the brain or spinal cord.
- Spinal cord disorders such as syrinx.

Clinical features:

- Patient experiences loss of movement or muscle control in the legs, feet, toes, or trunk.
- Patient experiences loss of sensation in the legs, feet, toes or trunk.
- Tingling in the legs, feet, toes or trunk can also be felt.
- Bladder and bowel incontinence.
- Changes in sexual function, sexual sensitivity and fertility.
- Exaggerated reflex activities or spasms.
- Pain or an intense stinging sensation caused by damage to the nerve fibers in your spinal cord.
- Difficulty breathing, coughing or clearing secretions from your lungs.

Complications:

Paraplegia can cause a number of complications.

- Pressure sores.
- Thrombosis.
- Pneumonia.
- Chronic nerve pain in the area around the injury.

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Diagnosis:

- Computerized CT scan for a better understanding of the severity of the injury.
- X-ray to examine any tumors or fractures in the spine.
- Magnetic Resonance Imaging(MRI) to test for blood clots or any mass formation that may compress the spinal cord.

Treatment:

General Management:

- Frequent change of the patient's posture to guard against bedsores.
- Care of the skin by frequent washing with alcohol followed by talc powder. In case of urinary incontinence, frequent change of bed-sheets.
- Care of the bladder: If there is retention, use parasympathomimetic drugs. If this fails, use a catheter to evacuate the bladder.

Symptomatic Treatment:

- Analgesics and sedatives for pain.
- Muscle relaxants for the spasticity.
- Vitamins and tonics

Physiotherapy Management:

A balanced exercise program includes three types of exercise:

(1) Stretching/Flexibility Exercises:

- slow, sustained lengthening of the muscle should be done.
- Stretching improves flexibility the ability to move the parts of te body through their full range of motion.
- Stretching also can reduce muscle spasticity and cramps and may also reduce problems such as tendonitis and bursitis.

(2) Aerobic Exercises:

- Steady exercise using large muscle groups
- Aerobic exercise strengthens heart and lungs and improves body's ability to use oxygen. It also reduces fatigue, increases energy levels and helps you sleep better, control your weight,
- It is generally recommended to gradually work up to three or four sessions per week, each lasting 15 to 60 minutes. Include a 5-minute warm-up (including stretching) before the activity and 5 to 10 minutes of a cool down (stretching and slower activity) afterwards.
- Walking, stationary bicycling, water exercises and chair exercises are excellent choices.

(3) Strengthening Exercises:

- Repeated muscle contractions until the muscle becomes tired.
- Strengthening exercises help increase muscle tone and improve the quality of muscles. This enhances mobility and provides energy and a positive sense of well-being.
- Strong hip and leg muscles are needed to lift the legs to walk, and strong arm muscles are needed to carry out daily functions. Strong abdominal and back muscles help maintain correct posture and can counter pain resulting from poor gait, poor posture or the use of mobility aids.

Physical agents:

- Thermotherapy: are used to decrease the pain and spasticity. They are (i) Superficial heat: IRR, wax bath, etc. (ii) Deep heat: SWD, MWD, etc.
- Electrical therapy: is used to increase muscle power and to decrease the pain. e.g, TENS, EST, IFT.

Therapeutic exercises:

- Mat exercise.
- PNF exercise.
- Active and passive ROM exercise.
- Strengthening exercise.
- Stretching exercise.
- Endurance exercise
- Co-ordination exercise.
- Pelvic tilting exercise.
- Hamstring muscle stretching.
- Spinal rotation.
- Calf muscle stretching.
- Neck raising exercise
- Knee rolling exercise.
- Lying in extension.
- Extension exercise.
- Back and gluteal exercise.

Orthosis:

- Various orthosis are used to assist patient with paraplegia.
- These are: crutch, walker, cane, brace and wheelchair.

Gait training:

- It is the important part of rehabilitation program balance can be achieved by proper gait training. Gait training can be done by following methods:
- Pre ambulation MAT program:

- Rolling, prone on elbow, prone on hand, quadruped, pelvic tilting, setting and standing balance.
- Parallel bar progression
- Advanced parallel bar activities.
- Assistive device: E.g, Cane, crutches, walker

Home program and Ergonomics:

- Patient is advised to use the lumbosacral orthosis to support the back during travelling.
- Patient is advice for hot fomentation at home.
- Patient is advised to lying in prone position for at least 15 minutes duration twice in a day.
- Patient is explained about the proper sitting, standing, lying and lying to standing, doing the household activity in a proper way.
- Patient is advised to take rest and to avoid the forward bending as much as the patient can avoid.

QUESTIONS:

2 marks

- 1. Write the causes and clinical features of head injury?
- 2. Write the causes and clinical features of coma?
- 3. Define hemiplegia and write the causes?
- 4. Write the clinical features of hemiplegia?
- 5. Write the causes and clinical features of paraplegia?

6 marks

- 1. Explain about Head injury in detail along with its physiotherapy treatment?
- 2. Explain about COMA in detail along with its physiotherapy treatment?
- 3. Explain about Hemiplegia in detail along with its physiotherapy treatment?
- 4. Explain about Paraplegia in detail along with its physiotherapy treatment?

Ψ

UNIT 9

OTHER CONDITIONS

Structure:

- 9.1 Rheumatoid arthritis
- 9.2 Amputations
- 9.3 Ankylosing spondylitis
- 9.4 Orthopaedic appliances

9.1 RHEUMATOID ARTHRITIS

Rheumatoid arthritis is a long-term, progressive, and disabling autoimmune disease, in which the body's immune system mistakenly attacks its own body's tissues i.e joints and organs, which cause inflammation, swelling, and pain in and around the joints and other body organs. It usually affects the hands and feet first, but it can occur in any joint. It usually involves the same joints on both sides of the body.

If inflammation goes unchecked, it can damage cartilage, the elastic tissue that covers the ends of bones in a joint, as well as the bones themselves. Over time, there is loss of cartilage, and the joint spacing between bones can become smaller.

Causes:

The cause of rheumatoid arthritis is unknown. Even though infectious agents such as viruses, bacteria, and fungi have long been suspected, none has been proven as the cause. The cause of rheumatoid arthritis is a very active area of worldwide research. It is believed that the tendency to develop rheumatoid arthritis may be genetically inherited (hereditary). Certain genes have been identified that increase the risk for rheumatoid arthritis. It is also suspected that certain infections or factors in the environment might trigger the activation of the immune system in susceptible individuals. This misdirected immune system then attacks the body's own tissues. This leads to inflammation in the joints and sometimes in various organs of the body, such as the lungs or eyes.



RHEUMATOID ARTHRITIS

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Risk factors

Factors that may increase the risk of rheumatoid arthritis include:

- Women are affected more than men
- Age begins between the ages of 40 and 60.
- Family history.
- Smoking.
- Environmental exposures.
- Obesity.

Clinical features:

In the early stages, people with RA may not initially see redness or swelling in the joints, but they may experience tenderness and pain.

These following joint symptoms are clues to RA:

- Joint pain, tenderness, swelling or stiffness for six weeks or longer
- Morning stiffness for 30 minutes or longer
- More than one joint is affected
- Small joints (wrists, certain joints of the hands and feet) are affected
- The same joints on both sides of the body are affected

Along with pain, many people experience fatigue, loss of appetite and a low-grade fever. The symptoms and effects of RA may come and go. A period of high disease activity (increases in inflammation and other symptoms) is called a flare. A flare can last for days or months. Ongoing high levels of inflammation can cause problems throughout the body. Here of some ways RA can affect organs and body systems:

- Eyes. Dryness, pain, redness, sensitivity to light and impaired vision
- Mouth. Dryness and gum irritation or infection
- Skin. Rheumatoid nodules small lumps under the skin over bony areas
- Lungs. Inflammation and scarring that can lead to shortness of breath
- **Blood Vessels.** Inflammation of blood vessels that can lead to damage in the nerves, skin and other organs
- Blood. Anemia, a lower than normal number of red blood cells

Diagnosis :

Rheumatoid arthritis can be difficult to diagnose in its early stages because the early signs and symptoms mimic those of many other diseases. There is no one blood test or physical finding to confirm the diagnosis.

Diagnostic Criteria

Four out of the Following Seven Must be Present

• Morning Stiffness for an hour or greater

- Arthritis of 3 or more of the following joints: right or left PIP, MCP, Wrist, Elbow, Knee, Ankle, and MTP Joint.
- Arthritis of wrist, MCP, PIP
- Symmetric involvement of a Joint
- Rheumatoid nodules over bony prominences or extensor surfaces
- Positive serum rheumatoid factor
- Radiographic changes including erosion or bony decalcifications localized in or adjacent to joints.

Blood tests: People with rheumatoid arthritis often have an elevated erythrocyte sedimentation rate (ESR, or sed rate) or C-reactive protein (CRP), which may indicate the presence of an inflammatory process in the body. Other common blood tests look for rheumatoid factor and anti-cyclic citrullinated peptide (anti-CCP) antibodies. Imaging tests : X-rays , MRI and ultrasound tests can help to judge the severity of the disease in the body.

Treatment :

Conservative management:

There is no cure for rheumatoid arthritis. But recent discoveries indicate that remission of symptoms is more likely when treatment begins early with strong medications

Drugs for Rheumatoid Arthritis

Four main groups of drugs are used to treat Rheumatoid Arthritis:

- painkillers (analgesics)
- non-steroidal anti-inflammatory drugs (NSAIDs)
- disease-modifying anti-rheumatic drugs (DMARDs)
- steroids.

Surgical management:

If medications fail to prevent joint damage, surgical intervention may be needed to repair the joints, restore ability, decrease pain, and correct deformities.

- Total Joint Replacement
- Tendon Repair
- Joint Fusion

Physiotherapy management :

- **Rest:** Rest and energy conservation can be helpful for locally inflamed joints, but should be avoided long-term due to the side effects of inactivity include decrease range of motion, loss of strength, altered joint-loading response, and decrease aerobic capacity.
- **Massage**: massage and the manual trigger of an articular movement focused on the improvement of function, pain reduction, reduction of disease activity improve flexibility
- Therapy gloves: used to control and manage hand pain, to maintain or restore the patient's hand function, or to psychologically help to relax or calm the wearer. Wearing therapy gloves led to the improvement in hand grip strength. The glove can be worn during the day or at night. They are made of various materials: nylon, wool and elastane fibres.
- **Cold/Hot Applications:** Cold/hot modalities are the most commonly used physical agents in RA treatment. It is well known that cold application is mostly used in acute stages whereas hot is used in chronic stage. Ice helps to decreases pain ,reduce inflammation in muscles and joints by constricting blood vessels and preventing fluids from leaking into surrounding tissues. Heat (paraffin wax, hot packs)works to Provides pain relief by reducing muscle spasm ,Improves the elasticity of soft tissues and stimulate blood circulation. By applying heat prior to getting up in the morning, or during the day helps reduce discomfort and stiffness in the joint.
- **T.E.N.S:** Small current passed across the skin by electrodes. It Provides short-term pain relief (6 -18 hours) and Can be used several times a day
- **Infrared radiation:** Mostly used for patients who cannot tolerate the weight of hot packs. The energy is absorbed by the skin and converted into superficial heat.
- **Hydrotherapy :** Involves the use of water, either hot or cold, to treat conditions. Forms of hydrotherapy include whirlpool baths (partial body emersion), Hubbard tanks (whole body emersion), and contrast baths which are specifically used for RA.
- Ultrasound : Is used in a variety of conditions, for treating joint contracture, periarticular inflammation, muscle spasm and pain, in rheumatoid osteoarthritis. A form of ultrasound, phonophoresis, is proposed to aid in the transdermal movement of topical medications. The most commonly used are corticosteroids and local anesthetics.
- **Diathermy :** Both short wave and microwave involve similar principles. Short wave uses lower frequencies than microwave, and both use electromagnetic

radiation to heat tissue. They are used to heat relatively superficial muscles and joints todecrease pain and spasm

- **Iontophoresis :** Is believed to work through the transcutaneous delivery of charged medications (i.e. lidocaine, corticosteroids, salicylate, antibiotics). Its efficacy is unproven, but is used for delivery of substances that need local penetration in order to avoid systemic effects, and in cases where oral absorption is variable or contraindicated
- Orthoses : Deformities resulting from RA can limit a patient's functioning, an often overlooked consequence of the disease. Most deformities involve the hand, (Boutonniere deformity ,Swan Neck deformity) knees, feet, and shoulder. A careful decision should be made regarding the goal of orthotic prescription (e.g., prevention of foot-drop, relief of joint contractures). Joint preservation techniques are vital for prolonging patient independence. Orthotic devices can make activities of daily living much easier, leading to a greater degree of independence.

Examples - anti Boutonniere splint and anti Swan Neck splint

Stabilizing and coordinating exercises: The improvement of stabilization and coordination of a certain joint will be achieved by doing exercises that stimulate the sensorimotor system. For example, standing on a balance board. Important aspects during this exercises are motion control, balance and coordination.

Strengthening exercises: Should be utilized in non-inflamed joints , while isometric exercises can help maintain strength to prevent injury or facilitate fatigue. In RA patients, it has been shown that isometric strengthening can lead to ADL performance with reduced effort and an increase in V02max, which is a measure of ones work capacity using oxygen consumption. Exercise programs should progress slowly, while monitoring the patients for signs of inflammation

Stretching: Stretching can help improve flexibility, reduce stiffness, and increase range of motion. Stretching daily, ideally in the morning, is important for relieving RA symptoms. The ideal stretching routine will be different for each person and will depend on which joints are affected and what symptoms occur. However, stretches often involve slowly and gently moving the joints of the knees, hands, and elbows.Hand exercises : **RA can sometimes lead to limited use of the hands. Bending the wrists up and down, slowly curling the fingers, spreading the fingers wide on a table, and squeezing a stress ball can all help increase strength and flexibility in the hands.**

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Walking : Walking is a low-impact form of exercise that can help with aerobic conditioning, heart and joint health, and mood. It is essential to wear proper shoes and stay hydrated, even if the walking is not strenuous. It is often sensible to walk slowly initially and then increase the pace when possible

Cycling : As RA increases the risk of cardiovascular disease, it is vital to keep the heart as healthy as possible. Riding a stationary bike can be a safe way to get the joints moving and improve cardiovascular fitness. In addition to improving aerobic conditioning, cycling can reduce stiffness, increase range of motion and leg strength, and build endurance.

Water exercises : Water helps support bodyweight, which means that water exercises do not impact heavily on the joints. Swimming, water aerobics, and other gentle water exercises can increase flexibility, range of motion, strength, and aerobic conditioning. They can also reduce joint stress and stiffness.

Gardening : As well as being a form of exercise, gardening offers the benefit of improving mood. People should be gentle with their body, work slowly, and avoid overstraining the muscles and joints.

9.2 AMPUTATIONS

: Amputation is the intentional surgical removal of a limb or body part. It is performed to remove diseased tissue or relieve pain or due to Trauma.

Purpose Arms, legs, hands, feet, fingers, and toes can be amputated. Most amputations involve small body parts such as a finger, rather than an entire limb. Amputation is performed for the following reasons:

- to remove tissue that no longer has an adequate blood supply
- to remove malignant tumors
- because of severe trauma to the body part

The blood supply to an extremity can be cut off because of injury to the blood vessel, hardening of the arteries, arterial embolism, impaired circulation as a complication of diabetes mellitus, repeated severe infection that leads to gangrene, severe frostbite, Raynaud's disease, or Buerger's disease.

Causes:

<u>Congenital</u>

- Congenical limb deficiency
- Phocomelia: "a congenital deformity in which the limbs are extremely shortened so that the feet and hands arise close to the trunk"

<u>Acquired</u>

- Vascular
- Ischaemia
- Diabetes
- Frostbite
- Arterial insufficiency leading to death or decay of body tissue (gangrene)
- Chronic leg ulcer leading to Septicaemia
- Infection e.g. Bone infection (Osteomyelitis)
- Malignant tumours e.g. sarcoma (cancer of the connective tissue)
- Trauma (limb buried under / crushed by heavy object, limb damaged by car accident, stabbing, gunshot, animal bite etc.)

LEVELS of amputation

Upper Limb :

- Forequarter
- Shoulder Disarticulation (SD)
- Transhumberal (Above Elbow AE)
- Elbow Disarticulation (ED)
- Transradial (Below Elbow BE)
- Hand/ Wrist Disarticulation
- Transcarpal (Partial Hand PH)

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Lower Limb :

- Hemipelvectomy
- Hip Disarticulation (HP)
- Transfemoral TF (Above Knee AKA)
- Knee Disarticulation (KD)
- Transtibial TT (Below Knee BKA)
- Ankle Disarticulation
- Symes
- Partial Foot PF (Chopart)
- Toe amputation

Complications

1) Phantom Limb Sensation

The amputee has the sensation that the missing limb is still present and 'normal'. The limb often seems to move, and may feel hot, cold or sweaty, especially in highly innervated areas such as the hands and feet. In most instances, this PLS is present immediately after surgery and often continues for weeks, months or even years.

2) Phantom Limb Pain

Phantom limb pain (PLP) usually affects only a small number of amputees, severe pain that is variable in frequency, intensity and duration. Onset may not occur for weeks. The reason why PLP occurs is uncertain, but it seems to be linked with psychological and physiological mechanisms. It is exacerbated by emotional stress or cold weather.

3) Skin problems: Sweating, infection, Friction and bad pressure distribution.

4) Infection

5) Edema

6) Contractures:

- Hip: flexion, abduction, and external rotation
- Knee: flexion
- Shoulder: flexion, abduction, and external rotation
- Elbow: flexion.

7) Acceptance or rejection of the prosthesis.

- 8) Bone problems: osteoporosis, spurs.
- 9) Scoliosis: Patient with unequal leg length.
- 10) Neuroma: at the end of cut nerve.
- 11) Psychological problems: Depression

Treatment:

Assessment before surgery

The assessment is likely to include:

- A thorough medical examination assessing physical condition, nutritional status, bowel and bladder function, cardiovascular system (heart, blood and blood vessels) and your respiratory system (lungs and airways) the patient.
- An assessment of the condition and function of the healthy limb removing one limb can place extra strain on the remaining limb, so it's important to look after the healthy limb
- A psychological assessment to determine how well patient will cope with the psychological and emotional impact of amputation, and whether he need additional support
- An assessment of home, work and social environments of the patients to determine whether any additional provisions will need to be made to help to cope up.

Surgery

• Amputations can be carried out under general anaesthetic (where you're unconscious) or using an epidural anaesthetic (which numbs the lower half of the body).

- Once the limb has been removed, a number of additional techniques can be used to help improve the function of the remaining limb and reduce the risk of complications.
- These include shortening and smoothing the bone in the remaining limb so it is covered by an adequate amount of soft tissue and muscle, and stitching the remaining muscle to the bones to help strengthening the remaining limb (a technique known as myodesis).
- After the amputation, wound will be sealed with stitches or surgical staples. It will be covered with a bandage and a tube may be placed under your skin to drain away any excess fluid. The bandage will usually need to be kept in place for a few days to reduce the risk of infection.
- A general strengthening program that includes the trunk and all extremities is indicated particularly for the elderly person who may have been quite sedentary prior to surgery.

Post operative care :

- After amputation, medication is prescribed for pain, and patients are treated with antibiotics to discourage infection. The stump is moved often to encourage good circulation.
- Physical therapy and rehabilitation are started as soon as possible usually within 48 hours. In addition, psychological counselling is an important part of rehabilitation. Phantom limb syndrome where they feel as if the amputated part is still in place. They may even feel pain in the limb that does not exist.
- Active and resistive exercises for the uninvolved lower extremity, trunk, and upper extremities are initiated immediately after surgery.
- After amputation varies greatly, depending on which body part is amputated and what amputation level is involved. In the early stages of rehabilitation following amputation, the most important considerations are to control pain and swelling and to avoid infection.
- Cold treatments, such as cold packs with or without compression, cause blood vessels to become smaller, helping to control excess bleeding and swelling of soft tissues. Often combine various cold treatments with electrical stimulation.
- Positioning of the stump after amputation is very important to prevent swelling & deformity. The tendency of patient is to keep limb in flexion. No pillow should be kept under the knee in case of Below Knee amputee.
- Above knee amputee usually develops flexion and abduction deformity. Keep the part in elevation to prevent oedema. Posterior slab may be used in case of BK amputation, use stump board while sitting in wheelchair. One must lie in prone to prevent hip flexion deformity.
- Static stump exercises can be initiated once the drain is removed and dynamic stump exercises start after stitch removal.

- One can attend the gym for strengthening of upper limbs, opposite lower limb and trunk. Exercises to improve sitting balance, standing balance should be given. One must learn the Hopping.
- Rigid POP dressing, intermittent pneumatic compression devices, immediate post operative prosthetic fitment, crape bandaging etc are used to prevent edema.
- Prosthetic fitting is dependent on a good 'cone-shaped' stump, and initially this shaping is controlled using bandage, elasticized stump socks or figure-of-eight stump bandaging.
- Upper extremity strengthening exercise using weights, elastic bands, or manual resisted exercises are important. Shoulder depression and elbow extension are particularly necessary to provide the patient with a means of lifting the body from place to place
- The exercise program is designed individually and includes strengthening and coordination activities. The hip extensors and abductors and knee extensors and flexors are particularly important for prosthetic ambulation
- Regarding lower extremity amputations, walking exercises (gait training) with the use of a temporary prosthesis are often indicated and started when appropriate.
- A temporary prosthesis allows a predetermined amount of weight to be placed on the involved limb and enables the individual to progress with exercises while the size of the residual limb stabilizes, allowing a permanent prosthesis to be fitted.
- If extremity pain is severe and persists for extended periods of time, (TENS) may be helpful. Desensitization by tapping helps in relieve of neuroma pain.

Stump : After an amputation, the bit that's left beyond a healthy joint is called a residual limb or a stump. Stump is the sensory and motor end organ. It must have adequate strength sensation, mobility and free from complication for functional use of prosthesis.

Stump care : It's very important to keep the skin on the surface of the *stump* clean to reduce the risk of it becoming irritated or infected. Gently wash the *stump* at least once a day (more frequently in hot weather) with mild unscented soap and warm water, and dry it carefully.

9.3 ANKYLOSING SPONDYLITIS

Ankylosing spondylitis (AS) is a condition that mainly affects the spine. The joints of the neck, back and pelvis become inflamed, causing pain and stiffness. The sacroiliac joints are commonly affected in AS. These joints connect the base of the spine (sacrum) to the pelvis. Other joints, such as the hips and shoulders, can also be involved. AS can also affect other parts of the body, such as the eyes, skin, bowel and lungs. The symptoms of AS usually begin between the ages of 15 and 45 years.

Causes:

Ankylosing spondylitis has no known specific cause, though genetic factors seem to be involved. In particular, people who have a gene called HLA-B27 are at greatly increased risk of developing ankylosing spondylitis. However, only some people with the gene develop the condition.

- Sex. Men are more likely to develop ankylosing spondylitis than are women.
- Age. Onset generally occurs in late adolescence or early adulthood.
- **Heredity.** Most people who have ankylosing spondylitis have the HLA-B27 gene. But many people who have this gene never develop ankylosing spondylitis.

Clinical features:

- **Pain and stiffness**. Constant pain and stiffness in the low back, buttocks, and hips that continue for more than three months. Spondylitis often starts around the sacroiliac joints, where the sacrum (the lowest major part of the spine) joins the ilium bone of the pelvis in the lower back region.
- **Bony fusion**. Ankylosing spondylitis can cause an overgrowth of the bones, which may lead to abnormal joining of bones, called "bony fusion." Fusion affecting bones of the neck, back, or hips may impair a person's ability to perform routine activities. Fusion of the ribs to the spine or breastbone may limit a person's ability to expand his or her chest when taking a deep breath.
- **Pain in ligaments and tendons**. Spondylitis also may affect some of the ligaments and tendons that attach to bones. Tendonitis (inflammation of the tendon) may cause pain and stiffness in the area behind or beneath the heel, such as the Achilles tendon at the back of the ankle.



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Ankylosing spondylitis is a systemic disease, which means symptoms may not be limited to the joints. People with the condition also may have fever, fatigue, and loss of appetite. Eye inflammation (redness and pain) occurs in some people with spondylitis. In rare cases, lung and heart problems also may develop.

Diagnosis :

The diagnosis of ankylosing spondylitis is based on several factors, including:

- Symptoms
- Findings of a physical exam
- X-rays of the back and pelvis
- Measurements of the chest when breathing
- Results of lab tests

Treatment:

There is no specific therapy or cure for AS. The aim of Ankylosing Spondylitis Treatment are to control pain, maintain maximum skeletal mobility, and prevent deformity. The treatment include:-

- Drug Therapy .
- Surgical Management.
- Physiotherapy Management.

Drug therapy :

- Non-steroidal anti-inflammatory drugs (NSAIDs)
- Corticosteroids.
- Muscle relaxants.
- Opioids.

Surgical management : Artificial joint replacement surgery may be a treatment option for some people with advanced joint disease affecting the hips or knees.

Physiotherapy management :

Aims : Regular physiotherapy is very essential in the management of a patient of AS and only physiotherapist is the person who can help the patient to fight with the disease. Main aims of physiotherapy includes

- Relieve pain.
- Maintain the mobility of joints affected like spine, **hip**, thorax, shoulder etc.
- Prevent and correct deformity.
- Increase chest expansion and vital capacity.
- Attention to posture.
- To maintain and improve physical endurance.
- Advice to patient.

General instruction to patients:-

- Make the exercise part of the daily routine.
- Try to do a complete set of exercises at least twice daily at a time convenient to you.
- Heat and cold application any precede exercises to enhance relaxation and decrease pain.
- Perform only those exercises given to you by the physiotherapist.
- Perform exercises on a firm surface.
- Exercise slowly with a smooth motion, do not rush.
- Avoid holding the breath while exercising.
- Modify the exercise regime during an acute attack and contact the physical therapist if you have any complaints or problems with the exercises.

Pain and muscle spasm are treated by the following modalities and the relaxation is advised-

- Infra red.
- Hot packs.
- Cryotherapy.
- Steam bath.
- Hydrotherapy.

Exercises for mobilization of joints:-

- Maintaining the mobility of joints, by giving mobility exercises to particular joints, which are affected like, spine, hip, shoulder, thoracic cage are essential in Ankylosing Spondylitis Treatment.
- Maintenance of the mobility is very important and the basic aim is that all the joints are moved to their maximum limit and by this, we can delay the process of ankylosis.

Prevent and correct deformity by giving attention to posture:-

- The spondylitic patient should always be conscious of his posture while sitting, standing and walking. patient should maintain the erect posture during these activities. This helps to prevent and correct deformity and thus help in Ankylosing Spondylitis Treatment.
- Sleeping should occur in prone position or supine on a firm mattress with a thin or no pillow. By this, the spine remain in extended position and not in flexion.

- The design of chairs is important particularly for those who spend most of their working hours sitting at desk. Low arm chair should be avoided, an upright chair with some cushioning to support the lower lumber spine is better.
- Adjust the height of the working table and ensure that the patient does not stoop on that.
- Avoidance of prolonged immobilization or bed rest, because of this, the spinal extensors become weak and by this the extended position of the spine is not retained.

Increase chest expansion and vital capacity:-

To increase the chest expansion and vital capacity, the breathing exercises are required. Breathing exercises that are used in Ankylosing Spondylitis Treatment:

- Apical breathing exercises.
- Diaphragmatic breathing exercises.
- Lateral costal breathing exercises.
- Deep breathing exercises are encouraged. Ballooning exercise is also very useful in Ankylosing Spondylitis Treatment. They increase the vital capacity of the lung

Hydrotherapy/Aquatic Physiotherapy

in real sense refers to the therapeutic use of water. The therapeutic effects of water in relation to Ankylosing Spondylitis Treatment-

- The relief of pain and muscle spasm.
- The maintenance or increase in range of motion of joints.
- The strengthening of weak muscles and an increase in their tolerances to exercise.
- The importance of circulation.
- The encouragement of functional activities.
- The maintenance and improvement of balance, co-ordination and posture.

Group Therapy Classes:-

- The patient can give support to the other member of the class that is another patient.
- Shared problems providing a good medium for patient's education and latest information about the disease process.
- Development of competitiveness and motivational aspects.
- Improvement in physical fitness

9.4 ORTHOPAEDIC APPLIANCES

Orthopaedic appliances are the Devices used to influence growth and/or position of bones. They are used for both short and long term treatments. A brace used while a muscle injury heals in order to prevent movement that might re-injure the muscle is an example of a shortterm orthopedic appliance use. Elderly people may need orthopaedic appliances for mobility, particularly if they develop severe arthritis or other conditions that limit movement or make

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movement painful. Orthotic appliances may be used in combination with treatments such as surgery and physical therapy to help patients with complex concerns.

Orthosis

An orthosis is the correct term for an externally applied device that is designed and fitted to the body to achieve one or more of the following goals:

- Control biomechanical alignment
- Correct or accommodate deformity
- Protect and support an injury
- Assist rehabilitation
- Reduce pain
- Increase mobility
- Increase independence

Indications:

- To relieve pain
- To limit motion
- To correct deformity
- To relieve symptoms of a disease
- To reduce axial loading
- To improve function
- Assist and improve movement and function
- Reduce muscle tone
- Protect against injury
- Provide proprioceptive feedback
- Provide rest

Therapeutic Benefits

- Resist motion
- Assist motion
- Transfer force
- Protect body parts

Types of upper-limb orthoses

> Cervical Orthosis (CO)

This brace is used to support the neck and head, and prevent unwanted movement in these areas.

This device may be suitable for individuals with:

- Muscular weakness
- Torticollis
- Cervical fracture or instability

Shoulder Orthoses (SO)

These braces are used to provide stability and support to the shoulder to promote healing and/or reduce pain. A sling is one style of this type; others include abduction restraints, airplane splints, and clavicle braces.

This device may be suitable for individuals with:

- Soft tissue and nerve injuries including rotator cuff tears
- Subluxation and dislocations
- Post-surgical trauma

Spinal orthosis : Lumbosacral and Thoracolumbosacral Orthoses (LSO, TLSO) These devices, which are applied to the trunk, are used to stablize the spine and/or reduce pain. A TLSO extends from the upper chest down toward the pelvis. An LSO extends from the bottom of the rib cage to the pelvis. Both custom and ready-to-wear devices such as the Harris brace, CASH brace, Jewett brace, Knight-Taylor orthosis, and corsets are available.

• Harris Brace

This is a custom-fit brace that is used to prevent side and backward bending of the lumbar spine as well as off-loading of the spine through intra abdominal pressure.



• Jewett Brace

This a custom-fit brace that is used to prevent forward bending of the spine. It is used to allow healing following trauma to the spine.



Elbow Orthoses (EO)

These braces cross the elbow and can be used to resist movement or assist bending of the elbow for progressive stretching. EOs can also be used for support and positioning.

These devices may be suitable for individuals with:

- Soft tissue injuries including ligamentous injuries
- Post-surgical
- Conditions that result in self-harm
- Conditions that require contracture management

> Elbow Wrist Hand Finger Orthoses (EWHFO)

Like elbow orthoses, these braces are used to either assist or prevent bending of the elbow but also involve other joints. These devices are often used to prevent loss of range of motion across the elbow, wrist, and hand. EWHFOs may have joints at the elbow or wrist to allow for adjustments.

These devices may be suitable for individuals with:

- Cerebral Palsy (CP)
- Stroke
- Multiple Sclerosis (MS)
- Traumatic brain injury
- Spinal cord injury
- Conditions that require contracture management

Thumb Spicas

These short splints are used to immobilize the thumb while also allowing the wrist and other fingers to move. There are longer versions that address conditions that extend from the thumb to the wrist. They are commonly referred to as long opponens orthoses.



These devices may be suitable for individuals with:

- Osteoarthritis
- Rheumatoid arthritis
- Ligamentous injuries to the thumb
- Post-surgical treatment
- De Quervain's Tenosynovitis

> Upper Extremity Peripheral Nerve Palsy Orthoses

These devices may be suitable for individuals with:

- Ulnar nerve palsy
- Median nerve palsy
- Radial nerve palsy

Also called hand splints, these devices can help to position the fingers for functional tasks.

Wrist Hand Orthoses (WHO)

These orthotics encompass the forearm and the palm. They are primarily used to support weak muscles and/or immobilize or limit the motion of the wrist while allowing the fingers to move.

These devices may be suitable for individuals with:

- Osteoarthritis
- Rheumatoid arthritis
- Carpal Tunnel Syndrome
- Ligamentous injury to wrist
- Radial nerve palsy

> Wrist Hand Finger Orthosis (WHFO)

WHFOs are similar to wrist hand orthoses (WHOs), but extend to the tips of the fingers and thumb. They are used to prevent loss of range of motion or contracture at the wrist and fingers. WHFOs can be static or incorporate a joint for progressive stretching.

These devices may be suitable for individuals with:

- Cerebral Palsy (CP)
- Stroke
- Multiple Sclerosis (MS)
- Traumatic brain injury
- Spinal cord injury
- Conditions requiring contracture management
- Burns
- Trauma

> Finger Orthosis

Finger orthoses work to align the joints of affected fingers to promote healing, prevent progression of deformity, and increase function.

This device may be suitable for individuals with:

- Rheumatoid arthritis
- Swan neck deformity
- Boutonniere deformity
- Mallet finger

> Hip Orthoses

These orthoses can be used for a variety of specific needs to aid in positioning the hip. In young children they are often used to assist with proper development of a hip joint, while in older people the goal is to reduce pain or provide stability.

This device may be suitable for individuals with:

- Legg-Calvé-Perthes-Disease (LCPD)
- Osteoarthritis
- Development hip dysplasia (DDH)
- Post-operative hip replacement



Knee Orthosis (KO)

Commonly referred to as knee braces, KOs can provide pain relief, increase joint stability, and support return-to-work or recreational activities. Types of KOs include: post-operative braces, unloaders, ACL braces, neoprene sleeves, patella stabilizers, and knee immobilizers.

This device may be suitable for individuals with:

- Osteoarthritis
- Ligamentous injuries
- Post-surgical

Knee Ankle Foot Orthosis (KAFO)

Thermoplastic KAFOs are custom made by first moulding heated plastic (thermoplastics) to a modified replica of the leg. They have become popularized as a lighter and more cosmetically appealing design option.

This device may be suitable for individuals with:

- Poliomyelitis
- Spinal cord injury
- Peripheral nerve injury
- Severe knee osteoarthritis
- Multiple Sclerosis (MS)
- Trauma

> Supramalleolar Orthoses (SMO)

These orthotic devices do not extend above the ankle. The foot orthosis and its lesserknown cousin the supramalleolar orthosis have a lot in common in that they are generally used to improve the mechanics of the foot structure by improving or accommodating its alignment.

This device may be suitable for individuals with:

- Overpronation
- Flat-foot (pes planus)
- Hypotonia

Foot Abduction Orthosis (FAB)

These custom-fit devices are used as part of the Ponseti system for the management of idiopathic clubfoot (Talipes Equinovarus or TEV) in the infant patient.

This device may be suitable for individuals with:

- Clubfoot (Talipes Equinovarus or TEV)
- Management post Ponseti casting

Foot Orthoses (FO)

Commonly known as insoles, foot orthoses help support the foot structure, offload areas of high pressure, and improve biomechanics during gait. For some patients the benefits of foot orthotics may be felt all the way up in the back.

This device may be suitable for individuals with:

- Plantar fasciitis
- Rheumatoid arthritis
- Osteoarthritis
- Heel pain
- Metatarsalgia
- Sever's Disease
- Diabetes
- Overpronation

Ankle Foot Orthoses (AFO)

These devices may benefit a wide range of conditions, including but not limited to:

- Cerebral Palsy (CP)
- Stroke
- ALS
- Multiple Sclerosis (MS)
- Idiopathic toe walking
- Foot drop
- Spinal cord injury
- Trauma
- Partial foot amputation
- Muscular dystrophy
- Nerve damage

Ankle-foot orthoses (AFOs) are designed to improve walking or protect and support the foot and ankle. These braces start below the knee, extending past the ankle and under the foot. They are often used to help support or align the foot and ankle, but can also influence knee stability. They can be used to prevent muscle contractures in the calf. AFOs come in many designs to meet a range of needs.

PROSTHESIS

A Prosthetic is defined as an artificial substitute or replacement of a part of the body such as a tooth, eye, a facial bone, the palate, a hip, a knee or another joint, the leg, an arm, etc.

A prosthesis is designed for functional or cosmetic reasons or both. A prosthesis is an artificial extension that replaces a missing body part. It is part of the field of biomechatronics, the science of fusing mechanical devices with human muscle, skeleton, and nervous systems to assist or enhance motor control lost by trauma, disease, or defect.

Typical prostheses for joints are the hip, knee, elbow, ankle, and finger joints. Prosthetic implants can be parts of the joint such as a unilateral knee. Joint replacement and arthroplasty mean the same thing.

An artificial limb is a type of prosthesis that replaces a missing extremity, such as arms or legs.

The type of artificial limb used is determined largely by the extent of an amputation or loss and location of the missing extremity. Artificial limbs may be needed for a variety of reasons, including disease, accidents, and congenital defects. Inside the body, artificial heart valves are in common use with artificial hearts and lungs seeing less common use but under active technology development. Other medical devices and aids that can be considered prosthetics include artificial eyes, palatal obturator, gastric bands, and dentures.

In recent years there have been significant advancements in artificial limbs. New plastics and other materials, such as carbon fiber, have allowed artificial limbs to be stronger and lighter, limiting the amount of extra energy necessary to operate the limb. With advances in modern technology, cosmesis, the creation of life-like limbs made from silicone or PVC, has been made possible. Such prosthetics, such as artificial hands, can now be made to mimic the appearance of real hands,

complete with freckles, veins, hair, fingerprints and even tattoos. Cosmeses are attached to the body in any number of ways, using an adhesive, suction, form-fitting, stretchable skin, or a skin sleeve.

There are Four Main Types of Artificial Limbs

These include the transradial, transhumeral prostheses, transtibial and transfemoral. The type of prosthesis depends on what part of the limb is missing.

> Transradial prosthesis

A transradial prosthesis is an artificial limb that replaces an arm missing below the elbow. Two main types of prosthetics are available. Cable operated limbs work by attaching a harness and cable around the opposite shoulder of the damaged arm. The other form of prosthetics available are myoelectric arms. These work by sensing, via electrodes, when the muscles in the upper arm moves, causing an artificial hand to open or close.



> Transhumeral Prosthesis

A transhumeral prosthesis is an artificial limb that replaces an arm missing above the elbow. Transhumeral amputees experience some of the same problems as transfemoral amputees, due to the similar complexities associated with the movement of the elbow. This makes mimicking the correct motion with an artificial limb very difficult.

Transtibial Prosthesis

A transtibial prosthesis is an artificial limb that replaces a leg missing below the knee. Transtibial amputees are usually able to regain normal movement more readily than someone with a transfemoral amputation, due in large part to retaining the knee, which allows for easier movement.



> Transfemoral Prosthesis

A transfemoral prosthesis is an artificial limb that replaces a leg missing above the knee. Transfemoral amputees can have a very difficult time regaining normal movement. In general, a transfemoral amputee must use approximately 80% more energy to walk than a person with two whole legs. This is due to the complexities in movement associated with the knee. In newer and more improved designs, after employing hydraulics, carbon fiber, mechanical linkages, motors, computer microprocessors, and innovative combinations of these technologies to give more control to the user.



QUESTIONS:

2 marks

- 1. Write the clinical features of rheumatoid arthritis?
- 2. Define amputation and write the causes?
- 3. Mention upper limb amputation levels?
- 4. Mention lower limb amputation levels?
- 5. What is phantom limb pain?
- 6. What is stump?
- 7. What is meant by ankylosing spondylitis?
- 8. What are orthopaedic appliances?
- 9. Define orthosis and its indications?
- 10. Define prosthesis and mention any two?
- 11. Name the conditions in which thumb spica is used?
- 12. Name the conditions in which ankle foot orthosis is used?
- 13. Name the conditions in which knee orthosis is used?
- 14. Name the conditions in which wrist hand orthosis is used?

6 marks

- 1. Explain about Rheumatoid arthritis in detail along with physiotherapy treatment?
- 2. Explain about Amputation in detail along with physiotherapy treatment?
- 3. Explain about Ankylosing spondylitis in detail along with physiotherapy treatment?

Ψ

PHYSIOTHERAPY Paper – III ELECTROTHERAPY

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UNIT 1

PHYSICS AND BASIC ELECTRICAL COMPONENTS

Structure:

- 1.1 Electrotherapy
- 1.2 Basic Physics
- 1.3 Transmission of heat
- 1.4 Physical effects of heat
- 1.5 Dangers of electricity

1.1 ELECTROTHERAPY:

Electrotherapy is an integral part of physiotherapy. The use of electricity for therapeutic purposes has grown up in recent years and now includes a wide variety of apparatus and equipments. A large number of therapeutic modalities for treating several disorders are now in use.

Electrotherapy is the treatment of various ailments by electro physical modalities which include low frequency, medium frequency and high frequency currents.

LOW FREQUENCY CURRENT: Low frequency current is an alternating current having a frequency of less than about 100 kilohertz.

Eg: Faradic and galvanic currents, TENS

MEDIUM FREQUENCY CURRENT: It is an alternating current having a frequency between 100 KHZ TO 1MHZ.

Eg: Interferential therapy (IFT)

HIGH FRQUENCY CURRENT: The high frequency current having a frequency more than 1 MHz this is also called the Tesla Current.

Eg: Short wave diathermy and Ultrasound Therapy, LASER

1.2 BASIC PHYSICS

ELECTROMAGNETIC RADIATION:

Electromagnetic Radiation is produced by the movement of electrons within the atom. If energy is added to an atom, E.g. by heat, this can cause an electron to move out to a higher energy electron shell, it is then said to be in an excited state. When the electron returns to its normal level,

PAPER -- III

energy is released as a pulse of electromagnetic energy. The type of electromagnetic wave produced depends upon which electron shells are involved in the electron 'Jump' and it is this which gives rise to the characteristic spectra seen when certain elements are heated, yellow for sodium. Tungsten illustrates the phenomena well. When it is first heated only infra-red electromagnetic waves are emitted, and these can be felt as heat. As more energy is added, the energy 'Jump' between electron shells become bigger and the photons of electromagnetic energy eventually reach the visible spectrum. So that the metal glows red and then white as the temperature increases.

The **electromagnetic spectrum** is the distribution of electromagnetic radiation according to energy (or equivalently, by virtue of the relations in the previous section, according to frequency or wavelength).

Regions of the Electromagnetic Spectrum:

The following table gives approximate wavelengths, frequencies, and energies for selected regions of the electromagnetic spectrum.



Wave length: Wave length is the distance between a point on one electromagnetic wave and exactly the same point on the next wave.



Frequency: Frequency describes the number of waves that pass a fixed place in a given amount of time. Usually frequency is measured in the hertz (Hz) unit.
THE CONDUCTORS AND NON CONDUCTORS:

Conductors: Conductors are elements whose atoms have few electrons in their outer orbit. For example, copper has a single loosely held electron in its outer orbit. It is such conducting electrons which facilitate the passage of an Electric Current. Eg. Copper.

Non-Conductors (Insulators): These materials made of atoms in which the electrons in the outer shell are firmly held in their orbits and do not leave the atom in order to conduct the current. Eg. Wood and rubber.

STATES OF MATTER:

Matter can be solid, liquid or gaseous, e.g. water may exist as ice, water or a steam. The molecules of substances are usually influenced by at least two forces- a cohesive force, which attracts the molecules of the substance to one another, and a kinetic force – the force of movement of the molecules.

In the **solid state** there is a strong cohesive force between the molecules, which holds them in rigid. The kinetic energy produces only a vibration of molecules about a mean position.

In the **liquid state** (when heat is added to solids) the kinetic energy increases and the movement of the molecules eventually becomes such that the rigid structure collapse and the liquid state is reached. In this state the molecules are in contact but can move freely fast on another. The liquid thus maintains its volume but takes on the shape of its container.

In the **gaseous state** (even more heat is applied) there becomes a point when the kinetic energy is much greater than the cohesive force that the molecules fly apart to form a gas. The molecules of the gas continually colliding with another and with the walls of the container so that the exerts pressured. This pressure increases with ant further raise include the temperature.

Latent heat:

A specific amount of energy is required to change the solid from a particular substance into a liquid, or the liquid into a gas. The energy is called latent heat and is the energy required for (or released by) a change of state. In the case of water, 1 gram of ice at 0^{0} C requires 336 joules of energy to convert into 1 gram of water at 0^{0} C.

ELECTRICITY:

Electricity is the presence and flow of **electric** charge. It is a form of energy which we use to power machines and **electrical** devices.

Types of electricity:

1. **Static Electricity:** When the charges on a body do not flow then it is called static electricity.

2. **Current electricity:** When charges flow through a conductor it is known as current electricity. There are two types of charges. Positive and Negative.

Volt meter: A **voltmeter** is an instrument used for measuring electrical potential difference between two points in an electric circuit.

Ammeter: The meter uses for measuring the current is known as the **ammeter**. Hence the instrument which measures the flows of current in ampere is known as ampere meter or **ammeter**.

Potential: The electrical potential of a body is the electrical condition of that body when compared to the neutral potential of the earth. Bodies with an excess of electrons are called negative, bodies deficient in electrons are called positive. The unit of the potential is the Volt.

Potential Difference (PD) is the amount of work energy required to move an electric charge from one point to another. The unit of potential difference is the volt.

Electromotive force (emf) is a measurement of the energy that causes current to flow through a circuit. It can also be **defined** as the potential difference in charge between two points in a circuit. **Electromotive force** is also known as voltage, and it is measured in volts.

Resistance is a measure of the opposition to current flow in an electrical circuit. **Resistance** is measured in ohms.

Pulse Duration is defined as the time that the **pulse** is on. It is determined by the number of cycles and the period of each cycle.



FUSE

A Fuse is nothing more than a short length of wire designed to melt and separate in the event of excessive current. **Fuses** are always connected in series with the component(s) to be protected from over current, so that when the **fuse** blows (opens) it will open the entire circuit and stop current through the component(s).

TRANSFORMER:

A device used to transfer electrical energy from one circuit to another. With an alternating current, a **transformer** will either raise or lower the voltage as it makes the transfer. There two types of transformers, namely: step down and step up transformers.

In a step – down transformer the secondary windings are fewer than the primary windings.



A step-up transformer is the direct opposite of a step-down transformer. There are many turns on the secondary winding than in the primary winding in the step-up transformers.



1.3 TRANSMISSION OF HEAT

Conduction: If one end of a solid metal rod is heated, the energy added causes an increased vibration of molecule. This vibration is transmitted to adjacent molecules and in this way heat is conducted from area of high temperature to area of low temperature. For example, Metals.



TRANSMISSION OF HEAT

Convection: It takes place in fluids. If one part of a fluid is heated, the kinetic energy of the molecule in that part is increased, they move further apart and this part becomes less dense. As a result it rises, displacing the more dense fluid above which descends to take its place. The current produced is called convection current.

Radiation: Heat may be transmitted by infrared electromagnetic radiation. As a substance is heated, it causes the electron to move to the higher energy shell. As it returns to its normal shell, the energy is released as pulse of infrared electromagnetic energy.

1.4 PHYSICAL EFFECTS OF HEAT

Expansion: Expansion is the result of increased kinetic energy producing a greater vibration of molecule, which thus moves further apart.

Change of State: Heat can change solids into liquids and liquids into gaseous state. **Acceleration of chemical action:** Van't Hoff's law says that any chemical action capable of being accelerated is accelerated by a rise in temperature. The converse, that cooling slows the rate of reaction, is also true.

Production of a potential difference: If the junction of two dissimilar Metals, E.g. bismuth and antimony, is heated a potential difference is produced between their free ends. **Production of Electromagnetic waves:** Electromagnetic waves are produced by the movement of electrons within the atom. If energy is added to an atom, E.g. by heat, this can cause an electron to move out to a higher energy electron shell, it is then said to be in an excited state. When the electron returns to its normal level, energy is released as a pulse of electromagnetic energy.

Thermionic emission: The heating of molecules E.g. tungsten, may cause some electrons to leave their atoms and may even break free of the surface of the metal. This leaves a positive charge which tends to attract the negative electrons back. However, a part is reached where the rate of loss of electrons equals the rate of return and a cloud of electrons then exists as space charge around the object. This process is called thermionic emission and is the principal upon electric valves work.

Reduced viscosity of fluids: The molecules in viscous fluids are fairly strongly attracted to one another. Heating increases the kinetic movement of these molecules and reduces their cohesive mutual attraction which makes the fluid less viscous.

1.5 DANGERS OF ELECTRICTY

ELECTRIC SHOCK: Electric Shock is a painful stimulation of sensory nerves caused by

- 1. Sudden flow of current.
- 2. Cessation or pause of flow of current.
- 3. Variation of the current passing through the body.

Causes of Electric shock:

- Poorly designed electro medical apparatus.
- Improper insulation of equipment.
- Improper insulation of wires.
- Badly serviced medical equipment
- Mishandling of apparatus
- Improper guidance to the patient.
- Lack of proper safety measures.

Severity of electric shock:

- In accordance with the ohm's law, resistance is inversely proportional to current. Hence, lower the resistance of the skin greater the current which passes through the body. Therefore, if exposed part of the circuit is touched with wet hands, the shock is more likely to be severe than if the hands are dry.
- The greater the current passing through the body, the more severe is the shock.
- The severity also depends upon the path taken by the current. A strong current through the head, neck or heart proves to be more fatal.
- The severity also depends upon the type of current which passes through the body.

TYPES OF ELECTRIC SHOCK:

According to the severity of the shock, it could be of following types.

- 1. Minor electric shock
- 2. Major or severe electric shock

Effects of electric shock:

- 1. <u>Minor electric shock</u>: In minor electronic shock, the victim gets frightened and distressed. In this type of shock, there is no loss of consciousness.
- 2. <u>Major or severe electric shock</u>: In major or severe electric shock, there is a fall of blood pressure and patient may become unconscious. There could be cessation of respiration, followed by ventricular fibrillations and cardiac arrest. These could be diagnosed by seeing absence of pulse in the carotid artery and with fully dilated pupils.

Precautions to avoid electric shock:

- All apparatus should be tested before use.
- Connections to be checked before applications
- Controls should be checked to ensure that they are at zero before switching on.
- Adequate warming up time should be allowed.
- The current intensity should be increased with care.
- Patients should never be allowed to touch electrical equipment.
- All apparatus should be services regularly by a competent person.
- Machine should be properly insulated.
- Mishandling of apparatus by unqualified person should be avoided.
- All safety measures should be taken before application to the patient.

Treatment of electric shock:

- The current should be switched off immediately.
- The victim to be disconnected from the source of supply.

- If there is no switch in the circuit, the victim must be removed from the contact with the conductor, but rescuer must take care not to receive a shock himself from touching the affected person, contact with whom should be made only through a thick layer of insulating material.
- Following a minor shock the patient is to be reassured that everything is alright and allowed to rest.
- Water may be given to drink, but hot drinks should be avoided as they may cause vasodilatation.
- Tight clothing should be loosened and plenty of air allowed.
- If respiration has ceased, the airway must be cleared and artificial respiration is to be commenced immediately by the mouth-to-mouth or mouth-to-nose method.
- Cardiopulmonary resuscitation may also be given.
- Oxygen therapy may also be administered if required.
- Patient must be shifted to the hospital after the primary care.

EARTH SHOCK: When a shock is due to a connection between the live wire of the mains and the earth, it is called an Earth shock.

Earth Circuit: Electric power is transmitted by one live cable and one neutral cable which are connected to earth. The earth forms part of the conducting pathway and connection between the live wire of the mains and earth completes a circuit through which current passes. If some person forms part of this circuit, he receives an earth shock. Thus on earth shock is liable to occur if any person makes contact with the live wire of the mains while connected to earth.

Causes of Earth shock:

Earth shock may be caused by the following two reasons.

- 1. Connection to the live wire.
- 2. Connection to the earth.

Connection to the live wire:

- When wire is not properly insulated.
- When the switch is put in the neutral wire, the neutral wire is disconnected and live wire is not disconnected.
- Live wire is touched to metal casing.
- Live wire is touched to any wet thing.

Connection to the Earth:

- If the floor is made up of stone.
- If the conductor is touching any conductor which is connected. To the earth, such as gas pipe or water pipes.
- If the conductor is touched to any radiated metal casing or metal wire.

Precautions:

- Insulated flooring of the physiotherapy department should be done.
- While treatment patient should not touch any of the machine part.
- The metal casing of all apparatus must be connected to the earth.
- The floor should be kept dry.
- While using water containers, they should be kept on insulating material. E.g. Wooden table.
- Leaky bath tub should not be used.
- The bath tub should not have fixed taps or water pipes.

QUESTIONS:

2 marks:

- 1. Define electrotherapy?
- 2. What is high frequency current?
- 3. What is low frequency current?
- 4. What is electromagnetic radiation?
- 5. What is wave length?
- 6. What is frequency?
- 7. What is meant by conductors and non conductors of electricity?
- 8. Mention the three states of matter?
- 9. What is electricity and write the types?
- 10. What is voltmeter?
- 11. What is ammeter?
- 12. What is potential?
- 13. Define potential differences?
- 14. What is fuse?
- 15. Define transformer and mention the types?
- 16. Write the modes of transmission of heat?
- 17. Define electric shock?
- 18. What are the precautions to be taken to prevent electric shock?
- 19. Define earth shock?
- 20. What are the precautions to be taken to prevent earth shock?

6 marks:

- 1. Explain about electric shock in detail?
- 2. Explain about earth shock in detail?
- 3. Write about physical effects of heat in detail?

Ψ

LOW FREQUENCY CURRENTS

UNIT 2

Structure:

- 2.1 Faradic current
- 2.2 Galvanic current
- 2.3 S-D curve
- 2.4 Iontophoresis
- **2.5 TENS**

Low frequency current is an alternating current having a frequency of less than 100 kilohertz.

A current which varies sufficiently in magnitude can stimulate a motor nerve and so produce contraction of the muscles which it supplies.

- Impulses with duration of less than 10ms may be classed as having a short duration and said to be faradic type current
- Impulses with duration of more than 10ms may be classed as having a short duration and said to be galvanic type current.

2.1 FARADIC CURRENT

Faradic current is a short-duration interrupted current, with a pulse duration ranging from 0.1 and 1 ms and a frequency of 50 to 100 Hz. Faradic currents are always surged for treatment purposes to produce a near normal tetanic-like contraction and relaxation of muscle.

Physiological effects:

- Stimulation of sensory nerves: The sensory stimulation causes reflex vasodilatation of the superficial blood vessels leading to slight reddening of the skin (erythema). The vasodilatation occurs only in the superficial tissues.
- Stimulation of the motor nerves: It occurs if the current is of a sufficient intensity, causing contraction of the muscles supplied by the nerve distal to the point of stimulus. A suitable faradic current applied to the muscle elicits a contraction of the muscle itself and may also spread to the neighboring muscles.

- Effects of muscle contraction: when a muscle contracts as a result of electrical stimulation, the changes taking place within the muscle are similar to those associated with voluntary contraction. There is increased metabolism and also removal of waste products.
- Stimulation of denervated muscle: For contraction of denervated muscle the impulse more than 1 ms is required. This impulses is usually is not tolerable by the patient for treatment purpose, thus faradic current is not used in denervated.
- Chemical changes: The ions move one way during one phase of the current, and in the reverse direction during the other phase of the current if it is alternating. If the two phases are equal, the chemicals formed during one phase are neutralized during the next phase. In faradic current, chemical formation should not be great enough to give rise to a serious danger of burns because of the short duration of impulses.

Indications:

- Facilitation of muscle contraction inhibited by pain
- Re-education of muscle action
- Training of new muscle action
- Severed motor nerve
- Improvement of venous and lymphatic drainage
- Prevention and loosening of adhesions

Contraindications:

- Skin lesions and Certain dermatological conditions: Such as psoriasis and eczema
- Acute infections and inflammations
- Thrombosis
- Loss of sensation
- Cancer
- Cardiac pacemakers
- Superficial metals
- Non union fractures

TECHNIQUES OF TREATMENT:

Preparation of apparatus:

- i. First, a low frequency electronic stimulator with surge facility is selected.
- ii. Make sure that all the wires from mains to plug box and to machine is intact and properly insulated.
- iii. Check the leads for any breaks in the insulation.
- iv. Test the machine by attaching leads and electrodes to the terminals and feel the current by switching 'on' and increasing the intensity.
- v. Make sure that before starting 'on' or 'off' an apparatus, all the 'knobs' are at zero.
- vi. Select the appropriate and suitable electrodes.
- vii. The electrodes should be properly linted with lint or sponge pad.
- viii. It should be noted that, there should be at least eight layers of folds in lint covering the electrode.
 - ix. The layers should be crease free and the lint pad should be 1cm greater all around that the electrodes.
 - x. The lint pads are soaked in 1% saline or tap water to decrease the resistance.

Skin resistance tray: contains

- Bowl of water
- Soap
- Macintosh
- Kidney tray

Treatment tray: contains

- Leads
- Pen and plate electrodes
- Lint pads
- 1% saline warm water in a plastic board
- Supporting pads and pillows, cotton
- Talcum powder
- Vaseline
- Towels
- Velcro straps or adhesive plaster

Preparation of patient:

- i. Place the patient in a suitable and comfortable position.
- ii. Explain briefly the entire procedure of the treatment.
- iii. Describe the patient the sensation he feel after the current is applied.
- iv. To make the patient is confident, show the type of contraction by placing the electrodes first on your body.
- v. Check the sensations of the skin to be treated.
- vi. The part to be treated should be exposed.
- vii. The skin resistance is reduced by washing the area with soap and water.
- viii. The indifferent electrode is placed in position by applying strap or adhesive bandage.

MOTOR POINT:

It is a small area on a muscle at which a minimal amount of electrical stimulation will cause the muscle contraction. The motor point is usually located at the center of the muscle mass where the motor nerve enters the muscle. It is the most excitable area in the muscle. Some of the motor points



PAPER-III





Quadriceps Inhibition:

Definition: Quadriceps inhibition is the stoppage of contraction of quadriceps muscle due to fear of pain or immobilised for a long time in plaster cast. In this condition, the muscle may forget how to contract. So it is important to teach the pattern of movement by muscle stimulation.

Quadriceps is a large muscle group present in the anterior compartment of thigh. The four muscle bulks are VastusLateralis, VastusIntermedius, Vastusmedialis, and Rectus femoris.

Causes:

- Prolonged immobilization
- Fracture of patella
- Ligament injuries around the knee
- Menisectomy and patellectomy
- Arthroscopy
- Synovitis

2. FARADIC FOOT BATH:

Faradic foot bath is used to bring about arches of the foot by teaching the pattern of movement to the patient.

Indications:

- Flat foot
- Pott's fracture
- Chronic tendo calcaneal bursitis
- March fracture
- Metatarsalgia
- Plantarfacitis

GALVANIC CURRENTS

Galvanic current: Impulses with duration of more than 10ms may be classed as having a short duration and said to be galvanic type current. These are long duration interrupted or modified direct currents with duration of more than 10ms.

Characteristics of galvanic currents: there are various modified D.C currents They are:

- a. Rectangular
- b. Trapezoidal
- c. Triangular
- d. Saw-tooth
- e. Depolarized

Physiological effects:

- With adequate intensity and duration of impulse, a contraction of denervated muscle can be initiated.
- When interrupted direct current is applied to the body there is stimulation of sensory nerves.
- With application of direct current, there is reflex dilation of superficial blood vessels and results in erythema of skin.
- Stimulation of motor nerves with interrupted direct currents produces contraction of the muscles supplied.

Indications:

- To stimulate denervated muscles
- To maintain muscle properties of denervated muscles
- Iontophoresis
- To plot S-D curves
- To conduct faradic galvanic tests

Contraindications:

- Phobia (electric)
- Hypo sensitivity and hyper sensitivity of skin
- Open, unhealed wounds
- Recent unhealed fractures
- Boils and abscess

Method of application:

In order to achieve direct stimulation of muscle fibers, following methods may used:

- a. One electrode (passive) over the origin of muscle group and other electrode i.e a pen electrode (active) stimulates each muscle individually. This technique is called 'Labile' technique .Moving the electrode over muscle ensures that the current passes through maximum number of fibers. This technique will have less skin irritation.
- Both electrodes (Metal) may be used, one placed at origin and the other at insertion of the muscle to be stimulated. This technique is useful for deep muscles. This technique is called 'Stabile' technique.

Preparation of apparatus:

- i. First, a low frequency electronic stimulator with interrupted direct current facility is selected.
- ii. Make sure that all the wires from mains to plug box and to machine is intact and properly insulated.
- iii. Check the leads for any breaks in the insulation.
- iv. Test the machine by attaching leads and electrodes to the terminals and feel the current by switching 'on' and increasing the intensity.
- v. Make sure that before starting 'on' or 'off' an apparatus, all the 'knobs' are at zero.
- vi. Select the appropriate and suitable electrodes.
- vii. The electrodes should be properly linted with lint or sponge pad.
- viii. It should be noted that, there should be atleast eight layers of folds in lint covering the electrode.
 - ix. The layers should be crease free and the lint pad should be 1cm greater all around that the electrodes.
 - x. Te lint pads are soaked in 1% saline or tap water to decrease the resistance.

Skin resistance tray: contains

- Bowl of water
- Soap
- Macintosh
- Kidney tray

Treatment tray: contains

- Leads
- Pen and plate electrodes
- Lint pads
- 1% saline warm water in a plastic board
- Supporting pads and pillows, cotton
- Talcum powder
- Vaseline
- Towels
- Velcrow straps or adhesive plaster

Preparation of patient:

- i. Place the patient in a suitable and comfortable position.
- ii. Explain briefly the entire procedure of the treatment.
- iii. Describe the patient the sensation he feel after the current is applied.
- iv. To make the patient is confident, show the type of contraction by placing the electrodes first on your body.
- v. Check the sensations of the skin to be treated.
- vi. The part to be treated should be exposed.
- vii. The skin resistance is reduced by washing the area with soap and water.
- viii. The indifferent electrode is placed in position by applying strap or adhesive bandage.

2.3 STRENGHT-DURATION CURVES (S/d curves or I/t curves)

Strength duration curve shows the relationship between the magnitude of the change of stimulus and the duration of the stimulus. The curve provides valuable information regarding the state of excitability of nerve lesion. It should be done only after 21 days following nerve injury.

USES OF S-D CURVE

- 1. To detect excitable nerve fibers in the muscle.
- 2. Assess the extent of the deneration/innervations.
- 3. Detect the sign of reinnervation.
- 4. It monitors the progress of the lesion and denotes whether the lesion is recovering / progressing.

Procedure:-

- 1. Prepare the patient and apparatus
- 2. The inactive Electrode is applied to some convenient area usually on the midline of the body, or over the origin of the muscle.
- 3. The active electrode is usually a Pen Electrode.
- 4. To assess a nerve, we choose a proximal muscle and a distal muscle supplied by a nerve in its course.
- 5. The active electrode is placed over the Motor point of the muscle to be tested.
- 6. The longest stimulus is selected first and the intensity of the current is increased until the minimum observable contraction is obtained.
- 7. Note the intensity of current and reduce the intensity to Zero.
- 8. Now shift the duration to second longest stimulus and repeat the procedure.
- 9. Note the intensity of current required to get the similar stimulus for various durations as described below.
- 10. Now the plot the points on a graph paper by taking duration on x-axis and intensity in y-axis.

11. S.D. Curve is draw	'n by connecting	the plotted points.
------------------------	------------------	---------------------

Duration (millisec)	Intensity milliamp
300	-
100	-
30	-
10	-
3	-
1	-
0.3	-
0.1	-
0.03	-
0.01	-

Characteristics of strength duration curves.

- 1. By plotting the curve, we can know whether a nerve is:
 - a. Completely innervated
 - b. Completely denervated
 - c. Partially innervated and partially denervated



Rheobase: The rheobase is the smallest current that will produce a muscle contraction.

Chronaxie: It is the duration of the shortest impulse that will produce a response with a current of double the rheobase.

2.4 IONTOPHORESIS

Iontophoresis is a technique which uses an electric current to deliver a medicine or other chemical

through the skin in to the patients tissue. In popular (lay) terms it is sometimes called "an injection without the needle

Basic Principles:

In order to 'drive' the ions into the tissues, a DIRECT (Galvanic) CURRENT needs to be employed. Continuous (classic) DC is most commonly used in practice. Essentially, the substance to be driven into the tissues NEEDS to be IONIC in nature, and MUST be placed under the electrode with the SAME CHARGE (i.e. positively charged ions placed under the positive electrode (ANODE) and the reverse for a negatively charged ion).

Commonly used ions Positive ions

- 1. 1 Hydrocortisone used in rheumatoid arthritis, tendinitis, bursitis
- 2. 2. Calcium chloride- used in stiff joints and post traumatic pains
- 3. 3. Zinc oxide- used in ulcers, open lesions
- 4. 4 Magnesium oxide used as muscle relaxants, good vasodilator, mild analgesic

Negative ions

- 5. Iodine -used in adhesive capsulitis , adherent scars
- 6. chlorine- used in scar tissue, burns
- 7. salicylic- acid used as anti inflammatory agent
- 8. sodium citrate- used in rheumatoid arthritis

Precautions to be taken by the therapist:

- He must have a complete idea about the patient's condition.
- Selection of treatment ion must be correct.
- He should know the ionic charge.
- He must check the patient's skin sensitivity before starting the treatment.
- He should explain the treatment procedure to the patient.

Apparatus required:

- Galvanic current
- Shallow plastic tray Anode
- Foot/ arm bath- Cathode
- Two large electrodes, leads
- Two large lint pads
- Anti cholinergic compound
- Glycopyrovium bromide
- Distilled water

Methods of treatment:

Hands:

- Place a shallow plastic tray on the table and ask the patient to sit beside it.
- Cover the active electrodes with lint pads.
- Add 0.05% of anti cholinergic compound, glycopyrovium bromide and distilled water to the tray.
- Dip the hands into the solution containing the tray and place one electrode i.e. Anode under the palm.
- Place the patient's feet in foot bath and place the another electrode i,e. Cathode under the feet.
- When current passes, ions enters through anode into the body tissues.

Feet:

- The above same arrangement but in reverse. For the keep the of shallow plastic tray on the floor.
- Place the arm bath on the table to complete the circuit.

Side effects:

- Dryness of mouth and throat
- Decreases general body sweating

Indications:

- Hyper hydrosis
- Parkinsonism
- Mild tremors
- Arthritis
- Bursitis
- Tendinitis
- adherent scars
- mild analgesic

Contra indications:

• Pregnancy

Precautions:

- Check for any skin cuts
- remove any metal ornaments of the treatment part
- patient should not move during the treatment

Physiological and therapeutic effects:

Depending upon the nature of drug introduced into the tissues the effects may be:

- Local anesthesia can be achieved with ions like lignocaine or procaine.
- Reduction in oedema can be obtained by introduction of hyalurodinase.
- Inflammation can be reduced by xylocaine.
- Ear infections can be successfully treated be gentamicin sulphate.
- Idiopathic hyperhydroses can be treated by means of glycopyrovium bromide.

2.5 TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (T.E.N.S)

Definition: Transcutaneous electrical nerve stimulation (TENS) is the application of pulsed rectangle wave current via surface electrodes on the patient's skin.

This current is often generated by small battery operated machines in which circuit modify the battery's output in such a way that it will have stimulatory effects.

Many different types of TENS apparatus are manufactured and consequently some knowledge of the **Parameters**:

Pulse Shape: Is usually rectangular.

Pulse Width: Is measured in microseconds (ms) and is from 50 to 300 **Frequency:** Can be as low as 2 Hz or as high as 600 Hz. **Intensity:** Can be varied from to 0 to 60 milliamps **Types of TENS:**

- 1. Conventional TENS
- 2. Acupuncture like TENS
- 3. Burst TENS
- 4. Brief TENS
- 5. Modulated TENS.



TENS UNIT

Positioning of electrodes:

Electrode positioning is an area of considerable debate and a number of approaches may be used. Electrodes can be placed over:

- a. Acupuncture points, motor points or trigger points.
- b. The area of greater intensity of pain.
- c. The appropriate dermatome or spinal segment.
- d. The appropriate peripheral nerve.

Placement of electrodes:

- a. over the pain area
- b. over the trigger point
- c. over the anesthetic area
- d. over the painful dermatome
- e. over the nerve trunk.

TECHNIQUES OF APPLICATION

Prepare the apparatus and patient as described earlier. A number of treatment strategies may be adopted.

Large mains units are available to produce the current, but often small units made to be placed in the patient's pocket and utilizing batteries are preferred. Conductive rubber electrodes covered with a conductive gel in order to gain good skin contact are placed on the

patient's skin. The electrodes can be bandaged onto the patient or fixed with adhesive tape. The wires connecting the electrodes to the unit can be strategically concealed by clothing.

Time Duration:

Acute pain 20 to 60min up to four times daily

Chronic pain - 20 to 30min up to five times weekly

There are two methods used to apply TENS

1. HIGH TENS - It is most commonly used and the treatment parameters include

-Frequency between 100 and 150 Hz

-Pulse width between 100 and 500 micro sec

-Intensity between 12 and 30 mA

2. LOW TENS - It is less popular method and treatment parameters include

-Frequency between 1 and 5 hz

-Pulse width between 100 and 150 micro sec

- Intensity is higher than 30mA

Indications:

- Chronic pain syndromes
- Brachial plexus injuries
- Neuralgia
- Stump or phantom limb pain
- Back and neck pain with referred pain
- All radiating pains
- Trigeminal neuralgia
- Post- operative pain
- Obstetric pain

Contraindications:

- Pacemakers
- Heart disease
- Undiagnosed pain
- Epilepsy
- In the first three months of pregnancy

Dangers:

- Shock
- Over dosage

QUESTIONS:

2marks:

- 1. Define faradic current?
- 2. Define galvanic current?
- 3. Write the indications of faradic current?
- 4. Write the indications of galvanic current?
- 5. Write the contra indications of galvanic current?
- 6. Write the physiological effects of galvanic current?
- 7. Define Iontophorosis?
- 8. What is Rheobase?
- 9. What is chronexia?
- 10. What is quadriceps inhibition and write the causes?
- 11. What is faradic foot bath and write the indications?
- 12. Abbreviate TENS?
- 13. Write the types of TENS?
- 14. Write the indications of TENS?
- 15. Write the contra indications of TENS?

6marks:

- 1. Explain in detail about SD curves?
- 2. Explain in detail about iontophoresis?
- 3. Define Faradic current and explain its physiological effects, indications , contra indications and techniques of treatment in detail?
- 4. Write about TENS in detail?

Ψ





MEDIUM FREQUENCY CURRENTS

Structure:

- 1.1 Interferential therapy
- 1.2 Physiological effects

Medium frequency currents are the currents whose frequency falls between the ranges of 1000 to 10000HZ. They are being used therapeutically due to their advantage of greater penetration and with a higher tolerance and comfort over the low frequency current.

3.1 INTERFERENTIAL THERAPY

The principles of interferential therapy were first introduced HO Nemec. Interferential currents are also known as Nemec's currents.

Definition:

Interferential therapy utilizes two medium frequency currents which pass through the tissues simultaneously. They are set up so that their paths cross and in simple terms they interfere with each other. This interference gives rise to an **interference** or **beat frequency**, which has the characteristics of low-frequency stimulation .Out of these two currents one current is always of 4000HZ because there is minimum impedance generated by the tissues against this frequency current, the other current varied accordingly

BASIC PRINCIPLES OF INTERFERENTIAL THERAPY:

The interferential therapy depends upon the principles of interferential effect of two medium frequency currents crossing in the patient's tissues. The interference produced by two currents in the tissue called the beat frequency. For example let us take two medium frequency currents, current in circuit A = 4000HZ and circuit B=3900HZ. Where these two currents are applied to the tissues, at the point where the currents cross over, a new frequency current is set up whose amplitude is modulated and the frequency of new current is called **Beat frequency** and that is 100HZ.



TECHNIQUES OF APPLICATION

PROCEDURE

- 1. Skin must be clean and clear before the start of the treatment.
- 2. The part of the body to be treated should be washed and if there is any skin lesion it should be covered by applying petroleum jelly on it.
- 3. The electrode should be placed in such a way that the crossing point of two currents lie above or around the affected part.
- 4. The suitable frequency current should be given for different conditions.
- 5. Select the base frequency and upper frequency, the difference between upper and base frequency would give the spectrum.
- 6. Select the spectrum mode rectangular, triangular or trapezoidal as needed.
- 7. Increase the power gently and cautiously until the patient starts feeling the current. It can be increased till the patient can tolerate

TECHNIQUES / METHODS

A - Quadripolar technique:

The four electrodes are positioned around the target area so that each channel runs perpendicular to the other and the current crosses at a midpoint. The interference effect branches off at 45° from the center of the treated area, in the shape of a four-leaf clover. Tissues within this area receive the maximal treatment effect .The electrodes are positioned in a coplanar arrangement to treat a flat surface



B - Bipolar technique:

When the IF current is applied using a bipolar technique, the mixing of the two channels occurs within the generator rather than in the tissue. This technique does not penetrate the tissues as deeply as quadripolar application, therefore it tends to be of more sensory sensation than with four pole technique, although still less than with low frequency stimulation. In some circumstances, a bipolar technique is preferable if a longitudinal zone requires stimulation rather than an isolated tissue area. When muscle contraction is the goal of the treatment, bipolar electrode placement is used . This way of treatment is useful for treating smaller areas like ankle, elbow, shoulder and knee etc.

Types of electrodes:

- Metal plate and pads:

The interferential current is applied by metal electrode with water-soaked sponges.

- Carbon rubber electrodes:

The interferential current is applied by carbon rubber electrodes with conducting gel.

- Suction cup electrodes:

Suction unit can be connected to the interferential machine. The electrodes are applied to the patient through flexible rubber cups, which have a sponge pad and electrode incorporated inside the cup to carry interferential current. This cup provides rhythmic negative pressure. This pressure produces mild massaging effect on the skin, stimulating cutaneous sensory nerves and causing slight vasodilatation.

3.2 PHYSIOLOGICAL EFFECTS:

The physiological effects may vary with such factors as the magnitude of the current, whether rhythmic or constant modes are used, the frequency range used and the accuracy of electrode positioning.

- 1. Relieves pain
- 2. Promotes healing of tissue injury
- 3. Absorption of exudates
- 4. Stimulates muscles
- 5. Promotes relaxation
- 6. Improves circulation

INDICATIONS:

- Pain relief
- Stress incontinence
- Placebo effects
- Low back pain

- Muscle spasm and strain
- Cervical and lumbar spondylosis
- Periarthritis of shoulder
- Sacro ilitis

CONTRA INDICATIONS:

- Patients with convulsive disorders
- Patients with altered sensations
- Open wounds
- Cardiac pace makers

DANGERS:

- Electric shock
- Burns

QUESTIONS:

2 marks:

- 1. What are medium frequency currents?
- 2. What is beat frequency?
- 3. Write the Indications of IFT?
- 4. What are the physiological effects of IFT?

6 marks:

1. Explain in detail about techniques of application, physiological effects, indications and contra indications of IFT?

Ψ

SUPERFICIAL HEATING METHODS

UNIT 4

Structure:

- 4.1 Physiological and therapeutic effects of heat
- 4.2 Paraffin wax bath
- 4.3 Hot packs
- 4.4 Contrast bath
- 4.5 Infrared radiation

4.1 PHYSIOLOGICAL AND THERAPEUTIC EFFECTS OF HEAT

A Physiological effect of heat includes:

- 1. Effects on metabolism of the body
- 2. Effects due to increased blood supply
- 3. Effects of heat on nervous tissues
- 4. Effects of heat on the muscular tissue
- 5. Effects of heat on sweat glands

1. Effects on metabolism of the body: According to Van't Hoff's statement, any chemical change which is capable of being accelerated is accelerated by the raise in temperature. Therefore, all the chemical changes of the body that can be accelerated are accelerated by heat. The metabolism of the body is itself is accelerated. The oxygen supply to the tissues is increased, removal of waste products is enhanced, the nutritional supply to the tissues is increased and thus the healing of damaged tissue is accelerated.

2. Effects due to increased blood supply: The heat has a direct effect on the blood vessels. It causes vasodilatation of the vessels in the area of heating. Stimulation of the superficial nerve endings can also cause reflex dilatation of the arterioles. As a result of vasodilatation there is an increased flow of blood through the area, so that the necessary oxygen and nutritive materials are supplied and the waste products are removed. Also, there is increased filtration and diffusion through different membranes and faster transport of some enzymes. Thus, this result in faster healing of the damaged tissues and early recover y from the injury.

3. Effects of heat on nervous tissues: Heat alters conduction in the nervous tissues. It produces a sense of sedation. Perception of pain also reduced as it enhances the pain threshold.

4. Effects of heat on the muscular tissue: increased blood supply provides optimal environment for the muscle to contract. It provides fresh nutrients, oxygen and removes waste products faster. Thus, efficacy of muscle to contract is increased. Rise in temperature also induces muscle relaxation due to faster removal of the waste products.

5. Effects of heat on sweat glands: the heat has an effect on the sweat glands. As the heated blood is circulated throughout the body, it stimulates the centers of the regulation of the sweat. The production of sweat is increased and thus there is increased elimination of waste products.

Therapeutic effects of heat include:

- 1. Relief of pain
- 2. Reduction of muscle spasm
- 3. Reducing healing time
- 4. Sedative effect
- 1. Relief of pain: Therapeutically heat is widely used for the relief of pain. It is found that heat is the most effective non-analgesic method of pain control. Stimulation of sensory heat receptors may activate pain gate mechanism. Vascular changes could also decrease local pain.
- 2. Reduction of muscle spasm: It has been suggested that heating may diminish muscle excitation. Also the pain and spasm are interdependent a reduction in one will cause a reduction in the other.
- 3. Reducing healing time: To promote the healing of a wound or injured tissue an increased blood supply to the tissues may be of benefit due to increased oxygen ,nutrition supply to that area
- 4. Sedative effect: This might be simply a consequence of pain relief. The sedative effects are evident in heat therapy.

4.2 PARAFFIN WAX BATH THERAPY

Definition: Paraffin wax bath therapy is an application of molten paraffin wax over the body parts. The temperature of the paraffin wax is maintained at 40-44° C, whereas its melting point is 51-55 ° C. If the molten wax at 51-55 ° C is poured on the body parts, it may cause burn over the body tissue that is why some impurity is added to lower down its melting point such as liquid paraffin or mineral oil. The combination of paraffin and mineral oil has low specific heat which enhances the patient's ability to tolerate heat from paraffin better than that from the water of the same temperature. The composition of solid wax, liquid paraffin;

petroleum jelly is 7:3:1. The mode of transmission of heat from paraffin to the patient skin is by means of conduction.

PARAFFIN WAX BATH UNIT:

Parts of a paraffin wax bath unit are - stainless steel container, mains, thermostat, thermostat pilot lamp, power pilot lamp, lid and caster.



Initially, heating is quicker with this type because there is no water jacket to be heated. Container contains wax and paraffin oil. Main function is to switch on or off the heating element, which is located in the casing of paraffin wax bath unit. Thermostat keeps the temperature fixed or static in the range which is adjusted with knob. Thermostat pilot lamp indicates whether thermostat is on or off. Power pilot lamp function is to show whether power is on or off. Lid covers the container and caster allows the paraffin wax bath container to be moved from one place to another.

TECHNIQUES OF APPLICATION:

Treatment procedure

1. Get patient's vital sign. Check the paraffin temp. It should be around 40 to 44 deg C on the thermometer. You can also test by dipping your fingers directly to the wax. Show it to the patient as a demonstration.

2. Let the patient washed the area to be treated (usually hand and foot) and remove all the jewelleries,

3. Position the patient with the part to be treated relaxed and comfortable

4. Inspect the area to be treated for abrasions, cuts, wounds, scars, oedema and other circulatory dysfunction.

5. Test patient's sensation as to hot and cold.

6. Give the rationale to the patient as to the intensity, duration and the purpose of the treatment

7. Position the patient and apply the technique

8. Wrap the part in a layer of greaseproof of paper and towels to retain the heat.

9. Set a timer. Treatment time of 15-20 mins.

Post Treatment Procedure

- 1. When the treatment completed, remove the towel carefully
- 2. Remove the paraffin glove by loosening the top going down
- 3. Inspect and dry the area treated
- 4. After removal, the paraffin glove is deposited in the paraffin bath unit.

Common Techniques

- 1. **Direct pouring Method:** The molten wax is directly poured by a mug on the part to be treated and then wrapped around by a towel. The wax is allowed to solidify for about 10-12 minutes. Several (4-6) layers can be made over the body tissues.
- 2. **Brushing Method:** A brush of various sizes (4" or 6") is used for the application of molten wax over the body tissues. Several coats (4-6) are applied over the body tissues and wax is allowed to solidify and wrapped over by a towel.



- 3. **Direct immersion or dipping Method:** In this method, the body part to be treated is directly immersed into the container of paraffin wax and taken out. Once the wax solidifies, the part is again immersed to make another layer of paraffin wax and wrapped around by a towel.
- 4. **Toweling or Bandaging Method:** A towel or a roll of bandage is immersed in molten paraffin wax and then wrapped around the body part. Several layers can be made over the body part. This method is preferably used for treating proximal parts of the body.

Physiological effects:

- Paraffin wax bath therapy provides superficial heating to the tissues.
- It increases the local circulation to the area.
- Increases the pliability of the skin.
- Reduces stiffness and thus pain.

Indications:

- Rheumatoid arthritis
- Osteoarthritis
- Joint stiffness, adhesions
- Post immobilization stiffness,
- Scars on the skin etc.

Contraindications:

- Open wounds.
- Skin rashes.
- Allergic Conditions.
- Impaired skin sensation.
- Defective arterial supply etc.

Dangers:

• Burns

Precautions:

- The 'dip and re-immerse' method should be avoid in patients with significant oedema
- Cooler wax temperatures are required for the foot than the hand
- Moisture may encourage damaged or infected skin to break down

MAINTENANCE OF PARAFFIN WAX BATH UNIT: Sterile the paraffin wax bath by heating it to 212^{0} Fahrenheit. For reuse, sterilization should be done frequently. Drain the melted paraffin wax, filter it out and replace it back for reuse. Change the wax at least once in 6 month.

4.3 HOT PACKS / HYDROCOLLATOR PACKS

Definition: Hot packs are the packs which are immersed in an apparatus called hydro collator. They provide superficial moist heat to the part where applied. They are stored in a thermostatically controlled water bath inside the equipment. The temperature inside the hydro collator ranges between 65-80°C. The aim of the hydro collator pack is to rise the body temperature at 40-45° C.

Hydro collator packs are available in various sizes and shapes. The size and shape of pack should be chosen on the basis of area being treated. The common sizes are small (for smaller joints like elbow, ankle), large (for large joint like hip and back) contoured (for cervical spine).

When used, hot packs are taken out of apparatus by means of tongs and wrapped inside a towel. Six to eight layers of towel is made around the pack. The total treatment time is a round 8-10 minutes.







PHYSIOLOGICAL EFFECTS:

- 1. Relieving the Muscular Spam.
- 2. Local Rise In Temperature
- 3. Relieving Pain.
- 4. Increase Of Local Circulation:
- 5. Skin Becomes Supple And Elasticity Of Connective Tissue Is Increased
- 6. Increase in Joint Range of Motion.

Techniques of Application:

Treatment Procedures:

- 1. Get the patient's Vital Signs
- 2. Position the patient with the part to be treated relaxed and comfortable
- 3. Inspect the area to be treated for abrasions, cuts, wounds, scars, edema and other circulatory dysfunction.
- 4. Test patient's sensation as to hot and cold
- 5. Do not expose the patient unnecessarily
- 6. Give the rationale to the patient as to the intensity, duration and the purpose of the treatment
- 7. Inform the patient to alert if any pain, discomfort or burning sensation is felt
- 8. Remove the hot pack from the tank with tongs
- 9. Place the hot pack in a terry cloth or towel. Ensure that there will be 6-8 layers from the HMP and the patient's skin.
- 10. Place the hot pack on the appropriate body area and secure it firmly to prevent slipping.
- 11. Tell the patient not to fall asleep
- 12. Check the patient every 5 mins to ensure that no extremely hot red areas or burns have developed.

Post Treatment Procedures:

- 1. Dry and inspect patient's skin
- 2. Put the pack back in the tank
- 3. Hang the towels and covers to dry
- 4. Change patient's towel if wet and if necessary
- 5. Get the patient's Vital signs before leaving

Indications:

- 1. Osteo arthritis.
- 2. Rheumatoid arthritis
- 3. Joint stiffness.
- 4. Adhesions.
- 5. Post immobilization stiffness.
- 6. Periarthritis of shoulder
- 7. Low back pain.

Contra indications:

The hot packs should not be used in the area of:

- 1. Impaired Skin sensation.
- 2. Open wounds.
- 3. Recent hemorrhage
- 4. Skin allergy.
- 5. Impaired circulation

Dangers:

• Burns

Precautions:

- Never allow a patient to lie on top of a hot pack, particularly if treating the trunk.
- Avoid using hot packs on overweight patients as the tissues may not feel the heat effectively and thus lead to a burn.
- Moisture may encourage damaged or infected skin to break down.

4.4 CONTRAST BATH

The principle of contrast bath therapy is to combine the effects of both hot as well as cold bath together. The part is immersed alternatively in cold and hot water tanks. The temperature of the hot water ranges from $36 - 45^{\circ}$ C and the cold water from $15-20^{\circ}$ C. The part is immersed first in hot water and then in the cold water and the treatment is repeated thereafter.

As a general rule, the treatment should begin with the hot water and should end with the cold water.

The total treatment time may vary 15-30 minutes, with the immersion in the warm around 3 minutes and the cold around 1 minute. The whole cycle is repeated for about 4-5 times.



Techniques of Application:

Treatment Procedures

- 1. Get the patient's Vital Signs
- 2. Position the patient with the part to be treated relaxed and comfortable
- 3. Inspect the area to be treated for abrasions, cuts, wounds, scars, edema and other circulatory dysfunction.
- 4. Test patient's sensation as to hot and cold
- 5. Do not expose the patient unnecessarily
- 6. Position the patient and apply the technique
- 7. Set a timer. Treatment time of 15-30 mins
- 8. Tell the patient to immerse the part in the warm around 3 minutes and the cold around 1 minute. The whole cycle is repeated for about 4-5 times

Post Treatment Procedures:

1. Dry and inspect patient's skin

Maintenance:

To maintain proper hygiene, contrast baths are also need to be cleaned frequently. Some disinfectant or antimicrobial agent should be used for cleaning both the tanks.

Physiological effects:

- Alternate contraction and dilation of blood vessels.
- Marked increase of blood flow locally and by circulatory reflex.
- Increased metabolism and healing.
- Increased white blood cell activity.

Indications:

- Decreasing pain.
- Decreasing swelling.
- Decreasing/controlling inflammation.
- Improving mobility.
- Improve muscle recovery after exercising.

Contraindications:

- Open wounds
- recent hemorrhage
- skin allergy
- eczema or infection

4.5 INFRARED RADIATION

Definition: The infrared rays are electromagnetic waves with the wavelengths of 750 to 400000 nm and frequency 4×10^{14} HZ to 7.5 x 10^{11} HZ. It lies beyond the red boundary of visible spectrum. Any hot body can produce infrared rays like the sun, electric bulb, coal fire, gas fire etc. Sun is the natural source of infrared radiations. Infrared radiations can be produced by artificial generators.

Production: In physiotherapy departments Infrared rays are produced by two types of generators:

- 1. Non -luminous generators
- 2. Luminous generators

Non-luminous generators provide infrared rays only, where as luminous generators emit infrared rays, visible as well as ultraviolet rays. Therefore Non luminous generators are termed as infrared radiation generators and luminous generators are called the radiant heat.

Non luminous generators:

Non luminous generator consists of a simple type of element or coil wound on a cylinder of some insulating material such as fire clay or porcelain. An electric current is passed through the wire which results in the production of heat. This heat produces infrared rays which are transmitted through the porcelain. Porcelain gets heated by the method of conduction but the radiations generated in this way also include some of the visible rays.

Therefore to avoid this, the coil is embedded in fireclay or porcelain or placed behind fireclay. Now the emission of rays is entirely from the fireclay which is commonly painted black and thus very few visible rays are produced. The element or the coil is thus placed at the focal point of a parabolic or spherical reflector. The reflector is mounted on a stand and its position can be adjusted as required



In another type of non luminous generator, a steel tube within which an electric coil is embedded on some material which is electric insulator but good conductor of heat .When electric current is passed through the central coil and thus heat is produced which is conducted by the insulator to the steel tube thus emits infrared rays.

All of these non luminous generators take some time to get heated up for the production of infrared radiations, so they should be switched on before 5-7min of the treatment.

Luminous generators:

Luminous generators emit infrared, visible and a few ultraviolet rays, these generators are in the forms of incandescent lamps or bulbs. An incandescent lamp consists of a wire filament enclosed in a glass bulb, which may contain an inert gas at low pressure. The filament is a coil of fine wire which is usually made up of tungsten. These luminous generators emit the electromagnetic waves with the wave length in between 350 to 4000nm, the maximum proportion of the rays having wavelength in the region of 1000nm. The front of the bulb is usually red as to filter out the shorter visible and the ultraviolet rays.



IRR LAMP
DEPTH OF PENETRATION OF RAYS:

Luminous generator produces infrared rays having wavelength between 350 to 4000nm. It can penetrate into dermis and epidermis of the subcutaneous tissue.

Non luminous generator produces infrared rays of wave length 750 to 1500nm which can penetrate the superficial dermis only.

The depth of penetration depends upon the wave length and the nature of the material. Thus infrared rays produced from a luminous generator have more penetration power than that produced from non luminous generators.



TECHNIQUES OF TREATMENT:

The choice of apparatus:

In most cases luminous and non luminous generators are equally suitable, but in some instances one proves better than the other. When there is acute inflammation or recent injury, the sedative effect of rays obtained from nonluminous generator may prove more effective for relieving pain than the counter irritant effect of those from the luminous source.

Preparation of the patient:

- Place the patient in a suitable and comfortable position.
- Explain briefly the entire procedure of the treatment.
- Check the sensations of the skin to be treated.
- The part to be treated should be exposed.
- The patient is warned that he should report immediately if the heating become excessive as undue heat may cause burn.
- He should be instructed not to touch the apparatus and nor to move nearer to the apparatus.

Arrangement of the lamp and the patient:

The lamp is positioned so that it is opposite to the center to be treated and the rays strike the skin at the right angle thus ensuring maximum absorption. The distance of the lamp from the patient should be measured. Optimum distance is around 50 - 75 cm depending upon the output of the generator.

Care must be taken that the patient's face is not exposed to infrared rays and eyes must be shielded to avoid this.

Application of infrared treatment:

At the start of treatment exposure the intensity of the radiation should be low, but after 5-10mins when vasodilatation has taken place and the increased blood flow has become established, the strength of the radiation may be increased. This can be achieved by moving the lamp closer to the patient or by adjusting the variable resistance.

The physiotherapist should be near the patient throughout the treatment session and should reduce the intensity of radiation if the heat becomes excessive. If the irradiation is extensive, it is desirable that sweating should occur to counteract any excess rise in body temperature. Sweating is encouraged if the patient is provided water to drink during treatment.

At the end of treatment the skin should be mid red, not excessively red. After extensive irradiation the patient should not rise suddenly from the recumbent position

Duration and frequency of treatment:

In case of acute inflammation or recent injuries and for treatment of wounds, an exposure of 10-15mins is adequate, but it may be applied several times during the day. In cases of chronic conditions longer exposures may be used.

Indications:

- Low back pain
- Post immobilization stiffness
- Oedema
- Osteoarthritis
- Rheumatoid arthritis
- Cervical and lumbar spondylosis

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Contraindications:

- Defective arterial blood supply
- Damage of hemorrhage
- Defective skin sensation
- Directly over the eyes
- After deep x-ray or cobalt therapy
- Known cases of tumors

Physiological effects:

- Increases local temperature
- Increases local metabolism
- Increases lymphatic and venous drainage
- Increases vasodilatation of arterioles and venules
- Increases nerve conduction velocity

Therapeutic effects:

- Decreases pain
- Decreases muscle spasm
- Accelerates rate of healing
- Decreases oedema
- Removes waste products of metabolism

Dangers:

- Burns
- Electric shock
- Faintness or giddiness.
- Headache
- Gangrene
- Injury to the eyes

QUESTIONS:

2 marks:

- 1. What are the indications of wax bath?
- 2. What are the contra indications of wax bath?
- 3. Write the indications of hot packs?
- 4. Write the contra indications of hot packs?
- 5. What are the dangers and precautions of hot packs?
- 6. Mention the Physiological effects of wax bath?
- 7. Mention the Physiological effects of hot packs?
- 8. What is contrast bath?
- 9. What are the indications of IRR?
- 10. Mention the therapeutic effects of IRR?

6 marks:

- 1. Explain about physiological and therapeutic effects of heat?
- 2. Explain Infrared Non luminous and luminous generators in detail along with its indications and contra indications?
- 3. Explain about techniques of application, dangers and precautions of Wax bath?
- 4. Write about the indications, contra indications, physiological effects and techniques of application of Contrast bath?

Ψ



HIGH FREQUENCY CURRENTS

Structure:

- 5.1 Short wave diathermy
- 5.2 Ultra sound therapy
- 5.3 Laser therapy

5.1 SHORT WAVE DIATHERMY Introduction:

SWD is electrical field that oscillate at varying frequencies and different wavelength is applied to a patient by capacitor field or coil field method. The SWD machines used by physical therapist with a frequency of 27.12 MHz and wavelength of 11meter.

Principle: It is not possible to produce high frequency by some mechanical device which produces sufficient rapid movements. This type of currents can only be produced by discharging a condenser through an inductance of low ohmic resistance. If a current of high frequency is required, the capacitance and inductance should be small and if a current of low frequency is required the capacitance and inductance should be large. This is the mechanism of production of high frequency current.



SHORT WAVE DIATHERMY UNIT

METHODS OF APPLICATION:

A. CONDENSER / CAPACITOR FIELD METHOD

B. CABLE METHOD

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A. CONDENSOR / CAPACITOR FIELD METHOD:

Electrodes are placed on each side of the treated part, separated from the skin by an insulating material. The electrodes act as plates of a condenser, while the patient's tissues form the dielectric. When the current is applied rapidly, alternating charges are setup on the electrodes, causing a rapidly alternating electric field between them. The electric field influences the materials which lie within it and produces heat.

The selection or placement of electrodes: this is based on

- a. Type of electrodes
- b. Size of electrodes
- c. Spacing of electrodes
- d. Positioning of electrodes
- a. Type of electrodes: there are various types of electrodes. Electrodes could be pad electrodes, plate electrodes and disk electrodes. Each electrode consists of a metal plate surrounded by some form of insulating material.
- b. Size of electrodes: electrodes should be in equal size and slightly larger than the part to be treated to achieve a uniform electric field through the tissues. If uneven size electrodes are used, it results in concentration of heat under small electrode leads to skin damage.
- c. Spacing of electrodes: suitable spacing by means of towel is advised to ensure the safety of SWD. 2-4cm skin –electrode distance is maintained. Wide spacing gives the most uniform field in the tissues. Closer spacing of one electrode leads to concentration of field on that side.
- d. Positioning of electrodes: electrodes are placed parallel to skin surface so that skinelectrode distance is as close as possible. The distance between the electrodes must be greater than the combined skin-electrode distance of the two electrodes.

Common positioning of electrodes is:

1. Contra planar technique: It is the most satisfactory technique, especially for the treatment of deeply-placed structures. The electrodes are placed over the opposite aspects of the joint or limb, so that the electric field is directed through the deep tissues.



Contra planar method

2. Coplanar technique: In this technique, electrodes are placed side by side on the same aspect of the part, provided there is an adequate distance between them. The distance between the two electrodes

should be more than the total width of spacing. The heat is more superficial and suits certain areas such as the spine, where one electrode is placed over the dorsal region, while the other placed over the lumbar one.



Coplanar method

3. Cross fire technique: Half of the treatment is given with the electrodes in one direction and remaining half of the treatment in another direction For example, for the knee joint, during the first half of the session, the electrodes are placed on the medial and lateral aspects of the knee. On the opposite, during the second half of the session, the electrodes are transferred to the anterior and posterior aspects of the knee.

4. Monopolar technique: The active electrode is placed over the site of the lesion, while the indifferent one is applied to some distant part of the body. This method is used for very superficial lesions (sinusitis).

B. CABLE METHOD:

The cable is coiled in relation to the patient's skin but separated from it by a layer of insulating material. As high-frequency currents oscillate in the cable, an electric field is setup between its ends and a magnetic field around its center. These fields affect the tissues that lie within them.

- Electro static field: it is produced at the end of the cable and the effects are similar when the current is applied by a condenser method. The heating is more in superficial tissues and those of low impedance.
- Magnetic field: the magnetic field varies as the current oscillates and an EMF is produced by electromagnetic induction. If the conductor is a solid piece of conducting material, the EMF gives rise to eddy currents. Such currents are produced specially in the tissues which lie close to the center of the cable. The eddy currents produce heat and their effects confines only to the tissues of low impedance, thus the heating of fat and white fibrous tissue is avoided. The currents are produced primarily near the surface of the conductor where the magnetic field is strongest and the superficial tissues are heated most.

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Advantages: the cable method is useful

- For the treatment of an extensive area which could not be included between the condenser electrodes.
- When the area is irregular
- When it is desirable to avoid heating of the subcutaneous fat

Disadvantages:

• Impossibility of using air spacing

Preparation of the patient:

- Treatment should be on a couch, chair or a table, which must be woodened free from metals.
- Do not allow the target area to be hidden by clothes to avoid unwanted irritation or burn.
- The skin must be dry.
- Metal objects such as earrings and necklaces, tight straps or elastic supports should be removed.
- The patient must be comfortable and the part to be treated should be fully supported.
- Skin sensation must be tested before treatment starts.
- Expose the area to be treated adequately.

Preparation of the apparatus:

- Check all the leads from mains to power plug box and to the machine have intact insulating material.
- Check and keep all the operating knobs at zero.
- Switch on the machine and check the working of the apparatus with an output indicator.
- Arrange all the necessary things. Eg. Towels
- Select the suitable method of treatment i,e. condenser method or cable method.

Monitoring the treatment:

- The apparatus should be earthen.
- Before starting treatment, all knobs of the apparatus should be on zero position (the starting position).
- Select the power level according to the patient's condition.
- Increase the intensity gradually till the desired heating level is reached.
- A mild sensation of warmth is felt which continues throughout the session.
- Immediately check for any complaint of hot sensation.
- The physical therapist should remain within call of the patient during the whole treatment period.
- At the end of treatment, the control knobs are returned to zero position, current switched off and the electrodes removed.

Duration of treatment:

• Treatment time may vary between 10 and 30 minutes, depending on the patient's condition.

- Frequency of treatment is usually twice weekly, while daily treatment is not contraindicated when needed.
- When treatment is within a limited space such as the sinuses or the face, excessive treatment should be avoided.

Physiological effects:

The principal effect of short wave diathermy on the body is the production of heat in the tissues due to the rise of temperature. It leads to

- Increased metabolism
- Increased blood supply
- General rise of temperature
- Fall in blood pressure
- Increased activity of sweat glands

Therapeutic effects:

- Decreases pain
- Reduced muscle spasm
- Resolution of inflammation
- Accelerate wound healing
- Controls infection
- Increase extensibility of fibrous tissues such as tendons, joint capsule and scars

Indications:

- Localized musculoskeletal pain
- Inflammation (joint or tissue)
- Pain/spasm
- Sprains/strains
- Tendonitis
- Tenosynovitis
- Bursitis
- Rheumatoid arthritis
- Periostitis
- Capsulitis

Contra indications:

- Metal implants or metal jewellary
- Cardiac pacemakers
- Ischemic areas
- Peripheral vascular disease

- moist dressings
- During menstruation.
- Pregnancy
- Fever
- Sensory loss
- Cancer
- Tuberculosis

Dangers:

- Burns
- Scalds or moist heat burns
- Over dosage
- Electric shock

5.2 ULTRASOUND THERAPY

Therapeutic ultrasound is most widely used modalities in physiotherapy department. It has been used as a valuable tool in rehabilitation of many different injuries, to stimulate the repair of soft tissue injuries and to relive pain. It has been traditionally classified as deep heating modality and used primarily to elevate tissue temperature.

Definition: Ultrasound refers to mechanical vibrations which are essentially the same as sound waves but of a higher frequency. Such waves are beyond the range of human hearing and therefore also be called Ultrasonic.

Frequency of Ultrasound:

Majority of ultrasound generators are set at a frequency of 1MHz, although there are ultrasound units that are set at a frequency of 3 MHz. A generator that can be set between 1 and 3 MHz affords the therapist the treatment flexibility.

1 MHz frequency is most useful in individual with a high percentage of cutaneous body fat and whenever the desired effects are in the deeper structures.

3 MHz, the energy is absorbed in the more superficial tissues with a depth of penetration between 1 and 2 cm.

Production of ultra sound:

Ultrasound can be produced by following ways,

For 1 MHz machine a vibration source with a frequency of one million cycles per second is needed. This is achieved by using either *quartz* or a *barium titanate*. These crystals deform when subjected to a varying potential difference, called PIEZO ELECTRIC EFFECT.

The basic components of ultrasonic apparatus are: a source of high frequency current, a coaxial cable, a transducer circuit or treatment head or application or sound head.

PAPER-III

Inside the treatment head high frequency current is applied to the crystal being fused to the metal front plate of the treatment head. Any change in the shape of the crystal causes a movement of the metal front plate which in turn produces ultrasonic waves.



ULTRASONIC APPARATUS

Parameters of ultrasound

Mode: In continuous mode, treatment head continuously produces ultrasonic energy. In pulsed mode the periods of ultrasound are separated by periods of silence. Continuous mode produces more heat so

it is used for musculoskeletal conditions such as muscular spasm, Joint stiffness, pain etc. pulsed mode produces less heat so it is used for soft tissue repair.

Frequency:

Attenuation increases with increase in frequency effectively, lower frequency penetrates further.

- Ultrasonic 3MHz superficial tissue
- Ultrasonic 0.75 MHz to 1MHz penetrate deeply

Intensity:

Power is the total energy / sec supplied by the machine and is measured in Watts. Intensity applied is according to the nature of the lesion. For acute and immediate post traumatic: 0.1 to 0.25 W/cm²

For chronic and scar tissue: 0.25 to 1 W/ cm^2

Dosage: three factors which determine the dosage are:

- 1. Size of the treatment area
- 2. Depth of the lesion from the surface
- 3. Nature of lesion

Transmission of ultrasound:

If ultrasonic beam encounters an interface between two media and is transmitted, it may be refracted, i.e. deflected from its original path as light. When travelling from a medium in which its velocity is low into one in which its velocity is high, it is refracted away from the normal.

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Attenuation of Ultrasound:

It is the term used to describe the gradual reduction in intensity of the ultra sonic beam once it has left the treatment head. There are two main factors that contribute to attention.

- i. **Absorption:** Ultrasound is absorbed by the tissues and converted to heat at that point. This contributes the thermal effect of ultrasound.
- ii. **Scatter (to spread):** This occurs when the normally cylindrical ultrasonic beam is deflected from its path by reflection at interfaces, bubbles or particles in its path.

Coupling media:

Ultrasonic waves are not transmitted by air, thus some couplant which does transmit them must be interposed between the treatment head (transducer) and the patient's skin.

Air (Zero transmission) will in fact reflect the US beam back into the treatment head this could set up standing wave which might damage the crystal .consequently, the treatment head is never left switched on when not in contact with a transmitting medium. Some coupling Medias and their efficiency of transmission are:

- Aqua sonic gel 72.6%
- Glycerol 67 %
- Distilled water 59 %
- Liquid paraffin 19 %
- Petroleum jelly 0 %
- Air 0 %

TREATMENT PROCEDURE:

Preparation of the patient:

- Explain the entire treatment procedure to the patient and explain him the effects and uses of ultrasound.
- The skin surface must be check and if any inflammatory conditions are there the treatment should avoid.
- Check out for all the contra indications.

Preparation of the apparatus:

- Check all the leads from mains to power plug box and to the machine have intact insulating material.
- Check and keep all the operating knobs at zero.

Testing the apparatus:

Prior to any treatment it is sensible to check that there is an output from the machine. This can be done by placing the treatment head just allow the water surface in a suitable container and observing the disturbance (Ripples) which appears.

Techniques of application:

1. Direct contact method:

If the surface to be treated is fairly regular then a coupling medium is applied to the skin in order to eliminate air between the skin and the treatment head and transmit the ultrasonic beam from the treatment head to the tissues. The treatment head is moved in small concentric circles over the skin in order to avoid concentration at any one point, keeping whole of the front plate in contact with the patient. This technique is suitable for areas up to three times the size of the treatment head. Large area should be divided and treated separately. The size of the area and its exact location should be specified on the treatment head.



2. Water bath method:

When direct contact is not possible because of irregular shape of part or because of tenderness, a water bath may be used. As the part to be treated is immersed in water this can

only reasonably be applied to the hand, ankle and foot. A water bath filled with degassed water is used if possible. Ordinary tap water presents the problem that gas bubbles dissociate out from the water, accumulate on the patient skin and the treatment head, and reflect the US beam. If tap water has to be used then the gas bubbles must be wiped from these surfaces frequently.

The treatment head is placed under the water and held 1cm from the skin and moved in small concentric circles, keeping the front parallel to the skin surface to reduce reflection to a minimum.

If the patient's hand to be immersed in the bath while the application is active, care should be taken to minimize exposure to any reflected or scattered ultrasound. This can be done by wearing a dry knitted glove inside a water proof rubber or plastic glove.



Treatment of a friction syndrome of the

3. Water bag method:

Another method of applying ultrasound therapy to irregular surface which cannot placed in a water bath method is treated with a plastic or rubber bag filled with water forming a water cushion between the treatment head and skin.

Rubber bag filled with degassed water can be used. All visible air bubbles should be squeezed out before knotting the neck of the bag to seal it. A coupling medium has to be placed both between the rubber bag and skin and between the rubber bag and the treatment head to eliminate any air.

The bag placed on irregular surface is then held with the help of patient or others. Treatment head pressed firmly on to the bag so that a layer of water about 1cm thick separates it from the surface (body). Inevitably some bubbles will form and it is important to ensure that these are in the sides of the bag and not in the region transmitting the ultrasound. The treatment head is then moved over the surface of the bag.



Source: Prentice WE, 4thEdition: www.acce

Duration of treatment:

Amount of energy depends upon intensity and duration of treatment. Size of area determine the treatment time

Minimum 1 - 2minMaximum 8 min 5min Average

For chronic: longer treatment time

For acute : lesser treatment time

PHYSIOLOGICAL EFFECTS OF ULTRASOUND:

Thermal effects:

- Increase in tissue extensibility
- Increase in blood flow
- Reduction of pain
- Mild inflammatory response
- Reduction in joint stiffness
- Reduction of muscle spasm

Non thermal effects:

- Cavitation
- Bone healing
- Tissue regeneration
- Increase in protein synthesis

Therapeutic effects:

- 1. To remove the traumatic exudates and reduces the danger of adhesion formation.
- 2. Accelerates the rate of repair of damaged tissues.
- 3. Mobilization of Scar tissues
- 4. It also breaks down adhesions formed between adjacent structures.
- 5. To promote the soaring of varicose ulcers and pressure sores.
- 6. Ultrasound is an effective painless method for eliminating plantar warts.
- 7. A placebo effect in patients receiving ultrasound.

Indications:

- 1. Tennis elbow
- 2. Golfer's elbow
- 3. Supraspinatus tendinitis
- 4. De quervain's disease
- 5. Bicepital tendinitis
- 6. Sub deltoid bursitis
- 7. Subacromial bursitis
- 8. Meta tarsalgia

Contra indications:

- Acute injuries
- Impaired circulation
- Areas having sensory problems

- Tumors
- Infections
- Pace makers or implants
- Joint replacements
- Ischemic areas

Dangers:

- Burns
- Cavitation
- Over dose
- Danger to equipment

PHONOPHORESIS

Phono means sound and phoresis means migration of the ions through a membrane by the action of an electric current.

Phonophoresis is defined as the movement of the drugs through skin into the subcutaneous tissues under the influence of ultrasound. It is otherwise called as sonophoresis or ultra sonophoresis.

5.3 LASER THERAPY

The word 'LASER' is an acronym for Light Amplification by the Stimulated Emission of Radiation. It refers to the production of a beam of radiation which differs from ordinary light in many ways.

Properties of laser:

Laser differs from the ordinary light in the following ways:

1. Monochromaticity:

This means that the Laser light has a single colour. This is because the lasers are of a single wave length and thus the definite frequency. Ordinary light however has many wave lengths.

- 2. **Coherence**: Laser radiations are not of the same wave lengths but also has same phase. Coherence means similar or synchronous behavior of laser beam.
- 3. **Collimation**: Laser beams remain collimated that means they remain in parallel. They do not diverge much and the energy can be propagated over larger distance.

Production of Laser:

The diagram given below shows a pair of reflectors. The emitted photons reflect to and fro between the pair of reflectors and during this process they cause electrons to emit photons. When the number of photons increases the partial reflector allows the laser light to pass through.



Components for production of LASER: For the production of laser radiation, the device must consist of the following components:

- 1. Lasing medium
- 2. Resonating chambers
- 3. Energy source

1. Lasing medium: The material which is capable of producing Laser is known as Lasing medium. It can absorb energy form the external source and then gives off its excess energy as photons of light. Lasing medium could be solid crystal or semi-conductor, liquid or gas.

2. **Resonating chamber**: The resonating chamber contains the lasing medium which is surrounded by two parallel mirrors at either ends.

3. Energy source: A flash gun is used to excite the electrons of the lasing medium. The source of flash gun is usually electricity.

TYPES OF LASER:

The various types of laser are available now a days. The commonly used lasers are:

- 1. Ruby laser or Crystal laser
- 2. Helium-neon laser or Gas laser
- 3. Diode laser or Semiconductor laser

Techniques of application:

The method of application of laser therapy is quite simple. Generally, the laser energy is emitted by a hand applicator for therapeutic purposes. The gallium- arsenide Laser contains the semiconductor or diode element at the tip of the applicator, where as the heliumneon laser contains their components inside the unit and delivers the laser light to the target area via a fiber optic tube.



Laser unit

This causes divergence of the beam. To administer the laser for therapeutic purposes, two methods are generally used;

- 1. Grid method
- 2. Scanning method
- 1. Grid method: The treatment area is divided into a grid each of 1sqcm. The hand held applicator should be in light contact with the skin and directly perpendicular to the target tissue. Each square cm is stimulated for a specific period of time.
- 2. Scanning method: No contact is made between the tip of the laser and the patient's skin. The tip of the applicator is held at a distance of 5 to 10mm.

Physiological effects:

- Altered cell proliferation
- Activation of phagocytes
- Stimulation of immune responses
- Increased cellular metabolism
- Stimulation of macrophages
- Alteration of cell membrane potentials
- Alteration of action potentials
- Altered endogenous opoid production

Therapeutic effects:

- Helps wounds heal faster
- Reduces scar tissue
- Regulates immune system
- Improves vascular activity
- Stimulates muscles
- Pain relief

Indications:

- Wound healing
- Relieves pain in arthritic conditions
- Neuralgia
- Myalgia
- Inflammatory conditions like tennis elbow, plantarfascitis

Contra indications:

- Metal implants
- Pregnancy
- Areas of impaired sensation
- Malignancy
- Epileptics
- Skin infections

Dangers:

- A risk of eye damage if beam is applied directly into the eye.
- Its exposure to cancerous tissue can lead to acceleration of its growth and metastasis.
- Laser should not be applied directly over the pregnant uterus as it may cause abnormal growth.

QUESTIONS:

2marks:

- 1. Define SWD?
- 2. What are the indications of SWD?
- 3. What are the contraindications of SWD?
- 4. Write about various physiological effects of SWD?
- 5. Write about various therapeutic effects of SWD?
- 6. Define ultra sound?
- 7. Write the parts of ultrasound apparatus?
- 8. What is coupling media?
- 9. Write the indications of ultrasound?
- 10. Write the contra indications of ultrasound?
- 11. What is meant by phonophoresis?
- 12. Abbreviate LASER and the types?
- 13. What are the physiological effects of LASER?

6 Marks:

- 1. Explain in detail about the methods of application of SWD?
- 2. Explain the techniques of application of ultrasound along with physiological and therapeutic effects?
- 3. Write about the indications, properties, production and techniques of application of LASER therapy?

Ψ

CRYOTHERAPY & TRACTION

UNIT

Structure:

6.1 Cryo therapy

6.2 Traction

6.1 CRYOTHERAPY

The application of cold for various therapeutic purposes is called cryotherapy. Cryotherapy is commonly used in the treatment of acute trauma and sub acute injury .The magnitude of cooling depends upon the area of the body tissue exposed, temperature of the cooling agent and the duration of exposure. The depth of penetration is also related to intensity and duration of cold application and the circulatory response to the body segment exposed.

BASIC PRINICIPLES:

When cold therapy is applied to the tissues, the heat is absorbed from the tissues by the cooling agent. Ice changes its state from solid to liquid by absorbing heat. A specific amount of energy is required to change the solid from of Ice into water which is called Latent heat. One gram of Ice at 0° C requires 336 joules of energy to convert it into 1 gram of water at 0° C, where as 1 gram of water at 0° C requires 155 joules of energy to convert it into 1 gram of water at 37° C. thus, for cooling the body tissues it is better to use ice for treatment rather than water.

Techniques of Application

- 1. Check Vital Signs
- 2. Inspect the patient's skin before applying the cold to determine if any rashes or discolorations are present
- 3. Test for patient's sensation
- 4. Verify the circulatory status of the area to be treated
- 5. Make sure that patient has not had frostbite in the area and never experience exacerbation of spasticity
- 6. Explain the treatment procedure
- 7. Position the patient relaxed and comfortable
- 8. Cover the patient properly and don't exposed unnecessary parts
- 9. Apply the cold modality
- 10. Provide the proper treatment procedures of application

Post Treatment Procedure

- 1. Check patient's skin for signs of adverse effects and frostbite
- 2. Check patients Vital Sign or prepare patient for the next treatment

Various techniques that used for administering cold are:

- Ice massage
- Ice Towels
- Immersion in cold or cold whirlpool
- Ice Packs or Cold Packs
- Evaporative cooling or vapo coolant sprays.
- 1. **Ice massage:** In this technique, Ice is placed in a polythene bag and applied over the body tissue. Ice cubes, crushed ice or flaked ice, etc. can be used. The ice bag is placed over the patient's tissue and patient is not allowed to lie over the pack. The pressure of application should be minimal and the movement of the bag should be to and fro and circular. The ice can be placed over the body tissue for a period of 10-20 minutes.
- 2. **Ice Towels:** This is a popular method of application because there is little danger of producing an Ice burn. Prepare the ice solution by filling a bucket with two parts of flaked or crushed ice to one part water in which two terry towels are immersed. The surplus water is wrung from towel, leaving as much ice clinging to it as possible. It is then applied to that part being treated. The towels are changed after every 30 seconds to 2 minutes. Up to ten towels can be applied consecutively with total treatment time of 15-20 minutes.
- 3. Immersion in cold or cold whirlpool: The part of the body is immersed in cold water or a whirlpool in which temperature of water is lowered up to 0-10° C. Flaked ice or crushed ice is used. Extremities of the body can be effectively treated with this technique. The total duration of the treatment is around 10 minutes in which the patients can immerse either for a single 10minute session or for a series of shorter immersions until accumulative total of 10 minutes have been reached.
- 4. **Cold packs:** Commercially used cold packs are used for administering cold. These cold packs contain special material which retains the cold like the silicate gel. These are available in various sizes and shapes. Different body parts are treated with different sizes and shapes of cold packs. These packs are stored in a special refrigeration or freezer for at least 20 minutes to 1 hour before use. The main advantage of these cold packs are that they are reusable and can contour or mould themselves according to the body part treated.
- 5. Evaporated Cooling or Vapocoolant sprays: The use of vapocoolant sprays are increasing now a days. These are being used very commonly in sporting activities or athletic Injuries. The commonly used sprays are fluoromethane or ethylchloride. The jet or spray is usually applied from a distance of about 1 feet or 12 inches. Gentles stretch is applied to the tissues after application of vapocoolant sprays.

Physiological effects:

- Lewis's Hunting Reaction: The alternate phases of vasoconstriction and vasodilatation leads to hunting towards the mean point and is known as lewis's hunting reaction.
- Decreases muscle spasm
- Decreases pain
- Decreases metabolism
- Decreases tissues extensibility
- Increases joint stiffness

Therapeutic effects:

- Decreases blood flow to site of injury and thereby decreasing inflammation and oedema formation.
- Decreases blood flow, facilitating clotting and control bleeding.
- Reduces oxygen consumption of tissues.
- Acts as local anesthetic.

Indications:

- Recent Injury
- Reduction of pain
- Spasticity
- Muscular spasm
- Reduce oedema
- Reduce joint effusion
- Bursitis
- Tenosynovitis
- Sprains and strains

Contra Indications:

- Hypersensitivity to cold
- Open wounds
- Cardiovascular problems
- Sensory or circulatory deficits
- Raynaud"s phenomenon
- High blood pressure
- Diabetes or Peripheral vascular diseases
- Infections

Dangers:

• Ice burn

6.2 TRACTION

Traction is a therapeutic method performed by a physical therapist to relieve pain by stretching and realigning the spine. Placing a stretch on the spine separates the vertebrae and helps to relieve direct nerve pressure and stress on the vertebral discs. It uses a gentle pulling technique to stretch and lengthen the bones, reducing pain, increasing blood flow, and promoting proper alignment. It is commonly performed on the cervical or lumbar for pain relief or posture correction Traction is performed while the patient is lying down.



Spinal traction can be classified into following categories:

1. Continuous Traction

Continuous traction uses low weights for extended periods of time (up to several hours at a time).

2. Static Traction

This type of traction involves heavier weights applied steadily for short periods of time. Static traction is sometimes referred to as sustained traction.

3. Intermittent Traction

Intermittent traction is similar to static traction in intensity and duration but utilizes a mechanical unit to alternately apply and release the traction force at preset intervals.

Duration of traction:

- Continuous traction –several weeks
- Static traction 20 to 25 minutes
- Intermittent traction 15 to 20 minutes

Traction force:

- Cervical traction 1/7 or 1/10th of total body weight
- Lumbar traction $1/3^{rd}$ of total body weight



Indications:

- Spinal nerve root impingement: Herniated disc, Narrowing of the inter vertebral foramen, Osteophyte encroachment, spinal nerve root swelling
- Joint hypo mobility,
- Spondylolisthesis,
- Degenerative joint disease
- Extrinsic muscle spasm and muscle guarding,
- Discogenic pain, Joint pain, Compression fracture,
- Lumbar disc disorders of primary origin and secondary origin,
- Sciatica

Contra indications:

- Old age
- Ligamentous instability,
- Osteomyelitis,
- Diskitis
- Primary or metastatic tumor
- Spinal cord tumor
- Severe osteoporosis
- Clinical signs of myelopathy
- Severe anxiety, and
- Untreated hypertension.

Effects

Traction helps in:

- Relieve pain and intra- discal pressure, thereby increasing mobility of lower back region.
- Gliding (Movement of bones) of the inter vertebral joints
- Widening of the inter vertebral foramen (space between vertebral joints)
- Straightening of the spinal curves
- Stretching of the spinal muscles
- Pain relief, by releasing and stretching the tight capsule or ligament, or adherent nerve root
- Mobilizing stiff inter-vertebral joints
- Reducing muscle guarding and spasm
- •

QUESTIONS:

2 Marks:

- 1. Define Cryotherapy?
- 2. What is Lewis hunting reaction?
- 3. Write the indications of Cryotherapy?
- 4. Mention the contraindications of Cryotherapy?
- 5. What is traction?
- 6. Write the indications of traction?
- 7. Mention the effects of traction?

6 Marks:

- 1. Write about the methods of application, physiological and therapeutic effects of Cryotherapy in detail?
- 2. Explain in detail about traction?

Ψ

PHYSIOTHERAPY II YEAR PART-B, VOCATIONAL COURSE PAPER-I THEORY Medical And Surgical Conditions

Periods/Week :04

Periods/Year:110

Time Schedule Weightage And Blue Print

S.No	Name of Unit	No.Of Periods	Weightage In Marks	Short Answer Questions	Essay type Questions
1	Nutritional Disorders Nutrition –Vitamins, Protein Energy Mal Nutrition Rickets, scurvy, Osteo- malacia and Osteoporosis	8	2	1	
2	Common health Problems Fevers (viral, malaria, typhoid, dengue), common cold, cough, conjunctivitis, dermatitis, anaemia, First Aid management	8	4	2	
3	Respiratory disorders C.O.P.D – Asthma, Bronchitis, Bronchiectasis, Emphysema TUBERCULOSIS	10	8	1	1
4	Cardio Vascular disorders Coronary artery disease Hypertension Cardiac arrest	15	8	1	1
5	Endocrinal disorders Hyperthyroidism Hypothyroidism Diabetic Mellitus	8	8	1	1
6.	CPR- Introduction Basic life support Advance Life Support Prolong Life Support	8	8	1	1
7.	Obesity- Introduction, BMI, body fat distribution, causes, risk factors, management	8	6		1

8	Incision- definision, Types Anaesthesia- definition, Types Burns-Classification, degree of burns Contractures, skin graft and flaps.	15	8	1	1
9	Paediatrics Developmental mile stones Cerebral palsy Polio myelitis	15	8	1	1
	Total	135	68	10	08

PHYSIOTHERAPY II YEAR PART-B, VOCATIONAL COURSE PAPER-II THEORY Orthopaedic And Neurology

Periods/Week :04

Time Schedule Weightage And Blue Print

Periods/Year:110

S.No	Name of Unit	No.Of Periods	Weightage In Marks	Short Answer Questions	Essay type Questions
	Should cover all the topics along with physiotherapy management				
1	Definition, causes, types/Grades, clinical features, investigations, management and complications of the following Fracture Sprains Strains Dislocations	15	8	1	1
2	Upper Limb Conditions Periarthritis of Shoulder Tennis Elbow Dequerevain Disease Trigger Finger Carpal Tunnel Syndrome	12	8	1	1
3	Lower Limb Conditions ; Osteoarthritis of Knee Chondromalacia of Patella Meniscal injury Plantar fasciitis	10	8	1	1
4	Spinal conditions : Cervical Spondylosis I.V.D.P.	12	8	1	1
5	Deformities Spinal Deformities(scoliosis, lordosis,kyphosis) Knee Deformities (genu valgum,	11	4	2	

	genu varam, genu recurvatum) Foot Deformities(club foot, flat foot)				
6	Central Nervous System Conditions Parkinsonism Ataxia Motor Neuron Diseases	10	8	1	1
7	Peripheral Nervous System Coniditions Types of nerve injuries Diabetic Neuropathy GBS Facial Palsy Trigeminal Neuralgia Foot Drop	15	8	1	1
8	Injuries of Brain and Spinal Cord Head Injury Coma Hemiplegia Paraplegia	15	8	1	1
9	Other Conditions Rheumatoid Arthritis Amputations Ankylosing Spondylitis Orthopedic Appliances (orthotics and prosthetics)	10	8	1	1
	Total	135	68	10	8

PHYSIOTHERAPY II YEAR PART-B, VOCATIONAL COURSE PAPER-III THEORY Electrotherapy

Periods/Week :04

Periods/Year:110

Time Schedule Weightage And Blue Print

S.No	Name of Unit	No.Of Periods	Weightage In Marks	Short Answer Questions	Essay type Questions
1	Physics and Basic Electrical Components Basic physics Physical effects and transmission of heat Dangers of electricity (electric and earth shock)	20	10	2	1
2	Low frequency currents Faradic current Galvanic currents SD curve, lontophoresis, TENS Quadriceps inhibition Faradic foot bath	20	16	2	2
3	Medium Frequency Current Interferential Therapy	10	8	1	1
4	Superficial heating methods Physiological and therapeutic effects of heat, paraffin Wax bath, Hot packs, contrast bath Infra-red radiation	15	16	2	2
5	High Frequency currents: Short wave diathermy Ultra sound LASER	25	10	2	1

6	-Cryotherapy -Traction	10	8	1	1
	Note : In all the above units definition, preparation of apparatus & Patient, physiological effects, techniques, dosage ,indications, contraindications, dangers and precautions are to be covered.				
	Total	135	68	10	8

PHYSIOTHERAPY II YEAR PAPER I Medical And Surgical Conditions

TIME: 3 Hours

Max. Marks: 50

SECTION-A

Note : (i) Answer all questions. (ii) Each question carries 2 marks

- 1. Define emphysema
- 2. Write the symptoms of cardiac arrest
- 3. What are the causes of hypothyroidism
- 4. Short note on vitamins
- 5. What is osteoporosis
- 6. Define anaemia
- 7. What are endocrine disorders
- 8 Write the symptoms of malaria
- 9. Mention the names of polio virus
- 10. Name the types of incisions

SECTION-B

Note : (i) Answer any 5 questions. (ii) Each question carries 6 marks

- 11. Write in detail about Diabetes mellitus.
- 12. Short non on coronary artery diseases.
- 13. Describe asthma and P.T. Management
- 14. Short note on P.M.E.
- 15. Explain developmental mile stones
- 16. Short note on Burns.
- 17. Explain CPR in detail.
- 18. Explain about OBESITY.

5x6=30

2x10=20

PHYSIOTHERAPY II YEAR PAPER II Orthopaedic And Neurology

TIME: 3 Hours

Max. Marks:50

SECTION-A

Note: (i) Answer all questions. (ii) Each question carries 2 marks

- 1. What is ankylosing spondylitis.
- 2. what are the clinical features of cervical spondylosis.
- 3. Mention upper limb splints
- 4. Write the types of nerve injuries
- 5. What is ataxia
- 6. Define sprain
- 7. What is tennis elbow
- 8. What is kyphosis.
- 9. What is genu recurvatum
- 10. What is the difference between UMN and LMN lesions

SECTION-B

Note : (i) Answer any 5 questions. (ii) Each question carries 6 marks

- 11. Write about motor neuron diseases and its PT Management.
- 12. Write briefly on I.V.D.P with PT Management.
- 13. Write briefly on Meniscal injuries of knee with PT management.
- 14. Write about PA Shoulder with PT Management.
- 15. Write about fracture with PT Management.
- 16. Write about Rheumatoid arthritis and its physiotherapy Management
- 17. Amputation Types, complications and PT Management.
- 18. Write a short notes on Hemiplegia

5x6=30

2x10=20

PHYSIOTHERAPY II YEAR PAPER III Electrotherapy

TIME:3 Hours

Max. Marks:50

SECTION-A

Note : (i) Answer all questions. (ii) Each question carries 2 marks

2x10=20

- 1. Write about conductors & Non-conductors of electricity.
- 2. Mention the physiological effects of heat
- 3. What is fuse
- 4. Write contra indications of US
- 5. Expand LASER and its uses.
- 6. Write the difference between low frequency & high frequency currents.
- 7. Write about different types of TENS
- 8. Write indications of IFT
- 9. Mention different techniques for applying wax bath.
- 10. What is Iontophoresis.

SECTION-B

Note : (i) Answer any 5 questions. (ii) Each question carries 6 marks

- 11. Write about SD curve.
- 12. Write in detail about I.F.T
- 13. Write briefly on infrared rays.
- 14. Write about techniques of application and physiological effects of SWD.
- 15. Write about electric shock in detail
- 16. Explain the physical effects and transmission of heat.
- 17. Write about US.
- 18. Write a short notes on Traction

5x6=30