Reading Material for
Physiotherapy Technique – II

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Preface

This book is crafted as a guide for aspiring and practicing physiotherapist assistants or physiotherapy technicians/aids, providing basic insights into complexities of this dynamic profession. The instructional materialsare created keeping in mind, the main objective of technical training under Punjab MedicalFaculty in Pakistan, which is to help an individual to master technical skills in the profession of physiotherapy.

As a physiotherapy technician, you are on the front lines of healthcare, working tirelesslyto restore and improve the functional abilities of your patients. This book aims to be yourcompanion on this rewarding journey, offering a blend of theoretical knowledge and practical skills essential for success in the field.

From foundational principles to advanced techniques, each chapter is designed to equipyou with the expertise needed to address a spectrum of musculoskeletal and neurologicalconditions. The integration of theoretical and practical knowledge to ensure that you not only understand the concepts but can apply them effectively in diverse clinical settings.

This book endeavors to keep you up-to-date with current practice, emerging technologies, and innovative approaches in technician physiotherapy.

Whether you are a student beginning your educational journey or a seasoned professional seeking to refine your skills, this book aims to serve as a valuable resource.As you delve into its pages, may you find inspiration, knowledge, and practical insights that empower you to make a meaningful impact in the lives of those you serve.

Best wishes on your pursuit of excellence in the field of technician physiotherapy.

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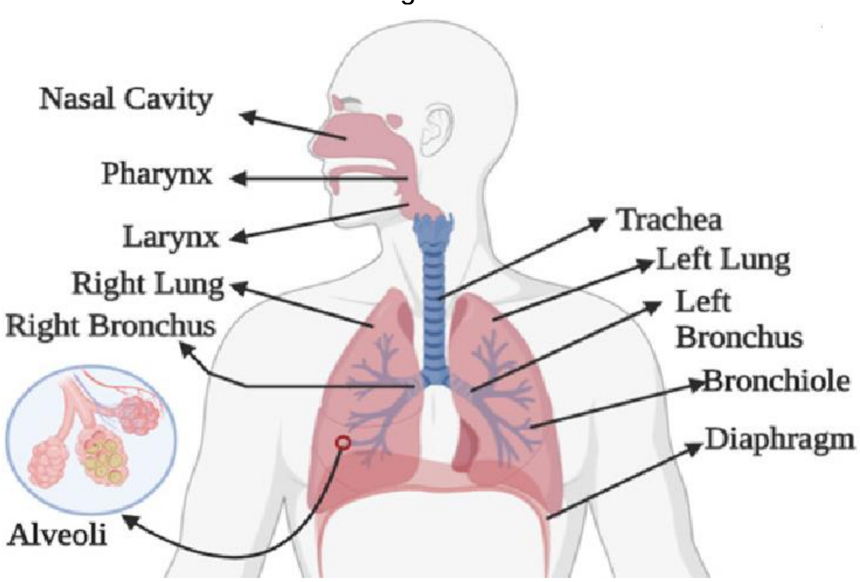

Nasal Cavity
Pharynx
Larynx
Right Lung
Right Bronchus
Alveoli
Trachea
Left Lung
Left
Bronchus
Bronchiole
Diaphragm

CHAPTER: 1

SPECIAL PHYSIOLOGY

1.1 Physical principles of resting membrane potential in nerve & muscle

The resting membrane potential in nerve and muscle cells is a crucial aspect of cellular physiology. It is primarily established and maintained through the selective permeability of the cell membrane to ions and the action of ion pumps and channels. The primary ions involved in establishing the resting membrane potential are sodium (Na+), potassium (K+), and chloride (Cl-).

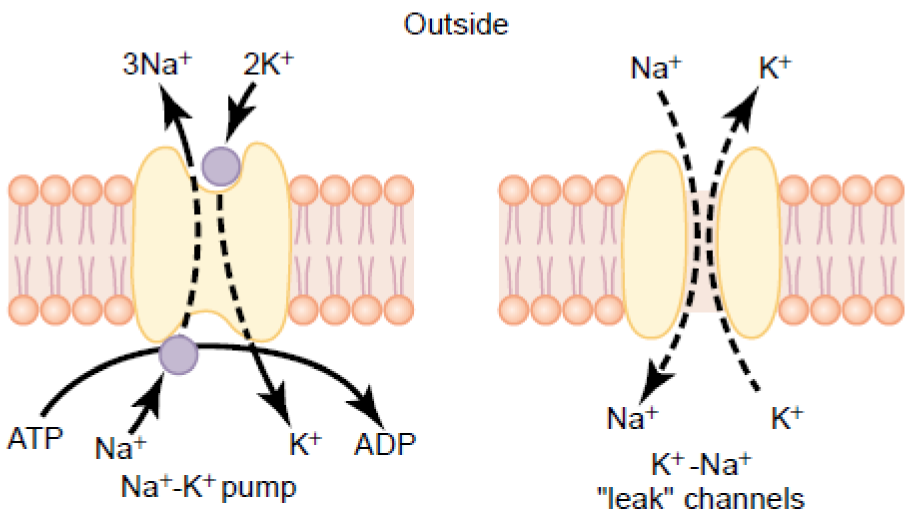


Figure 5–4

Functional characteristics of the Na^+-K^+ pump and of the K^+-Na^+ "leak" channels. ADP, adenosine diphosphate; ATP, adenosine triphosphate.

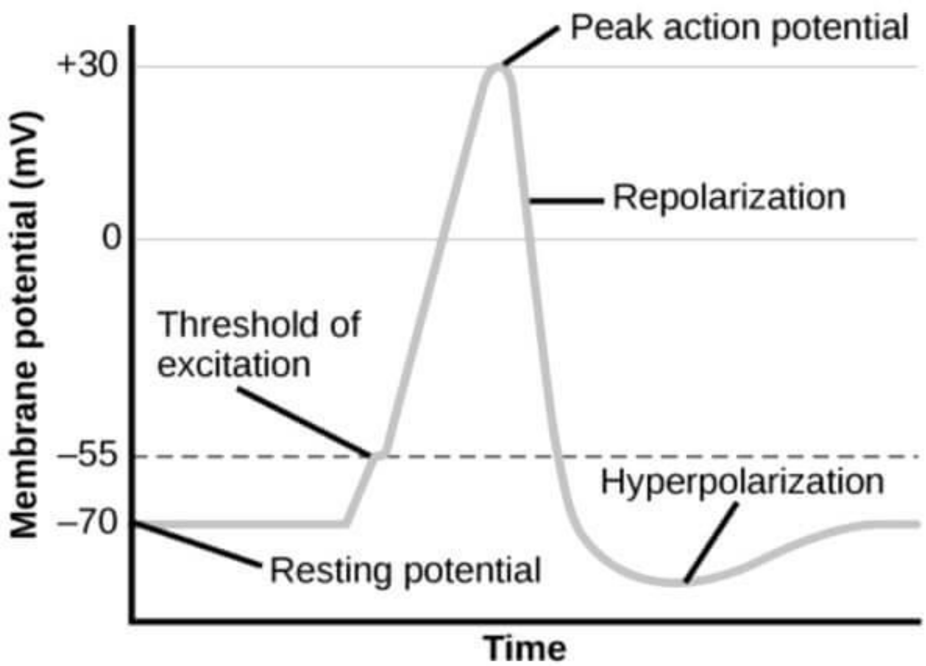
1.2 Action potential

An action potential is a brief and rapid change in the membrane potential of a neuron or muscle cell. It is a key process involved in the transmission of electrical signals within the nervous system and the contraction of muscle cells. The action potential is characterized by a sequence of depolarization and repolarization phases.

1. **Resting Membrane Potential:**

- The cell is at rest, maintaining a stable resting membrane potential (typically around -70 millivolts in neurons). At this stage, the voltage-gated ion channels are closed.

2. **Depolarization:**
   - A stimulus, such as a neurotransmitter binding to a receptor or a sensory input, triggers the opening of voltage-gated sodium (Na+) channels. Sodium ions rapidly enter the cell, causing a rapid increase in membrane potential (depolarization). If the threshold potential is reached (-55 to -50 mV in neurons), it triggers an all-or-nothing response, initiating the action potential.
3. **Rising Phase:**
   - Voltage-gated sodium channels continue to open, allowing a massive influx of sodium ions into the cell. The membrane potential becomes more positive, reaching a peak (around +30 mV).
4. **Repolarization:**
   - Voltage-gated sodium channels inactivate, and voltage-gated potassium (K+) channels open. Potassium ions move out of the cell, leading to a rapid repolarization of the membrane potential. The cell returns to a negative membrane potential.
5. **Hyperpolarization:**
   - In some cases, the membrane potential may briefly become more negative than the resting potential (hyperpolarization) before returning to the resting state. This hyperpolarization phase is due to the delayed closing of potassium channels.
6. **Refractory Period:**
   - The cell enters a refractory period during and after the action potential, during which it is less responsive to additional stimuli. This ensures that the action potential travels in one direction along the axon and prevents back-and-forth signaling.



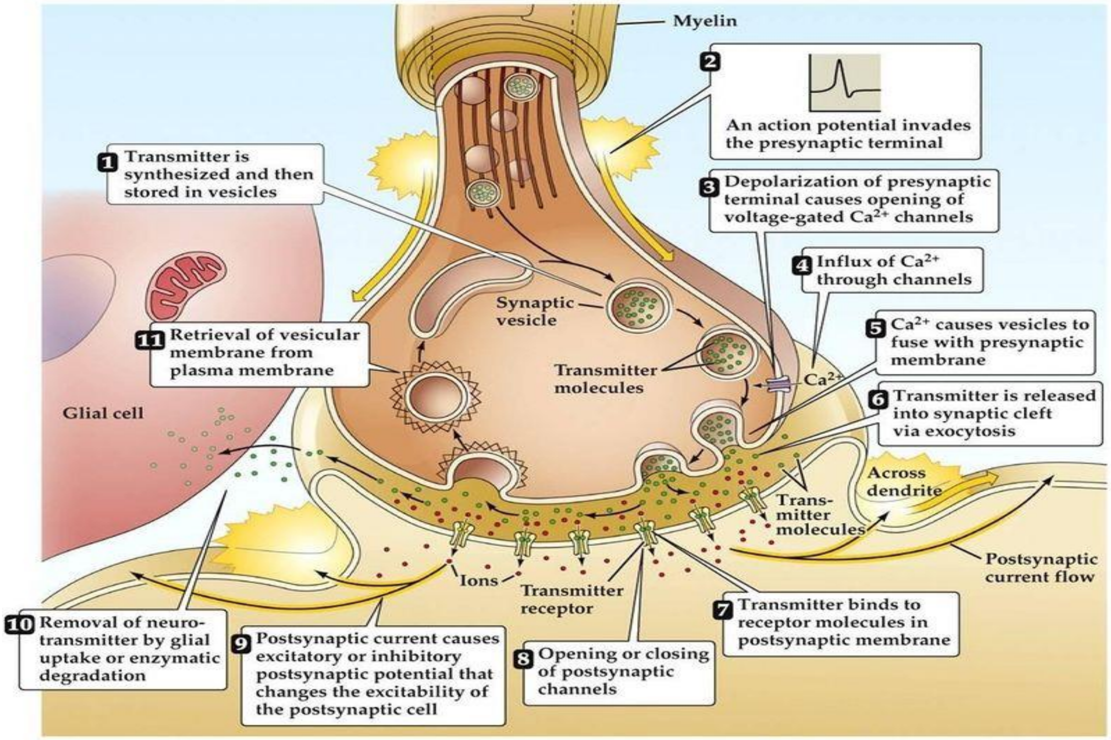
1.3 Physiology of nerve impulse Synaptic Transmission.

The physiology of a nerve impulse involves the transmission of signals between neurons through a process known as synaptic transmission. This complex process occurs at synapses, which are specialized junctions between neurons. The synaptic transmission can be divided into several key steps:

1. **Action Potential Generation:**
   - The nerve impulse begins with the generation of an action potential in the presynaptic neuron. The action potential is a brief, rapid change in membrane potential that travels down the axon of the neuron.
2. **Axon Terminal Depolarization:**
   - As the action potential reaches the axon terminal (presynaptic terminal), it depolarizes the membrane. This depolarization triggers the opening of voltage-gated calcium channels in the axon terminal.
3. **Calcium Influx:**

- Calcium ions (Ca^{2+}) rush into the axon terminal through the opened voltage-gated calcium channels. The increase in intracellular calcium concentration is a key event that triggers the release of neurotransmitters.

4. **Neurotransmitter Release:**
    - In response to the elevated calcium levels, synaptic vesicles containing neurotransmitters move to the presynaptic membrane and release their contents into the synaptic cleft. Neurotransmitters are chemical messengers that transmit signals from the presynaptic neuron to the postsynaptic neuron.
5. **Neurotransmitter Binding:**
    - Released neurotransmitters cross the synaptic cleft and bind to specific receptors on the postsynaptic membrane. This binding can lead to a change in the postsynaptic membrane potential.
6. **Postsynaptic Response:**
    - The binding of neurotransmitters to receptors on the postsynaptic membrane can result in either excitatory or inhibitory effects. Excitatory neurotransmitters, such as glutamate, often lead to depolarization and an increased likelihood of the postsynaptic neuron firing an action potential. Inhibitory neurotransmitters, such as GABA, typically induce hyperpolarization, making it less likely for the postsynaptic neuron to generate an action potential.
7. **Termination of Signal:**
    - Neurotransmitter effects are terminated through mechanisms such as reuptake into the presynaptic neuron, enzymatic degradation in the synaptic cleft, or diffusion away from the synapse.
8. **Postsynaptic Integration:**
    - Integration of excitatory and inhibitory signals at the postsynaptic neuron determines whether an action potential will be generated. If the combined effect is depolarizing and reaches the threshold, an action potential is triggered



1.4 Sympathetic system

The sympathetic system is often associated with the "fight or flight" response. It is activated in situations that require increased alertness, energy, and readiness to respond to stress or danger. Sympathetic neurons originate from the thoracic and lumbar regions of the spinal cord. Sympathetic activation leads to increased heart rate, dilation of the airways, mobilization of energy reserves, increased blood flow to skeletal muscles, and inhibition of digestive and reproductive functions. The sympathetic system causes pupillary dilation (mydriasis) to enhance vision in response to a potential threat.The sympathetic response is typically rapid and prepares the body for immediate action.

1.5 Parasympathetic system.

The parasympathetic system is associated with the "rest and digest" response. It is activated during periods of relaxation, recovery, and energy conservation. Parasympathetic neurons originate from the brainstem and the sacral region of the spinal cord. Parasympathetic activation slows down heart rate, constricts the airways, stimulates digestion, and promotes energy storage. The parasympathetic system causes pupillary constriction (miosis) under normal conditions.

1.6 Sensory system various types of sensations, their pathways and brain centers.

The sensory system is responsible for processing and transmitting information from the external environment and the body's internal state to the brain. Different types of sensations are detected by specialized sensory receptors, and these signals are transmitted through specific pathways to reach dedicated brain centers for processing. Here are some key types of sensations, their pathways, and the associated brain centers:

1. Vision

2. Hearing (Audition)

3. Taste (Gustation)

4. Smell (Olfaction)

5. Touch and Pressure

6. Temperature Sensation

7. Proprioception (Body Position)

8. Pain Sensation

9. Balance and Spatial Orientation

10. Kinesthesia (Body Movement)

The processing of sensory information involves complex neural pathways and integration in various brain regions. The thalamus often serves as a relay station for sensory signals before they are directed to their respective cortical areas for further processing and interpretation.

1.7 Special senses.

Special senses refer to the sensory systems that are more specialized and provide distinct perceptions related to specific organs. The special senses include vision (eyes), hearing (ear), taste (gustation), and smell (olfaction).

1. Vision (Eyes):

- **Sensory Receptors:** Photoreceptor cells (rods and cones) in the retina.
- **Function:** Detection of light and color.

- **Pathway:** Light enters the eye, is focused by the cornea and lens onto the retina, where photoreceptor cells convert light into electrical signals. The optic nerve carries these signals to the brain.

2. Hearing (Ear):

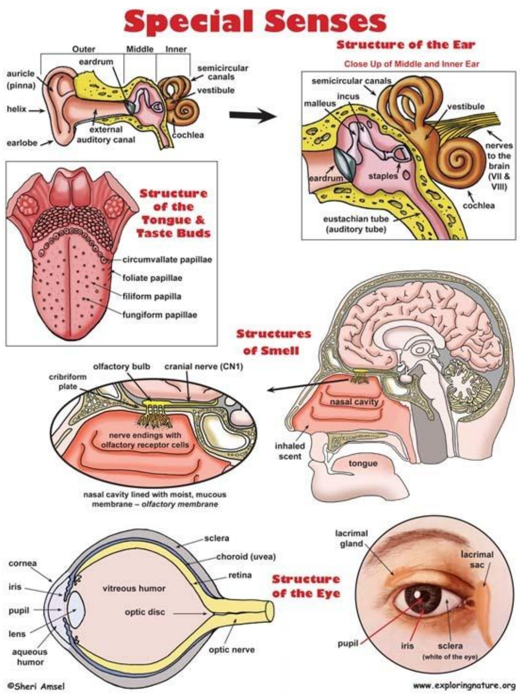
- **Sensory Receptors:** Hair cells in the cochlea of the inner ear.
- **Function:** Detection of sound waves and conversion into electrical signals.
- **Pathway:** Sound waves enter the ear canal, vibrate the eardrum, and are transmitted to the cochlea, where hair cells convert the vibrations into electrical signals. The auditory nerve carries these signals to the brain.

3. Taste (Gustation):

- **Sensory Receptors:** Taste buds on the tongue and in the oral cavity.
- **Function:** Detection of chemical compounds in food, providing sensations of sweet, salty, sour, bitter, and umami.
- **Pathway:** Facial, glossopharyngeal, and vagus nerves transmit taste signals to the medulla oblongata, thalamus, and then to the primary gustatory cortex in the insula.

4. Smell (Olfaction):

- **Sensory Receptors:** Olfactory receptors in the nasal epithelium.
- **Function:** Detection of odor molecules in the air.
- **Pathway:** Olfactory nerve fibers transmit signals to the olfactory bulb, which projects to the olfactory cortex, including the piriform cortex and orbitofrontal cortex.



1.8 Motor system pyramidal and Extrapyramidal.

The motor system in the human body is responsible for controlling voluntary and involuntary movements. It can be broadly classified into two main components: the pyramidal system (also called the corticospinal or direct motor pathway) and the extrapyramidal system. These systems work together to coordinate and regulate motor functions.

1. Pyramidal System (Corticospinal Tract):

- **Origin:** The pyramidal system originates in the primary motor cortex, which is located in the precentral gyrus of the frontal lobe.
- **Pathway:**

Pyramidal neurons project through the internal capsule and form the pyramidal tracts. The fibers cross over (decussate) at the medullary pyramids in the brainstem, leading to contralateral motor control. The fibers continue as the lateral corticospinal tract (for limb control) and the anterior corticospinal tract (for axial and girdle muscles).

- **Function:** The pyramidal system is primarily involved in the direct control of voluntary, skilled, and fine motor movements. It is essential for precise and coordinated movements.

2. Extrapyramidal System:

The extrapyramidal system is a complex network of neural pathways involved in motor control, but it does not pass through the pyramids of the medulla like the corticospinal tract. It includes several tracts and nuclei, such as the rubrospinal tract, reticulospinal tract, vestibulospinal tract, and others.

Posture and Balance: Some extrapyramidal pathways contribute to the maintenance of posture and balance.

Automatic Movements: The extrapyramidal system is involved in automatic and reflexive movements.

Coarse Movements: It contributes to larger, less precise movements, such as walking.

Origin: Neurons involved in the extrapyramidal system originate in various parts of the brain, including the brainstem and certain subcortical nuclei.

3. Basal Ganglia:

- While not a direct motor pathway, the basal ganglia is often considered part of the extrapyramidal system due to its role in motor control. It includes structures like the striatum, globus pallidus, and substantia nigra. The basal ganglia is involved in planning, initiation, and modulation of voluntary movements, as well as in procedural learning and cognitive functions related to motor control.

1.9 Cerebellum RAS. Sleep, Higher brain functions, EEG

Cerebellum:

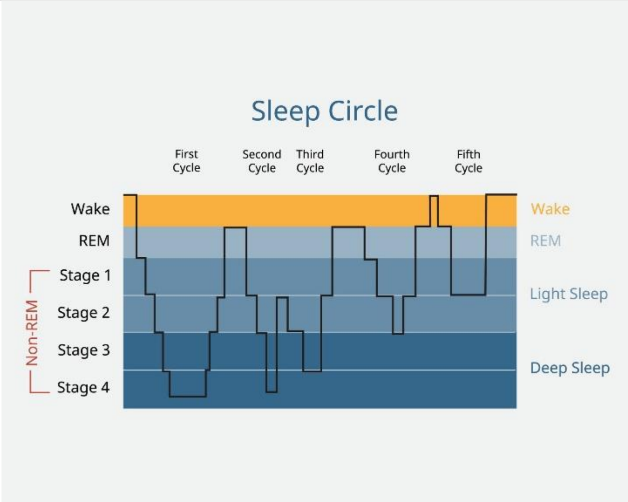
- **Function:** The cerebellum is primarily involved in the coordination and regulation of voluntary movements. It plays a crucial role in motor control, precision, and timing of movements. The cerebellum is located at the back of the brain, below the cerebrum, and is connected to the brainstem.
- **Cerebellar Ataxia:** Damage or dysfunction of the cerebellum can result in ataxia, a condition characterized by impaired coordination and balance.

2. Reticular Activating System (RAS):

- **Function:** The Reticular Activating System is a network of neurons in the brainstem that regulates arousal, attention, and sleep-wake transitions. It plays a critical role in maintaining wakefulness and alertness. Disruption of the RAS can lead to conditions such as coma or altered states of consciousness.
- **Influence on Higher Brain Functions:** The RAS influences higher cognitive functions by modulating the level of consciousness and attention.

3. Sleep:

- **Stages of Sleep:** Sleep is a complex physiological process with different stages, including non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. Sleep is essential for memory consolidation, emotional regulation, and overall cognitive functioning. It is also crucial for physical restoration and maintenance of health.
- **Circadian Rhythms:** The sleep-wake cycle is influenced by circadian rhythms, regulated by the internal biological clock.



4. Higher Brain Functions:

- **Cognition:** Higher brain functions encompass various cognitive processes, including perception, attention, memory, language, problem-solving, and executive functions. Higher brain functions are primarily associated with the cerebral cortex, which is highly developed in humans. Different regions of the cortex play specialized roles in cognitive processes.

5. Electroencephalogram (EEG):

- EEG measures electrical activity in the brain by recording the patterns of neural impulses generated by the firing of neurons. EEG recordings reveal different types of brain waves, including alpha, beta, theta, and delta waves, each associated with different states of consciousness and mental activity. EEG is used in clinical settings to diagnose and monitor various neurological conditions, including epilepsy, sleep disorders, and brain injuries.

1.10 Functions of Hypothalamus.

The hypothalamus is a small but crucial region located at the base of the brain, below the thalamus and above the pituitary gland. It serves as a vital link between the nervous system and the endocrine system, playing a central role in regulating various physiological processes and maintaining homeostasis. The functions of the hypothalamus are diverse and include:

1. **Control of Autonomic Nervous System:**
    - The hypothalamus regulates autonomic functions such as heart rate, blood pressure, respiratory rate, and digestive processes. It helps maintain the body's internal balance.
2. **Endocrine Regulation:**
    - The hypothalamus controls the pituitary gland, which is often referred to as the "master gland." It releases hormones that stimulate or inhibit the release of hormones from the pituitary gland, influencing the activity of other endocrine glands throughout the body.
3. **Temperature Regulation:**
    - The hypothalamus acts as the body's thermostat, monitoring core body temperature and initiating responses to regulate it. This includes mechanisms like sweating, shivering, and adjustments to blood flow.
4. **Thirst and Hunger Regulation:**
    - The hypothalamus regulates sensations of hunger and thirst. It integrates signals from the digestive system and the bloodstream to determine when the body needs food or fluids.
5. **Circadian Rhythms:**
    - The hypothalamus is involved in the regulation of circadian rhythms, influencing the sleep-wake cycle and other rhythmic physiological processes. The suprachiasmatic nucleus (SCN) in the hypothalamus plays a key role in the body's internal clock.
6. **Emotional Responses:**

- The hypothalamus is involved in emotional responses and behaviors. It plays a role in the expression of emotions such as fear, pleasure, and anger.

7. **Sexual Function:**

- The hypothalamus is essential for the regulation of reproductive behaviors and the release of hormones that influence sexual development, maturation, and fertility.

8. **Fluid and Electrolyte Balance:**

- The hypothalamus helps regulate the balance of fluids and electrolytes in the body by influencing kidney function and fluid intake.

9. **Stress Response:**

- In response to stress, the hypothalamus activates the sympathetic nervous system and the release of stress hormones, such as cortisol, to prepare the body for a "fight or flight" response.

10. **Behavioral and Motivational Functions:**

- The hypothalamus is involved in various behavioral and motivational functions, including motivation for eating, drinking, and other basic survival behaviors.

1.11 Physiology skeletal muscle and smooth muscle

Skeletal and smooth muscles are two types of muscles in the human body with distinct characteristics and functions.

1. Skeletal Muscle:

Skeletal muscles are under voluntary control, meaning their contraction is consciously initiated and controlled by the somatic nervous system. Skeletal muscles are attached to bones by tendons and are responsible for movements of the skeleton. Contraction occurs through the sliding filament theory. Muscle fibers contain myofibrils composed of actin and myosin filaments. Contraction is initiated by the release of calcium ions, leading to the interaction between actin and myosin. Motor neurons release acetylcholine at the neuromuscular junction, initiating muscle fiber contraction. The motor end plate is the specialized region of the muscle cell membrane where the neuromuscular junction occurs. Skeletal muscles can experience fatigue due to depletion of energy reserves, accumulation of metabolic byproducts, and central nervous system factors. Skeletal muscle fibers have a striated appearance due to the organization of myofibrils and sarcomeres.

2. Smooth Muscle:

Smooth muscles are under involuntary control, meaning their contraction is not consciously controlled. Autonomic nervous system signals regulate smooth muscle activity. Smooth muscles are found in the walls of internal organs, blood vessels, and other structures. They lack the striated appearance seen in skeletal muscle. Smooth muscles are generally more fatigue-resistant compared to skeletal muscles. Smooth muscle cells lack the striations seen in skeletal muscle due to the different organization of contractile proteins.

1.12 Physiology of cardiac muscle

The neurophysiology of cardiac muscle involves the electrical and mechanical processes that regulate the contraction of the heart. Unlike skeletal muscles, which are under voluntary control, cardiac muscle contraction is involuntary and regulated by the cardiac conduction system. Cardiac muscle, like skeletal muscle, is made up of sarcomeres that allow for contractility. However, unlike skeletal muscle, cardiac muscle is under involuntary control. The cardiac muscle is responsible for the contractility of the heart and, therefore, the pumping action.

1.13 EMG

EMG stands for Electromyography, and it is a diagnostic technique used to evaluate the electrical activity of muscles. This test provides information about the health and functioning of muscles and the nerves that control them. EMG is used to assess the electrical activity of muscles and the corresponding nerve cells (motor neurons) that control them. It helps in diagnosing and monitoring various neuromuscular disorders, such as muscle disorders, nerve disorders, and disorders affecting the junction between nerves and muscles.

Nerve Conduction Studies (NCS):

Often performed in conjunction with EMG. NCS involves applying small electrical shocks to nerves and recording the electrical signals that result. This helps evaluate the speed and strength of signals traveling along nerves.

Indications for EMG:

- Muscle Weakness
- Muscle Pain or Cramping
- Numbness or Tingling
- Motor Neuron Diseases
- Radiculopathy

EMG is a valuable tool for diagnosing and monitoring a variety of neuromuscular conditions. It provides real-time information about the electrical activity of muscles and nerves, aiding in the identification of abnormalities and guiding further diagnostic and treatment decisions

1.14 Physiology of respiration

Respiration is the process by which living organisms exchange gases with their environment, involving the intake of oxygen (O_2) and the release of carbon dioxide (CO_2). In humans, respiration is a complex physiological process that can be divided into two main components: external respiration and internal respiration.

External Respiration (Breathing):

1. Ventilation:

- **Inspiration (Inhalation):**

- The diaphragm and external intercostal muscles contract. Thoracic cavity volume increases, and intrapulmonary pressure decreases. Air is drawn into the lungs to equalize pressure.

- **Expiration (Exhalation):**

The diaphragm and external intercostal muscles relax. Thoracic cavity volume decreases, and intrapulmonary pressure increases. Air is forced out of the lungs.

2. Gas Exchange in the Lungs (Pulmonary Gas Exchange):

Oxygen from inhaled air diffuses across the alveolar-capillary membrane into the pulmonary capillaries. Carbon dioxide produced by cellular metabolism diffuses from the blood into the alveoli to be exhaled.

3. Transport of Gases in the Blood:

Oxygen binds to hemoglobin in red blood cells, forming oxyhemoglobin. Carbon dioxide is transported in the blood as dissolved CO2, bicarbonate ions, and carbamino compounds.

Internal Respiration:

1. Systemic Gas Exchange:

Oxygen is released from oxyhemoglobin in systemic capillaries and diffuses into tissues. Carbon dioxide produced in tissues diffuses into systemic capillaries.

2. *Cellular Respiration:*

Oxygen is used in mitochondria during cellular respiration to produce ATP (adenosine triphosphate) energy. Carbon dioxide is generated as a byproduct.

3. *Gas Transport in Tissues:*

Oxygen is transported from systemic capillaries to tissues. Carbon dioxide is transported from tissues to systemic capillaries.

1.15 Physiology of cardiovascular system

The cardiovascular system, also known as the circulatory system, is a complex network of structures and processes responsible for the transportation of blood, oxygen, nutrients, hormones, and waste products throughout the body. The physiology of the cardiovascular system involves the heart, blood vessels, and blood, and it plays a crucial role in maintaining homeostasis and supporting the functions of various organs and tissues.

1. Heart Physiology:

- **Cardiac Cycle:**

The heart undergoes a rhythmic cycle of contraction (systole) and relaxation (diastole). Atria contract simultaneously, followed by ventricular contraction. Blood is pumped from the atria to the ventricles and then into the pulmonary and systemic circulations.

- **Heart Chambers:**

Four chambers include the left and right atria (receiving chambers) and the left and right ventricles (pumping chambers).

- **Heart Valves:**

Atrioventricular valves (tricuspid and bicuspid/mitral) separate atria from ventricles. Semilunar valves (aortic and pulmonary) separate ventricles from major arteries.

- **Conduction System:**

The sinoatrial (SA) node initiates the electrical impulse, followed by the atrioventricular (AV) node, bundle of His, bundle branches, and Purkinje fibers. The conduction system regulates the heart's rhythm and ensures coordinated contractions.

- **Cardiac Output:**

Cardiac output is the volume of blood pumped by the heart per minute. It is the product of heart rate (beats per minute) and stroke volume (volume of blood ejected per beat).

2. Blood Vessel Physiology:

- **Arteries:**

Carry oxygenated blood (except for the pulmonary artery) away from the heart to the body. Have thick, elastic walls to withstand high pressure during ventricular contraction.

- **Veins:**

Carry deoxygenated blood (except for the pulmonary veins) toward the heart. Contain valves to prevent backflow of blood.

- **Capillaries:**

Microscopic vessels where exchange of oxygen, nutrients, and waste products occurs between blood and tissues. Walls are thin, allowing for diffusion.

- **Blood Pressure:**

The force exerted by blood against the walls of arteries. Systolic pressure is the maximum pressure during ventricular contraction, while diastolic pressure is the minimum pressure during relaxation.

3. Blood Physiology:

- **Composition:**

Plasma (fluid matrix), red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes). Plasma contains water, electrolytes, proteins, hormones, and waste products.

- **Oxygen Transport:**

Hemoglobin in red blood cells binds with oxygen in the lungs and releases it in tissues.

- **Carbon Dioxide Transport:**

Carbon dioxide is carried in the blood as dissolved CO_2, bicarbonate ions, and carbamino compounds.

- **Blood Clotting:**

Platelets and clotting factors prevent excessive bleeding when blood vessels are damaged.

4. Regulatory Mechanisms:

- **Autonomic Nervous System:**

Sympathetic stimulation increases heart rate and contractility. Parasympathetic stimulation (vagus nerve) decreases heart rate.

- **Baroreceptor Reflex:**

Baroreceptors in arteries detect changes in blood pressure and signal adjustments to maintain homeostasis.

- **Chemoreceptor Reflex:**

Chemoreceptors in the carotid and aortic bodies sense changes in blood O_2, CO_2, and pH levels, influencing respiratory and cardiovascular function.

1.16 Physiology Endocrine GIT

The gastrointestinal tract (GIT), also known as the digestive system, plays a crucial role in the digestion and absorption of nutrients, as well as the elimination of waste from the body. The physiology of the GIT involves various processes that take place from the moment food is ingested until its residues are expelled. Here are key aspects of the GIT physiology:

1. Ingestion is the process of taking food and liquids into the mouth. Function is to breaks down large pieces of food into smaller particles, making it easier for digestion.

2. Digestion:

- **Mechanical Digestion:**

Chewing (Mastication) is Breaks down food into smaller pieces in the mouth. Peristalsis is Wave-like muscle contractions that move food through the digestive tract.

- **Chemical Digestion:**

Enzymes, such as amylase, lipase, and protease, break down carbohydrates, fats, and proteins, respectively. Hydrochloric acid in the stomach helps break down proteins and activates digestive enzymes.

3. Absorption:

- **Small Intestine:**

Most nutrient absorption occurs in the small intestine (duodenum, jejunum, and ileum). Villi and Microvilli has increase surface area for absorption. Transport Mechanisms includes active transport, passive diffusion, and facilitated diffusion move nutrients into the bloodstream.

- **Large Intestine:**

The large intestine absorbs water and electrolytes, forming feces. Bacteria in the colon break down undigested carbohydrates, producing gases and certain vitamins.

4. Motility:

- Peristalsis is the Rhythmic contractions that propel food through the digestive tract. Controlled by the enteric nervous system and hormonal signals. Segmentation is Mixing contractions that aid in mechanical digestion.

5. Secretion:

- **Salivary Glands:** Secrete saliva containing enzymes (e.g., amylase) to initiate carbohydrate digestion in the mouth.
- **Stomach:** Gastric glands secrete gastric juice with hydrochloric acid and enzymes (e.g., pepsin) for protein digestion.
- **Pancreas:** Releases pancreatic enzymes (lipase, amylase, protease) into the small intestine for digestion.
- **Liver:** Produces bile, stored in the gallbladder, to emulsify fats for better digestion and absorption.

6. Hormonal Regulation:

- **Gastrointestinal Hormones:**
    - **Gastrin:** Stimulates gastric acid secretion.
    - **Secretin:** Stimulates pancreas to release bicarbonate.
    - **Cholecystokinin (CCK):** Stimulates gallbladder contraction and pancreatic enzyme release.
    - **Ghrelin:** Stimulates appetite.

1.17 Physiology of urinary system

The urinary system, also known as the renal system or excretory system, plays a vital role in maintaining the body's internal environment by regulating fluid balance, electrolytes, and removing waste products. Here are key aspects of the physiology of the urinary system:

1. Regulation of Water and Electrolyte Balance:

Antidiuretic Hormone (ADH) is released by the pituitary gland in response to low blood volume or high osmolality. Increases water reabsorption in the collecting ducts, reducing urine output.

Aldosterone is released by the adrenal glands in response to low blood pressure or low sodium levels. Increases sodium reabsorption in the distal tubules and collecting ducts, promoting water retention.

2. Acid-Base Balance:

Kidneys can reabsorb and regenerate bicarbonate ions to help regulate blood pH

3. Erythropoietin (EPO):

Produced by the kidneys in response to low oxygen levels in the blood. Stimulates the production of red blood cells in the bone marrow.

7. Calcitriol Synthesis:

The kidneys convert vitamin D into its active form, calcitriol, which is essential for calcium absorption in the intestines.

8. Micturition Reflex:

Controlled by spinal reflexes and higher brain centers. It involves the detrusor muscle and sphincters for controlled urination

1.18 Physiology of blood

The physiology of blood involves the study of the components and functions of blood, a vital connective tissue in the human body. Blood performs various crucial roles, including transportation of gases, nutrients, hormones, waste products, and immune cells. Here are key aspects of blood physiology:

1. Blood Composition:

- **Plasma:**
    - Liquid component of blood, comprising water, electrolytes, proteins, hormones, and waste products.
    - Major proteins include albumin, globulins, and fibrinogen.
- **Formed Elements:**
    - **Red Blood Cells (Erythrocytes):**
        - Contain hemoglobin for oxygen transport.
        - Lack a nucleus and most organelles.
    - **White Blood Cells (Leukocytes):**

- Play a role in the immune system's defense against infections.
- Types include neutrophils, lymphocytes, monocytes, eosinophils, and basophils.

- **Platelets (Thrombocytes):**
  - Involved in blood clotting and hemostasis.
  - Fragments of larger cells called megakaryocytes.

2. Blood Functions:

- **Transportation:**
  - Oxygen is carried by hemoglobin in red blood cells.
  - Nutrients, hormones, and waste products are transported in the plasma.
- **Regulation:**
  - Blood helps regulate pH through buffer systems.
  - Maintains electrolyte balance.
- **Protection:**
  - White blood cells defend against pathogens and participate in immune responses.
  - Platelets and clotting factors prevent excessive bleeding.

3. Physiology of immune system

The immune system is a complex and highly orchestrated network of cells, tissues, and organs that work together to defend the body against pathogens, such as bacteria, viruses, fungi, and parasites. The physiology of the immune system involves various components and processes that contribute to its ability to recognize and eliminate foreign invaders while maintaining tolerance to the body's own cells. Here are key aspects of the physiology of the immune system:

1. Components of the Immune System:

- **White Blood Cells (Leukocytes):**
    - **Granulocytes:** Neutrophils, eosinophils, basophils.
    - **Agranulocytes:** Lymphocytes (T cells, B cells, NK cells) and monocytes (macrophages, dendritic cells).
- **Lymphoid Organs:**
    - **Primary Lymphoid Organs:** Bone marrow (B cell development) and thymus (T cell development).
    - **Secondary Lymphoid Organs:** Lymph nodes, spleen, tonsils, and Peyer's patches in the small intestine.

2. Innate Immunity:

- **Physical and Chemical Barriers:**
    - Skin, mucous membranes, stomach acid, and enzymes create barriers to pathogen entry.
- **Phagocytosis:**
    - Neutrophils and macrophages engulf and digest pathogens and cellular debris.
- **Inflammation:**
    - Redness, heat, swelling, and pain are signs of the inflammatory response.
    - Attracts immune cells to the site of infection or injury.
- **Natural Killer (NK) Cells:**
    - Recognize and destroy infected or abnormal host cells.

3. Adaptive Immunity:

- **Humoral Immunity (B Cells):**

- B cells produce antibodies (immunoglobulins) that circulate in the blood and lymph.
- Antibodies bind to pathogens and neutralize them or mark them for destruction by other immune cells.

- **Cellular Immunity (T Cells):**
  - T cells include helper T cells, cytotoxic T cells, and regulatory T cells.
  - Helper T cells coordinate immune responses, cytotoxic T cells kill infected cells, and regulatory T cells maintain immune tolerance.
- **Antigen Presentation:**
  - Antigen-presenting cells (APCs), such as dendritic cells and macrophages, display antigens to T cells to initiate immune responses.
- **Memory and Specificity:**
  - Immunological memory allows the immune system to respond more rapidly upon re-exposure to a previously encountered pathogen.
  - Immune responses are highly specific to particular antigens.

1.19 Physiology of bones and Ca ++metabolism.

The physiology of bone and calcium metabolism involves the dynamic processes that regulate the structure and function of bones, as well as the homeostasis of calcium in the body. Bones serve as structural support, protect vital organs, and act as reservoirs for calcium, a crucial mineral involved in various physiological functions. Here are key aspects of bone physiology and calcium metabolism:

1. Bone Structure and Composition:

- **Bone Tissue:**
  - Osseous tissue is composed of mineralized extracellular matrix, primarily hydroxyapatite (calcium phosphate crystals), collagen fibers, and bone cells.

- **Types of Bone:**
    - **Compact Bone:** Dense and forms the outer layer of bones.
    - **Spongy (Cancellous) Bone:** Porous and found in the inner regions of bones.
- **Bone Cells:**
    - **Osteoblasts:** Synthesize and secrete bone matrix.
    - **Osteocytes:** Mature bone cells embedded in the matrix.
    - **Osteoclasts:** Responsible for bone resorption and remodeling.

2. Bone Formation and Remodeling:

- **Ossification (Bone Formation):**
    - Intramembranous ossification (formation of flat bones) and endochondral ossification (formation of long bones).
- **Bone Remodeling:**
    - Continuous process involving bone resorption by osteoclasts and bone formation by osteoblasts.
    - Maintains bone strength, repairs microdamage, and regulates calcium levels.

3. Calcium Homeostasis:

- **Functions of Calcium:**
    - Structural component of bones and teeth.
    - Essential for muscle contraction, blood clotting, nerve impulse transmission, and cellular processes.
- **Regulation of Calcium Levels:**

- **Parathyroid Hormone (PTH):**
  - Released by the parathyroid glands in response to low blood calcium.
  - Stimulates osteoclast activity, enhances calcium absorption in the intestines, and promotes calcium reabsorption in the kidneys.
- **Calcitonin:**
  - Released by the thyroid gland in response to high blood calcium.
  - Inhibits osteoclast activity, reducing bone resorption.
- **Vitamin D:**
  - Necessary for the absorption of dietary calcium in the intestines.
  - Converted to its active form (calcitriol) in the kidneys.

4. Calcium Absorption:

- **Intestinal Absorption:**
  - Active transport of calcium occurs in the duodenum and jejunum.
  - Facilitated by calcitriol (active vitamin D).

5. Calcium Storage:

- **Bone Reservoir:**
  - Bones store about 99% of the body's calcium.
  - Mobilized during periods of low dietary calcium or increased demand.

6. Physiology of Exercise.

The physiology of exercise involves understanding how the body responds and adapts to physical activity and the various physiological processes that occur during exercise. Exercise can range from aerobic activities like running and cycling to resistance training such as weightlifting. Here are key aspects of the physiology of exercise:

1. Energy Systems:

- **ATP-PCr System (Phosphagen System):**
    - Immediate energy source for short bursts of high-intensity activity.
    - Utilizes stored ATP and phosphocreatine (PCr) for energy.
- **Glycolytic System (Anaerobic Glycolysis):**
    - Utilizes glucose/glycogen to produce ATP.
    - Provides energy for moderate-intensity activities of short to medium duration.
- **Oxidative System (Aerobic Metabolism):**
    - Primary source of ATP during prolonged, lower-intensity activities.
    - Relies on oxygen to metabolize carbohydrates, fats, and, to some extent, proteins.

2. Cardiovascular System:

- **Heart Rate (HR) and Cardiac Output (CO):**
    - Increase in response to exercise to deliver more oxygen and nutrients to working muscles.
- **Blood Pressure:**
    - Systolic blood pressure increases with exercise intensity, allowing for increased blood flow to muscles.
- **Stroke Volume:**
    - Volume of blood ejected by the heart with each contraction.
    - Increases with exercise, contributing to increased cardiac output.

- **Vasodilation:**
    - Blood vessels in active muscles dilate to enhance blood flow.

3. Respiratory System:

- **Ventilation (Breathing Rate):**
    - Increases to supply more oxygen to the blood and remove carbon dioxide.
- **Oxygen Uptake (VO2):**
    - Increases with exercise intensity, representing the amount of oxygen utilized by the body.
- **Respiratory Rate and Tidal Volume:**
    - Increase to meet the oxygen demand of exercising muscles.

4. Muscular System:

- **Muscle Contraction:**
    - Motor units are recruited based on the force required.
    - Fast-twitch fibers are recruited for high-intensity activities.
- **Lactic Acid Production:**
    - Generated during anaerobic glycolysis.
    - Accumulation can lead to muscle fatigue.
- **Mitochondrial Adaptations:**
    - Increased number and efficiency of mitochondria in response to aerobic training.

5. Temperature Regulation:

- **Thermoregulation:**

- Sweating and increased blood flow to the skin help dissipate heat during exercise.
- Cooling mechanisms prevent overheating.

6. Endocrine System:

- **Hormone Release:**
    - Exercise triggers the release of hormones such as adrenaline, cortisol, and growth hormone.
    - These hormones regulate metabolism, energy utilization, and muscle growth.

7. Metabolic Adaptations:

- **Substrate Utilization:**
    - Shifts in the utilization of carbohydrates and fats depending on exercise intensity and duration.
- **EPOC (Excess Post-exercise Oxygen Consumption):**
    - Oxygen consumption remains elevated after exercise to restore metabolic balance.

8. Neuromuscular Coordination:

- **Motor Unit Recruitment:**
    - Improved coordination and efficiency with training.
- **Proprioception:**
    - Enhanced awareness and control of body position and movement.

9. Adaptations to Training:

- **Cardiovascular Adaptations:**

- Increased stroke volume, cardiac output, and capillarization.
- **Muscular Adaptations:**
- Hypertrophy (muscle growth) and increased endurance.
- **Metabolic Adaptations:**
- Improved energy production and substrate utilization.

1.20 Metabolism. Diet & Nourishment especially in handicapped & paralyzed individuals

Individuals with disabilities, including those who are handicapped or paralyzed, may face unique challenges related to metabolism, diet, and nourishment. It's important to consider their specific needs and circumstances to ensure they receive adequate nutrition and support. Here are some considerations for metabolism, diet, and nourishment in individuals with disabilities:

1. Metabolism:

- **Basal Metabolic Rate (BMR):**

Individuals with limited mobility may have a lower BMR due to reduced muscle mass. Adaptations in diet and physical activity should consider metabolic changes.

- **Physical Activity Levels:**

Adjustments in energy intake based on reduced physical activity. Tailor caloric needs to the individual's abilities and daily activities.

2. Dietary Considerations:

- **Nutrient-Rich Diet:**

Emphasize nutrient-dense foods to meet nutritional needs despite potential reduced caloric requirements.

- **Protein Intake:**

Adequate protein is essential for maintaining muscle mass and supporting recovery. Consider protein sources that align with any dietary restrictions or preferences.

- **Calcium and Vitamin D:**

Individuals with limited mobility may have reduced exposure to sunlight, impacting vitamin D synthesis. Adequate calcium and vitamin D intake is crucial for bone health.

- **Fiber:**
  - Promote fiber-rich foods to support digestive health, especially if mobility issues contribute to sedentary behavior.
- **Hydration:**
  - Ensure sufficient fluid intake, as individuals with disabilities may face challenges in accessing fluids independently.
- **Meal Timing:**
  - Consider meal timing and spacing to accommodate any assistance required and prevent long periods without nourishment.

ELECTROLYTE PHYSIOLOGY, WATER AND ELECTROLYTE BALANCE PH REGULATION:

Electrolyte physiology, water balance, and pH regulation are essential aspects of the body's homeostasis, ensuring that internal conditions remain within a narrow and optimal range.

1. Electrolyte Physiology:

Electrolytes are ions with an electric charge, including cations (positively charged) and anions (negatively charged). Common electrolytes include sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), and phosphate (PO_4^{3-}). Electrolyte levels are tightly regulated by various organs, particularly the kidneys.

2. Water Balance:

Water is essential for various physiological processes, including digestion, nutrient transport, temperature regulation, and waste elimination.

- Ingested fluids (beverages and foods) and metabolic water produced during cellular respiration.
- **Thirst Mechanism:** Stimulated by an increase in blood osmolality or a decrease in blood volume.
- **Antidiuretic Hormone (ADH):** Released by the pituitary gland in response to dehydration, reducing urine output and conserving water.
- **Renin-Angiotensin-Aldosterone System (RAAS):** Activated in response to low blood volume, promoting water and sodium retention.

3. pH Regulation:

- pH represents the acidity or alkalinity of a solution, with a pH of 7 considered neutral, below 7 acidic, and above 7 alkaline. Maintaining proper pH is crucial for enzyme function, protein structure, and various biochemical reactions.
- **Buffers:**
- Bicarbonate Buffer System: Acts in the extracellular fluid to regulate blood pH. Phosphate Buffer System: Operates in the intracellular fluid and renal tubules. Protein Buffer System: Proteins can act as buffers by donating or accepting hydrogen ions.
- **Respiratory Regulation:**
- CO2 Elimination: Increased respiratory rate eliminates excess carbon dioxide, reducing acidity. Hypoventilation/Hyperventilation: Alters blood pH by changing CO2 levels.
- **Renal Regulation:**
- Hydrogen Ion Secretion: The kidneys excrete hydrogen ions and reabsorb bicarbonate to regulate pH. Ammonia Production: The kidneys can produce ammonia to buffer hydrogen ions.

4. Disorders of Electrolyte Balance and pH:

- **Respiratory Acidosis/Alkalosis:** Imbalance in CO_2 levels affecting blood pH.
- **Metabolic Acidosis/Alkalosis:** Imbalance in bicarbonate levels affecting blood pH.
- **Electrolyte Imbalances:** Disorders such as hypernatremia (high sodium), hyponatremia (low sodium), hyperkalemia (high potassium), and hypokalemia (low potassium) can lead to various health issues.

CHAPTER: 2

Special Anatomy

2.1 Skeletal system

The skeletal system is the body's framework, providing structural support, protection to vital organs, and facilitating movement. It is composed of bones, cartilage, ligaments, and tendons.

1. Cartilage:
    - **Types:**
    - **Hyaline Cartilage:** Covers the ends of bones at joints, providing a smooth surface.
    - **Fibrocartilage:** Found in intervertebral discs and provides strength and flexibility.
    - **Elastic Cartilage:** Contains more elastic fibers, found in the external ear.
    - **Function:** Acts as a cushion between bones, reducing friction and absorbing shock.
2. Ligaments and Tendons:
    - **Ligaments:** Connect bone to bone, providing stability to joints.
    - **Tendons:** Connect muscle to bone, enabling movement by transmitting the force generated by muscles.
3. Bone Development and Growth:
    - **Ossification:** The process of bone formation. Begins in the embryonic stage and continues through childhood and adolescence.
    - **Epiphyseal Plates:** Growth plates located at the ends of long bones. Close during adolescence, signaling the end of longitudinal bone growth.
4. Bone Remodeling:
    - **Osteoclasts and Osteoblasts:**
    - Osteoclasts break down bone tissue, releasing minerals into the blood. Osteoblasts build new bone tissue.
    - **Factors Influencing Remodeling:** Mechanical stress, hormonal regulation, and calcium levels.

2.1.1 Classification and general features of bones & joints

Classification of Bones:

1. *Long Bones:*

- Longer than they are wide.
- Comprised of a shaft (diaphysis) and two ends (epiphyses).
- Femur, humerus, radius, ulna, tibia, fibula.

2. *Short Bones:*

- Roughly cube-shaped.
- Provide support and stability.
- Carpals (wrist bones), tarsals (ankle bones).

3. *Flat Bones:*

- Thin and flattened.
- Often curved.
- Skull bones, ribs, sternum, scapulae.

4. *Irregular Bones:*

- Complex shapes that don't fit into other categories.
- Vertebrae, facial bones (e.g., mandible, maxilla).

5. *Sesamoid Bones:*

- Small, embedded within tendons.
- Protect tendons from stress and wear.
- Patella (kneecap).

6. *Accessory Bones:*

- Not present in everyone.
- Varied in size and location.
- Accessory ossicles in the foot (e.g., accessory navicular).

General Features of Bones:

1. *Bone Tissue:*

- **Compact Bone:**
- Dense outer layer.

- Provides strength and resistance to bending.
- **Spongy (Cancellous) Bone:**
- Porous inner layer.
- Contains trabeculae, providing structural support.

2. *Bone Marrow:*

- **Red Marrow:**
- Found in the spongy bone.
- Site of hematopoiesis (blood cell formation).
- **Yellow Marrow:**
- Found in the medullary cavity of long bones.
- Composed mainly of adipose tissue.

3. *Periosteum:*

- **Outer Membrane:**
- Covers the external surface of bones.
- Contains blood vessels, nerves, and osteoblasts involved in bone growth and repair.

4. *Endosteum:*

- **Inner Membrane:**
- Lines the medullary cavity.
- Contains osteoprogenitor cells and osteoclasts.

5. *Bone Cells:*

- **Osteoblasts:**
- Build bone tissue by secreting matrix.
- **Osteocytes:**
- Mature bone cells within lacunae.
- Maintain bone tissue.
- **Osteoclasts:**
- Break down bone tissue during remodeling.

6. *Haversian Systems (Osteons):*

- Concentric rings of bone tissue.

- Surround central canals containing blood vessels and nerves.

7. *Articular Cartilage:*

- Covers the ends of long bones at joints.
- Provides a smooth surface, reducing friction in joint movement.

Classification of Joints:

1. *Fibrous Joints:*

- United by fibrous connective tissue.
- Limited or no movement.
- Sutures in the skull, syndesmosis (e.g., tibiofibular joint).

2. *Cartilaginous Joints:*

- United by cartilage.
- Limited movement.
- Synchondrosis (e.g., epiphyseal plates), symphysis (e.g., pubic symphysis).

3. *Synovial Joints:*

- Articulating bones separated by a joint cavity filled with synovial fluid.
- Freely movable.
- Ball-and-socket (e.g., hip, shoulder), hinge (e.g., knee, elbow), pivot (e.g., atlas-axis joint).

4. *Suture Joints:*

- Found only in the skull.
- Bones are tightly interlocked.
- Coronal, sagittal, lambdoid sutures.

5. *Gomphosis Joints:*

- Peg-in-socket joint.
- Found in teeth sockets.
- Tooth in its socket.

6. *Symphysis Joints:*

- Fibrocartilage between articulating bones.
- Provides limited movement.
- Intervertebral discs, pubic symphysis.

(i) **Bones of upper limb**

The upper limb, also known as the upper extremity, consists of the bones of the arm, forearm, and hand. Here is a list of the major bones in the upper limb:

Arm (Brachium):

1. **Humerus:**

- The long bone of the upper arm & Articulates with the scapula at the shoulder joint and with the radius and ulna at the elbow joint.

Forearm (Antebrachium):

2. **Radius:**

- Located on the lateral (thumb) side of the forearm. Articulates with the humerus and ulna, allowing for rotation of the forearm.

3. **Ulna:**

- Located on the medial (pinky finger) side of the forearm. Articulates with the humerus and radius, forming the elbow joint.

Hand:

Carpals (Wrist Bones):

4. **Scaphoid:**
5. **Lunate:**
6. **Triquetrum:**
7. **Pisiform:**
8. **Trapezium:**
9. **Trapezoid:**
10. **Capitate:**
11. **Hamate:**

Metacarpals (Palm Bones):

12. **First Metacarpal (Thumb):**
13. **Second Metacarpal:**
14. **Third Metacarpal:**
15. **Fourth Metacarpal:**

16. **Fifth Metacarpal (Pinky):**

Phalanges (Finger Bones):

17. **Proximal Phalanx (Thumb):**
18. **Middle Phalanx (Thumb):**
19. **Distal Phalanx (Thumb):**
20. **Proximal Phalanx (Index to Pinky):**
21. **Middle Phalanx (Index to Pinky):**
22. **Distal Phalanx (Index to Pinky):**

(ii) **Bones of Lower limb**

The lower limb, also known as the lower extremity, consists of the bones of the thigh, leg, and foot. Here is a list of the major bones in the lower limb:

Thigh (Femoral Region):

1. **Femur:**

- The long bone of the thigh. Articulates with the hip bone at the hip joint and with the tibia and patella at the knee joint.

Leg (Crural Region):

2. **Tibia:**

- Located on the medial (big toe) side of the leg. Articulates with the femur, fibula, and talus.

3. **Fibula:**

- Located on the lateral (pinky toe) side of the leg. Articulates with the tibia, talus, and calcaneus.

Foot:

Tarsal Bones (Ankle Bones):

4. Calcaneus
5. Talus
6. Navicular
7. Medial Cuneiform
8. Intermediate Cuneiform
9. Lateral Cuneiform

10. Cuboid
11. Metatarsals (Foot Bones)
11. First Metatarsal (Big Toe)
12. Second Metatarsal
13. Third Metatarsal
14. Fourth Metatarsal
15. Fifth Metatarsal (Pinky Toe)

Phalanges (Toe Bones):

16. Proximal Phalanx (Big Toe)
17. Middle Phalanx (Big Toe)
18. Distal Phalanx (Big Toe)
19. Proximal Phalanx (Second to Fifth Toes)
20. Middle Phalanx (Second to Fifth Toes)
21. Distal Phalanx (Second to Fifth Toes)

(iii) Joints of upper & lower limbs, classification of joints and Bones.

Joints in both the upper and lower limbs allow for movement and flexibility.

Joints of the Upper Limb:

1. *Shoulder Joint (Glenohumeral Joint):*

- **Type:** Synovial ball-and-socket joint.
- **Articulation:** Head of the humerus with the glenoid fossa of the scapula.
- **Movement:** Flexion, extension, abduction, adduction, medial and lateral rotation.

2. *Elbow Joint:*

- **Type:** Synovial hinge joint.
- **Articulation:** Trochlea of the humerus with the trochlear notch of the ulna and the capitulum of the humerus with the head of the radius.
- **Movement:** Flexion and extension.

3. *Radioulnar Joints:*

- **Proximal Radioulnar Joint:**

- **Type:** Synovial pivot joint.
- **Articulation:** Head of the radius with the radial notch of the ulna.
- **Movement:** Pronation and supination.
- **Distal Radioulnar Joint:**
- **Type:** Synovial pivot joint.
- **Articulation:** Head of the ulna with the ulnar notch of the radius.
- **Movement:** Pronation and supination.

4. *Wrist (Radiocarpal) Joint:*

- **Type:** Synovial condyloid joint.
- **Articulation:** Radius and ulna with the carpal bones (scaphoid, lunate, triquetrum).

5. *Hand Joints:*

- **Metacarpophalangeal (MCP) Joints:**
- **Type:** Synovial condyloid joints.
- **Articulation:** Metacarpals with proximal phalanges.
- **Interphalangeal (IP) Joints:**
- **Type:** Synovial hinge joints.
- **Articulation:** Proximal and distal phalanges.

Joints of the Lower Limb:

1. *Hip Joint:*

- **Type:** Synovial ball-and-socket joint.
- **Articulation:** Head of the femur with the acetabulum of the hip bone.
- **Movement:** Flexion, extension, abduction, adduction, medial and lateral rotation.

2. *Knee Joint:*

- **Type:** Synovial hinge joint.
- **Articulation:** Femur with the tibia and patella.
- **Movement:** Flexion and extension.

3. *Tibiofibular Joints:*

- **Proximal Tibiofibular Joint:**
- **Type:** Fibrous joint.

- **Articulation:** Head of the fibula with the lateral tibial condyle.
- **Distal Tibiofibular Joint (Syndesmosis):**
- **Type:** Fibrous joint.
- **Articulation:** Distal ends of the tibia and fibula.

4. *Ankle (Talocrural) Joint:*

- **Type:** Synovial hinge joint.
- **Articulation:** Talus with the tibia and fibula.

5. *Subtalar Joint:*

- **Type:** Synovial gliding joint.
- **Articulation:** Talus with the calcaneus.
- **Movement:** Inversion and eversion.

6. *Foot Joints:*

- **Tarsometatarsal Joints:**
- **Type:** Synovial plane joints.
- **Articulation:** Tarsal bones with metatarsal bones.
- **Metatarsophalangeal (MTP) Joints:**
- **Type:** Synovial condyloid joints.
- **Articulation:** Metatarsals with proximal phalanges.
- **Interphalangeal (IP) Joints:**
- **Type:** Synovial hinge joints.
- **Articulation:** Proximal and distal phalanges.

- **Essential features of each type.**

Classification of Joints:

1. *Fibrous Joints:*

- Connected by fibrous tissue.
- Limited or no movement.
- **Types:**
- Sutures (e.g., in the skull).

- Syndesmosis (e.g., tibiofibular joint).
- Gomphosis (e.g., tooth in its socket).

2. *Cartilaginous Joints:*

- Connected by cartilage.
- Limited movement.
- **Types:**
- Synchondrosis (e.g., epiphyseal plates).
- Symphysis (e.g., pubic symphysis, intervertebral discs).

3. *Synovial Joints:*

- Articulating bones separated by a joint cavity filled with synovial fluid.
- Freely movable.
- **Subtypes:**
- **Hinge Joint:**
  - Allows flexion and extension (e.g., elbow, knee).
- **Ball-and-Socket Joint:**
  - Allows movement in multiple directions, including rotation (e.g., hip, shoulder).
- **Pivot Joint:**
  - Allows rotation around a central axis (e.g., atlantoaxial joint).
- **Condyloid (Ellipsoidal) Joint:**
  - Allows flexion, extension, abduction, adduction, and circumduction (e.g., wrist).
- **Saddle Joint:**
  - Allows movements similar to condyloid joints (e.g., carpometacarpal joint of the thumb).
- **Plane (Gliding) Joint:**
  - Allows sliding or gliding movements (e.g., intercarpal and intertarsal joints).

Classification of Bones:

1. *Long Bones:*

- Longer than they are wide.
- Shaft (diaphysis) and two ends (epiphyses).

- Femur, humerus, radius, ulna, tibia, fibula.

2. *Short Bones:*

- Roughly cube-shaped.
- Provide support and stability.
- Carpals (wrist bones), tarsals (ankle bones).

3. *Flat Bones:*

- Thin and flattened, often curved.
- Provide protection and surface area for muscle attachment.
- Skull bones, ribs, sternum, scapulae.

4. *Irregular Bones:*

- Complex shapes, don't fit into other categories.
- Vertebrae, facial bones (e.g., mandible, maxilla).

5. *Sesamoid Bones:*

- Small, embedded within tendons.
- Protect tendons from stress and wear.
- Patella (kneecap).

6. *Accessory Bones:*

- Not present in everyone.
- Varied in size and location.
- Accessory ossicles in the foot (e.g., accessory navicular).

2.2 Skull - general features, bone and position of bone.

Skull General Features:

The skull is a complex structure that houses and protects the brain and sensory organs. It is divided into two main parts: the cranium and the mandible.

1. *Cranium:*

- Protects the brain.
- Provides attachment points for muscles.
- Frontal bone, parietal bones (2), temporal bones (2), occipital bone, sphenoid bone, and ethmoid bone.

2. *Mandible:*

- Forms the lower jaw.
- Articulates with the temporal bone to form the temporomandibular joint (TMJ).
- Allows for mastication (chewing) and speech.

Bones of the Skull:

1. *Frontal Bone:*

- Forms the forehead and the upper part of the eye sockets (orbits).

2. *Parietal Bones (2):*

- Form the top and sides of the skull.

3. *Temporal Bones (2):*

- Form the sides and base of the skull.

4. *Occipital Bone:*

- Forms the back and base of the skull.

5. *Sphenoid Bone:*

- Located at the base of the skull.

6. *Ethmoid Bone*

- Located between the eyes, forming part of the eye sockets and nasal cavity.

7. *Maxilla (Upper Jaw):*

- Forms the upper jaw and part of the eye sockets.

8. *Zygomatic Bones (2):*

- Form the cheekbones.

9. *Nasal Bones (2):*

- Form the bridge of the nose.

10. *Mandible (Lower Jaw):*

- Forms the lower jaw and is the only movable bone of the skull.

Sutures of the Skull:

- **Sagittal Suture:** Between the parietal bones.
- **Coronal Suture:** Between the frontal bone and parietal bones.

- **Lambdoid Suture:** Between the parietal bones and the occipital bone.

Squamous Suture: Between the parietal and temporal bones

2.2.1 Vertebral column

The vertebral column, also known as the spine or backbone, is a flexible, segmented structure that provides support, protection, and flexibility to the human body.

Components of the Vertebral Column:

1. *Vertebrae:*

- The vertebral column is made up of 33 vertebrae in total, which can be categorized into five regions:

- **Cervical Vertebrae (C1-C7):** Located in the neck region.
- **Thoracic Vertebrae (T1-T12):** Corresponding to the upper and mid-back.
- **Lumbar Vertebrae (L1-L5):** Forming the lower back.
- **Sacral Vertebrae (S1-S5):** Fused to form the sacrum.
- **Coccygeal Vertebrae (Co1-Co4):** Fused to form the coccyx.

2. *Intervertebral Discs:*

- Cartilaginous discs located between adjacent vertebrae.
- Provide cushioning, absorb shock, and allow flexibility in the spine.
- Composed of a fibrous outer layer (annulus fibrosus) and a gel-like inner core (nucleus pulposus).

Structure of a Typical Vertebra:

1. *Body (Centrum):*

- Weight-bearing portion of the vertebra.

2. *Vertebral Arch:*

- Surrounds and protects the spinal cord.
- Composed of two pedicles and two laminae.

3. *Spinous Process:*

- Projects posteriorly, providing an attachment site for muscles and ligaments.

4. *Transverse Processes:*

- Extend laterally from the vertebral arch, serving as attachment points for muscles.

5. *Articular Processes:*

- Form joints with adjacent vertebrae, allowing for movement.

6. *Intervertebral Foramen:*

- Opening between adjacent vertebrae through which spinal nerves pass.

Curvatures of the Vertebral Column:

1. *Cervical Lordosis:*

- Forward curvature in the cervical region.

2. *Thoracic Kyphosis:*

- Outward curvature in the thoracic region.

3. *Lumbar Lordosis:*

- Forward curvature in the lumbar region.

4. *Sacral Kyphosis:*

- Outward curvature in the sacral region.

Functions of the Vertebral Column:

1. **Support:** Bears the weight of the body and provides structural support.
2. **Protection:** Surrounds and protects the spinal cord.
3. **Flexibility:** Allows for a range of movements, including bending and twisting.
4. **Posture:** Maintains an upright posture and balance.
5. **Shock Absorption:** Intervertebral discs absorb shock during movement.

2.2.2 Sternum & Ribs.

The sternum and ribs are essential components of the thoracic cage, forming the anterior and lateral aspects of the chest. Together, they protect vital organs in the thoracic cavity and contribute to the structure and flexibility of the ribcage.

Sternum:

The sternum, commonly known as the breastbone, is a flat bone located at the front of the chest. It consists of three main parts:

1. *Manubrium:*

- The broad, uppermost part of the sternum.
- Articulates with the clavicles (collarbones) at the clavicular notch.
- Also articulates with the first and second ribs.

2. *Body (Gladiolus):*

- The middle and largest part of the sternum.
- Articulates with the costal cartilages of the second to seventh ribs.

3. *Xiphoid Process:*

- The smallest and most inferior part of the sternum.
- Articulates with the inferior portion of the body of the sternum.
- Often cartilaginous in early life and gradually ossifies with age.

Ribs:

There are 12 pairs of ribs, and each rib is composed of a bony part and a cartilaginous part. Ribs are categorized into three types:

1. *True Ribs (1-7):*

- Connect directly to the sternum via their own costal cartilage.
- Each true rib has its own costal cartilage, forming a direct articulation with the sternum.

2. *False Ribs (8-12):*

- Do not connect directly to the sternum.
- Costal cartilages of these ribs either attach indirectly to the sternum or lack a sternal attachment.
- **a. Vertebrochondral Ribs (8-10):**
- Indirectly connected to the sternum by sharing a common costal cartilage with the rib above.
- **b. Floating Ribs (11-12):**
- Lack a direct or indirect connection to the sternum.
- The costal cartilages of these ribs end in the muscles of the abdominal wall.

Articulations:

1. *Costovertebral Joints:*

- Joints between the ribs and the vertebrae.

2. *Costotransverse Joints:*

- Joints between the ribs and the transverse processes of the vertebrae.

3. *Costosternal Joints:*

- Joints between the ribs and the sternum.

4. *Costochondral Junctions:*

- Junctions between the bony part and cartilaginous part of each rib.

Functions:

1. **Protection**
2. **Respiration**
3. **Support**
4. **Attachment**

2.2.3 Foot

The human foot is a complex structure that plays a crucial role in supporting the body, maintaining balance, and facilitating movement.

Bones of the Foot:

1. **Tarsal Bones (7):**
- Includes the calcaneus (heel bone), talus, navicular, cuboid, and three cuneiform bones (medial, intermediate, and lateral).
2. **Metatarsal Bones (5):**
- Located in the midfoot, between the tarsal bones and the phalanges.
3. **Phalanges (14):**
- Each toe (except the big toe) has three phalanges (proximal, middle, and distal), while the big toe has two.

Joints of the Foot:

1. **Tarsometatarsal Joints:**

2. **Metatarsophalangeal (MTP) Joints:**
3. **Interphalangeal (IP) Joints:**

Ligaments and Tendons:

1. **Plantar Fascia:**
2. **Achilles Tendon:**
3. **Ligaments:**

Arches of the Foot:

1. **Medial Longitudinal Arch:**
- Extends from the heel to the big toe. Consists of the calcaneus, talus, navicular, cuneiforms, and the first three metatarsals.
2. **Lateral Longitudinal Arch:**
- Extends from the heel to the little toe. Consists of the calcaneus, cuboid, and the fourth and fifth metatarsals.
3. **Transverse Arch:**
- Runs across the midfoot and is formed by the cuneiforms, cuboid, and bases of the metatarsals.

Functions:

1. Support and Weight-Bearing
2. Mobility and Propulsion
3. Shock Absorption
4. Balance and Stability

2.2.4 Description of Carpus, metacarpus and phalangeal bones and their movements

The hand is a highly specialized structure with intricate anatomy, including the carpals, metacarpals, and phalanges.

Carpals (Wrist Bones):
The carpal bones are eight small, irregularly shaped bones arranged in two rows.

1. **Scaphoid:**

- Boat-shaped bone, lateral in the proximal row.

2. **Lunate:**
- Crescent-shaped bone, medial in the proximal row.

3. **Triquetrum:**
- Pyramidal-shaped bone, medial to the lunate.

4. **Pisiform:**
- Small, pea-shaped bone, situated anteriorly on the triquetrum.

5. **Trapezium:**
- Four-sided bone, lateral in the distal row.

6. **Trapezoid:**
- Four-sided bone, medial to the trapezium.

7. **Capitate:**
- Largest carpal bone, situated between the trapezoid and hamate.

8. **Hamate:**
- Hook-shaped bone, medial and distal in the distal row.

Metacarpals:

The metacarpals are five long bones, one for each digit, numbered from the thumb (first) to the little finger (fifth). Each metacarpal has a base, shaft, and head:

1. **First Metacarpal (Thumb):**
- Short and stout, allowing for opposable movement.

2. **Second to Fifth Metacarpals:**
- Gradually lengthen from the second to the fifth digit.

Phalanges (Finger Bones):

The phalanges are the bones of the fingers and thumb. Each finger has three phalanges, except the thumb, which has two:

1. **Proximal Phalanx:**
- Located closest to the metacarpal.
- Articulates with the metacarpal at the base.

2. **Middle Phalanx:**

- Present in the second and third digits.
- Articulates with the proximal phalanx.

3. **Distal Phalanx:**

- The terminal bone of each digit.
- Articulates with the middle phalanx.

Movements of the Hand:

1. **Flexion and Extension:**

- **Flexion:** Decreasing the angle between the bones of the hand.
- **Extension:** Increasing the angle between the bones.

2. **Abduction and Adduction:**

- **Abduction:** Moving fingers away from the midline.
- **Adduction:** Moving fingers toward the midline.

3. **Opposition and Reposition:**

- **Opposition:** Bringing the thumb and little finger together.
- **Reposition:** Returning the thumb and little finger to their original positions.

4. **Circumduction:**

- Circular movement, involving flexion, extension, abduction, and adduction.

5. **Pronation and Supination:**

- **Pronation:** Rotating the hand and forearm so that the palm faces downward.
- **Supination:** Rotating the hand and forearm so that the palm faces upward.

2.3 Muscles: General anatomy of muscles, their classification and action.

Muscles are the contractile tissues in the human body responsible for movement, stability, and heat production. They can be classified into three types: skeletal, smooth, and cardiac.

1. *Skeletal Muscles:*

- **Location:** Attached to bones by tendons.
- **Voluntary Control:** Under conscious control.

- **Striated Appearance:** Striped or banded appearance under a microscope.
- **Function:** Responsible for body movement, posture, and locomotion.

2. *Smooth Muscles:*

- **Location:** Found in the walls of internal organs (e.g., digestive tract, blood vessels).
- **Involuntary Control:** Not under conscious control.
- **Non-Striated Appearance:** Lack the striped appearance.
- **Function:** Regulate the movement of substances within internal organs.

3. *Cardiac Muscles:*

- **Location:** Exclusive to the heart.
- **Involuntary Control:** Not under conscious control.
- **Striated Appearance:** Striped appearance similar to skeletal muscles.
- **Function:** Pump blood throughout the circulatory system.

Components of a Skeletal Muscle:

1. **Muscle Belly:** The fleshy, contractile part of the muscle.
2. **Tendons:** Connect muscle to bone.
3. **Origin:** The point of muscle attachment to the stationary bone.
4. **Insertion:** The point of muscle attachment to the movable bone.
5. **Agonist (Prime Mover):** The muscle responsible for the main action.
6. **Antagonist:** The muscle that opposes the action of the agonist.
7. **Synergists:** Muscles that assist the agonist.
8. **Fascicles:** Bundles of muscle fibers within the muscle belly.

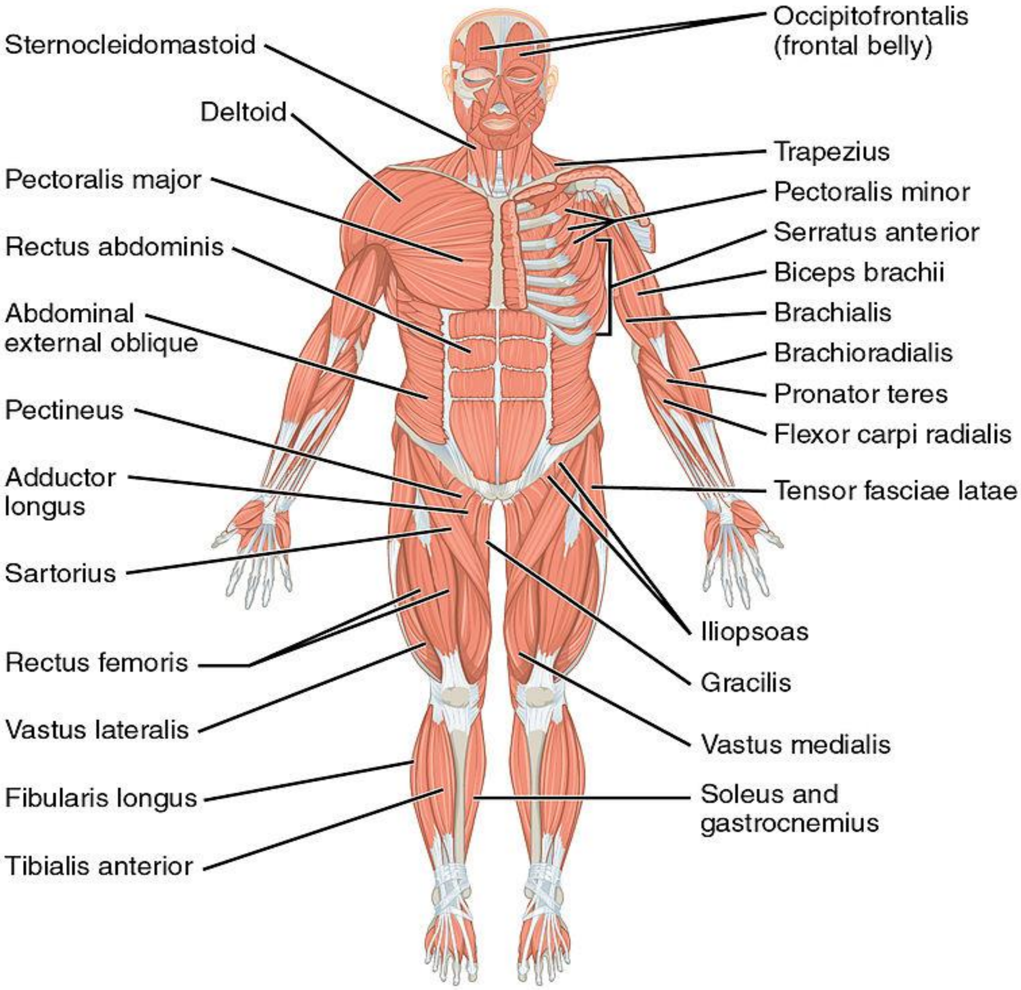
9. **Endomysium, Perimysium, Epimysium:** Connective tissue layers surrounding muscle fibers, fascicles, and the entire muscle, respectively.

Muscle Actions:

Muscles work in pairs or groups to produce movements. The action of a muscle is often described in terms of joint movement. Common muscle actions include:

1. **Flexion:** Decreases the angle between two body parts.
2. **Extension:** Increases the angle between two body parts.
3. **Abduction:** Moves a body part away from the midline.
4. **Adduction:** Moves a body part toward the midline.
5. **Rotation:** Moves a body part around its own axis.
6. **Elevation:** Raises or moves a body part superiorly.
7. **Depression:** Lowers or moves a body part inferiorly.
8. **Pronation:** Rotates the forearm or hand to a palm-down position.
9. **Supination:** Rotates the forearm or hand to a palm-up position.
10. **Dorsiflexion:** Flexion at the ankle, bringing the foot toward the shin.
11. **Plantarflexion:** Extension at the ankle, pointing the foot downward.
12. **Inversion:** Turns the sole of the foot inward.
13. **Eversion:** Turns the sole of the foot outward.

2.4 Nerve supply & actions of various limbs & body muscles including diagrams, their nerve supply with special emphasis on their group action as against antagonist, synergist.



Major muscles of the body.
Right side: superficial; left side: deep (anterior view)

Describing the nerve supply and actions of various muscles in the body involves an extensive list of muscles and their associated nerves. Here, I'll provide an overview of some major muscle groups in different regions of the body, emphasizing their nerve supply and group actions. Note that this is not an exhaustive list, and there are many more muscles and details to explore.

Upper Limb Muscles:

1. *Deltoid Muscle:*

- **Nerve Supply:** Axillary nerve.
- **Action:** Abduction of the shoulder.

2. *Biceps Brachii:*

- **Nerve Supply:** Musculocutaneous nerve.
- **Action:** Flexion of the elbow.

3. *Triceps Brachii:*

- **Nerve Supply:** Radial nerve.
- **Action:** Extension of the elbow.

4. *Flexor Muscles of the Forearm:*

- **Nerve Supply:** Median and ulnar nerves.
- **Actions:** Flexion of the wrist and fingers.

5. *Extensor Muscles of the Forearm:*

- **Nerve Supply:** Radial nerve.
- **Actions:** Extension of the wrist and fingers.

Trunk Muscles:

1. *Rectus Abdominis:*

- **Nerve Supply:** Intercostal nerves.
- **Action:** Flexion of the trunk.

2. *External Obliques:*

- **Nerve Supply:** Intercostal nerves.
- **Action:** Rotation and lateral flexion of the trunk.

3. *Erector Spinae Group:*

- **Nerve Supply:** Spinal nerves.
- **Actions:** Extension and lateral flexion of the spine.

Lower Limb Muscles:

1. *Quadriceps Femoris:*

- **Nerve Supply:** Femoral nerve.
- **Action:** Extension of the knee.

2. *Hamstring Muscles:*

- **Nerve Supply:** Sciatic nerve.
- **Actions:** Flexion of the knee and extension of the hip.

3. *Gastrocnemius:*

- **Nerve Supply:** Tibial nerve.
- **Action:** Plantarflexion of the ankle.

4. *Anterior Tibialis:*

- **Nerve Supply:** Deep peroneal nerve.
- **Action:** Dorsiflexion of the ankle.

Group Actions:

1. *Agonist and Antagonist:*

- **Example:** Biceps and triceps in the arm. Biceps (agonist) flexes the elbow, while triceps (antagonist) extends it.

2. *Synergist Muscles:*

- **Example:** During flexion of the forearm, biceps is the prime mover (agonist), and brachialis acts as a synergist.

3. *Muscle Groups for Joint Stability:*

- **Example:** Rotator cuff muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) work together to stabilize the shoulder joint.

2.5 Mechanism and action of muscles acting on joints and movements they produce.

Muscles play a critical role in producing movements at joints through the contraction and relaxation of muscle fibers. The mechanism and action of muscles can be understood in the context of their interactions with joints, bones, and other tissues. Here's a general overview of the mechanism and action of muscles acting on joints:

1. Muscle Contraction:

- **Neuromuscular Junction:** The nerve impulse reaches the neuromuscular junction, where the motor neuron releases acetylcholine, initiating a muscle action potential.
- **Muscle Fiber Excitation:** The action potential travels along the sarcolemma and into the transverse tubules, triggering the release of calcium ions from the sarcoplasmic reticulum.
- **Actin-Myosin Interaction:** Calcium ions bind to troponin, exposing active sites on actin. Myosin heads attach to these active sites, forming cross-bridges.
- **Sliding Filament Mechanism:** Myosin heads pull actin filaments toward the center of the sarcomere, causing muscle contraction.

2. Muscle Action on Joints:

- **Origin and Insertion:** Muscles have points of attachment known as origin (proximal, less movable) and insertion (distal, more movable). When a muscle contracts, the insertion is pulled toward the origin.
- **Joint Movement:** The type of joint movement depends on the orientation of muscle fibers, the joint structure, and the muscle's attachment points.

Examples of Joint Movements:

a. Flexion:

- **Action:** Decreases the angle between two body parts.
- **Example:** Biceps brachii flexing the elbow.

b. Extension:

- **Action:** Increases the angle between two body parts.
- **Example:** Triceps brachii extending the elbow.

c. Abduction:

- **Action:** Moves a body part away from the midline.
- **Example:** Deltoid abducting the shoulder.

d. Adduction:

- **Action:** Moves a body part toward the midline.
- **Example:** Adductor muscles adducting the hip.

e. Rotation:

- **Action:** Movement around an axis.
- **Example:** External and internal rotation of the shoulder by rotator cuff muscles.

f. Pronation and Supination:

- **Pronation:** Rotating the forearm or hand to a palm-down position.
- **Supination:** Rotating the forearm or hand to a palm-up position.

g. Dorsiflexion and Plantarflexion:

- **Dorsiflexion:** Flexion at the ankle, bringing the foot toward the shin.
- **Plantarflexion:** Extension at the ankle, pointing the foot downward.

3. Antagonistic and Synergistic Muscle Actions:

- **Antagonistic Muscles:** Work in opposition to each other. For example, biceps (flexor) and triceps (extensor) at the elbow.
- **Synergistic Muscles:** Work together to produce a coordinated movement. For example, quadriceps muscles acting synergistically during knee extension.

4. Stabilizing Muscles:

- **Fixators or Stabilizers:** Muscles that provide stability to a joint or body part, allowing other muscles to produce movement. For example, core muscles stabilizing the spine during limb movements.

2.6 C.N.S. - General Orientation of CN.S.

2.6.1 Brain & Spinal cord.

BRAIN AND SPINAL CORD:

The CNS consists of two main components: the brain and the spinal cord. Here's a general orientation of the CNS:

Brain:

The brain is the primary control center of the nervous system and is located within the cranial cavity of the skull. It is divided into several major regions:

1. **Cerebrum:**

- Largest part of the brain.
- Divided into two hemispheres (left and right).
- Responsible for conscious thought, sensory perception, motor functions, and higher cognitive functions such as reasoning and memory.
- The surface of the cerebrum is characterized by gyri (ridges) and sulci (grooves).

2. **Cerebellum:**

- Located at the back of the brain, below the cerebrum.
- Responsible for coordination of voluntary movements, balance, and posture.

- Contains a highly folded surface known as the cerebellar cortex.

3. **Brainstem:**

- Connects the brain to the spinal cord.
- Composed of the medulla oblongata, pons, and midbrain.
- Vital for basic life functions such as breathing, heart rate, and blood pressure regulation.

Spinal Cord:

The spinal cord is a long, tubular structure that extends from the base of the brain (brainstem) down the vertebral column. It is protected by the vertebrae of the spine. Key features include:

1. **Gray Matter:**

- Inner region of the spinal cord.
- Contains cell bodies of neurons and synapses.

2. **White Matter:**

- Outer region of the spinal cord.
- Composed of myelinated axons that form tracts connecting different regions of the CNS.

3. **Spinal Nerves:**

- Arise from the spinal cord and exit through openings between vertebrae.
- Serve as communication pathways between the CNS and the peripheral nervous system.

Meninges:

The CNS is enveloped and protected by three layers of connective tissue known as meninges:

1. **Dura Mater:**

- Outermost layer, thick and tough.

2. **Arachnoid Mater:**

- Middle layer, delicate and web-like.

3. **Pia Mater:**

- Innermost layer, adhering to the surface of the brain and spinal cord.

Ventricular System:

The brain contains a system of interconnected cavities filled with cerebrospinal fluid (CSF). These cavities are known as ventricles:

1. **Lateral Ventricles (1 in each hemisphere):**
- Located in the cerebrum.
2. **Third Ventricle:**
- Midline ventricle within the diencephalon.
3. **Fourth Ventricle:**
- Between the brainstem and cerebellum.

Orientation:

The CNS is organized into anatomical regions, and the orientation is typically described in terms of directional and sectional planes:

1. **Directional Planes:**
- **Coronal Plane:** Divides the body into front and back portions.
- **Sagittal Plane:** Divides the body into left and right portions.
- **Transverse (Horizontal) Plane:** Divides the body into upper and lower portions.
2. **Sections of the Spinal Cord:**
- **Cross Section:** Cutting across the spinal cord horizontally.

Longitudinal Section: Cutting along the length of the spinal cord.

2.6.2 Sympathetic & para sympathetic system.

The sympathetic and parasympathetic nervous systems are two branches of the autonomic nervous system.

Sympathetic Nervous System:

1. **Function:**
- **Fight or Flight:** Prepares the body for rapid, intense physical activity and is associated with the "fight or flight" response.
- **Stress Response:** Activated in response to stress, danger, or challenging situations.
2. **Effects on Organs:**
- **Dilation of Pupils:** Increases visual acuity.
- **Increased Heart Rate:** Enhances blood flow.

- **Dilation of Airways:** Facilitates increased oxygen intake.
- **Inhibition of Digestive Functions:** Redirects energy away from digestion.

3. **Overall Response:**

- Readies the body for immediate action and heightened physical performance.

Parasympathetic Nervous System:

1. **Function:**

- **Rest and Digest:** Promotes relaxation and recovery.
- **Conservation of Energy:** Active during periods of rest and normal functioning.

2. **Effects on Organs:**

- **Constriction of Pupils:** Adaptation to close vision.
- **Slowing of Heart Rate:** Promotes conservation of energy.
- **Constriction of Airways:** Promotes normal breathing.
- **Stimulation of Digestive Functions:** Enhances digestion and absorption.

3. **Overall Response:**

- Facilitates digestion, energy storage, and bodily functions associated with a relaxed state.

Balance and Homeostasis:

- The sympathetic and parasympathetic systems operate in a dynamic balance to maintain homeostasis.
- This balance is often referred to as autonomic tone, with the relative activity of both systems determining the overall physiological state.
- In many organs, there is a dual innervation, meaning they receive input from both sympathetic and parasympathetic nerves, allowing for precise control.

2.6.3 Cranial and peripheral nerves.

The cranial nerves are a set of 12 pairs of nerves that emerge directly from the brain, primarily from the brainstem.

1. **Olfactory (I)**
2. **Optic (II)**
3. **Oculomotor (III)**

4. **Trochlear (IV)**
5. **Trigeminal (V)**
6. **Abducens (VI)**
7. **Facial (VII)**
8. **Vestibulocochlear (VIII)**
9. **Glossopharyngeal (IX)**
10. **Vagus (X)**
11. **Accessory (XI)**
12. **Hypoglossal (XII)**

PERIPHERAL NERVES:

Peripheral nerves are bundles of nerve fibers (axons) that extend from the spinal cord to various parts of the body, connecting the central nervous system (CNS) to muscles, glands, and sensory receptors. These nerves are categorized based on their functions into sensory (afferent) nerves, motor (efferent) nerves, and mixed nerves that carry both sensory and motor fibers.

1. Classification of Peripheral Nerves:

- **Sensory Nerves (Afferent):** Transmit sensory information from the periphery to the CNS.
- **Motor Nerves (Efferent):** Transmit signals from the CNS to muscles and glands, controlling motor functions.
- **Mixed Nerves:** Contain both sensory and motor fibers, allowing bidirectional communication.

The cranial nerves are a set of 12 pairs of nerves that emerge directly from the brain, primarily from the brainstem. They play crucial roles in controlling various sensory and motor functions in the head and neck. Each cranial nerve is identified by a Roman numeral and a name, and they are numbered based on their order of appearance from anterior to posterior along the brainstem. Here is a brief overview of the 12 cranial nerves:

1. **Olfactory (I):**

- **Function:** Sense of smell.

- **Pathway:** Sensory fibers from olfactory epithelium to olfactory bulbs.

2. **Optic (II):**

- **Function:** Vision.
- **Pathway:** Sensory fibers from the retina to the optic chiasm and optic tracts.

3. **Oculomotor (III):**

- **Function:** Controls most eye movements, constriction of the pupil, and shape of the lens.
- **Pathway:** Motor fibers innervate extraocular muscles; parasympathetic fibers control pupil and lens.

4. **Trochlear (IV):**

- **Function:** Controls the superior oblique muscle, involved in eye movement.
- **Pathway:** Motor fibers innervate the superior oblique muscle.

5. **Trigeminal (V):**

- **Function:** Sensation of the face, chewing muscles.
- **Pathway:** Sensory fibers from the face to the trigeminal ganglion; motor fibers to muscles of mastication.

6. **Abducens (VI):**

- **Function:** Controls the lateral rectus muscle, involved in eye movement.
- **Pathway:** Motor fibers innervate the lateral rectus muscle.

7. **Facial (VII):**

- **Function:** Facial expressions, taste sensation, salivation.
- **Pathway:** Sensory fibers for taste; motor fibers for facial expression and salivary glands; parasympathetic fibers control tear and salivary glands.

8. **Vestibulocochlear (VIII):**

- **Function:** Hearing and balance.
- **Pathway:** Sensory fibers from the cochlea and vestibular apparatus.

9. **Glossopharyngeal (IX):**

- **Function:** Swallowing, taste, salivation.
- **Pathway:** Sensory fibers for taste; motor fibers for swallowing; parasympathetic fibers control salivary glands.

10. **Vagus (X):**

- **Function:** Regulates involuntary bodily functions such as heart rate, digestion, and respiratory rate.
- **Pathway:** Sensory and motor fibers to various organs in the thoracic and abdominal cavities.

11. **Accessory (XI):**

- **Function:** Controls neck and shoulder muscles.
- **Pathway:** Motor fibers innervate the sternocleidomastoid and trapezius muscles.

12. **Hypoglossal (XII):**

- **Function:** Controls tongue movements.
- **Pathway:** Motor fibers innervate the muscles of the tongue.

PERIPHERAL NERVES:

Peripheral nerves are bundles of nerve fibers (axons) that extend from the spinal cord to various parts of the body, connecting the central nervous system (CNS) to muscles, glands, and sensory receptors. These nerves are categorized based on their functions into sensory (afferent) nerves, motor (efferent) nerves, and mixed nerves that carry both sensory and motor fibers. Here are some key aspects of peripheral nerves:

1. Classification of Peripheral Nerves:

- **Sensory Nerves (Afferent):** Transmit sensory information from the periphery to the CNS.
- **Motor Nerves (Efferent):** Transmit signals from the CNS to muscles and glands, controlling motor functions.
- **Mixed Nerves:** Contain both sensory and motor fibers, allowing bidirectional communication.

2. Peripheral Nerve Components:

- **Axons:** Long, slender projections that carry electrical impulses.
- **Connective Tissues:**
- **Endoneurium:** Surrounds individual axons.
- **Perineurium:** Surrounds bundles of axons (fascicles).
- **Epineurium:** Surrounds the entire nerve.

4. Functions of Peripheral Nerves:

- **Sensory Functions:** Transmit information about touch, pain, temperature, proprioception, and other sensations from the periphery to the CNS.
- **Motor Functions:** Transmit signals from the CNS to muscles, allowing voluntary and involuntary movements.
- **Autonomic Functions:** Control involuntary bodily functions, including heart rate, blood pressure, digestion, and respiratory rate.

6. Peripheral Nerve Disorders:

- **Neuropathy:** Damage or dysfunction of peripheral nerves, leading to symptoms such as pain, tingling, weakness, and loss of sensation.
- **Radicular Pain:** Pain radiating along the path of a nerve, often caused by compression or irritation of nerve roots.

- **Distribution of 5,7,10,11. Name, & functions only of the other nerves.**

1. Cranial Nerve V: Trigeminal Nerve

- **Sensory Component:**
  - Provides sensation to the face, including touch, pain, and temperature from the forehead, upper eyelid, nose, upper lip, and part of the oral cavity.
- **Motor Component:**
  - Controls the muscles involved in chewing (mastication).

2. Cranial Nerve VII: Facial Nerve

- **Sensory Component:**
  - Taste sensation from the anterior two-thirds of the tongue.
- **Motor Component:**
  - Controls muscles of facial expression.
  - Innervates the salivary glands (submandibular and sublingual) and lacrimal glands (tear production).
  - Involved in the sense of taste.

3. Cranial Nerve X: Vagus Nerve

- **Sensory Component:**
  - Sensation from the pharynx, larynx, and viscera of the thorax and abdomen.
- **Motor Component:**
  - Innervates muscles of the pharynx and larynx, controlling speech and swallowing.
  - Provides parasympathetic innervation to the heart, lungs, and abdominal organs.
  - Regulates autonomic functions, including heart rate, digestion, and respiratory rate.

4. Cranial Nerve XI: Accessory Nerve

- **Motor Component:**
    - Controls the sternocleidomastoid and trapezius muscles.
    - Involved in movements of the head, neck, and shoulders.

2.7 C.V.S.

2.7.1 Heart – aorta, major arteries of limbs, head, neck, brain, abdomen & thorax

The heart pumps oxygenated blood to various parts of the body through a network of arteries. The major arteries originate from the aorta, the largest artery, and branch out to supply blood to different regions.

1. Aorta:

- The aorta is the main artery that originates from the left ventricle of the heart.
- It is divided into different segments:
- **Ascending Aorta:** Begins at the aortic valve.
- **Aortic Arch:** Curved portion with three branches.
- **Descending Aorta:** Divided into thoracic and abdominal segments.

2. Major Arteries of the Limbs:

- **Brachial Artery:**
- Supplies blood to the upper arm.
- Branches into radial and ulnar arteries in the forearm.
- **Radial Artery:**
- Runs along the radius bone in the forearm.
- **Ulnar Artery:**
- Runs along the ulna bone in the forearm.
- **Femoral Artery:**
- Supplies blood to the thigh.
- Continuation of the external iliac artery.

- **Popliteal Artery:**
- Located behind the knee.
- Branches into anterior and posterior tibial arteries.
- **Anterior Tibial Artery:**
- Runs along the front of the shin.
- **Posterior Tibial Artery:**
- Runs along the back of the shin.

3. Major Arteries of the Head and Neck:

- **Common Carotid Artery:**
- Branches into internal and external carotid arteries.
- Supplies blood to the head and neck.
- **Internal Carotid Artery:**
- Supplies blood to the brain.
- **External Carotid Artery:**
- Supplies blood to the face and neck muscles.

4. Major Arteries of the Brain:

- **Vertebral Arteries:**
- Merge to form the basilar artery.
- Supply blood to the brainstem and cerebellum.
- **Basilar Artery:**
- Supplies blood to the brainstem and posterior cerebral arteries.
- **Internal Carotid Arteries:**
- Supply blood to the anterior and middle cerebral arteries.

5. Major Arteries of the Abdomen:

- **Celiac Artery:**
- Supplies blood to the upper abdominal organs.
- **Superior Mesenteric Artery:**
- Supplies blood to the small intestine and part of the large intestine.
- **Inferior Mesenteric Artery:**
- Supplies blood to the remaining part of the large intestine.

6. Major Arteries of the Thorax:

- **Thoracic Aorta:**
- Gives off various branches supplying the thoracic region.
- **Pulmonary Arteries:**
- Carry deoxygenated blood from the right ventricle to the lungs for oxygenation.

2.7.2 Veins of body

The venous system is responsible for returning deoxygenated blood from the tissues back to the heart. Veins are blood vessels that carry this deoxygenated blood. The venous system includes a network of veins that are categorized into various types based on their location, function, and the areas they drain. Here's an overview of the major veins in the body:

1. Systemic Veins:

- **Superior Vena Cava (SVC):**
- Drains deoxygenated blood from the upper body (head, neck, arms, and upper torso) into the right atrium of the heart.
- **Inferior Vena Cava (IVC):**
- Drains deoxygenated blood from the lower body (abdomen, pelvis, legs) into the right atrium of the heart.

2. Veins of the Head and Neck:

- **Internal Jugular Vein:**

- Drains blood from the brain, face, and neck into the subclavian vein.
- **External Jugular Vein:**
- Drains blood from the scalp and face into the subclavian vein.

3. Veins of the Upper Limbs:

- **Subclavian Vein:**
- Drains blood from the upper limbs and merges with the internal jugular vein to form the brachiocephalic vein.
- **Brachiocephalic Vein:**
- Formed by the convergence of the subclavian and internal jugular veins.
- Drains into the superior vena cava.

4. Veins of the Lower Limbs:

- **Common Iliac Veins:**
- Drains blood from the pelvic region.
- Merge to form the inferior vena cava.
- **Femoral Vein:**
- Drains blood from the thigh.
- **Popliteal Vein:**
- Drains blood from the popliteal fossa (area behind the knee).
- **Great Saphenous Vein:**
- Longest vein in the body, drains blood from the foot, leg, and thigh into the femoral vein.

5. Portal Vein System:

- **Portal Vein:**
- Collects blood from the digestive organs (stomach, intestines, spleen, pancreas) and carries it to the liver for processing.

- **Hepatic Veins:**
- Drain blood from the liver into the inferior vena cava.

6. **Veins of the Thorax:**

- **Pulmonary Veins:**
- Carry oxygenated blood from the lungs to the left atrium of the heart.

7. **Dural Venous Sinuses:**

- **Superior Sagittal Sinus:**
- Located in the midline of the brain, drains into the confluence of sinuses.
- **Inferior Sagittal Sinus:**
- Drains into the straight sinus.
- **Transverse Sinuses:**
- Drain into the sigmoid sinuses.
- **Sigmoid Sinuses:**
- Converge to form the internal jugular veins.

2.7.3 Lymphatic

The lymphatic system is a vital part of the circulatory and immune systems, consisting of lymphatic vessels, lymph nodes, lymphatic organs, and lymphatic fluid (lymph). Its primary functions include the drainage of excess interstitial fluid, transportation of dietary fats, and the immune response. Here's an overview of the key components and functions of the lymphatic system:

Components of the Lymphatic System:

1. **Lymphatic Vessels:**

- Thin-walled vessels that form a network throughout the body.
- Collect excess tissue fluid (lymph) and transport it toward larger lymphatic vessels.

2. **Lymph Nodes:**

- Small, bean-shaped structures located along lymphatic vessels.
- Filter lymph, removing pathogens, foreign particles, and damaged cells.
- Contain immune cells (lymphocytes) that help mount an immune response.

3. **Lymphatic Organs:**

- **Spleen:**
    - Largest lymphatic organ.
    - Filters blood, removes old or damaged blood cells, and stores platelets.
    - Contains white blood cells for immune responses.
- **Thymus:**
    - Located in the upper chest.
    - Site of T-cell maturation, crucial for the immune system.
- **Tonsils:**
    - Clusters of lymphatic tissue in the throat.
    - Help trap and remove bacteria and other pathogens entering through the mouth and nose.
- **Peyer's Patches:**
    - Found in the walls of the small intestine.
    - Play a role in immune responses to pathogens in the digestive system.

Functions of the Lymphatic System:

1. **Fluid Homeostasis:**

- Drains excess interstitial fluid from tissues and returns it to the bloodstream, maintaining fluid balance.

2. **Transportation of Dietary Fats:**

- Absorbs and transports dietary fats and fat-soluble vitamins from the digestive system to the bloodstream.

3. **Immune Response:**

- Filters and screens lymph for pathogens, preventing their spread in the body.
- Lymph nodes house immune cells that help recognize and attack foreign invaders.
- The lymphatic system plays a crucial role in the adaptive immune response.

4. **Circulation of Lymph:**

- Lymphatic vessels carry lymph from peripheral tissues to lymph nodes, where it is filtered and returned to the bloodstream.
- Lymphatic circulation is unidirectional and depends on skeletal muscle contractions and valves within the vessels.

Disorders of the Lymphatic System:

1. **Lymphedema:**

- Swelling due to the accumulation of lymph, often caused by blockage or damage to lymphatic vessels.
- Commonly occurs after lymph node removal during cancer surgery.

2. **Lymphadenopathy:**

- Enlargement of lymph nodes, often due to infection, inflammation, or malignancy.

3. **Lymphoma:**

- Cancer affecting lymphocytes, often originating in lymph nodes or lymphatic tissues.

2.8 Digestive System:

2.8.1 Mouth

The anatomy of the mouth involves various structures that play crucial roles in functions such as eating, speaking, and the initial stages of digestion. Here's an overview of the major components of the mouth:

1. Oral Cavity:

- The oral cavity is the hollow space inside the mouth, surrounded by the lips, cheeks, gums, and palate.

2. Lips:

- Form the anterior boundary of the oral cavity.
- Composed of muscle and connective tissue covered by skin.

3. Cheeks:

- Form the lateral boundaries of the oral cavity.
- Contain muscles that help with movements during chewing.

4. Gums (Gingiva):

- Tissues surrounding the teeth.
- Provide support and protection for the teeth.

5. Teeth:

- Responsible for the mechanical breakdown of food during chewing (mastication).
- Different types include incisors, canines, molars, and premolars.

6. Palate:

- Forms the roof of the oral cavity.
- Divided into the hard palate (anterior bony portion) and soft palate (posterior muscular portion).
- The uvula hangs from the free edge of the soft palate.

7. Tongue:

- A muscular organ that occupies the floor of the oral cavity.
- Functions include taste, speech, manipulation of food, and initiation of swallowing.
- Papillae on the tongue contain taste buds.

8. Salivary Glands:

- **Parotid Glands:**
- Located near the ear.

- Produces serous saliva containing enzymes.
- **Submandibular Glands:**
- Located beneath the lower jaw.
- Produces a mixture of serous and mucous saliva.
- **Sublingual Glands:**
- Located under the tongue.
- Produces mainly mucous saliva.
- **Minor Salivary Glands:**
- Scattered throughout the oral cavity.

9. Tonsils:

- Collections of lymphoid tissue located at the back of the oral cavity.
- Help with immune responses against pathogens entering through the mouth and nose.

10. Oral Mucosa:

- The lining of the oral cavity, composed of stratified squamous epithelium.
- Protects underlying tissues and aids in the movement of food.

11. Temporomandibular Joint (TMJ):

- The joint connecting the jawbone (mandible) to the skull (temporal bone).
- Allows for movements such as opening, closing, and lateral movements of the jaw.

12. Saliva:

- Secreted by salivary glands.
- Contains enzymes (e.g., amylase) that initiate digestion, lubricates food for swallowing, and helps maintain oral health.

2.8.2 Pharynx esophagus

The pharynx and esophagus are parts of the digestive system located in the throat and chest, respectively. They play essential roles in the process of swallowing and the transport of food from the mouth to the stomach.

Pharynx:

The pharynx is a muscular tube-shaped structure that connects the nasal and oral cavities to the larynx and esophagus. It is divided into three regions:

1. **Nasopharynx:**

- Located behind the nasal cavity.
- Functions in the passage of air from the nasal cavity to the larynx.

2. **Oropharynx:**

- Located behind the oral cavity (mouth).
- Serves as the common passage for air and food.

3. **Laryngopharynx:**

- Located between the hyoid bone and the larynx.
- Serves as a passageway for both air and food.
- Connects to the esophagus and trachea.

Esophagus:

The esophagus is a muscular tube that extends from the lower part of the pharynx to the stomach. It is approximately 25 centimeters (10 inches) in length. Key features include:

1. **Location:**

- Lies behind the trachea (windpipe) and in front of the spine.
- Passes through the diaphragm before connecting to the stomach.

2. **Muscular Structure:**

- Contains two types of muscle layers:

- **Inner Circular Muscle Layer:** Contracts to propel food downward.
- **Outer Longitudinal Muscle Layer:** Assists in the peristaltic movement of food.

3. **Lower Esophageal Sphincter (LES):**

- A muscular ring at the junction of the esophagus and stomach.
- Prevents stomach contents from flowing back into the esophagus (reflux).

Swallowing Process:

1. **Oral Phase:**

- Chewing and mixing food with saliva in the mouth.

2. **Pharyngeal Phase:**

- The tongue pushes the food to the back of the mouth, triggering the swallowing reflex.
- The soft palate prevents food from entering the nasal cavity.
- The epiglottis covers the trachea to prevent aspiration (food entering the airway).

3. **Esophageal Phase:**

- Peristaltic waves move the food down the esophagus.
- The lower esophageal sphincter relaxes to allow food into the stomach.

Functions:

- The pharynx serves as a passage for both air and food, allowing the respiratory and digestive systems to share a common space briefly.
- The esophagus functions to transport swallowed food and liquids from the pharynx to the stomach for further digestion.

2.8.3 Gastrointestinal tract

The gastrointestinal (GI) tract, also known as the digestive tract or alimentary canal, is a long and continuous tube that extends from the mouth to the anus. It is responsible for the digestion and absorption of nutrients from ingested food. The GI tract is composed of several organs, each with specific functions in the digestive process. Here's an overview of the major components of the gastrointestinal tract:

1. Mouth:

- **Functions:**
- Mechanical breakdown of food by chewing.
- Mixing of food with saliva containing enzymes (e.g., amylase) for initial digestion.
- **Structures:**
- Lips, cheeks, tongue, palate, and teeth.

2. Pharynx:

- **Functions:**
- Common passageway for air and food.
- Initiation of the swallowing reflex.
- **Divisions:**
- Nasopharynx, oropharynx, and laryngopharynx.

3. Esophagus:

- **Functions:**
- Transport of food from the pharynx to the stomach.
- **Structure:**
- Muscular tube with upper and lower esophageal sphincters.

4. Stomach:

- **Functions:**
- Storage of ingested food.
- Mechanical and chemical digestion.
- Secretion of gastric juices (e.g., hydrochloric acid, pepsin).
- **Structures:**

- Fundus, body, antrum, and pylorus.

5. Small Intestine:

- **Functions:**
- Final digestion and absorption of nutrients.
- **Divisions:**
- Duodenum, jejunum, and ileum.

6. Liver:

- **Functions:**
- Production of bile (stored in the gallbladder).
- Detoxification of blood.
- Metabolism of nutrients.
- **Structures:**
- Lobes (right and left), hepatic ducts.

7. Gallbladder:

- **Functions:**
- Storage and concentration of bile.
- **Structure:**
- Sac-like organ connected to the liver.

8. Pancreas:

- **Functions:**
- Production of pancreatic enzymes for digestion.
- Regulation of blood glucose levels through insulin secretion.
- **Structure:**

- Head, body, and tail.

9. Large Intestine (Colon):

- **Functions:**
- Absorption of water and electrolytes.
- Formation and storage of feces.
- **Divisions:**
- Cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum, and anal canal.

10. Rectum:

- **Functions:**
- Temporary storage of feces before elimination.

11. Anus:

- **Functions:**
- Opening through which feces are expelled from the body.

12. Accessory Organs:

- **Salivary Glands:**
- Secrete saliva containing enzymes.
- **Teeth and Tongue:**
- Involved in mechanical breakdown of food.
- **Appendix:**
- Located near the junction of the small and large intestines.

2.8.4 Associated glands, salivary glands, liver, pancreas

The gastrointestinal system is associated with several glands that play crucial roles in the digestion and processing of food. Here are the major associated glands:

1. **Salivary Glands:**

- **Parotid Glands:**
- Located near the ear.
- Produces serous saliva, which contains enzymes like amylase for the initial digestion of carbohydrates.
- **Submandibular Glands:**
- Located beneath the lower jaw.
- Produces a mixture of serous and mucous saliva.
- **Sublingual Glands:**
- Located under the tongue.
- Produces mainly mucous saliva.

2. **Liver:**

- **Functions:**
- Produces bile, which is stored in the gallbladder before being released into the small intestine.
- Detoxifies blood, metabolizes nutrients, and stores glycogen.
- **Structures:**
- Divided into lobes (right and left).
- Hepatic ducts carry bile to the common bile duct.

3. **Gallbladder:**

- **Functions:**
- Stores and concentrates bile produced by the liver.
- Releases bile into the small intestine to aid in the digestion and absorption of fats.

4. **Pancreas:**

- **Functions:**
- Produces digestive enzymes (lipases, proteases, and amylases) that are released into the small intestine to break down fats, proteins, and carbohydrates.
- Secretes insulin and glucagon, which regulate blood sugar levels.
- **Structure:**
- Divided into the head, body, and tail.
- Connected to the duodenum via the pancreatic duct.

2.8.5 Endocrines Pituitary thyroid & parathyroid suprarenal etc.

The endocrine system is a complex network of glands that secrete hormones, which are chemical messengers that regulate various physiological processes in the body. Here are some key endocrine glands and their associated hormones:

1. Pituitary Gland:

- **Location:**
- Situated at the base of the brain, attached to the hypothalamus.
- **Hormones:**
- *Anterior Pituitary (Adenohypophysis):*
    - Growth Hormone (GH)
    - Prolactin (PRL)
    - Thyroid-Stimulating Hormone (TSH)
    - Adrenocorticotropic Hormone (ACTH)
    - Follicle-Stimulating Hormone (FSH)
    - Luteinizing Hormone (LH)
- *Posterior Pituitary (Neurohypophysis):*
    - Oxytocin
    - Antidiuretic Hormone (ADH, Vasopressin)

2. Thyroid Gland:

- **Location:**
- Located in the neck, just below the Adam's apple.
- **Hormones:**
- Thyroxine (T4) and Triiodothyronine (T3): Regulate metabolism.
- Calcitonin: Regulates calcium levels.

3. Parathyroid Glands:

- **Location:**
- Four small glands located on the posterior surface of the thyroid gland.
- **Hormone:**
- Parathyroid Hormone (PTH): Regulates calcium and phosphate levels in the blood.

4. Adrenal (Suprarenal) Glands:

- **Location:**
- Situated on top of each kidney.
- **Hormones:**
- *Adrenal Cortex:*
    - Cortisol: Regulates metabolism and immune response.
    - Aldosterone: Regulates salt and water balance.
    - Androgens: Precursors of sex hormones.
- *Adrenal Medulla:*
    - Epinephrine (Adrenaline) and Norepinephrine: Part of the "fight or flight" response.

5. Pancreas:

- **Location:**

- Located behind the stomach.
- **Hormones:**
- Insulin: Lowers blood sugar.
- Glucagon: Raises blood sugar.

6. Pineal Gland:

- **Location:**
- Located deep within the brain.
- **Hormone:**
- Melatonin: Regulates sleep-wake cycles.

7. Hypothalamus:

- **Location:**
- Located in the brain.
- **Function:**
- Produces releasing hormones that stimulate or inhibit the release of hormones from the pituitary gland.

8. Gonads (Ovaries and Testes):

- **Ovaries:**
- Produce estrogen and progesterone.
- **Testes:**
- Produce testosterone.

9. Thymus:

- **Location:**
- Located in the chest.

- **Function:**
- Produces thymosin, which plays a role in the development of the immune system.

2.9 SURFACE ANATOMY

Understanding various bony and surface landmarks on the body is crucial for healthcare professionals, anatomists, and individuals in fields such as physical therapy, sports medicine, and fitness. These landmarks serve as reference points for anatomical orientation, palpation, and communication about specific locations on the body. Here are some major bony and surface landmarks:

Bony Landmarks:

1. **Cranium:**
- Frontal Bone
- Parietal Bones
- Occipital Bone
- Temporal Bones
2. **Face:**
- Maxilla
- Mandible
- Zygomatic Bones (Cheekbones)
3. **Neck:**
- Hyoid Bone
- Cervical Vertebrae
4. **Shoulder Girdle:**
- Clavicle (Collarbone)
- Scapula (Shoulder Blade)
5. **Upper Limb:**
- Humerus (Upper Arm Bone)

- Radius and Ulna (Forearm Bones)
- Carpals (Wrist Bones)
- Metacarpals (Palm Bones)
- Phalanges (Finger Bones)

6. **Thoracic Cage:**

- Sternum (Breastbone)
- Ribs

7. **Vertebral Column:**

- Cervical Vertebrae (Neck)
- Thoracic Vertebrae (Upper Back)
- Lumbar Vertebrae (Lower Back)
- Sacrum
- Coccyx

8. **Pelvis:**

- Ilium, Ischium, and Pubis (Constitute the hip bone)
- Sacroiliac Joint
- Pubic Symphysis

9. **Lower Limb:**

- Femur (Thigh Bone)
- Patella (Kneecap)
- Tibia and Fibula (Leg Bones)
- Tarsals (Ankle Bones)
- Metatarsals (Foot Bones)
- Phalanges (Toe Bones)

Surface Landmarks:

1. **Head and Neck:**

- External Occipital Protuberance
- Mastoid Process
- Mental Point
- External Auditory Meatus
- Suprasternal Notch

2. **Shoulder and Upper Limb:**

- Acromion Process
- Coracoid Process
- Olecranon Process
- Radial and Ulnar Styloid Processes

3. **Thorax:**

- Jugular Notch
- Xiphoid Process
- Sternal Angle

4. **Abdomen and Pelvis:**

- Anterior Superior Iliac Spine (ASIS)
- Anterior Inferior Iliac Spine (AIIS)
- Pubic Tubercle

5. **Back:**

- Scapular Spine
- Inferior Angle of Scapula

6. **Lower Limb:**

- Greater Trochanter
- Ischial Tuberosity

- Medial and Lateral Malleoli

7. **Foot:**

- Calcaneus (Heel Bone)
- Medial and Lateral Cuneiforms
- Navicular Bone

CORRELATION OF THESE MARKS WITH DEEP STRUCTURES:

Correlating surface landmarks with deep structures is essential for medical professionals, particularly during physical examinations, surgeries, and other clinical procedures. Here's a correlation of some surface landmarks with underlying deep structures:

1. Clavicle:

- **Correlation:**
- Lies superficially on the upper thorax.
- **Deep Structures:**
- Subclavian vessels and brachial plexus pass beneath the clavicle.

2. Iliac Crest:

- **Correlation:**
- Palpable at the top of the pelvic bone.
- **Deep Structures:**
- Kidneys are located beneath the lower part of the iliopsoas muscles, close to the iliac crest.

3. Anterior Superior Iliac Spine (ASIS) and Pubic Tubercle:

- **Correlation:**
- ASIS and pubic tubercle form the anterior pelvic landmarks.

- **Deep Structures:**
- Inguinal ligament connects ASIS to pubic tubercle and marks the inguinal canal.

4. Spinous Processes:

- **Correlation:**
- Palpable along the midline of the back.
- **Deep Structures:**
- Overlie the vertebral column and spinal cord.

5. Scapula:

- **Correlation:**
- Shoulder blade on the posterior thorax.
- **Deep Structures:**
- Overlie the ribs, lungs, and part of the thoracic spine.

6. Axillary Fold:

- **Correlation:**
- Fold of skin in the axillary region.
- **Deep Structures:**
- Axillary artery, vein, and brachial plexus pass through the axilla.

7. Popliteal Fossa:

- **Correlation:**
- Depressed area at the back of the knee.
- **Deep Structures:**
- Popliteal artery and vein, tibial and common fibular nerves.

8. Inguinal Ligament:

- **Correlation:**
- Forms the lower border of the abdomen.
- **Deep Structures:**
- Marks the inguinal canal where structures like the spermatic cord or round ligament pass through.

9. Superior and Inferior Borders of the Scapula:

- **Correlation:**
- Palpable along the back.
- **Deep Structures:**
- Overlie the ribs, lungs, and part of the thoracic spine.

10. Sternum:

- **Correlation:**
- Central bone of the anterior thorax.
- **Deep Structures:**
- Lies over the heart, great vessels, and parts of the respiratory and digestive systems.

11. Medial and Lateral Malleoli:

- **Correlation:**
- Bony prominences on either side of the ankle.
- **Deep Structures:**
- Overlie the tibia and fibula bones and surrounding ligaments.

SURFACE MARKING OF VARIOUS DEEP STRUCTURE IN BODY:

Surface markings of various deep structures refer to the observable points on the body's surface that correspond to underlying anatomical structures. These markings are essential for healthcare professionals during physical examinations, surgeries, and diagnostic procedures. Here are some surface markings and their correlations with deep structures:

1. Heart:

- **Surface Markings:**
- Apex: Located at the fifth intercostal space, midclavicular line.
- Base: Lies beneath the second rib.
- **Correlation:**
- Overlies the left ventricle and part of the right ventricle.

2. Lungs:

- **Surface Markings:**
- Borders extend from the apex of the lungs (above the clavicle) to the base (above the diaphragm).
- **Correlation:**
- Overlie the thoracic cavity and are separated by the heart.

3. Liver:

- **Surface Markings:**
- Upper border at the right fifth intercostal space.
- Lower border at the costal margin.
- **Correlation:**
- Predominantly located on the right side beneath the diaphragm.

4. Spleen:

- **Surface Markings:**
- Left costal margin at the ninth to eleventh ribs.
- **Correlation:**

- Lies beneath the left rib cage.

5. Stomach:

- **Surface Markings:**
- Extends from the left costal margin to the right costal margin.
- **Correlation:**
- Occupies the upper central part of the abdomen.

6. Kidneys:

- **Surface Markings:**
- Right kidney sits slightly lower than the left.
- Right kidney's upper border is at the twelfth rib, while the left kidney's upper border is at the eleventh and twelfth ribs.
- **Correlation:**
- Positioned in the retroperitoneal space on either side of the spine.

7. Appendix:

- **Surface Markings:**
- McBurney's Point: One-third of the way from the anterior superior iliac spine (ASIS) to the umbilicus.
- **Correlation:**
- Location of the appendix in the right lower quadrant of the abdomen.

8. Bladder:

- **Surface Markings:**
- Pelvic region.
- **Correlation:**
- Located in the pelvic cavity, often palpable above the pubic symphysis when full.

9. Pancreas:

- **Surface Markings:**
- Lies horizontally across the upper abdomen.
- **Correlation:**
- Retroperitoneal organ behind the stomach.

10. Colon:

- **Surface Markings:**
- Ascending and descending colon on the right and left sides of the abdomen, respectively.
- **Correlation:**
- Parts of the large intestine with specific locations in the abdominal cavity.

11. Rectum:

- **Surface Markings:**
- Pelvic region, terminating at the anus.
- **Correlation:**
- The final part of the large intestine leading to the anus.

12. Prostate Gland:

- **Surface Markings:**
- Palpable through the anterior wall of the rectum (in males).
- **Correlation:**
- Part of the male reproductive system located below the bladder.

MEASURMENTS IN LIMBS-RECOGNITION OF VARIOUS PARTS IN LIMBS, ABDOMEN, THORAX, HEAD AND NECK:

Measurements in limbs and various parts of the body are often taken for clinical assessments, anthropometric studies, and diagnostic purposes. Here are some common measurements and points of recognition for different body regions:

1. Limbs:

Upper Limb:

1. **Upper Arm (Humerus):**

- Measure from the acromion process to the olecranon process.

2. **Forearm (Radius and Ulna):**

- Measure from the olecranon process to the styloid processes of the radius and ulna.

3. **Hand:**

- Measure from the styloid process of the radius to the tip of the middle finger.

Lower Limb:

1. **Thigh (Femur):**

- Measure from the anterior superior iliac spine (ASIS) to the proximal border of the patella.

2. **Leg (Tibia and Fibula):**

- Measure from the proximal border of the patella to the medial and lateral malleoli.

3. **Foot:**

- Measure from the heel to the tip of the longest toe.

2. Abdomen:

1. **Waist Circumference:**

- Measure at the narrowest part of the waist, typically above the navel.

2. **Hip Circumference:**

- Measure at the widest part of the hips.

3. **Abdominal Girth:**

- Measure around the abdomen at the level of the umbilicus.

3. Thorax:

1. **Chest Circumference:**

- Measure at the level of the nipple line.

2. **Chest Expansion:**

- Measure the change in circumference during inhalation and exhalation.

4. Head and Neck:

1. **Head Circumference:**

- Measure around the widest part of the head, usually above the eyebrows.

2. **Neck Circumference:**

- Measure just below the Adam's apple in males or at the level of the cricoid cartilage in females.

3. **Interpupillary Distance:**

- Measure the distance between the pupils of the eyes.

4. **Orbitomeatal Line:**

- A line passing through the external auditory meatus to the outer canthus of the eye.

5. Miscellaneous Measurements:

1. **Height:**

- Measure from the crown of the head to the heels.

2. **Arm Span:**

- Measure from the tip of one middle finger to the tip of the other with arms extended laterally.

3. **Crown-Heel Length:**

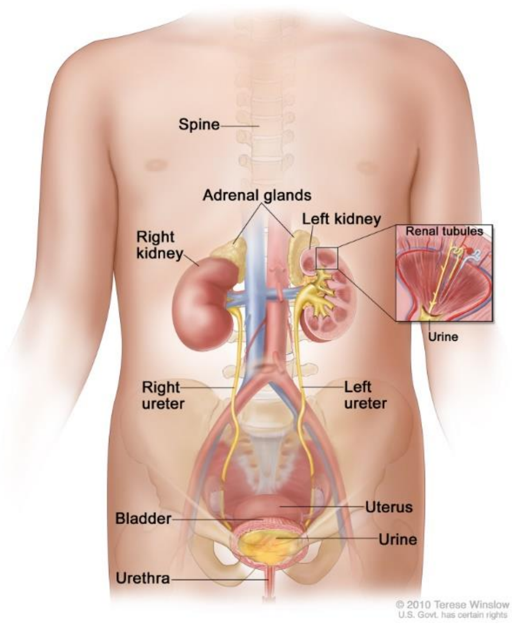
- Measure from the crown of the head to the heels when the individual is lying down.

4. **Shoulder Width:**

- Measure the distance between the acromion processes

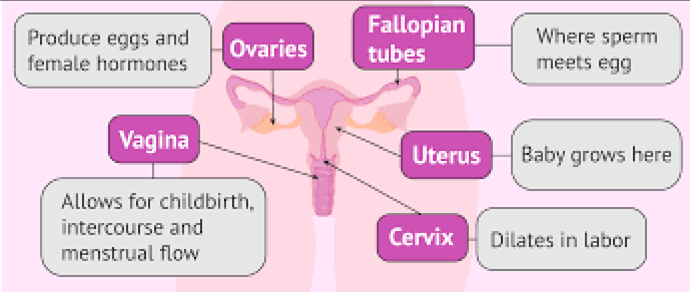
Practical

1. **Excretory System / Uro-genital**

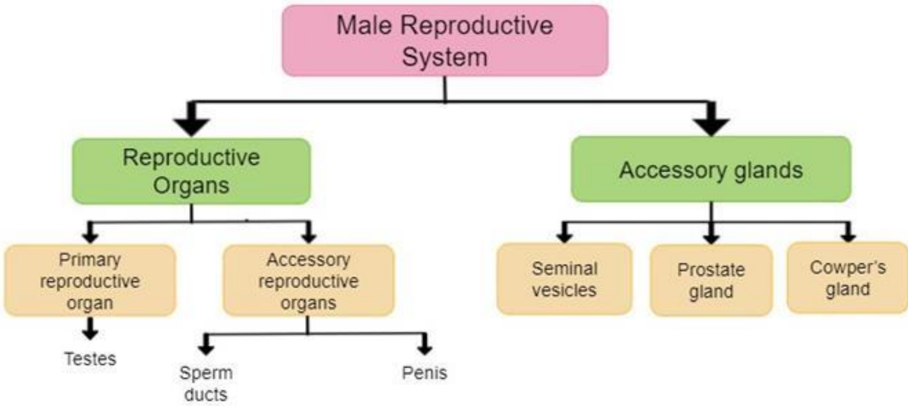
Question	**Sample answer**
Draw a diagram showing parts of excretory system	

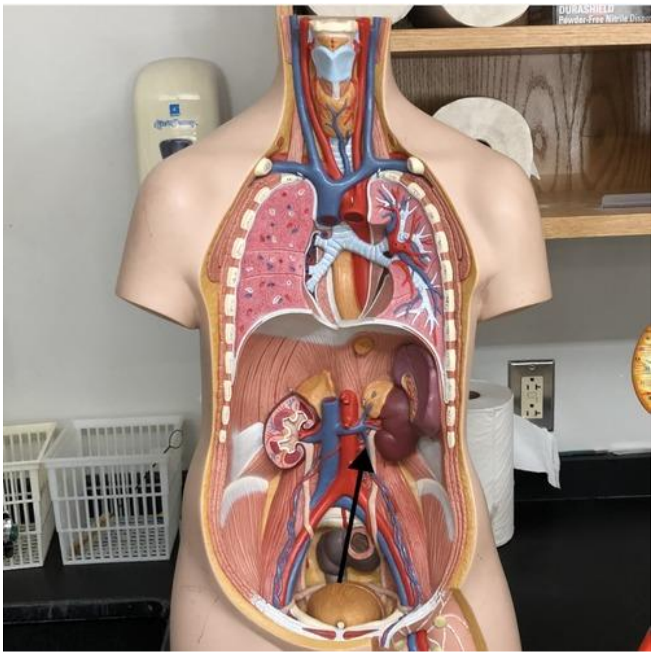
Reproductive system of female

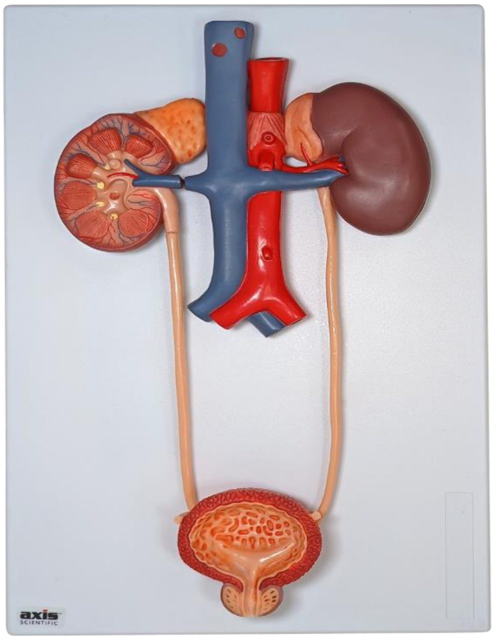
Question	**Sample Answer**

Draw a diagram showing parts of reproductive system of female	

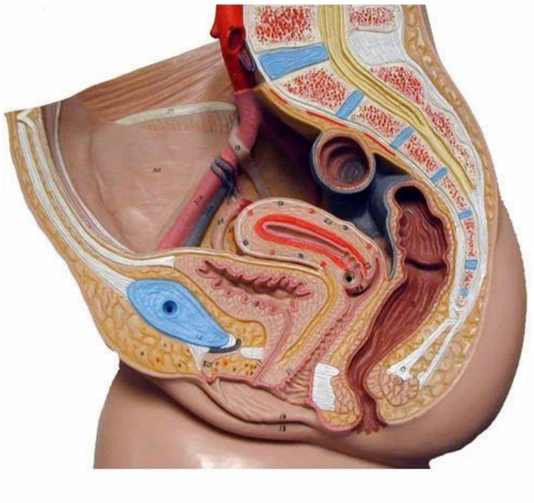
Reproductive system of male

Question	Sample Answer
Draw a chart showing parts of reproductive system of male	

Question	Sample Answer
Trainer shall display the mannequin to the trainees and ask them to locate parts of kidney, urinary bladder, urethra To be demonstrated in lab	

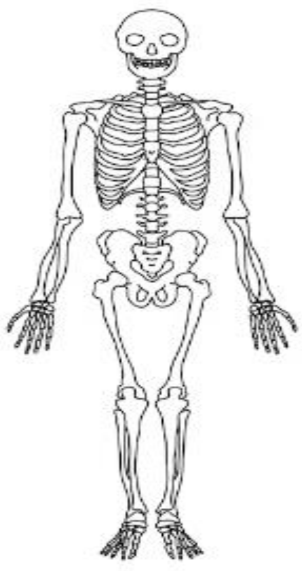
Question	Sample Answer

Trainer shall display the mannequin to the trainees and ask them to locate parts of reproductive system of female To be demonstrated in lab	

Question	Sample Answer
Trainer shall display the mannequin to the trainees and ask them to locate parts of reproductive system of male To be demonstrated in lab	

i. Skeleton

Trainer shall illustrate the skeletal system and ask the trainees to identify the parts of the skeletal system by locating it from the given illustration.



Sketch the parts of the skeleton system and write the names

1 See the image provided above, identify the various parts and make a list in the given Table1.

Table 1

S. No	List the different parts of skeletal system from the given image
1	
2	
3	
4	
5	
6	
7	

Individual bones

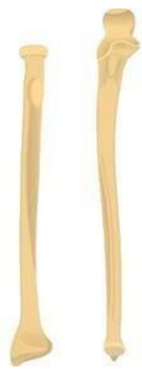
: **Identify the names of the various bones**

1 See the image provided above, identify the names and sides of bones from the given Table 1.

Table 1

Image given	**Name of the bone**	**Side of the bone (left or right)**
		
		

Image given	Name of the bone	Side of the bone (left or right)
		
		
		

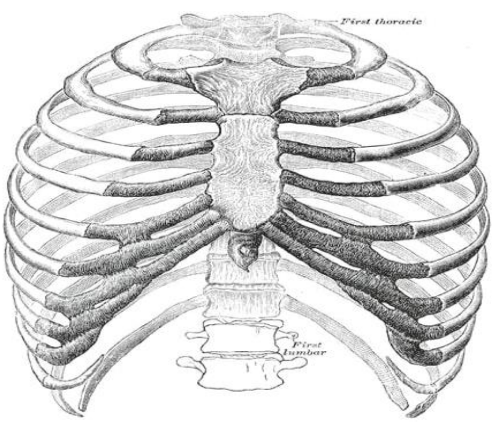
Sketch the vertebral column and write the names

See the image provided above, identify the various different parts and make a list in the given Table 1

Table 1

S .No	List the vertebrae from the given image	Write the numbers of vertebrae
1		
2		
3		

4		
5		



Thorax

Sketch the parts of the thorax and write the names

See the image provided above, identify the various parts and make a list in the given Table 1.

Sl.No	**List the different parts of thorax from the given image**
1	
2	
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CHAPTER: 3

KINESIOLOGY

Kinesiology is the study of body movements. The term comes from the Greek word *kinesis*, which means "to move."

The human movements can be passive or active movements.

3.1 CLASSIFICATION OF PASSIVE MOVEMENTS.

Passive movements refer to the motion of joints that is produced by an external force, without any voluntary muscle contraction. These movements can be classified into different categories:

i. **Continuous Passive Motion (CPM):** Continuous, repetitive, and controlled passive movement of a joint through a preset range of motion.
   Purpose: Often used in rehabilitation settings following surgery or injury to promote joint mobility, reduce stiffness, and enhance tissue healing.
ii. **Joint Mobilization:** Passive movement applied to a synovial joint to maintain or restore its mobility.
   Purpose: Used by physical therapists to improve joint function, decrease pain, and enhance the range of motion.
iii. **Manual Passive Stretching:** Passive elongation of a muscle or group of muscles performed by another person.
   Purpose: To increase flexibility, improve range of motion, and decrease muscle tightness.
iv. **Relaxation Passive Movements:** Passive movements applied to induce muscle relaxation.
   Purpose: Often used in therapeutic settings to alleviate muscle spasms and reduce tension/pain.

3.1.1 Relaxed Passive Movements

Relaxed passive movements involve the manual or mechanical movement of a joint through its range of motion without any active muscle contraction from the individual. These movements are typically performed with the person in a relaxed state, allowing an external force, such as a therapist or a device, to guide the joint through its available motions. The effects of relaxed passive movements include:

1. Joint Mobilization:

- Improved joint mobility.
- Increased synovial fluid circulation within the joint.
- Reduction of joint stiffness.

2. Prevention of Joint Contractures:

- Maintains or increases joint flexibility.
- Helps prevent the development of contractures (abnormal shortening of muscles or connective tissue).

3. Pain Reduction:

- Relieves pain associated with muscle spasms or joint restrictions.
- Promotes relaxation of muscle tissue.

4. Enhanced Circulation:

- Facilitates blood flow to the joint and surrounding tissues.
- Supports nutrient and oxygen delivery to the joint structures.

5. Stretching of Soft Tissues:

- Gentle elongation of muscles and connective tissues.
- May help address muscle tightness or imbalances.

6. Assessment of Joint Integrity:

- Allows for the assessment of the quality and quantity of joint movement.
- Identifies any restrictions, pain, or abnormalities.

7. Relaxation and Stress Reduction:

- Induces a state of relaxation in the individual.
- May contribute to overall stress reduction and improved mental well-being.

8. Assistance in Rehabilitation:

- Used in the early stages of rehabilitation when active muscle contraction is limited or contraindicated.
- Helps maintain joint mobility during the recovery period.

9. Improved Synovial Fluid Lubrication:

- Gentle movement enhances the distribution of synovial fluid within the joint.
- Supports joint lubrication and nutrition of cartilage.

10. Passive Stretching:

- Elongates muscle fibers and connective tissues.
- Can help address muscle tightness or shortening.

11. Psychological Benefits:

- Promotes a sense of comfort and trust in therapeutic relationships.
- Can positively impact the individual's psychological state.

3.1.2 Forced Passive Movements

Forced passive movements involve the application of external force to move a joint through its range of motion, often against the individual's voluntary resistance or without their active participation. These movements are typically performed by a therapist or a mechanical device, and they can be used for various therapeutic purposes. However, it's crucial to approach forced passive movements with caution, ensuring that they are applied safely and within the individual's tolerance. Here are some techniques and potential effects of forced passive movements:

Techniques:

1. **Overpressure:**

- Applying additional force beyond the individual's relaxed position to stretch the joint or soft tissues.
- Commonly used in stretching exercises to increase flexibility.

2. **Manual Resistance:**

- The therapist applies resistance to the joint movement to engage and strengthen specific muscles.
- Often used in rehabilitation to build muscle strength.

3. **Joint Mobilization:**

- Gentle, rhythmic movements applied to a joint to improve its range of motion.
- Utilizes oscillatory or sustained techniques.

4. **Forced Flexion and Extension:**

- Applying force to move a joint through flexion or extension motions.
- Can be used to address joint stiffness or limitations in range of motion.

5. **Passive Stretching:**

- Applying force to stretch muscles and connective tissues beyond their resting length.
- Aims to improve flexibility and address muscle tightness.

Effects:

1. **Increased Joint Mobility:**

- Forced passive movements can help improve joint range of motion, addressing stiffness or limitations.

2. **Muscle Relaxation:**

- The application of external force can induce muscle relaxation, reducing muscle tension and spasms.

3. **Stretching of Soft Tissues:**

- Forced stretching can elongate muscles and connective tissues, promoting flexibility.

4. **Improved Synovial Fluid Circulation:**

- Joint mobilization can enhance the distribution of synovial fluid, contributing to joint lubrication.

5. **Assistance in Rehabilitation:**

- Forced passive movements can be beneficial in the early stages of rehabilitation when active muscle contraction is limited.

6. **Strengthening with Resistance:**

- Manual resistance applied during forced passive movements can engage specific muscles, contributing to strength development.

7. **Enhanced Proprioception:**

- The controlled application of force can improve joint position sense and proprioception.

8. **Pain Reduction:**

- When performed within the individual's tolerance, forced passive movements can help alleviate pain associated with muscle tightness or joint restrictions.

9. **Addressing Muscle Imbalances:**

- Targeted resistance or stretching can be used to address muscle imbalances and promote symmetry.

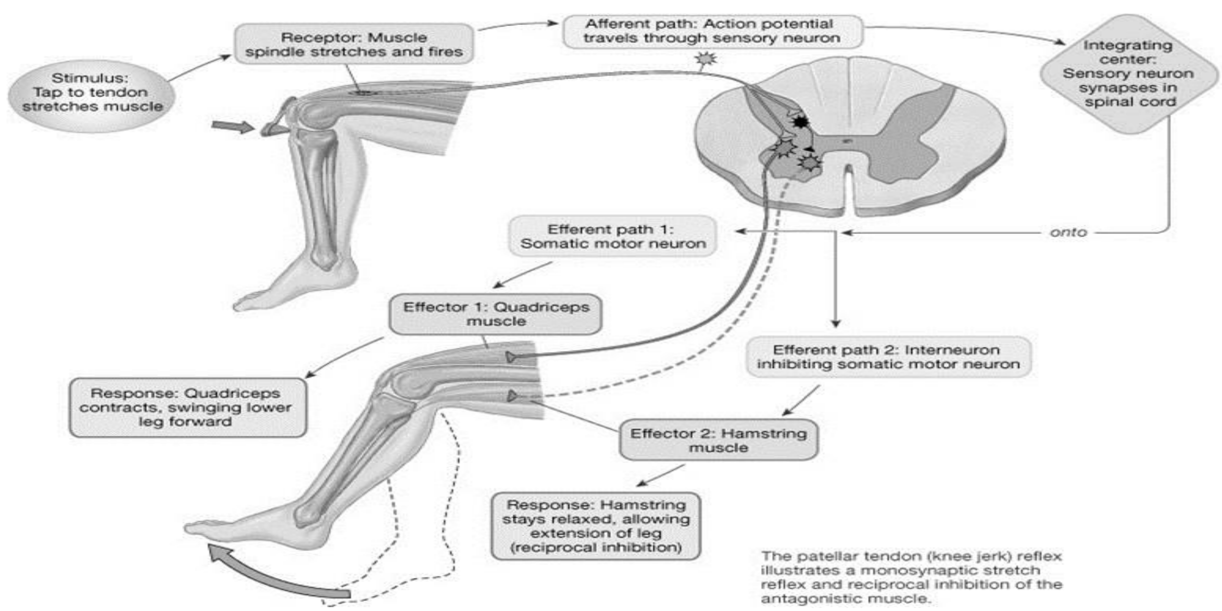
10. **Prevention of Joint Contractures:**

- Forced passive movements can help prevent the development of joint contractures by maintaining or increasing joint flexibility.

3.1.3 Its technique and effects.

Reflex Passive Movements:

Reflex passive movements involve stimulating reflexes to initiate a passive response in the muscles and joints. This is often used in rehabilitation settings to improve range of

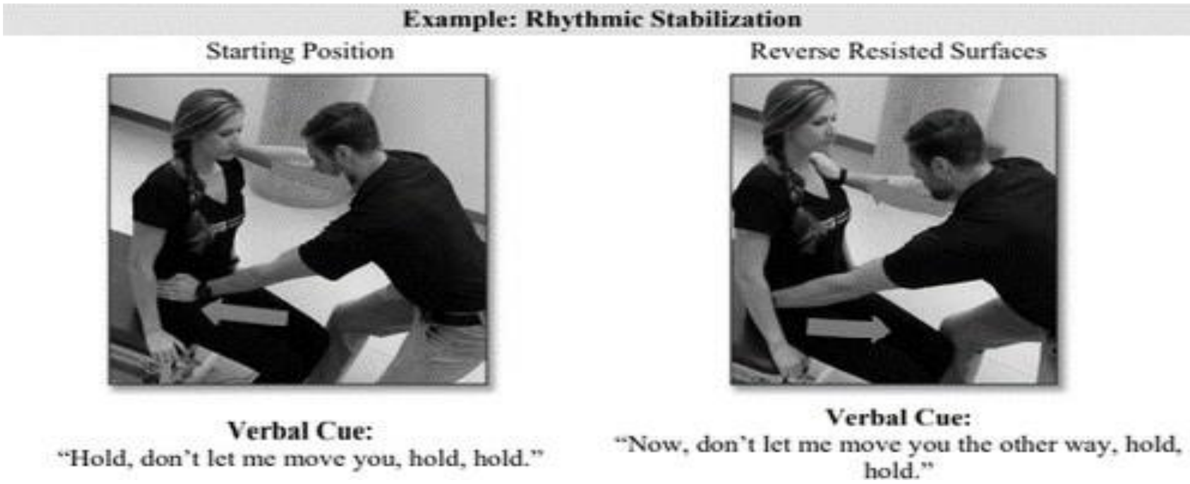


motion, flexibility, and neuromuscular control. Here are some reflex passive movement techniques:

i. **Reciprocal Inhibition:** This technique involves contracting the muscles opposing those being stretched. For example, when stretching the quadriceps, contracting the hamstrings can facilitate the stretch by inhibiting the stretch reflex in the quadriceps.

ii. **Hold-Relax Technique:** The therapist stretches the muscle to its limit, and the individual is then asked to contract the muscle isometrically against resistance for a few seconds. After relaxation, the muscle can often be stretched further.

iii. **Rhythmic Stabilization:** This technique involves applying resistance to the muscle in various planes while the joint is moved passively. The goal is to improve



muscle coordination and stability through reflex responses.

3.1.1.2 Forced Passive Movements:

Forced passive movements involve external forces applied to move a joint through its range of motion. These movements are typically guided by a therapist or a mechanical device. Here are some techniques and effects of forced passive movements:

iv. **Joint Mobilization:** Therapists use graded oscillations, sustained stretches, or gliding movements to restore joint mobility. This can help reduce pain, increase joint range of motion, and improve synovial fluid circulation.

v. **Continuous Passive Motion (CPM):** This is a technique where a mechanical device is used to continuously move a joint through a controlled range of motion. CPM is often used after joint surgery to prevent stiffness and promote healing.

vi. **PROM (Passive Range of Motion) Exercises:** In PROM exercises, a therapist moves a patient's limb through its range of motion without any effort from the patient. This helps maintain joint flexibility and prevent contractures in individuals with limited mobility.

3.2 CLASSIFICATION OF ACTIVE MOVEMENTS.

Active movements involve the voluntary contraction of muscles to produce motion at joints. These movements can be classified based on various factors, including the level of assistance or resistance provided.

Classification of Active Movements:

i. **Assisted Active Movements**: Voluntary muscle contractions with external assistance. Examples: Therapist-assisted joint movements, use of assistive devices.

   Purpose: Facilitate movement in individuals with limited strength or range of motion, promote independence in functional activities.

ii. **Resisted Active Movements**: Voluntary muscle contractions performed against resistance. Examples: Resistance bands, weights, isometric exercises.

   Purpose: Strengthen specific muscle groups, improve muscle endurance, and enhance functional capacity.

iii. **Free Active Movements:** Voluntary muscle contractions without external assistance or resistance. Examples: Performing daily activities, sports, functional movements.

   Purpose: Maintain and improve overall joint mobility, enhance coordination, and promote functional independence.

Techniques and Effects:

3.1.2.1 Assisted Active Movements:

Techniques:

Manual Assistance: Therapist provides hands-on support to guide the movement.

Assistive Devices: Use of tools or equipment to aid movement, such as canes or walkers.

Effects:

Facilitates movement in individuals with muscle weakness or joint restrictions. Enhances proprioception and motor control. Supports rehabilitation by promoting controlled, pain-free movement.

3.1.2.2Resisted Active Movements:

Techniques:

Resistance Bands: Applying resistance during joint movements.
Free Weights: Lifting weights to challenge muscle strength.

Effects:

Builds muscle strength and endurance. Improves neuromuscular coordination. Enhances joint stability and functional capacity.

3.1.2.3 Free Active Movements: Techniques:

Functional Activities: Engaging in daily tasks requiring various movements.
Sports-Specific Movements: Performing activities related to a particular sport.

Effects:

Maintains overall joint mobility and flexibility. Improves coordination and balance. Promotes functional independence in daily life and specific activities.

3.1.3 Pulley and weight circuit

A pulley and weight circuit are a type of resistance training system that utilizes pulleys and weights to provide variable resistance during exercises.

Components:

i. **Pulleys:** Mechanical devices with grooved wheels over which ropes or cables can move. Pulleys redirect the force applied to the cable, allowing for different exercise angles.

ii. **Cables:** Flexible, durable cables connect the weights to handles or attachments, transmitting resistance during exercises.

iii. **Weights:** Typically, a stack of weight plates that can be adjusted to vary resistance levels.

Effects and Uses of Pulley Circuit:

3.1.3.1 Variable Resistance:

a. Effect: Pulley circuits provide variable resistance throughout the range of motion, ensuring that the resistance matches the strength curve of the muscle.

b. Use: Effective for targeting specific parts of a movement, allowing for a more comprehensive muscle workout.

3.1.3.2 Isolation and Targeting:

c. Effect: Pulley circuits enable isolation of specific muscle groups by adjusting the direction and angle of resistance.

d. Use: Useful for rehabilitation exercises, bodybuilding, and muscle-specific training.

*3.*1.3.3 Safety and Control:

e. Effect: The controlled movement of cables and weights reduces the risk of injury by minimizing the impact of gravity.

f. Use: Suitable for individuals with joint issues or those undergoing rehabilitation, providing a safer alternative to free weights.

3.1.3.4 Functional Training:

g. Effect: Mimics real-life movements by allowing for multi-plane exercises.

h. Use: Ideal for functional training, which improves overall movement patterns, balance, and coordination.

3.1.3.5 Progressive Overload:

i. Effect: The ability to easily adjust weights supports the principle of progressive overload, essential for muscle growth and strength gains.

j. Use: Enables users to gradually increase resistance as their strength improves.

3.1.3.6 Space Efficiency:

k. Effect: Pulley systems often require less space compared to traditional free weights.

l. Use: Suitable for home gyms or facilities with limited space.

Pulley and weight circuits are commonly found in gyms and fitness centers, and they are used for various purposes, including strength training, rehabilitation, and functional fitness.

3.1.1 Assisted active movement its technique and effect

Assisted active movements involve an individual voluntarily contracting their muscles to produce joint motion, but with some external assistance to overcome resistance or limitations. These techniques are often used in rehabilitation settings to promote joint mobility, improve muscle strength, and facilitate functional movements. Here are some common techniques and potential effects of assisted active movements

1. Assisted Range of Motion (ROM):

- **Technique:**
- The therapist or a device provides support to guide a limb through its range of motion while the individual actively engages the muscles.
- **Effects:**
- Maintains or improves joint flexibility.
- Helps prevent joint stiffness and contractures.

2. Manual Resistance:

- **Technique:**
- The therapist applies resistance to the individual's active movement, challenging the muscles to work against the external force.
- **Effects:**
- Enhances muscle strength.
- Supports muscle endurance.

3. Theraband Exercises:

- **Technique:**
- The individual uses a resistance band to perform active movements, with the band providing resistance against the movement.

- **Effects:**
- Improves muscle strength.
- Allows for progressive resistance training.

4. **Assisted Walking:**

- **Technique:**
- The therapist or a device provides support and guidance as the individual walks, helping them maintain balance and proper gait.
- **Effects:**
- Promotes functional mobility.
- Assists in improving walking patterns.

5. **Assisted Sit-to-Stand:**

- **Technique:**
- The therapist or a support device assists the individual in transitioning from a sitting to a standing position.
- **Effects:**
- Strengthens lower extremity muscles.
- Enhances functional independence.

6. **Assisted Arm Exercises:**

- **Technique:**
- The therapist or a device assists the individual in performing various arm exercises, such as reaching, lifting, or pushing.
- **Effects:**

- Targets specific muscle groups for strengthening.
- Improves range of motion in the upper extremities.

7. Pulleys and Ropes:

- **Technique:**
- Using a system of pulleys and ropes, the individual actively engages in pulling or lifting movements with external assistance.
- **Effects:**
- Provides resistance for strengthening.
- Enhances coordination and control.

8. Assisted Cycling:

- **Technique:**
- The individual engages in cycling with assistance from a therapist or a specialized device.
- **Effects:**
- Improves cardiovascular fitness.
- Enhances lower extremity strength and coordination.

9. Aquatic Therapy:

- **Technique:**
- Performing active movements in water with buoyancy providing support and resistance.
- **Effects:**
- Facilitates joint movement in a low-impact environment.
- Enhances muscle strength and flexibility.

11. Assisted Stretching:

Assisted stretching involves a trained practitioner stretching your body for you, generally at a dedicated facility. The stretches are done both manually and using specialty equipment. Stretching programs are tailored to individuals and their goals, and may involve weekly visits for a month or two.

3.1.2 Resisted movement its technique and effect.

Resisted movements involve applying external resistance against an individual's voluntary muscle contractions, providing a challenging load for the muscles to work against. These techniques are commonly used in strength training and rehabilitation settings to enhance muscle strength, power, and endurance. Here are some common techniques and potential effects of resisted movements:

1. Free Weights:

- **Technique:**
- Individuals use dumbbells, barbells, or kettlebells to perform exercises against the resistance of the weights.
- **Effects:**
- Targets specific muscle groups.
- Allows for a wide range of motion.
- Enhances overall strength.

2. Machine Resistance:

- **Technique:**
- Individuals use resistance machines that provide a guided range of motion and adjustable resistance.
- **Effects:**

- Isolates specific muscle groups.
- Offers stability and safety.
- Allows for controlled resistance.

3. Resistance Bands:

- **Technique:**
- Elastic bands of varying resistance levels are used to perform exercises that challenge muscles.
- **Effects:**
- Provides variable resistance throughout the range of motion.
- Portable and versatile for various exercises.

4. Cable Machines:

- **Technique:**
- Individuals use cable machines with adjustable weights and pulley systems to perform resistance exercises.
- **Effects:**
- Allows for a variety of exercises.
- Provides constant tension on muscles.

5. Bodyweight Exercises:

- **Technique:**
- Individuals use their own body weight as resistance in exercises such as push-ups, squats, and lunges.
- **Effects:**

- Builds strength using minimal equipment.
- Improves functional strength.

6. Medicine Ball Exercises:

- **Technique:**
- Medicine balls of various weights are incorporated into exercises, adding resistance.
- **Effects:**
- Enhances power and explosiveness.
- Improves coordination.

7. Isometric Exercises:

- **Technique:**
- Muscles contract against an immovable object or resistance without joint movement.
- **Effects:**
- Builds static strength.
- Useful in rehabilitation for strengthening without joint motion.

8. Aquatic Resistance:

- **Technique:**
- Individuals perform exercises in water, which provides resistance.
- **Effects:**
- Low-impact resistance training.
- Beneficial for rehabilitation.

9. Partner Resistance:

- **Technique:**
- A partner applies resistance during exercises, such as pushing or pulling against the individual's movements.
- **Effects:**
- Allows for dynamic resistance.
- Incorporates functional movements.

12. Isotonic Exercises:

Exercise when a contracting muscle shortens against a constant load, as when lifting a weight. Isotonic exercise is one method of muscular exercise. In contrast, isometric exercise is when muscular contractions occur without movement of the involved parts of the body.

13. Plyometric Exercises:

Plyometric training involves short, intense bursts of activity that target fast-twitch muscle fibers in the lower body. These fibers help generate explosive power that increases speed and jumping height.

14. Variable Resistance Machines:

Variable resistance training is when you use equipment like resistance bands or even chains to vary the resistance through the range of motion of an exercise. The aim is to create more resistance through the areas of a lift when the muscles are working in the optimum range — this is where you produce more power

3.1.3 Free active movements technique and effect.

Free active movements refer to voluntary muscle contractions performed without external resistance or assistance. These movements are often part of natural, functional activities and can be incorporated into exercise routines to enhance mobility, flexibility, and overall physical well-being. Here are some common free active movements, along with their techniques and effects:

1. Free Active Range of Motion (ROM) Exercises:

- **Techniques:**
- Move joints through their full range of motion without external resistance.
- Examples include shoulder circles, neck rotations, and ankle circles.
- **Effects:**
- Maintains or improves joint flexibility.
- Helps prevent stiffness and promotes joint health.

2. Dynamic Stretching:

- **Techniques:**
- Perform controlled, rhythmic movements that take joints and muscles through their full range.
- Examples include leg swings, arm circles, and torso twists.
- **Effects:**
- Increases flexibility and range of motion.
- Prepares muscles for more intense activities.

3. Bodyweight Exercises:

- **Techniques:**
- Engage in movements that use your own body weight as resistance.
- Examples include squats, lunges, push-ups, and pull-ups.

- **Effects:**
- Builds strength, endurance, and functional fitness.
- Mimics natural movement patterns.

4. **Functional Movements:**

- **Techniques:**
- Perform activities that mimic real-life, everyday motions.
- Examples include bending to pick up objects, reaching, and twisting.
- **Effects:**
- Enhances coordination and motor skills.
- Supports the ability to perform daily tasks.

5. **Gentle Aerobic Exercises:**

- **Techniques:**
- Engage in low-impact activities that elevate your heart rate.
- Examples include walking, swimming, or cycling at a moderate pace.
- **Effects:**
- Improves cardiovascular health.
- Boosts overall endurance and stamina.

6. **Balancing Exercises:**

- **Techniques:**
- Practice standing on one leg, heel-to-toe walking, or other balance drills.
- Use stable surfaces initially and progress to unstable surfaces.

- **Effects:**
- Enhances proprioception and balance.
- Strengthens stabilizing muscles.

7. Yoga and Pilates Movements:

- **Techniques:**
- Engage in poses and movements that promote flexibility, strength, and body awareness.
- Examples include yoga poses, Pilates exercises, and flowing sequences.
- **Effects:**
- Improves flexibility, core strength, and posture.
- Enhances mind-body connection.

8. Joint Mobility Drills:

- **Techniques:**
- Perform specific movements to promote mobility in joints.
- Examples include wrist circles, hip circles, and spinal twists.
- **Effects:**
- Maintains joint health and range of motion.
- Reduces the risk of stiffness and discomfort.

9. Dance-Based Movements:

- **Techniques:**
- Engage in dance routines or free-form dancing.
- Move rhythmically and expressively.

- **Effects:**
- Provides a fun and creative way to stay active.
- Improves coordination and rhythm.

10. Tai Chi Movements:

Tai chi is a practice that involves a series of slow gentle movements and physical postures, a meditative state of mind, and controlled breathing. Tai chi originated as an ancient martial art in China. Over the years, it has become more focused on health promotion and rehabilitation.

3.3 BREATHING EXERCISES:

3.3.1 Its effect and technique.

Breathing exercises can have various positive effects on physical and mental well-being. Different techniques aim to enhance lung capacity, reduce stress, and promote relaxation. Here are some common breathing exercises, along with their techniques and effects:

i. Deep Breathing (Diaphragmatic Breathing):

Technique:

- Sit or lie down in a comfortable position.
- Inhale deeply through your nose, expanding your diaphragm.
- Exhale slowly and completely through your mouth.
- Place one hand on your chest and the other on your abdomen to feel the movement.

Effects:

- Increases oxygen intake.
- Activates the diaphragm for efficient breathing.
- Calms the nervous system and reduces stress.

ii. Box Breathing (Square Breathing):

Technique:

- Inhale for a count of four.
- Hold the breath for a count of four.
- Exhale for a count of four.
- Pause for a count of four before inhaling again.

Effects:

- Enhances focus and concentration.
- Regulates the autonomic nervous system.
- Alleviates anxiety and stress.

iii. 4-7-8 Breathing (Relaxing Breath):

Technique:

- Inhale quietly through your nose for a count of four.
- Hold your breath for a count of seven.
- Exhale completely through your mouth for a count of eight, producing a whooshing sound.

Effects:

- Induces relaxation.
- Slows down the heart rate.
- Aids in falling asleep.

iv. Alternate Nostril Breathing:

Technique:

- Sit comfortably with a straight spine.
- Use your right thumb to close off your right nostril and inhale through your left nostril.
- Close your left nostril with your right ring finger, release the right nostril, and exhale through it.
- Continue the pattern, alternating nostrils.

Effects:

- Balances the left and right hemispheres of the brain.
- Calms the mind and reduces stress.
- Enhances focus and concentration.

v. Pursed Lip Breathing:

Technique:

- Inhale through your nose for a count of two.
- Pucker your lips as if you were going to whistle.
- Exhale slowly and evenly through pursed lips for a count of four.

Effects:

- Improves lung function and oxygen exchange.
- Reduces shortness of breath.
- Promotes relaxation.

vi. Calm Breathing (Resonant Breathing):

Technique:

- Determine your resonant breathing rate (around 6 breaths per minute).

- Inhale for a count of four.
- Exhale for a count of six.

Effects:

- Activates the body's relaxation response.
- Reduces stress and anxiety.
- Enhances emotional well-being.

vii. Breath Counting:

Technique:

- Inhale naturally and then exhale.
- On the next inhale, count "one."
- Continue counting each inhale until you reach ten, then start again.

Effects:

- Improves concentration and mindfulness.
- Provides a focal point for meditation.
- Encourages rhythmic breathing.

There are several forms of breathing exercises that can improve ventilation and gas exchange.

Diaphragmatic Breathing Exercises

Diaphragmatic breathing (DB) exercises are often recommended to help people breathe better, especially those with conditions like chronic obstructive pulmonary disease (COPD).

How to Teach Diaphragmatic Breathing:

- Start with a comfortable position that promotes DB.
- Explain and demonstrate the exercise's purpose and goals.
- Use hands-on guidance to feel abdominal and chest movements.

- Add visual and auditory cues for better understanding.
- Encourage deep breathing with verbal cues.
- If needed, use techniques like sniffing or quick-stretch to assist diaphragmatic contraction.
- Gradually transition to the patient doing the exercise independently.

Breathing Control

Breathing Control is a technique meant for people with lung problems where the main breathing muscle, the diaphragm, doesn't work well. In these cases, Breathing Control suggests using other muscles, like those in the lower chest, along with any needed accessory muscles, to make breathing easier. These exercises often focus on conscious and intentional control of inhalation and exhalation.

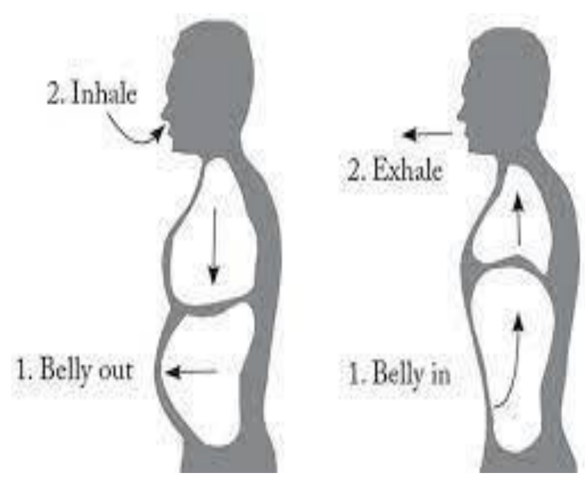
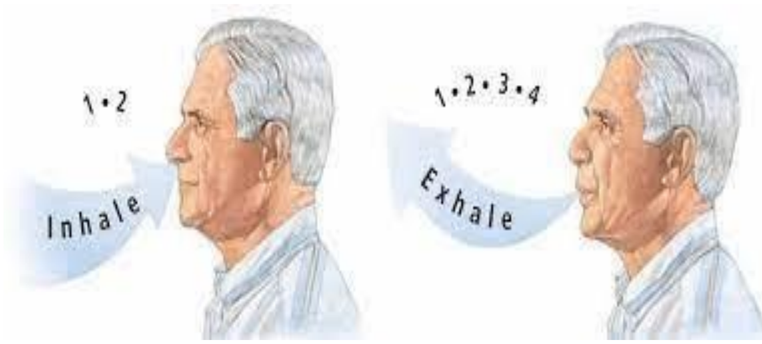


Figure 2: Diaphragmatic breathing

Pursed-lips breathing

Pursed lip breathing is a breathing technique that involves inhaling through the nose and exhaling slowly through pursed or tightened lips. This helps relieve shortness of breath



and improves the ability to exercise.

Figure 3: Pursed lip breathing

Proprioceptive Neuromuscular Facilitation (PNF):

For patients with nerve issues, therapists use PNF techniques. The therapist stretches muscles just before breathing in to boost muscle strength. Repeated stretches during deep breaths help expand the chest.

3.4 Posture Drainage and control:

3.4.1 Maintenance of correct posture.

Bronchial or postural drainage involves placing the patient in specific positions based on lung anatomy to help drain secretions. The aim is to position each lung segment so that gravity helps move secretions into the bronchus, making it easier to cough or suction them out.

Here's how the process works:

Positioning:

- Specific positions for draining upper, middle, and lower lobes are determined based on Broncho pulmonary anatomy.
- Traditional head-down positions (Trendelenburg) are often avoided due to potential negative effects, especially in patients with conditions like cystic fibrosis (CF). Modified positions have shown better outcomes over time.

Precautions and Contraindications:

- Head-down positions are not recommended for patients with certain conditions, including pulmonary edema, increased intracranial pressure, unstable cardiovascular status, aortic aneurysm, recent esophageal surgery, and more.
- Modified positions are often more suitable for these patients, with the bed flat or

nearly flat and the lower body elevated as tolerated.

Procedures for Positioning:

- Explain the treatment to the patient and ensure loose clothing.
- Check equipment and make necessary adjustments.

- Monitor vital signs before and during the procedure, especially in critically ill or unstable patients.
- If there are excessive secretions, encourage coughing or perform suctioning before positioning.
- Place the patient in the appropriate position, maintaining it for 5 to 20 minutes, depending on secretions and patient tolerance.
- Encourage coughing or suctioning before changing positions.
- Limit total treatment time to 30 to 40 minutes to avoid stress on the patient, prioritizing critical areas first.
- Encourage post-treatment coughing, as some secretions may take time to clear.

Supervision and Safety:

Patients should not be left unsupervised in head-down positions unless they are alert and can reposition themselves or seek assistance.

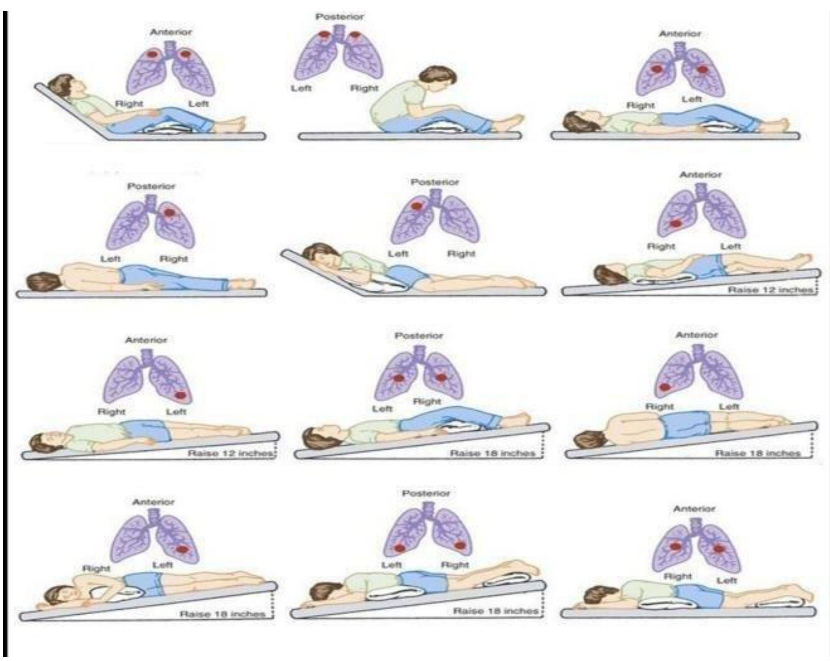


Figure 4: Postural drainage positions

8.2.5 : Manual Techniques:

Manual techniques like percussion and vibration are often applied during bronchial drainage to aid in mobilizing secretions.

Percussion

Percussion is a treatment method where the therapist rhythmically strikes the chest wall with cupped hands. This technique helps mechanically loosen and dislodge secretions in the lungs

Figure 5

8.2.6 : Vibration/Shaking/Rib Springing

Vibration therapy is a method where gentle, fast movements and chest compressions are used. Shaking is a stronger version, and rib springing involves bouncing chest compressions. These techniques, done while breathing out, help move loose secretions to the bigger airways for easier removal.

8.3 : Physiotherapy in thoracic surgery

Operations on the lung

- **Pneumonectomy**

  A pneumonectomy is a surgical procedure in which an entire lung is removed

- **Lobectomy**

  This means removal of a complete lobe with its lobar bronchus.

- **Segmental resection**

  A segment of a lobe along with its segmental artery and bronchus are removed.

- **Wedge resection**

  This is a small local removal of lung tissue.

- **Lung volume-reduction surgery**

  Damaged or diseased lung tissue is removed, allowing the healthier parts of thelungs to function more efficiently

Intercostal drains

During thoracic surgery, most patients receive two chest tubes:

- one at the top of the pleural cavity to remove air and help the lung re-expand,
- another at the bottom to address postoperative bleeding.

Monitoring the water level in the tubing helps assess lung expansion and detect potential issues like blockage. The drainage bottle must stay below the insertion level to prevent fluid from returning to the pleural cavity.

3.5 SUSPENSION THERAPY:

3.5.1 Introduction to suspension therapy.

"Suspension" in the context of the human body typically refers to the system of structures, such as ligaments and tendons that support and stabilize joints. It plays a crucial role in allowing movement while maintaining stability. Some key aspects and applications of suspension in the human body are:

2.1.19.1 Joint Stability:

Ligaments and tendons work together to provide stability to joints. They limit the range of motion and prevent joints from moving beyond their normal physiological limits. Example: The anterior cruciate ligament (ACL) in the knee prevents excessive forward movement of the tibia relative to the femur.

2.1.19.2 Shock Absorption:

Ligaments and tendons also act as shock absorbers, helping to dissipate forces and protect the joints from excessive impact during movement. Example: The Achilles tendon in the ankle absorbs and transmits forces during activities like running and jumping.

2.1.19.3 Muscular Suspension:

Muscles play a crucial role in suspension by providing dynamic support to joints. They contract to stabilize joints during movement and maintain posture. Example: The muscles of the core, such as the abdominal and back muscles, contribute to the suspension and stability of the spine.

2.1.19.4 Skeletal Alignment:

Ligaments and tendons contribute to maintaining proper skeletal alignment. They guide the direction of joint movement and prevent misalignment. Example: The ligaments of the hip joint help maintain the proper alignment of the femur in the acetabulum.

2.1.19.5 Injury Prevention:

A well-functioning suspension system is essential for injury prevention. Ligaments and tendons reduce the risk of joint dislocations, sprains, and strains. Example: Adequate muscle strength and flexibility, along with proper ligament and tendon function, contribute to preventing injuries during physical activities.

2.1.19.6 Joint Flexibility:

While ligaments provide stability, they also allow for controlled flexibility in joints. This flexibility is crucial for various movements.
Example: The flexibility of ligaments in the spine allows for controlled movement and bending.

3.5.2 Simple methods of suspension.

Suspension therapy, also known as suspension training, is a form of exercise that utilizes straps or ropes anchored to a stable point, allowing individuals to leverage their own body weight for resistance. It is a versatile and effective method that engages multiple muscle groups, improves core stability, and enhances overall strength. Here are some simple methods, effects, and uses of suspension therapy:

Simple Methods:

1. *Basic Suspension Exercises:*

- **Techniques:**
- Perform exercises like squats, lunges, and push-ups using the suspension straps.
- Adjust the length of the straps to increase or decrease the difficulty of the exercises.

2. *Single-Leg Exercises:*

- **Techniques:**
- Perform single-leg squats or single-leg lunges while holding onto the suspension straps for support.
- Engages stabilizing muscles and improves balance.

3. *Rows and Pulls:*

- **Techniques:**
- Set the straps at chest height and perform rows or pull-ups.
- Targets the muscles of the back, shoulders, and arms.

4. *Tricep Dips:*

- **Techniques:**
- Set the straps lower to the ground and perform tricep dips.
- Engages the triceps and chest muscles.

5. *Planks and Ab Rollouts:*

- **Techniques:**

- Use the suspension straps for planks or ab rollouts.
- Challenges the core muscles for stability.

Effects:

1. *Functional Strength:*

- Suspension training engages multiple muscle groups simultaneously, promoting functional strength useful in daily activities.

2. *Core Stability:*

- Many exercises involve stabilizing the core, leading to improved core strength and stability.

3. *Flexibility and Range of Motion:*

- The dynamic nature of suspension exercises can enhance flexibility and joint range of motion.

4. *Balance and Coordination:*

- Because of the instability introduced by the suspended straps, users must engage stabilizing muscles, improving balance and coordination.

5. *Versatility:*

- Suitable for various fitness levels as the difficulty can be easily adjusted by changing the body angle or position.

6. *Increased Caloric Burn:*

- The combination of strength training and the engagement of multiple muscle groups can lead to increased caloric expenditure.

Uses:

1. *Strength Training:*

- Suspension therapy is an effective method for building strength in both upper and lower body muscle groups.

2. *Rehabilitation:*

- It can be used in rehabilitation settings for individuals recovering from injuries, as the intensity can be adjusted based on the individual's capabilities.

3. *Core Conditioning:*

- Many suspension exercises inherently engage the core, making it an excellent tool for core conditioning.

4. *Sports-Specific Training:*

- Athletes can use suspension therapy for sports-specific training to improve strength, stability, and functional movement patterns.

5. *Home Workouts:*

- Portable suspension trainers make it easy to perform workouts at home, in parks, or while traveling.

6. *Group Fitness Classes:*

- Suspension training is often incorporated into group fitness classes, providing a dynamic and challenging workout.

7. *Military and Tactical Training:*

- Suspension training is utilized in military and tactical training programs due to its versatility and effectiveness.

Precautions:

- Beginners should start with simpler exercises and gradually progress to more challenging ones.
- Proper form is crucial to prevent injuries. Consider seeking guidance from a certified trainer.
- Individuals with certain medical conditions or injuries should consult with a healthcare professional before starting suspension therapy

3.5.3 Effects and uses.

3.6 Pulley Circuits:

3.6.1 Introduction to pulley and weight circuits.

A pulley and weight circuit are a type of resistance training system that utilizes pulleys and weights to provide variable resistance during exercises.

Components:

iv. **Pulleys:** Mechanical devices with grooved wheels over which ropes or cables can move. Pulleys redirect the force applied to the cable, allowing for different exercise angles.

v. **Cables:** Flexible, durable cables connect the weights to handles or attachments, transmitting resistance during exercises.

vi. **Weights:** Typically, a stack of weight plates that can be adjusted to vary resistance levels.

Effects and Uses of Pulley Circuit:

3.1.3.1 Variable Resistance:

m. Effect: Pulley circuits provide variable resistance throughout the range of motion, ensuring that the resistance matches the strength curve of the muscle.

n. Use: Effective for targeting specific parts of a movement, allowing for a more comprehensive muscle workout.

3.1.3.2 Isolation and Targeting:

o. Effect: Pulley circuits enable isolation of specific muscle groups by adjusting the direction and angle of resistance.

p. Use: Useful for rehabilitation exercises, bodybuilding, and muscle-specific training.

*3.*1.3.3 Safety and Control:

q. Effect: The controlled movement of cables and weights reduces the risk of injury by minimizing the impact of gravity.

r. Use: Suitable for individuals with joint issues or those undergoing rehabilitation, providing a safer alternative to free weights.

3.1.3.4 Functional Training:

s. Effect: Mimics real-life movements by allowing for multi-plane exercises.

t. Use: Ideal for functional training, which improves overall movement patterns, balance, and coordination.

3.1.3.5 Progressive Overload:

u. Effect: The ability to easily adjust weights supports the principle of progressive overload, essential for muscle growth and strength gains.

v. Use: Enables users to gradually increase resistance as their strength improves.

3.1.3.6 Space Efficiency:

w. Effect: Pulley systems often require less space compared to traditional free weights.

x. Use: Suitable for home gyms or facilities with limited space.

Pulley and weight circuits are commonly found in gyms and fitness centers, and they are used for various purposes, including strength training, rehabilitation, and functional fitness.

3.6.2 Effects and uses of pulley circuits.

3.7 DIFFERENT POSTURES: Effects, uses and Muscle work;

Posture is how you hold your body. There are two types: Dynamic posture is how you hold yourself when you are moving, like when you are walking, running, or bending over to pick up something. Static posture is how you hold yourself when you are not moving, like when you are sitting, standing, or sleeping.

- **Standing.**

Standing:

- **Effects:**

Engages core muscles for stability.

Promotes weight-bearing through the legs, improving bone density.

- Uses:

Daily activities, functional movements, and exercises like squats or lunges.

- Muscles Worked:

Lower limb muscles: Quadriceps, hamstrings, calves.
Core muscles: Abdominals, lower back muscles.
Postural muscles: Erector spinae, glutes.

3.1.4.2 Lying (Supine or Prone):

- **Effects:**

Reduces weight-bearing on the spine.
Allows for relaxation and recovery.

- Uses:

Supine: Floor exercises, stretching, and rest.

Prone: Prone plank, swimmers' exercise, or spinal extension exercises.

- Muscles Worked:

Supine (lying on the back): Abdominals, hip flexors.

Prone (lying on the stomach): Lower back, glutes, posterior shoulder muscles.

3.1.4.3 Hanging:

- **Effects:**

Decompresses the spine.

Engages upper body muscles, including the grip, shoulders, and back.

- Uses:

Hanging leg raises, pull-ups, or decompression exercises.

- Muscles Worked:

Grip strength: Forearm flexors.

Upper body muscles: Latissimus Dorsai, Rhomboids, Biceps.

3.1.4.4 Kneeling:

- **Effects:**

Relieves pressure on the lower back. Activates muscles around the hips and thighs.

- Uses:

Kneeling exercises like lunges, certain yoga poses, or gardening activities.

- Muscles Worked:

Quadriceps, hamstrings, and calves.
Core muscles for stability.
Hip flexors and Glutes

3.1.4.5 Sitting:

- **Effects:**

May contribute to poor posture and muscle imbalances.
Engages muscles in the lower back and hips for support.

- Uses:

Desk work, driving, or seated exercises like leg lifts or seated rows.

- Muscles Worked:

Lower back muscles.

Hip muscles: Hip flexors, glutes.

Upper back muscles: Rhomboids, trapezius

3.1.4.6 Pelvic Tilt:

- **Effects:**

Alters the curvature of the spine.

Engages abdominal and pelvic floor muscles.

- Uses:

Pelvic tilts are often used in exercises for core stability and rehabilitation.

- Muscles Worked:

Abdominals: Rectus abdominis, obliques.
Pelvic floor muscles.

Considerations:

- Ergonomics: Proper posture is crucial to prevent musculoskeletal issues. Ergonomic considerations should be taken into account, especially in sitting and standing postures.
- Dynamic Movement: Regularly changing between postures and incorporating dynamic movements helps prevent stiffness and promotes joint health.
- Individual Variations: The impact of postures can vary among individuals based on factors such as fitness level, flexibility, and existing health conditions.

3.8 RELAXATION:

- 3.8.1 Definition

Relaxation refers to a state of reduced tension, stress, and physiological arousal. It involves the release of physical and mental tension, leading to a sense of calmness and tranquility. Relaxation can be achieved through various techniques and practices aimed at promoting a state of rest and restoration.

Effects of Relaxation:

i. Physical Relaxation:

a. Reduced muscle tension and stiffness.

b. Lowered blood pressure and heart rate.

c. Improved circulation and oxygenation of tissues.

d. Enhanced immune system function.

ii. Mental Relaxation:

a. Decreased mental fatigue and cognitive strain.

b. Improved concentration and focus.

c. Alleviation of anxiety and stress.

d. Enhanced mood and emotional well-being.

iii. Emotional Relaxation:

a. Promotion of positive emotions.

b. Reduction in feelings of irritability and frustration.

c. Increased emotional resilience.

iv. Behavioral Relaxation:

a. Improved sleep quality and duration.

b. Enhanced ability to cope with challenges.

c. Reduction in impulsive or reactive behavior.

Uses of Relaxation:

i. **Stress Management:**

a. Relaxation techniques are widely used to cope with and manage stress in daily life.
b. Techniques like deep breathing, progressive muscle relaxation, and mindfulness can alleviate the physiological and psychological effects of stress.

ii. **Anxiety Reduction:**

a. Relaxation methods help reduce symptoms of anxiety disorders.

b. Practices like meditation and guided imagery can calm the mind and alleviate anxious thoughts.

iii. **Sleep Improvement:**

a. Relaxation promotes better sleep by calming the nervous system.

b. Bedtime routines incorporating relaxation techniques can improve sleep quality.

iv. **Pain Management:**

a. Relaxation can complement pain management strategies.

b. Techniques like guided imagery and progressive muscle relaxation may reduce perceived pain levels.

v. **Enhanced Well-being:**

a. Regular relaxation contributes to overall well-being and mental health.

b. It fosters a positive outlook and emotional balance.

Methods of Promoting Relaxation:

i. **Deep Breathing:**

a. Involves slow, deep breaths to trigger the body's relaxation response.

b. Diaphragmatic breathing and paced breathing are common techniques.

ii. **Progressive Muscle Relaxation (PMR):**

a. Involves tensing and then releasing different muscle groups to induce relaxation.

b. Helps reduce overall muscle tension.

iii. Mindfulness Meditation:

a. Focuses on being present in the moment without judgment.

b. Mindful breathing and body scans are common practices.

iv. Guided Imagery:

a. Involves creating a mental image of a peaceful scene.

b. Guided imagery scripts or recordings can be used.

v. Yoga and Tai Chi:

a. Incorporate gentle movements, breath control, and meditation.

b. Promote physical and mental relaxation.

vi. Massage:

a. Involves the manipulation of muscles and tissues to reduce tension.

b. Promotes both physical and mental relaxation.

vii. Listening to Music:

- Listening to calming music can have a soothing effect on the mind and body.
- Music with a slow tempo and nature sounds is often chosen.

3.1.3 Posture drawing and control Posture:

Posture refers to the alignment and positioning of the body parts in relation to each other and the surrounding environment. Good posture involves maintaining a balanced and neutral alignment of the body to reduce stress on muscles, joints, and ligaments.

Components of Posture:

- **Static Posture:** The body's position when at rest or during quiet standing.
- **Dynamic Posture:** The body's alignment during movement and different activities.

Factors Influencing Posture:

- **Muscle Imbalances:** Weak or tight muscles can lead to poor posture.
- **Joint Structure:** The anatomy of joints can affect posture.
- **Habitual Patterns:** Daily activities and habits can contribute to posture.

Postural Control:

- **Muscle Strength and Endurance:** Strong and well-conditioned muscles contribute to better postural control.
- **Proprioception:** The body's awareness of its position in space helps in maintaining proper posture.
- **Balance and Coordination:** These factors play a role in postural stability.

Postural Assessment:

Observation: Visually assessing a person's posture from different angles.

Functional Movement Screens: Evaluating movement patterns to identify any dysfunctions.
Muscle Length and Strength Testing: Assessing the flexibility and strength of key muscles.
Common Postural Issues:

- Kyphosis: Excessive rounding of the upper back.
- Lordosis: Excessive inward curvature of the lower back.
- Forward Head Posture: Protrusion of the head forward from the neutral position.

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Maintaining Correct Posture

Maintaining correct posture is crucial for preventing musculoskeletal issues, reducing fatigue, and promoting overall well-being. Here are some tips for the maintenance of correct posture:

i. **Body Awareness:**

Regular Checks: Throughout the day, be mindful of your posture. Take a moment to assess how you are sitting or standing.

ii. **Ergonomics:**

Workspace Setup: Arrange your workspace to promote good posture. Adjust your chair, desk, and computer monitor to the appropriate height. Use an ergonomic chair that supports the natural curve of your spine.

iii. **Standing Posture:**

Weight Distribution: Distribute your body weight evenly on both feet. Avoid locking your knees. Stand with your feet hip-width apart.

iv. **Sitting Posture:**

Chair Support: Sit back in your chair with your back against the backrest. Use a chair with proper lumbar support to maintain the natural curve of your spine.

v. **Head and Neck:**

Neutral Position: Keep your head in a neutral position, aligning it with your spine. Avoid tilting forward or looking down for extended periods.

vi. **Shoulders:**

Relaxation: Keep your shoulders relaxed and avoid hunching. Roll your shoulders back and down to open up the chest.

vii. **Strengthen Core Muscles:**

Core Exercises: Strengthen your core muscles with exercises like planks and abdominal workouts. A strong core provides support for your spine.

viii. **Posture Exercises:**

Stretching: Incorporate regular stretching exercises to release tension in muscles. Focus on areas prone to tightness, such as the neck, shoulders, and lower back.

ix. **Mindfulness:**

Conscious Effort: Be conscious of your posture throughout the day. Make a conscious effort to maintain good posture, especially during activities like sitting at a desk or standing for long periods.

x. **Mirror Checks:**

Self-Check: Use mirrors to periodically check your posture. Visual feedback can help you make immediate adjustments.

xi. **Professional Guidance:**

Physical Therapy: If you have persistent posture issues or pain, consider seeking guidance from a physical therapist. They can provide personalized assessments and exercises.

xii. Sleeping Posture:

Mattress and Pillow: Choose a mattress and pillow that support the natural alignment of your spine when sleeping.

3.8.2 Methods of promoting relaxation

1. **Deep Breathing:**

- Inhaling slowly and deeply through the nose, holding the breath briefly, and exhaling slowly through the mouth can promote relaxation by calming the nervous system.

2. **Progressive Muscle Relaxation (PMR):**

- Systematically tensing and then releasing different muscle groups in the body helps reduce muscle tension and promote overall relaxation.

3. **Meditation:**

- Mindfulness meditation and other meditation practices involve focused attention on the present moment, helping to calm the mind and induce relaxation.

4. **Yoga:**

- Yoga incorporates physical postures, breath control, and meditation, promoting relaxation by integrating the body and mind.

5. **Guided Imagery:**

- Visualization techniques involve creating mental images of peaceful and calming scenes, reducing stress and promoting relaxation.

6. **Autogenic Training:**

- This method involves focusing on specific sensations in the body, such as warmth and heaviness, to induce a state of relaxation.

7. **Massage:**

- Massage therapy involves manipulating the body's soft tissues to release tension and promote relaxation.

8. **Aromatherapy:**

- The use of essential oils and pleasant scents can have a calming effect on the nervous system, contributing to relaxation.

9. **Listening to Music:**

- Slow and soothing music has the power to reduce stress and induce a state of relaxation.

10. **Hot Baths:**

- Immersing oneself in a warm bath can help relax muscles and alleviate tension.

3.8.3 effects and uses.

3.9 P. N. F. TECHNIQUES

For patients with nerve issues, therapists use PNF techniques. The therapist stretches muscles just before breathing in to boost muscle strength. Repeated stretches during deep breaths help expand the chest

- **3.9.1 Basic technique, its effects and uses.**

Proprioceptive Neuromuscular Facilitation (PNF) Techniques:

Proprioceptive Neuromuscular Facilitation (PNF) is an approach to therapeutic exercise and stretching that involves the use of muscle contractions and passive stretches to improve flexibility, strength, and neuromuscular control. PNF techniques are commonly used in rehabilitation and sports training settings. There are several PNF patterns and techniques, and they are often performed with the assistance of a trained therapist or partner.

Common PNF Techniques:

1. **Hold-Relax (HR) or Contract-Relax (CR):**

- Involves an isometric contraction of the target muscle followed by relaxation and passive stretching.

2. **Agonist-Contract (AC):**

- Focuses on an isotonic contraction of the agonist muscle followed by passive stretching of the antagonist muscle.

3. **Contract-Relax-Antagonist-Contract (CRAC):**

- Combines both isometric and isotonic contractions to facilitate a stretch and strengthen the target muscle.

4. **Rhythmic Initiation (RI):**

- Involves passive movement of a limb through a range of motion, progressing from passive to active-assisted and then to active movement.

5. **Rhythmic Stabilization (RS):**

- Requires the patient to resist an isometric force applied by the therapist in multiple directions, promoting stability and neuromuscular control.

Effects and Uses of PNF Techniques:

1. **Improved Flexibility:**

- PNF stretching is highly effective for improving flexibility by engaging the stretch reflex and allowing for a greater range of motion.

2. **Increased Strength:**

- The combination of muscle contractions and stretches in PNF helps improve muscle strength, especially through the active engagement of agonist and antagonist muscles.

3. **Enhanced Neuromuscular Control:**

- PNF techniques focus on neuromuscular facilitation, improving the communication between the nervous system and muscles for better control and coordination.

4. **Rehabilitation:**

- PNF is widely used in rehabilitation settings to address muscle imbalances, enhance joint stability, and promote functional recovery after injuries or surgeries.

5. **Sports Training:**

- Athletes often incorporate PNF techniques into their training routines to improve performance, prevent injuries, and enhance overall athletic abilities.

6. **Postural Correction:**

- PNF exercises can be utilized to address postural imbalances by targeting specific muscle groups and promoting proper alignment.

7. **Muscle Activation:**

- PNF patterns involve activating specific muscles through isometric and isotonic contractions, aiding in muscle activation and strengthening.

8. **Increased Circulation:**

- The dynamic nature of PNF techniques can stimulate blood flow, promoting circulation to the targeted muscles and surrounding tissues.

9. **Pain Management:**

- PNF exercises can help manage pain by addressing muscle tightness, improving joint mobility, and promoting relaxation.

10. **Functional Movement Patterns:**

- PNF incorporates functional movement patterns, making it applicable to activities of daily living and specific tasks.

11. **Coordination and Proprioception:**

- PNF techniques enhance proprioception and coordination by challenging the nervous system to control movement in various planes.

Considerations for PNF Techniques:

1. **Professional Guidance:**

- PNF techniques are often best performed with the guidance of a trained therapist or fitness professional, especially initially.

2. **Individualized Approach:**

- PNF techniques can be adapted to suit individual needs and conditions, making them versatile in various rehabilitation and training scenarios.

3. **Safety Precautions:**

- Care should be taken to ensure that PNF exercises are performed safely, and individuals should communicate any discomfort or pain during the process.

4. **Progressive Overload:**

- Gradual progression in intensity and complexity is key to optimizing the benefits of PNF techniques over time.

3.10 Re-education of walking / Gait Training

Gait training is a rehabilitation process that involves teaching individuals how to walk correctly and safely. This can include the following:

- Symmetrical weight bearing between lower limbs during standing
- Weight shifting between lower limbs
- Stepping training (swinging/clearance) over level and unleveled surfaces
- Heel strike
- Single leg stance with stable balance and control
- Push off/initial swing of moving leg

Different modes of gait training include:

- Over the ground training

- Parallel bars
- Treadmill training
- Mirror therapy
    - **Without aids.**
    - **With Crutches**

Mobility Aids

Mobility aids are devices designed to assist individuals with mobility challenges in moving around and performing daily activities. These aids can be categorized into two main types: dependent aids and independent aids.

1. Dependent Mobility Aids:

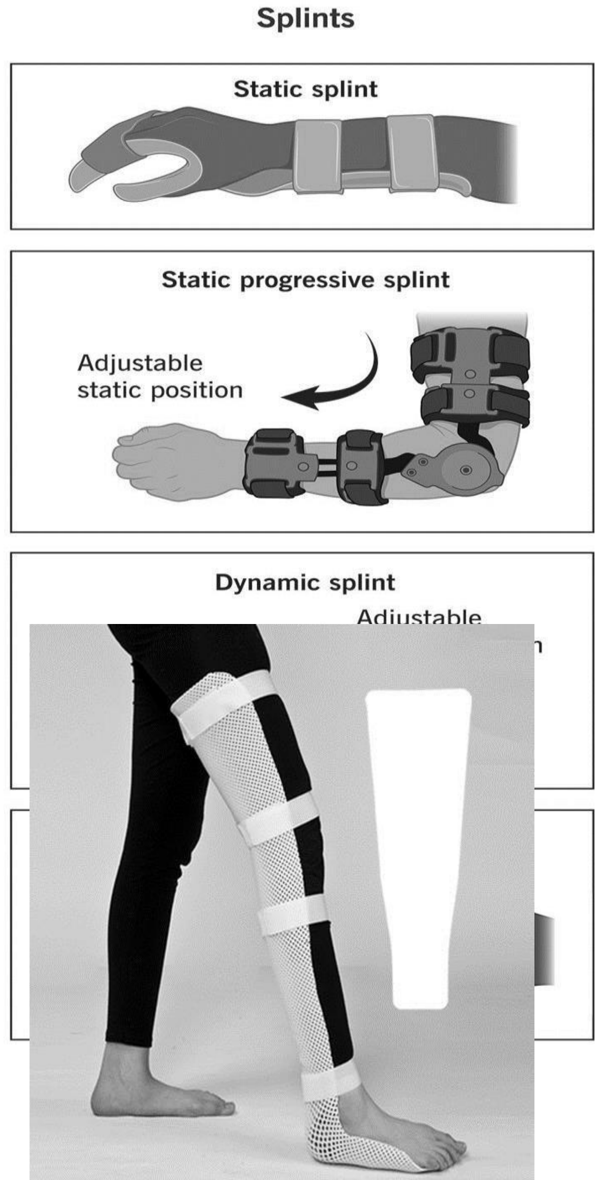
- **Wheelchairs:** Wheelchairs are one of the most common dependent mobility aids. They come in various types, including manual wheelchairs, which require assistance from another person or a power wheelchair that can be operated independently.
- **Mobility Scooters:** Similar to wheelchairs, mobility scooters provide a seated option for individuals with mobility limitations. These can be electrically powered for independent use or manually pushed with assistance.
- **Walkers:** Walkers provide support for individuals who may have difficulty maintaining balance or walking independently. Some walkers have wheels for easier movement, while others are stationary and require lifting.

2. **Independent Mobility Aids:**

- **Canes:** Canes provide support and stability, particularly for individuals who need assistance with balance but can still walk independently. There are various types of canes, including single-point canes, quad canes, and offset canes.
- **Crutches:** Crutches are used to transfer weight from the legs to the upper body. They require upper body strength and coordination and are often used by individuals with temporary injuries or disabilities.Crutches can be elbow crutches or axillary crutches.
- **Orthopedic Shoes and Braces:** These aids are designed to support and stabilize the feet and ankles, providing assistance for individuals with mobility challenges due to foot or lower limb issues.

Splints

Splints are medical devices designed to support and immobilize injured or weakened body parts, typically limbs. They are commonly used in the treatment of fractures, sprains, and other orthopedic conditions.



1. Wrist Splints:

Wrist Braces: These provide support and immobilization for the wrist and are commonly used for conditions like carpal tunnel syndrome or wrist sprains.

2. Ankle Splints:

Ankle Braces: These provide support and stabilization for the ankle joint, often used for ankle sprains or chronic instability.

3. Knee Braces:

Knee Braces: These come in various designs, such as hinged braces or sleeves, to provide support and stabilization for the knee joint. They are commonly used for knee injuries or conditions like arthritis.

4. Spinal Splints:

Back Braces: These are designed to support and immobilize the spine and are used for conditions like lower back pain, spinal fractures, or after spinal surgery.

5. Dynamic Splints:

Serial Casting: This involves the application of a series of casts over time to gradually stretch or reposition a joint.

Dynamic Splints for Contractures: These are designed to help with joint mobility by applying a continuous, low-load force.

Orthopedic Appliances

Orthopedic appliances, also known as orthopedic devices or equipment, are medical devices designed to support, align, prevent, or correct musculoskeletal problems or abnormalities. These appliances are used in the field of orthopedics to manage conditions affecting the bones, joints, muscles, ligaments, and other components of the musculoskeletal system. Here are some common orthopedic appliances:

1. Braces:

Knee Braces: Provide support and stability to the knee joint, commonly used for injuries such as ligament sprains or osteoarthritis.

Ankle Braces: Stabilize and support the ankle, often used for ankle sprains or chronic instability.

Wrist Braces: Immobilize and support the wrist, frequently used for conditions like carpal tunnel syndrome or wrist sprains.

Back Braces: Support the spine and provide stability for individuals with lower back pain or spinal conditions.

2. Orthopedic Shoes and Inserts:

Orthopedic Shoes: Designed to accommodate various foot conditions, providing support and comfort. They may have features like extra-depth, arch support, and wider toe boxes.

Orthotic Inserts/Insoles: Custom or prefabricated inserts that fit into shoes to support and correct foot abnormalities, such as flat feet or high arches.

3. Crutches and Canes:

Crutches: Assist individuals with walking when they have lower limb injuries or disabilities.

Canes: Provide support and balance for individuals with mild mobility issues.

4. Orthopedic Supports and Splints:

Shoulder Immobilizers: Limit movement of the shoulder joint after injury or surgery.

Hip Abduction Braces: Used to maintain proper hip positioning after hip surgery.

Dynamic Splints: Assist in joint mobility by applying a continuous, low-load force.

5. Orthopedic Devices for Joint Conditions:

Continuous Passive Motion (CPM) Machines: Aid in the rehabilitation of joints, particularly after surgery.

Joint Unloading Braces: Designed to alleviate pressure on specific joints, such as knee unloader braces for osteoarthritis.

6. Orthopedic Soft Goods:

Compression Garments: Assist in reducing swelling and providing support for various joint and muscle conditions.

Orthopedic Belts and Supports: Offer support and stability for the back, abdomen, or joints.

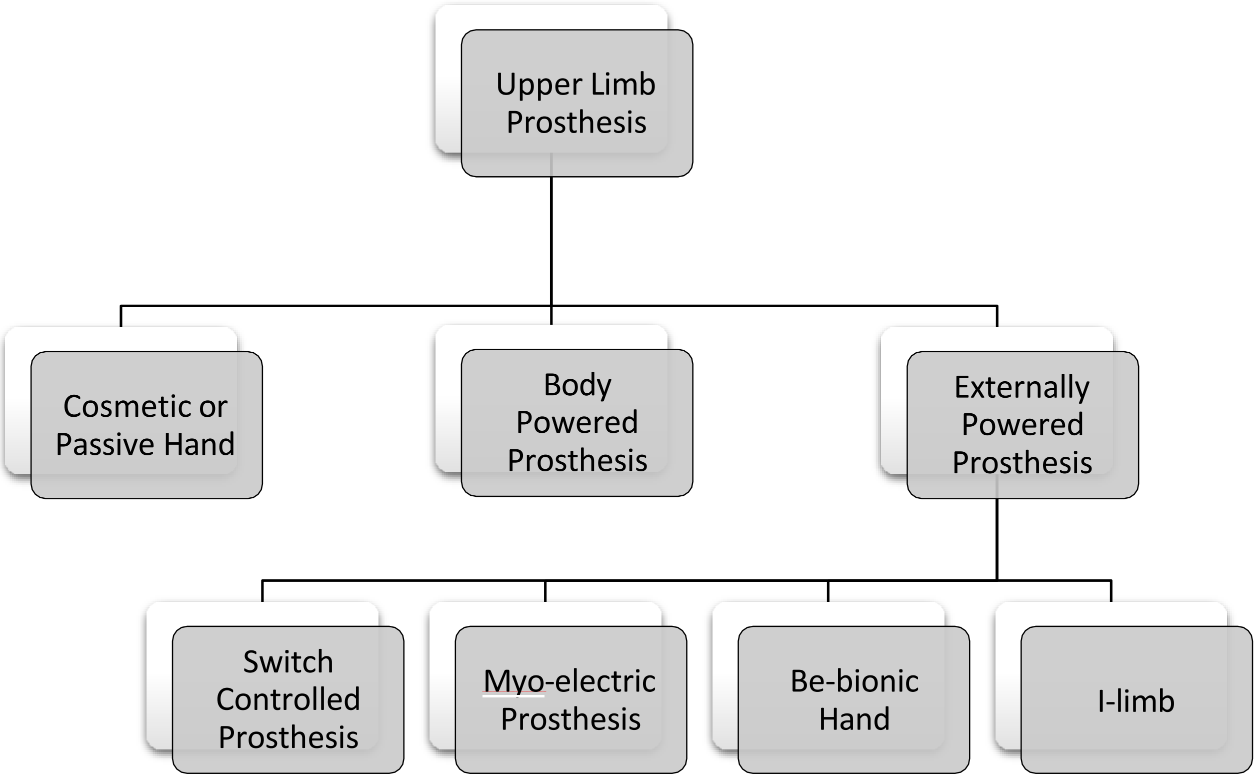
Prosthesis

Prosthetics is the evaluation, fabrication, and custom fitting of artificial limbs to the amputees. Amputation is the removal of a body extremity by trauma, prolonged constriction, or surgery. Prosthesis is a device designed to replace, as much as possible, the function or appearance of a missing limb or body part. An orthosis, in contrast, is a device designed to support, supplement, or augment the function of an existing limb or body part.

Upper Limb Prostheses:

Upper limb prostheses are artificial devices designed to replace a missing or amputated upper limb, including the hand, forearm, and arm. These prosthetic devices aim to restore functionality and improve the quality of life for individuals who have lost part or all of their upper limb due to injury, congenital conditions, or disease. Here are some key aspects of upper limb prostheses:

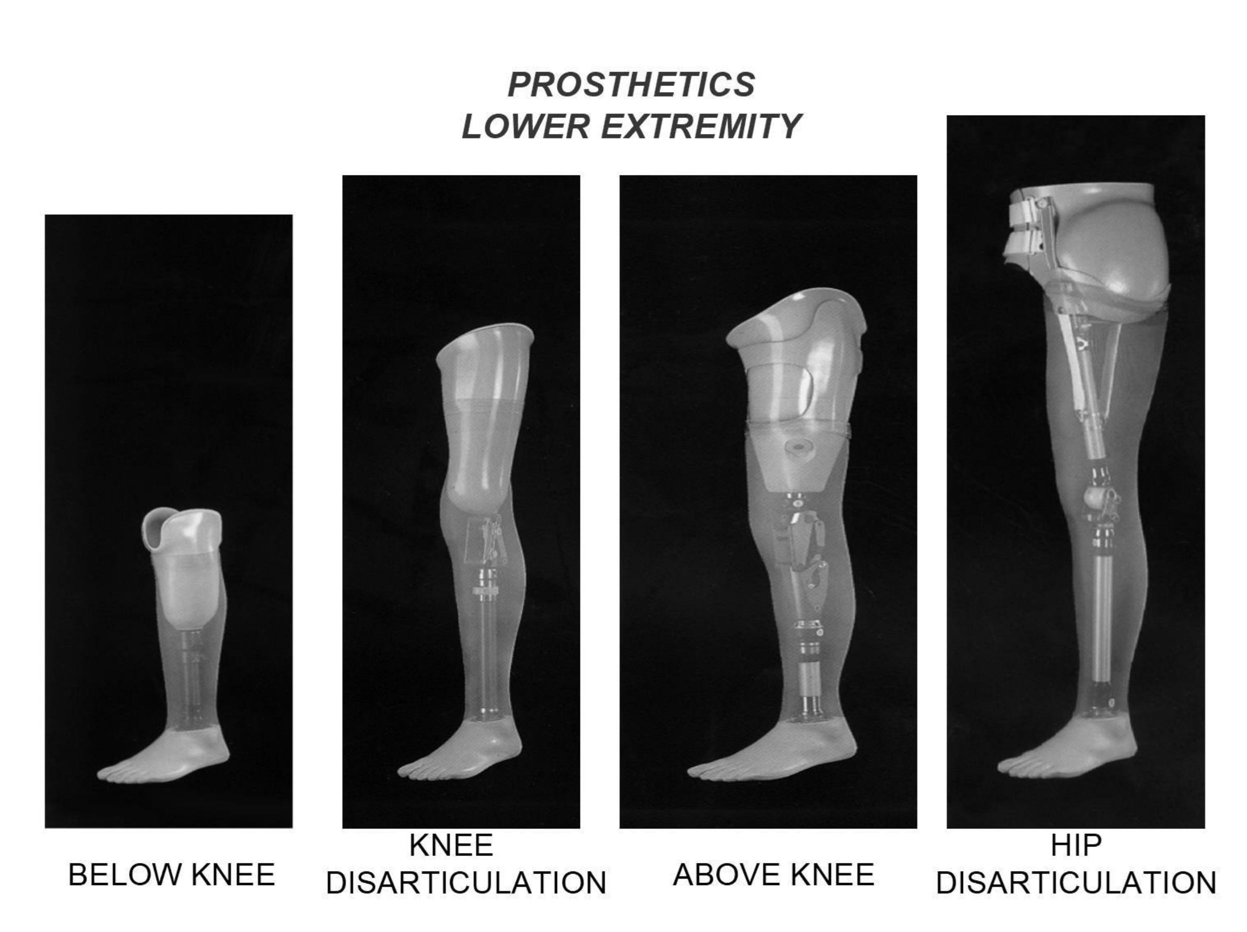
Types of Upper Limb Prostheses:



Lower Limb Prostheses:

Lower limb prostheses are artificial devices designed to replace a missing or amputated lower limb, including the foot, ankle, lower leg, and thigh. These prosthetic devices aim to restore mobility, support daily activities, and improve the overall quality of life for individuals who have experienced lower limb amputation due to various reasons, such as trauma, vascular disease, or congenital conditions. Here are key aspects related to lower limb prostheses:

Types of Lower Limb Prostheses:



1. **Below-Knee (Trans-tibial) Prostheses:**

   - Designed for amputations below the knee joint, involving the replacement of the foot, ankle, and lower leg.

2. **Above-Knee (Trans-femoral) Prostheses:**

   - Tailored for amputations above the knee joint, encompassing the replacement of the thigh, knee joint, and sometimes part of the hip.

3. **Symes Prostheses:**

   - Specifically designed for Symes amputations, which involve removal at the ankle joint while preserving the heel pad.

4. Partial Foot Prostheses:

- Customized for amputations that involve part of the foot, but not the entire foot.

  - sils with ergonomic handles for individuals with limited dexterity.
  - **Plate Guards:** Help individuals with one-handed use or limited coordination while eating.
  - **Specialized Cups and Straws:** Assist with drinking for those with swallowing difficulties or limited mobility.

2. **Orthopedic Aids:**
   - **Braces and Splints:** Provide support and stabilization for joints affected by injury or conditions like arthritis.
   - **Orthopedic Shoes:** Designed to accommodate foot deformities or provide extra support.
3. **Communication Devices:**
   - **Augmentative and Alternative Communication (AAC) Devices:** Assist individuals with speech or communication challenges in expressing themselves.
   - **Text-to-Speech Software:** Converts written text into spoken words, aiding individuals with literacy or communication difficulties.
4. **Vision and Hearing Aids:**
   - **Hearing Aids:** Amplify sound for individuals with hearing loss.
   - **Magnifiers and Large-Print Materials:** Assist those with visual

impairments in reading and other tasks.

5. **Home Accessibility Devices:**

- **Ramps:** Facilitate access for individuals using mobility aids, such as wheelchairs or walkers.

- **Stair Lifts:** Assist individuals with mobility challenges in navigating stairs.

6. **Assistive Technology Devices:**

- **Voice-activated Devices:** Enable individuals with limited mobility or dexterity to control electronic devices using voice commands.
- **Adaptive Computer Software:** Tailored programs to assist individuals with various disabilities in using computers.

The selection and use of assistive devices depend on the individual's specific needs, abilities, and the tasks they want to accomplish. Occupational therapists, physical therapists, and other healthcare professionals play a crucial role in assessing individuals and recommending appropriate assistive devices to enhance their independence and quality of life.

- **Wheel Chair**
- **Stick and Braces.**

PHYSIOTHERAPY TREATMENT AND TECHNIQUE

3.11 NERVOUS SYSTEM

Physiotherapy plays a crucial role in the management of various diseases and conditions affecting the nervous system.

- **Classification of Nervous Diseases.**

The nervous system diseases can be classified based on various criteria, including the affected part of the nervous system, the nature of the disease, and the underlying causes. Here's a broad classification:

Central Nervous System (CNS) Diseases:

Brain Disorders:

- Traumatic Brain Injury (TBI)
- Stroke (Cerebrovascular Accident - CVA)
- Tumors
- Neurodegenerative diseases (e.g., Alzheimer's, Parkinson's)

Spinal Cord Disorders:

- Spinal Cord Injury
- Degenerative Disc Disease
- Spinal Cord Tumors

Peripheral Nervous System (PNS) Diseases:

Peripheral Neuropathies:

- Diabetic Neuropathy
- Guillain-Barré Syndrome

- Charcot-Marie-Tooth Disease

Peripheral Nerve Injuries:

- Carpal Tunnel Syndrome
- Radial Nerve Palsy
- Ulnar Nerve Entrapment

Autonomic Nervous System Disorders:

- Dysautonomia
- Autonomic Neuropathy
- Multiple System Atrophy

Neuromuscular Junction Disorders:

- Myasthenia Gravis
- Lambert-Eaton Myasthenic Syndrome (LEMS)

Movement Disorders:

- Parkinson's Disease
- Huntington's Disease
- Essential Tremor

- Dystonia

Inflammatory and Infectious Diseases:

- Meningitis
- Encephalitis
- Multiple Sclerosis (MS)

Genetic and Developmental Disorders:

- Cerebral Palsy

- Neurogenetic Disorders (e.g., Huntington's, Muscular Dystrophy)

Vascular Diseases:

- Aneurysms
- Arteriovenous Malformations (AVMs)

Metabolic and Toxic Disorders

UPPER MOTOR NEURON DISEASES

- **HEMIPLEGIA**

Hemiplegia refers to the paralysis of one side of the body, typically caused by damage to the motor areas of the brain. It is a specific type of paralysis that affects either the right or left side of the body, including the arm and leg. Hemiplegia can result from various medical conditions, and the severity of symptoms can vary.

- **Causes of Hemiplegia:**

1. **Stroke (Cerebrovascular Accident - CVA):**

- Ischemic strokes (blockage of blood vessels)
- hemorrhagic strokes (bleeding in the brain)

2. **Traumatic Brain Injury (TBI):** Severe head injuries can damage the brain and result in hemiplegia. This can happen due to accidents, falls, or other traumatic events.
3. **Brain Tumors:** Tumors in the brain can press on or infiltrate the areas responsible for motor function, leading to hemiplegia.
4. **Infections:** Certain infections affecting the brain, such as encephalitis or

meningitis, can cause inflammation and damage, resulting in hemiplegia.

5. **Neurological Diseases:**

    1. multiple sclerosis

    2. cerebral palsy

3. certain genetic disorders can contribute to hemiplegia.

Symptoms of Hemiplegia:

1. **One-Sided Weakness:** Individuals with hemiplegia experience weakness or complete paralysis on one side of the body.
2. **Impaired Motor Function:** Movement and coordination on the affected side are significantly reduced.
3. **Speech and Language Difficulties:** Depending on the location of the brain damage, hemiplegia may be associated with speech and language difficulties.
4. **Cognitive Changes:** In some cases, cognitive functions may be affected, leading to difficulties with memory, attention, or problem-solving.
5. **Visual Impairments:** Hemiplegia can sometimes be associated with visual problems, such as difficulty with visual field perception.

Management and Rehabilitation:

1. **Physiotherapy:** Physical therapy is crucial for improving muscle strength, flexibility, and mobility. Therapists work on rehabilitation exercises to help regain function on the affected side.

- **Positioning:** Ability to change position and posture is affected in many individuals post stroke as a result of varying degrees of physical impairments

A. Lying on affected side
Supine position is not recommended.
Place one or two pillows under head
Affected shoulder is extended forward.
Place unaffected leg forward on a pillow
Patient's back is supported by a pillow.

B. Lying on unaffected side
Supine position is not recommended
Place one or two pillows under head
Affected shoulder forward with arm and supported with pillow
Place affected leg backwards on a pillow
Patients's back is supported by a pillow.

C. Sitting up position
Sitting well back in the centre of chair
Place affected arm well forward onto a pillow
Feets flat on floor
Kness directly above feets

D. Sitting in bed
Sitting in the bed position is not a preferred position.
Affected arm is supported with pillow
Legs are extended straight.
Sitting upright well supported from edges.

- **Early Mobilization:** start mobilization (out of bed activity) within 24 - 48 hours of stroke onset unless receiving palliative care

- **Balance:**
  - trunk exercise training
  - task specific training
- **Sitting:** Practicing reaching beyond arm's length while sitting with supervision/assistance should be undertaken for individuals who have difficulty with sitting
- **Standing:** Practice of standing balance should be provided for individuals who have difficulty with standing.
- **Gait & Mobility:** Repetitive practice of walking (or components of walking) should be practiced as often as possible for individuals with difficulty walking
- **Occupational therapy**
- **Speech therapy**
- **Medication**
- **Surgery**
- **Supportive care**

PARAPLEGIA

Paraplegia refers to the paralysis of the lower half of the body, typically involving both legs and often parts of the trunk. This condition is caused by damage to the spinal cord, resulting in the loss of motor and sensory function below the level of the injury.

Causes of Paraplegia:

1. **Spinal Cord Injury (SCI):** Trauma, such as a fall, car accident, or sports injury, can damage the spinal cord, leading to paraplegia. The severity and level of the injury determine the extent of paralysis.

2. **Spinal Tumors:** Tumors that affect the spinal cord can compress or infiltrate the nerve tissue, causing paraplegia.

3. **Vascular Issues:** Lack of blood flow to the spinal cord, often due to conditions like aortic aneurysms or blood clots, can result in paraplegia.

4. **Infections:** Certain infections affecting the spinal cord, such as abscesses or meningitis, can lead to paralysis.

5. **Autoimmune Disorders:** Conditions like transverse myelitis, where the immune system attacks the spinal cord, can cause paraplegia.

6. **Congenital Conditions:** Some individuals may be born with conditions that affect the spinal cord, leading to paraplegia.

Symptoms of Paraplegia:

- Loss of Motor Function
- Loss of Sensation
- Bowel and Bladder Dysfunction
- Sexual Dysfunction
- Spasticity or Flaccidity

Management and Rehabilitation:

1. **Physical Therapy:** Physical therapists work on strengthening and conditioning the upper body, as well as maintaining joint mobility and preventing contractures.
    - **Respiratory Function:** Physiotherapy interventions should always include secretion clearance and increased ventilatory techniques
    - **Range of Movement:** Treatment techniques should include passive

stretches, positioning in the lengthened position and other common hypertonic treatment techniques such as compression, heat and sustained deep pressure

- **Prevention of Pressure Ulcers:** interventions include passive pressure care, such as frequent rolling regimes and mobilizing, as well as adequate skin moisturizing, nutrition and monitoring.
- **Maintaining and Strengthening Innervated Muscles:** Progressive resistance training and functional strength training are helpful for maintaining and strengthening innervated muscle groups.
- **Bed Mobility and Transfers**
- **Wheelchair Mobility**
- **Gait and Standing**

2. **Occupational Therapy**
3. **Assistive Devices**
4. **Bowel and Bladder Management**
5. **Psychological Support**
6. **Medication**
7. **Surgical Interventions**

Rehabilitation efforts for paraplegia aim to maximize functional independence and improve the quality of life for individuals with this condition. Advances in assistive technology and rehabilitation techniques have contributed to significant improvements in the management of paraplegia. The overall prognosis and outcomes vary based on the cause and severity of the spinal cord injury.

CEREBRAL PALSY

Cerebral palsy (CP) is a group of permanent movement disorders that appear in early childhood. It is caused by abnormal development or damage to the parts of the brain that control movement, balance, and posture. Cerebral palsy is a non-progressive disorder, meaning the initial brain injury does not worsen over time, but the symptoms and functional abilities can change.

Types of Cerebral Palsy:

1. **Spastic Cerebral Palsy:**

    - The most common type, characterized by muscle stiffness and difficulties with movement.

2. **Dyskinetic (Athetoid) Cerebral Palsy:**

    - Involves uncontrolled, involuntary movements, and may affect the face, torso, and limbs.

3. **Ataxic Cerebral Palsy:**

    - Affects balance and coordination, resulting in shaky movements and difficulties with precision tasks.

4. **Mixed Type:**

    - Combines characteristics of more than one type of cerebral palsy.

Causes of Cerebral Palsy:

1. **Prenatal Factors:**

    - **Genetic Factors:** Inherited conditions that affect brain development.

    - **Infections during Pregnancy:** Infections like rubella or cytomegalovirus can increase the risk.

    - **Rh Incompatibility:** A blood incompatibility between the mother and baby.

    - **Multiple Births:** Twins or higher-order multiples are at a higher risk.

2. Perinatal Factors:

- **Premature Birth:** Preterm babies are at a higher risk.

- **Low Birth Weight:** Babies with low birth weight may have an increased risk.

- **Complications during Birth:** Oxygen deprivation during labor and delivery.

3. **Postnatal Factors:**

- **Infections:** Infections of the brain, such as meningitis, during early infancy.

- **Head Injury:** Trauma to the head, especially in the first few years of life.

Symptoms of Cerebral Palsy:

1. **Motor Impairments:**

- Delays in reaching motor milestones (e.g., crawling, walking).

- Abnormal muscle tone (spasticity, rigidity, or floppiness).

2. **Coordination and Balance Issues:**

- Difficulties with balance and coordination.

- Shaky or uncontrolled movements.

3. **Speech and Language Difficulties:**

4. **Muscle Weakness:**

- Weakness in one or more limbs.

5. **Gait Abnormalities:**

- Abnormal walking patterns, such as toe-walking or a crouched gait.

6. **Fine Motor Skill Challenges:**

    - Difficulty with precision tasks, such as writing or buttoning a shirt.

Management and Treatment:

1. **Physical Therapy:** Focuses on improving motor skills, muscle strength, and mobility.

- **Muscle Strengthening:** Develop exercises to strengthen specific muscle groups, addressing weaknesses and imbalances, encourage activities that promote weight-bearing to enhance bone density and muscle strength.
- **Range of Motion Exercises:** Perform gentle stretching exercises to improve joint flexibility and prevent contractures
- **Gait Training:** Prescribe and optimize the use of orthotics, braces, or walking aids to support and improve gait. Use treadmill exercises to work on walking patterns and endurance
- **Balance and Coordination Training:** Focus on strengthening core muscles to improve stability and balance. Focus on strengthening core muscles to improve stability and balance.
- **Aquatic Therapy:** Utilize the buoyancy of water to reduce the impact of gravity and facilitate movement. Perform resistance exercises in water to build strength

2. **Occupational Therapy**
3. **Speech Therapy**.
4. **Medications**
5. **Orthopedic Interventions**
6. **Assistive Devices**
7. **Counseling and Support Services**

Early intervention and a multidisciplinary approach are crucial for managing cerebral palsy and improving the individual's quality of life. Therapies and interventions are tailoredto the specific needs and challenges faced by each person with cerebral palsy.

LOWER MOTOR NEURON DISEASES:

Lower motor neuron diseases (LMND) affect the motor neurons in the spinal cord and brainstem, leading to weakness, atrophy, and decreased muscle tone.

POLIOMYELITIS:

Poliomyelitis, commonly known as polio, is an infectious viral disease caused by the poliovirus. The virus primarily affects the nervous system and can lead to paralysis, most commonly in the legs. Polio is highly contagious and is usually spread through contaminated water or food, as well as through direct contact with an infected person.

Here are key aspects of poliomyelitis:

1. **Types of Polio Virus:**

    - There are three types of polioviruses: type 1, type 2, and type 3. Infection withone type does not provide immunity against the other types.

2. **Transmission:**

    - Poliovirus is primarily spread through the fecal-oral route, often via contaminated water or food.
    - Person-to-person transmission can also occur through contact with respiratory secretions or infected feces.

3. **Symptoms:**

    - The majority of polio infections are asymptomatic or cause only mild symptoms. However, in some cases, the virus can invade the central nervous system and cause paralysis.
    - Non-paralytic symptoms may include fever, sore throat, headache, and gastrointestinal issues.

4. **Paralytic Polio:**

    - Paralytic polio occurs in a small percentage of cases, where the virus invades the spinal cord and causes muscle weakness or paralysis.

- Paralysis is most common in the legs but can also affect the muscles of the head, neck, and diaphragm, leading to breathing difficulties.

5. Post-Polio Syndrome:

- Some individuals who have recovered from paralytic polio may experience a recurrence of symptoms, known as post-polio syndrome, years after the initial infection.
- Symptoms may include new muscle weakness, fatigue, and muscle atrophy.

6. **Vaccination:**

- Vaccination is the most effective way to prevent polio. The oral polio vaccine (OPV) and the inactivated polio vaccine (IPV) are commonly used.
- Global efforts, particularly through initiatives like the Global PolioEradication Initiative (GPEI), have made significant progress in reducing theincidence of polio worldwide.

7. **Global Eradication Efforts:**

- There have been significant strides in the global effort to eradicate polio. Several countries have been declared polio-free, and there has been a substantial reduction in the number of polio cases globally.
- Challenges remain, including reaching vulnerable populations in conflict zones and addressing vaccine hesitancy.

8. **Physical therapy treatment:**

Acute Stage

- **Correct handling technique**-The child should not be lifted by one hand. While carrying the child, they should be held in front and preferably with the Hip in extension without any abduction.
- **Splinting and correct positioning**- Splinting-Lower limb to be immobilized

to prevent further damage to the muscles

- **Gentle passive movement:**

Convalescent Stage

- **Continuous Splintage**-Above knee splint or L splint, below knee splint, Abdominal Corset.
- **Muscle Charting.**
- **Stretching of contractures**: Principal contractures are IT band and ankle equines.
- **Stimulation and facilitation technique.**

Stage of recovery

Various strengthening techniques include:

- Sensory integration.
- Resisted exercises with springs and pulleys,
- Hydrotherapy and suspension therapy.
- Play therapy.
- Mat Exercises

It's important to note that while the incidence of polio has significantly decreased, it has not been eradicated globally. Continued vaccination efforts and surveillance are crucial to achieving complete eradication and preventing the reemergence of the disease. Public health campaigns, routine immunization programs, and international collaboration play key roles in the ongoing fight against polio.

PROGRESSIVE MUSCULAR ATROPHY:

Progressive Muscular Atrophy (PMA) is a rare neurological disorder that primarily affects the lower motor neurons, leading to progressive muscle weakness and atrophy. It is considered a form of motor neuron disease (MND) and shares some similarities with Amyotrophic Lateral Sclerosis (ALS). Here are key points about Progressive Muscular Atrophy:

1. **Clinical Features:**

    - PMA primarily involves the degeneration of lower motor neurons, which are located in the spinal cord and brainstem. Unlike ALS, PMA does not affect the upper motor neurons.
    - The hallmark feature is progressive muscle weakness and atrophy, particularly in the limbs.
    - Initial symptoms often include difficulty with fine motor tasks, muscle cramps, and muscle twitching.

2. **Onset and Progression:**

    - The onset of PMA is typically gradual, and symptoms progress slowly over time.
    - The progression of weakness and atrophy tends to be more restricted to the limbs, distinguishing PMA from ALS, where both upper and lower motor neurons are affected.

3. **Involvement of Upper Motor Neurons:**

    - Unlike ALS, PMA does not involve the degeneration of upper motor neurons in the cerebral cortex. This leads to a more focal and restricted pattern of muscle involvement.

4. **Diagnostic Challenges:**

    - Diagnosing PMA can be challenging, as it requires the exclusion of other conditions that may cause similar symptoms.

- Electromyography (EMG) and nerve conduction studies are often used to assess the function of motor neurons and muscles.

5. **Management and Treatment:**

- There is no cure for PMA, and treatment primarily focuses on managing symptoms and improving quality of life.
- Physical therapy is often recommended to address mobility issues and maintain joint flexibility.
- Assistive devices, such as braces or wheelchairs, may be prescribed to enhance mobility and independence.

6. **Physical therapy treatment:**

- Thoracic and cervical bracing to promote appropriate positioning and posture
- Orthoses, splints, serial casting, AAROM, PROM, stretching, and or standing frame use to facilitate contracture prevention and management
- Contracture management/prevention
- Scoliosis management/prevention
- Facilitate independence with function and mobility
- Improve of maintain endurance
- Improve or maintain balance
- Respiratory care

CHOREA:

Chorea is a neurological term that refers to a type of involuntary, rapid, and irregular movement that can affect various body parts. These movements often appear random and may be described as "dance-like" or "jerky." Chorea is associated with dysfunction in the basal ganglia, a group of nuclei in the brain involved in motor control.

1. **Symptoms:**

    - In chorea, the movements are typically brief, unpredictable, and may affect various body parts, including the face, trunk, and limbs.
    - Individuals with chorea may have difficulty controlling or inhibiting these movements, and they may be aggravated by stress.

Rheumatic chorea

2. **Physical therapy treatment:**

    - Gait re-education
    - Balance retraining
    - Fall prevention/management
    - Aerobic capacity
    - Muscle strengthening
    - Wheelchair prescription and training
    - Respiratory function
    - Task-specific reach, grasp, and manipulation.

PARKINSONISM:

Parkinsonism is a term used to describe a group of neurological disorders that share similar clinical features with Parkinson's disease. These disorders are characterized by a combination of motor symptoms such as tremors, bradykinesia (slowness of movement), rigidity, and postural instability. While Parkinson's disease is the most common cause of

Parkinsonism, there are other conditions that can produce similar symptoms. Here are key points about Parkinsonism:

1. **Parkinson's Disease:**

    - **Cause:** The most common cause of Parkinsonism is Parkinson's disease, a progressive neurodegenerative disorder.
    - **Symptoms:** Tremors, bradykinesia, rigidity, and postural instability are cardinal features. Other symptoms may include a shuffling gait, decreased arm swing while walking, and difficulty with fine motor tasks.

2. **Other Causes of Parkinsonism:**

    - **Drug-Induced Parkinsonism:** Certain medications, particularly antipsychotics and antiemetic, can cause Parkinsonism as a side effect.
    - **Vascular Parkinsonism:** Resulting from multiple small strokes that affect the basal ganglia or other parts of the brain involved in motor control.
    - **Toxic-Metabolic Causes:** Some metabolic disorders and exposure to toxins can lead to Parkinsonism.
    - **Postencephalitic Parkinsonism:** Rarely seen today, it is a delayed onset of Parkinsonism following an infection with the encephalitis virus.

3. **Symptoms:**

    - The primary motor symptoms include resting tremors (tremors at rest), bradykinesia, muscle rigidity, and postural instability.
    - Non-motor symptoms may include mood changes, sleep disturbances, and cognitive impairment.

4. **Diagnosis:**

    - Diagnosis involves a thorough medical history, clinical examination, and, in some cases, neuroimaging to rule out other causes.

- Response to levodopa, a medication commonly used to treat Parkinson's disease, may help confirm the diagnosis of idiopathic Parkinson's disease.

5. **Treatment:**

- Medications: Levodopa, dopamine agonists, and other medications may beprescribed to manage symptoms.
- Physical Therapy: Exercise and physical therapy can improve mobility,balance, and overall quality of life.
- Deep Brain Stimulation (DBS): In advanced cases, DBS may be considered to alleviate symptoms by modulating abnormal neural activity.

6. Physical therapy treatment:

- Maintain and improve levels of function and independence, which will helpto improve a person’s quality of life
- Use exercise and movement strategies to improve mobility
- Correct and improve abnormal movement patterns and posture, wherepossible
- Maximize muscle strength and joint flexibility
- Correct and improve posture and balance, and minimize risks of falls
- Maintain a good breathing pattern and effective cough
- Educate the person with Parkinson’s and their care-giver or family members

- Enhance the effects of drug therapy

- **Upper Motor Neurone Diseases.**
  - **Hemiplegia**
  - **Cerebral Plasy.**
- **Lower Motor neurone Diseases:**
    - **Acute Aneroid Poliomyelitis.**
    - **Progressive Muscular Atrophy.**

- **Chorea and Parkinsonism.**
- **Peripheral nerve Injuries.**

Peripheral nerve injuries refer to damage or trauma to the nerves outside the brain and spinal cord.

RADIAL NERVE INJURY:

The radial nerve is one of the major nerves in the arm, providing motor and sensory innervation to various muscles and skin areas. Radial nerve injuries can result from trauma, compression, or other causes, leading to functional deficits in the affected arm. Here are key points about radial nerve injuries:

1. **Causes of Radial Nerve Injury:**

    - **Trauma**

    - **Penetrating Injuries**

    - **Compression**.

    - **Saturday Night Palsy:** This term is used to describe radial nerve compression or injury due to prolonged compression, often seen after a night of heavy drinking where the arm is compressed for an extended period.

2. **Clinical Presentation:**

    - Wrist drop (inability to lift the wrist).

    - Difficulty extending fingers, especially those at the base of the thumb.

    - Weakness in forearm and upper arm muscles.

    - Numbness or tingling along the back of the hand, thumb, index, and middle fingers.

- Loss of sensation in the back of the hand and forearm.

- Pain or discomfort in the affected areas.

- Difficulty straightening the elbow.

- Impaired fine motor skills in the fingers and hand.

- Muscle atrophy in severe or prolonged cases.

- Difficulty lifting the arm, especially against resistance.

3. **Treatment:**

- **Conservative Management:** In mild cases or when the injury is expected to resolve on its own, conservative measures such as splinting and physical therapy may be recommended.
- **Surgical Intervention:** Severe injuries or cases with evidence of nerve disruption may require surgical exploration and repair.
- **Rehabilitation:** Physical therapy is essential for maintaining joint mobility, preventing muscle atrophy, and promoting functional recovery.

4. **Physical therapy treatment:**

- **Pain Management:** TENS, Laser therapy, relaxation exercises

- **Muscle weakness:** Muscle strengthening exercises are employed as appropriate, e.g. isometric, graded weight progression, open-close chain, and Use of support sling
- **Functional deficits and sensory deficit**: Sensory reeducation aids in the recovery of sensibility. In sensory stimulation pinching and tapping, brushing and icing are regularly used.
- **Proprioception deficits**: can be improved using eg exercise balls, balance pads for WB activities, juggling balls for upper limbs, yoga, Tai-chi
- **Joint Stiffness:** ROM exercises on a daily basis are useful to prevent these problems

ULNAR NERVE INJURY:

The ulnar nerve is one of the major nerves in the arm and performs the motor and sensory functions of the forearm and hand.

1. **Causes of Ulnar Nerve Injury:**

    - **Compression at the Elbow**

    - **Trauma**

    - **Guyon's Canal Compression:** Compression or injury to the ulnar nerve at Guyon's canal, often due to repetitive trauma or pressure, can lead to symptoms.

2. **Clinical Presentation:**

    - **Motor Symptoms:** Weakness in the muscles of the hand, particularly those responsible.

3. **Physical therapy treatment:**

    - **Pain Management:** TENS, Laser therapy, relaxation exercises

    - **Muscle weakness:** Muscle strengthening exercises are employed as appropriate, e.g. isometric, graded weight progression, open-close chain, and Use of support sling

    - **Functional deficits and sensory deficit**: Sensory reeducation aids in the recovery of sensibility. In sensory stimulation pinching and tapping, brushing and icing are regularly used.

    - **Proprioception deficits**: can be improved using e.g. exercise balls, balance pads for WB activities, juggling balls for upper limbs, yoga, Tai-chi

    - **Joint Stiffness:** ROM exercises on a daily basis are useful to prevent these problems

FEMORAL NERVE INJURY:

The femoral nerve is a major nerve in the thigh, originating from the lumbar plexus.

1. **Causes of Femoral Nerve Injury:**

    - **Trauma**

- **Compression**
- **Diabetic Amyotrophy**

2. **Clinical Presentation:**

- Weakness or paralysis in the hip flexor muscles.
- Difficulty in lifting the thigh or extending the leg.
- Diminished or absent knee jerk reflex.
- Numbness or tingling along the front and inner parts of the thigh.
- Sensory loss in the upper part of the leg, especially in the front and inner regions.
- Pain or discomfort in the hip, anterior thigh, or inner thigh.
- Difficulty in standing from a seated position or climbing stairs.
- Impaired walking and gait abnormalities.
- Weakness in knee extension, leading to a buckling sensation.
- In severe cases, muscle atrophy in the thigh may develop over time.

3. **Treatment:**

- The management of femoral nerve injuries depends on the underlying cause and severity of the injury.
- Conservative measures, such as rest, physical therapy, and pain

management, may be employed for mild cases.

- In cases of severe injury or compression, surgical intervention may be necessary to decompress the nerve or repair damage.

4. **Physical therapy treatment:**

- **Pain Management:** TENS, Laser therapy, relaxation exercises

- **Muscle weakness:** Muscle strengthening exercises are employed as appropriate, e.g. isometric, graded weight progression, open-close chain, and Use of support sling
- **Functional deficits and sensory deficit**: Sensory reeducation aids in the recovery of sensibility. In sensory stimulation pinching and tapping, brushing and icing are regularly used.
- **Proprioception deficits**: can be improved using e.g. exercise balls, balance pads for WB activities, juggling balls for upper limbs, yoga, Tai-chi
- **Joint Stiffness:** ROM exercises on a daily basis are useful to prevent these problems

FACIAL PALSY (BELLS PALSY)

Facial palsy, also known as Bell's palsy, is a condition characterized by sudden, temporary weakness or paralysis of the muscles on one side of the face. It is the most common cause of facial paralysis. Here are key points about facial palsy:

1. **Causes:**

- Idiopathic
- Viral infections, particularly the herpes simplex virus.
- Other potential causes include inflammatory conditions affecting the facial nerve, such as viral infections
- autoimmune diseases
- Environmental factors.

2. Clinical Presentation:

- Inability to close the eye

- Inability to move the lips (e.g. into a smile, pucker)

- At rest, the affected side of the face may "droop"

- If, however, the person is in synkinesis, the affected side of the mouth may sit higher than the unaffected side. Facial synkinesis is defined as “abnormal facial movements that occur during volitional or spontaneous movement, for example, voluntary movement of the mouth may result in the closure of the eye.”

3. **Physical therapy treatment:**

- Proprioceptive neuro muscular facilitation (PNF) techniques

- Breathing and relaxation exercises

- Exercises to help with eye and lip closure

- Letter, word and facial expression exercises

- **Facial Paralysis.**

3.12 DISEASES OF MUSCLES.

- **The Dystrophies.**

THE DYSTROPHIES:

Dystrophies" generally refer to a group of disorders characterized by progressive degeneration or dysfunction of tissues, organs, or systems in the body. The term is often used in the context of genetic or inherited disorders that result in abnormal development or function of certain tissues. Here are a few examples of dystrophies in different medical contexts:

1. **Muscular Dystrophy:** This is a group of genetic disorders characterized by the progressive weakening and degeneration of muscles. Duchenne muscular dystrophy and Becker muscular dystrophy are examples of muscular dystrophies.

- **Types of muscular dystrophies:**

1. **Duchenne Muscular Dystrophy (DMD):**

   - **Cause:** DMD is caused by mutations in the dystrophin gene located on the X chromosome. It is an X-linked recessive disorder, which means it primarily affects males.
   - **Symptoms:** Symptoms usually appear in early childhood, and affected individuals may experience
   - muscle weakness
   - difficulty walking
   - delayed motor milestone
   - As the disease progresses, there is a loss of muscle function, leading to the need for a wheelchair.

2. **Becker Muscular Dystrophy (BMD):**

- **Cause:** BMD is also caused by mutations in the dystrophin gene but typically involves different types of mutations than DMD. BMD is also an X-linked recessive disorder.
- **Symptoms:** BMD shares similarities with DMD but generally has a later onset and progresses more slowly. Individuals with BMD may experience
- muscle weakness
- difficulty walking
- But the progression is often more gradual, and some individuals may maintain the ability to walk into adulthood.
- **Physical therapy treatment:**
- Therapy for muscular dystrophy focuses on:
- Maintaining ambulation / independent mobility for as long as possible
- Range of motion exercises and stretching, focusing on joints that tend to develop contractures sooner
- Low-impact workouts, such as stationary cycling, swimming / aquatic exercise
- Supportive bracing - to help maintain function for as long as possible
- Molded ankle-foot orthoses - used to help with gait in individuals with foot drop to prevent tripping or to provide support and comfort
- Lightweight plastic ankle-foot orthoses (AFOs) are considered very useful for foot-drop
- Appropriate wheelchair seating or other assistive technology devices

- Non-invasive ventilation

Management and treatment for muscular dystrophy often involve a multidisciplinary approach, including physical therapy, orthopedic interventions, and respiratory support. While there is currently no cure for muscular dystrophy, ongoing

MYASTHENIA GRAVIS:

Myasthenia gravis (MG) is a neuromuscular disorder characterized by weakness and fatigue of the voluntary muscles.

1. **Cause:** Myasthenia gravis is primarily caused by an autoimmune response. The immune system produces antibodies that target and attack acetylcholine receptors at the neuromuscular junction.
2. **Symptoms:** The hallmark symptom is
   - Muscle weakness, which tends to worsen with activity and improve with rest.
   - Common areas affected include the eyes, face, throat, and limbs.
   - drooping eyelids (ptosis)
   - Double vision (diplopia).
3. **Fluctuating Symptoms:** Symptoms can vary widely among individuals and may fluctuate throughout the day. Some people may experience mild weakness, while others may have more severe and generalized muscle involvement.
4. **Treatment:**
   - **Acetylcholinesterase Inhibitors:** Medications such as pyridostigmine can help improve muscle strength by preventing the breakdown of acetylcholine.
   - **Immunosuppressive Drugs:** Corticosteroids and other

immunosuppressive medications may be prescribed to suppress the immune system's activity.

- **Thymectomy:** Surgical removal of the thymus gland is sometimes recommended, especially in cases where the thymus is abnormal or if there are thymic tumors.

5. **Physical therapy treatment:**

- Aerobic exercise
- respiratory muscle training
- strength training
- progressive resistance exercises
- Balance strategy training

Myasthenia gravis is a chronic condition that requires ongoing management and medical supervision. Treatment is tailored to the individual, and regular follow-up with healthcare providers is crucial for optimizing outcomes.

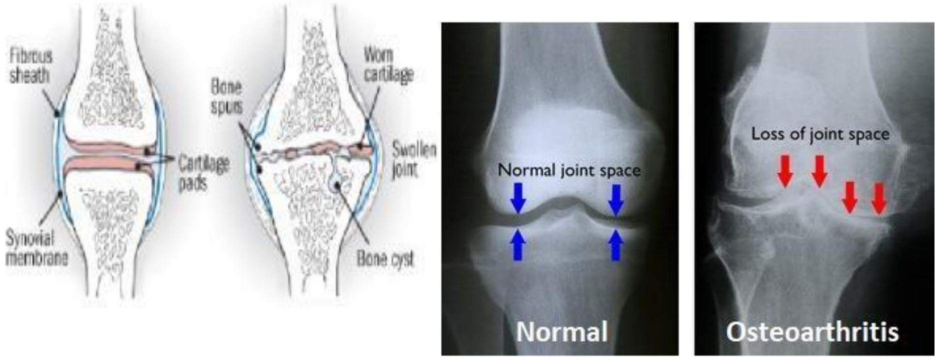
- **Myasthenia Gravis.**

3.13 DISEASES OF JOINTS.

3.2 Osteoarthritis.

OSTEOARTHRITIS:

Osteoarthritis (OA) is a common form of arthritis characterized by the degeneration of joint cartilage and the underlying bone. It is a chronic condition that typically affects the joints in the hands, knees, hips, and spine.



Here are key points about osteoarthritis:

Causes of Osteoarthritis:

1. **Age:**

- Osteoarthritis is more common as people age. The risk increases with advancing age.

2. **Genetics:**

- There is evidence of a genetic predisposition to osteoarthritis. If there is a family history of the condition, an individual may have a higher risk.

3. **Joint Overuse or Injury:**

- Previous joint injuries or overuse can contribute to the development of osteoarthritis. This is particularly true for athletes or individuals with physically demanding occupations.

4. **Obesity:**

- Excess body weight puts increased stress on weight-bearing joints, such as the knees and hips. This can accelerate the degeneration of joint cartilage.

5. **Gender:**

- Osteoarthritis is more common in women, especially after menopause. Hormonal factors may play a role in its development.

6. **Joint Congenital Abnormalities:**

- Individuals born with joint abnormalities or defects may be more prone to developing osteoarthritis.

7. **Metabolic Factors:**

- Conditions like diabetes and hemochromatosis (excessive iron in the body) may be associated with an increased risk of osteoarthritis.

8. **Bone and Joint Disorders:**

- Conditions that affect bone and joint health, such as rheumatoid arthritis or certain metabolic disorders, can contribute to the development of osteoarthritis.

9. **Joint Instability:**

- Conditions that cause joint instability, such as ligament injuries, can lead to abnormal joint loading and contribute to osteoarthritis.

➢ **Clinical Features of Osteoarthritis:**

1. **Pain:**

- Joint pain is a hallmark symptom. It is often described as a deep ache and is typically worse after activity or prolonged use of the joint.

2. **Stiffness:**

- Joint stiffness, especially after periods of inactivity, is common. Morning stiffness may also be experienced.

3. **Swelling:**

- Inflammation of the joint can lead to swelling. This is often seen in later stages of osteoarthritis.

4. **Joint Crepitus:**

- A grating or crackling sensation, known as crepitus, may be felt during joint movement.

5. **Limited Range of Motion:**

- Osteoarthritis can result in a reduced ability to move the joint through its full range of motion.

6. **Tenderness:**

- The affected joint may be tender to the touch.

7. **Bony Enlargements:**

- Osteophytes, or bony enlargements, may develop around the joint.

8. **Joint Deformities:**

- In severe cases, joint deformities may occur, affecting the overall structure of the joint.

9. **Functional Impairment:**

   - As the disease progresses, individuals may experience difficulty with activities of daily living, leading to functional impairment.

- **Physical therapy management:**

  - Range of motion exercises: To maintain or improve joint flexibility.
  - Strengthening exercises: Targeting muscles around the joint to provide better support.
  - Low-impact aerobic exercises: Such as walking, swimming, or stationary cycling to improve cardiovascular fitness without stressing the joints.
  - Aquatic exercises: Conducting exercises in water can be particularly beneficial for reducing joint stress.
  - Manual therapy
  - Modalities
  - Functional training

It's important to note that osteoarthritis is a progressive condition, and its clinical features can vary widely among individuals. Early diagnosis and appropriate management are crucial for optimizing outcomes and improving the quality of life for individuals affected by osteoarthritis.

RHEUMATOID ARTHRITIS:

Rheumatoid arthritis (RA) is a chronic autoimmune disorder that primarily affects the joints, causing inflammation, pain, and, over time, joint damage. Unlike osteoarthritis, which is caused by wear and tear on the joints, rheumatoid arthritis involves the immune system mistakenly attacking healthy joint tissues. Here are key points about rheumatoid arthritis:

Causes and Risk Factors:

1. **Autoimmune Response:**

   - Rheumatoid arthritis is an autoimmune disorder where the immune system attacks the synovium, the lining of the membranes that surround the joints.

2. **Genetic Factors:**

   - There is a genetic component to RA. Individuals with a family history of the disease may have a higher risk.

3. **Environmental Factors:**

   - Certain environmental factors, such as infections, may trigger the development of rheumatoid arthritis in individuals with a genetic predisposition.

4. **Gender and Age:**

   - RA is more common in women than in men. It often begins between the ages of 30 and 60, but it can affect individuals at any age.

Clinical Features of Rheumatoid Arthritis:

1. **Symmetrical Joint Involvement:**

   - RA typically affects joints on both sides of the body symmetrically. For example, if the right wrist is affected, the left wrist is likely to be affected as well.

2. **Joint Pain and Swelling:**

   - Joint pain, swelling, and stiffness are common symptoms. Morning stiffness that lasts for hours is a characteristic feature.

3. **Small Joint Affection:**

- RA often affects smaller joints first, such as those in the fingers and toes. However, it can also affect larger joints like the knees and shoulders.

4. **Systemic Symptoms:**

    - Rheumatoid arthritis can cause systemic symptoms, including fatigue,fever, and weight loss.

5. **Rheumatoid Nodules:**

    - Firm lumps, known as rheumatoid nodules, may develop under the skin, usually around joints or pressure points.

6. **Deformities:**

    - Over time, joint damage and inflammation can lead to joint deformities, such as swan-neck deformities in the fingers.

7. **Synovitis:**

    - Inflammation of the synovium can lead to the production of excess joint fluid, causing joint swelling.

8. **Joint Erosion:**

    - RA can cause progressive joint damage, leading to erosion of the bone and cartilage.

Physical Therapy treatment:

- Physical therapy can help improve joint function and reduce stiffness.
- Cold/Hot Applications: cold for acute phase; heat for chronic phase and used before exercise.
- Transcutaneous electrical nerve stimulation (TENS) is used to relieve pain.
- Hydrotherapy: exercise with minimal load on the joints

- Joint Protection

- ROM-exercises; aerobic exercise: stabilization/coordination exercises.

1. **Surgery:**

- In advanced cases, joint replacement surgery may be considered to relieve pain and improve joint function.

Early diagnosis and aggressive management are crucial in controlling the symptoms and preventing joint damage in rheumatoid arthritis. Regular monitoring and a multidisciplinary approach involving rheumatologists, physical therapists, and other healthcare professionals are essential for optimal care.

➢ **Deformities of RA:**

Rheumatoid arthritis (RA) is a chronic autoimmune disease that primarily affects the joints. Over time, the inflammation associated with RA can lead to joint damage and deformities. Here are some common deformities associated with rheumatoid arthritis:

1. **Swan-Neck Deformity:**
   - This deformity involves the fingers, where the middle joint hyperextends while the outermost joint flexes. It gives the appearance of a swan's neck.
2. **Boutonniere Deformity:**
   - In this deformity, the middle joint of the finger bends toward the palm, while the outermost joint hyperextends. This results in a button-like appearance.
3. **Ulnar Deviation:**
   - Ulnar deviation occurs when the fingers drift toward the ulnar (outer) side of the hand. It is a characteristic deformity in the hands of individuals with rheumatoid arthritis.
4. **Hammer Toe Deformity:**
   - This deformity affects the toes, causing them to bend downward at the middle joint, resembling a hammer.

5. Hallux Valgus (Bunion):

- Rheumatoid arthritis can lead to the development of bunions, particularly in the big toe joint. Hallux valgus involves the deviation of the big toe toward the other toes.

6. **Subluxation of Joints:**

- Subluxation refers to partial dislocation of a joint. In RA, this can occur in various joints, leading to instability and deformity.

7. **Ligament and Tendon Damage:**

- Chronic inflammation in RA can damage ligaments and tendons around joints, contributing to deformities and loss of joint stability.

8. **Wrist Deformities:**

- Rheumatoid arthritis commonly affects the wrists, leading to deformities such as volar subluxation (displacement towards the palm) and radial deviation (drifting towards the thumb side).

9. **Cervical Spine Involvement:**

- In some cases, rheumatoid arthritis can affect the cervical spine, leading to instability and deformities. This can have implications for spinal cord compression and neurological symptoms.

10. **Atlantoaxial Subluxation:**

- A specific deformity in the cervical spine where the joint between the first and second vertebrae becomes unstable. This can have serious consequences, including spinal cord compression.

ANKYLOSING SPONDYLITIS:

Ankylosing spondylitis (AS) is a chronic inflammatory arthritis that primarily affects the spine, causing inflammation, pain, and stiffness. Over time, this inflammation can lead to the fusion of the vertebrae and result in a rigid spine. Here are key points about ankylosing spondylitis:

Causes and Risk Factors:

1. **Genetic Predisposition:**
   - There is a strong genetic component to ankylosing spondylitis. Individuals with a specific genetic marker called HLA-B27 are at an increased risk.
2. **Immune System Involvement:**
   - Ankylosing spondylitis is considered an autoimmune disease, where the immune system mistakenly attacks the joints, primarily in the spine.
3. **Environmental Factors:**
   - While genetics play a significant role, environmental factors may also contribute to the development of ankylosing spondylitis. Infections, particularly in the gastrointestinal tract, have been suggested as potential triggers.

Clinical Features:

1. **Back Pain and Stiffness:**
   - Persistent pain and stiffness, especially in the lower back, are hallmark symptoms of ankylosing spondylitis. The pain is often worse in the morning and with periods of inactivity.
2. **Fusion of Vertebrae:**
   - Over time, chronic inflammation can lead to the fusion of the vertebrae,

resulting in reduced flexibility and a rigid spine. This fusion can extend into the neck and cause a stooped or hunched posture.

3. **Enthesitis:**

- Inflammation at the sites where tendons and ligaments attach to the bones (entheses) is common in ankylosing spondylitis. This can cause pain and swelling.

4. **Peripheral Joint Involvement:**

   - While the spine is the primary site of involvement, ankylosing spondylitis can also affect peripheral joints, such as the hips, knees, and shoulders.

5. **Fatigue:**

   - Chronic inflammation and pain can lead to fatigue, which is a common symptom in individuals with ankylosing spondylitis.

6. **Eye Inflammation:**

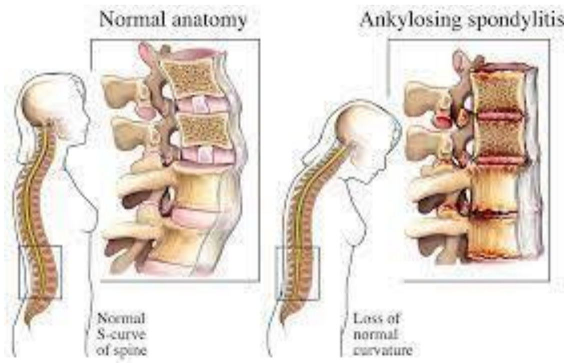
   - Inflammation of the eyes (uveitis) is a potential complication of ankylosing spondylitis and may cause eye pain, redness, and sensitivity to light.

7. **Chest Involvement:**

   - Ankylosing spondylitis can affect the joints between the ribs and the spine, leading to chest pain and restricted chest expansion.

Exercise and Physical Therapy:

- Regular exercise, especially exercises that promote flexibility and posture, is a key component of managing ankylosing spondylitis. Physical therapy can help individuals learn specific exercises and techniques. It aims to alleviate pain, increase spinal mobility and functional capacity, reduce morning stiffness, correct postural deformities, increase mobility and improve the psychosocial status of the patients



SEPTIC ARTHRITIS:

Septic arthritis, also known as infectious arthritis, is a serious medical condition characterized by the infection of a joint with bacteria, viruses, or fungi. This infection leads to inflammation within the affected joint, causing pain, swelling, and reduced joint mobility. Septic arthritis is considered a medical emergency, and prompt diagnosis and treatment are crucial to prevent joint damage and systemic complications.

Causes:

1. **Bacterial Infection:**
    - The majority of cases of septic arthritis are caused by bacterial infections. The most common bacterial pathogens include Staphylococcus aureus and Streptococcus species. In some cases, other bacteria such as Escherichia coli or Neisseria gonorrhoeae may be responsible.
2. **Viral and Fungal Infections:**
    - While less common, septic arthritis can also be caused by viral or fungal infections. Viral causes are often seen in immunocompromised individuals, and fungal causes may be associated with certain risk factors such as immunosuppression or intravenous drug use.

Risk Factors:

1. **Joint Predisposition:**

- Certain joints are more prone to septic arthritis, including the knee, hip, shoulder, and elbow.

2. **Age:**

   - Infants and elderly individuals are at a higher risk of developing septic arthritis.

3. **Existing Joint Conditions:**

   - Individuals with pre-existing joint conditions, such as rheumatoid arthritis or osteoarthritis, may have an increased susceptibility to septic arthritis.

4. **Joint Injections or Surgery:**

   - Procedures involving joint injections or joint surgery can introduce bacteria into the joint, increasing the risk of infection.

5. **Immune System Compromise:**

   - Conditions or medications that compromise the immune system, such as HIV/AIDS or immunosuppressive drugs, can increase the risk of septic arthritis.

6. **Skin Infections:**

   - Skin infections or open wounds near a joint can provide an entry point for bacteria.

Clinical Features:

1. **Joint Pain:**

   - Sudden onset of severe joint pain is a characteristic symptom.

2. **Joint Swelling and Redness:**

    - The affected joint becomes swollen, warm, and may appear red.

3. **Fever and Chills:**

- Systemic symptoms, including fever and chills, may be present, indicating a more widespread infection.

4. **Limited Joint Mobility:**

   - Due to pain and swelling, there may be a noticeable limitation in the range of motion of the affected joint.

5. **Systemic Signs of Infection:**

   - In severe cases, individuals may experience symptoms of systemic infection, such as fatigue and malaise.

GOUT:

Gout is a form of inflammatory arthritis characterized by sudden, severe attacks of pain, swelling, redness, and tenderness in the joints, often starting with the big toe. It is caused by the deposition of urate crystals in the joints and surrounding tissues. Urate crystals form when there is an elevated level of uric acid in the blood, a condition known as hyperuricemia. Here are key points about gout:

Causes and Risk Factors:

1. **Hyperuricemia:**

   - Gout is primarily caused by an excess of uric acid in the blood. Uric acid is a byproduct of the breakdown of purines, which are found in certain foods and are also produced by the body.

2. **Dietary Factors:**

   - Consuming foods high in purines, such as red meat, organ meats, seafood, and high-fructose corn syrup, can contribute to elevated uric acid levels.

3. **Genetics:**

- There is a genetic component to gout, and a family history of the condition increases the risk.

4. Age and Gender:

- Gout is more common in men, particularly after the age of 40. Women become more susceptible after menopause.

5. **Medical Conditions:**

- Conditions such as kidney disease, hypertension, metabolic syndrome, and diabetes can increase the risk of gout.

6. **Medications:**

- Certain medications, such as diuretics (water pills) and low-dose aspirin, can interfere with uric acid excretion and contribute to hyperuricemia.

Clinical Features:

1. **Acute Joint Attacks:**

- Gout typically presents with sudden and severe joint pain, often affecting the big toe (podagra). Other commonly affected joints include the ankles, knees, elbows, wrists, and fingers.

2. **Swelling and Redness:**

- The affected joint becomes swollen, red, and warm to the touch.

3. **Tophi:**

- In chronic cases, deposits of urate crystals (tophi) may form under the skin, causing nodules or lumps. Tophi can also develop in joints and internal organs.

4. **Limited Joint Mobility:**

- During acute attacks, joint mobility may be significantly reduced due to pain and swelling.

5. Flares and Remissions:

- Gout tends to have a pattern of flares (acute attacks) followed by periods of remission. Over time, without proper management, the frequency and severity of flares may increase.

3.3 Ankylosing Spondylitis.

3.4 Rheumatoid Arthritis.

3.5 Septic Arthritis

3.6 Gout

3.14 DISEASES OF RESPIRATORY TRACT.

3.7 Bronchitis

Bronchitis:

Bronchitis is the inflammation of the bronchial tubes, which carry air to and from the lungs. It can be acute (short-term) or chronic (long-term). Acute bronchitis is often caused by viral infections like the flu or common cold, while chronic bronchitis is commonly linked to smoking, air pollution, or repeated lung infection

Causes:

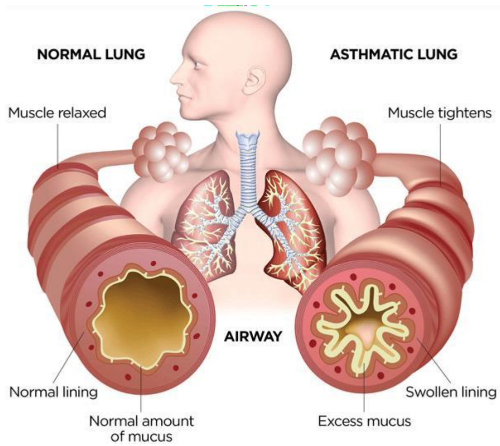
Bronchitis is commonly caused by viral infections, such as the same viruses that cause colds and the flu. Bacterial infections, irritants like smoke or air pollution, and sometimes even allergies can also trigger bronchitis.

Physiotherapy management:

Physiotherapy plays a vital role in managing bronchitis by employing techniques to clear mucus from the airways, improve breathing, and strengthen respiratory muscles. It involves exercises to enhance lung capacity, chest physiotherapy to help clear secretions, breathing techniques, and education on proper coughing to expel mucus effectively. This can significantly aid in the recovery process and reduce the risk of complications.

What is Asthma?

Asthma is a chronic respiratory condition characterized by inflammation and narrowing of the airways, leading to difficulty in breathing, wheezing, coughing, and chest tightness. It can be triggered by various factors like allergens, exercise, cold air, or respiratory infections. Management usually involves avoiding triggers, using inhalers (bronchodilators and anti-inflammatories), and creating an action plan with a healthcare professional to control symptoms and prevent flare-ups.



Causes:

The exact cause of asthma isn't fully understood, but it's believed to involve a combination of genetic and environmental factors. Some common triggers include allergies (pollen, dust mites, pet dander), respiratory infections, air pollution, smoke, certain medications, physical activity, and even emotional factors like stress. These triggers can cause inflammation and constriction of the airways in susceptible individuals, leading to asthma symptoms.

Physiotherapy management:

Physiotherapy can complement asthma management by focusing on breathing exercises, airway clearance techniques, and improving overall lung function. Techniques like deep breathing exercises, relaxation techniques, and respiratory muscle training can help individuals with asthma control their symptoms, reduce the frequency of attacks, and improve their quality of life. Additionally, physiotherapists can educate patients on proper inhaler use and offer guidance on managing exercise-induced asthma.

Emphysema:

Emphysema is a type of chronic obstructive pulmonary disease (COPD) characterized by damage to the air sacs (alveoli) in the lungs. This damage causes the air sacs to lose their elasticity, leading to difficulty in exhaling air. Common causes include long-term exposure to irritants like cigarette smoke, which leads to the destruction of lung tissue, reducing the surface area available for oxygen exchange. This results in symptoms like shortness of breath, wheezing, and a chronic cough.

Causes:

The primary cause of emphysema is usually long-term exposure to irritants, particularly cigarette smoke. Other factors like exposure to air pollution, secondhand smoke, industrial dust, and fumes can also contribute to the development of emphysema. Rarely, a genetic condition called alpha-1 antitrypsin deficiency can lead to early-onset emphysema, even in non-smokers, due to the body's inability to produce enough of a specific protein that protects the lungs.

Physiotherapy management:

Physiotherapy for emphysema aims to improve lung function, manage symptoms, and enhance overall quality of life. It involves breathing exercises to strengthen respiratory muscles, techniques to clear mucus from the airways, and strategies to optimize breathing patterns. Pulmonary rehabilitation programs, which often include exercise training, education, and support, are also beneficial for individuals with emphysema. Physiotherapists tailor these interventions to the individual's needs to maximize their respiratory function and minimize symptoms.

What is bronchiectasis?

Bronchiectasis is a chronic condition where the airways in the lungs become permanently widened, leading to a build-up of mucus and bacteria. This can result from various causes, including respiratory infections, immune system problems, or inhaling a foreign object. Physiotherapy for bronchiectasis involves airway clearance techniques, exercises to improve lung capacity, and strategies to manage symptoms. It aims to clear mucus from the airways, reduce infections, and enhance breathing function to improve the individual's quality of life.

Causes:

Bronchiectasis can be caused by a variety of factors, including:

Respiratory Infections: Severe or recurring lung infections, like pneumonia or tuberculosis, can lead to bronchiectasis.

Cystic Fibrosis:

A genetic condition where thick and sticky mucus accumulates in the lungs, leading to recurrent infections and lung

1. **Immune System Problems:** Conditions that affect the immune system can make the body more susceptible to infections that damage the airways.
2. **Inhaled Objects:** Inhaling a foreign object that gets lodged in the airway can lead to chronic inflammation and bronchiectasis in that area.
3. **Autoimmune Conditions:** Certain autoimmune diseases can cause inflammation inthe airways, leading to damage and widening.

Identifying and treating the underlying cause is essential in managing bronchiectasis.

Physiotherapy treatment:

Physiotherapy is a key component in managing bronchiectasis. It involves airway clearance techniques such as chest physiotherapy, postural drainage, and breathing exercises aimed at removing excess mucus from the lungs. These techniques help prevent infections, improve lung function, and reduce symptoms like coughing and shortness of breath. Physiotherapists also design exercise programs to enhance lung capacity and provide education on self-management strategies to improve the overall quality of life for individuals with bronchiectasis.

What is pneumonia?

Pneumonia is an infection that inflames the air sacs in one or both lungs. The air sacs may fill with fluid or pus, causing symptoms like cough with phlegm or pus, fever, chills, and difficulty breathing. Pneumonia can be caused by bacteria, viruses, or fungi, and it can range from mild to severe. Treatment often involves antibiotics for bacterial pneumonia and supportive care to manage symptoms and aid recovery. Vaccines are available to prevent some of the bacterial and viral infections that can cause pneumonia.

Types of pneumonia:

Lobar and bronchial pneumonia:

Lobar pneumonia and bronchial pneumonia refer to specific patterns of lung involvement in pneumonia.

- **Lobar Pneumonia:** This type of pneumonia affects one or more lobes of a lung. It's characterized by the consolidation of a specific lobe or lobes due to infection. It often presents with symptoms like high fever, chest pain, productive cough, and difficulty breathing.
- **Bronchopneumonia (Bronchial Pneumonia):** Bronchopneumonia is a more diffuse form of pneumonia affecting smaller areas of the lung, often involving multiple lobes or scattered patches throughout both lungs. It starts around the bronchi and spreads to nearby alveoli. The symptoms can be similar to lobar pneumonia but might be less severe.

Both types can be caused by bacteria, viruses, or other pathogens, and treatment usually involves

Physiotherapy:

Physiotherapy plays a crucial role in the recovery from pneumonia by aiding in clearing mucus from the lungs, improving lung function, and restoring normal breathing patterns. Techniques such as deep breathing exercises, coughing techniques, and chest physiotherapy help to mobilize and clear the mucus that accumulates in the lungs. Postural drainage, where positions are used to drain mucus from specific parts of the lungs, can also be beneficial. Physiotherapists tailor these interventions based on the individual's condition and overall health to support their recovery from pneumonia.

What is tuberculosis?

Antibiotics or antiviral medications, depending on the cause. The distinction between lobar and bronchial pneumonia is based on the distribution and pattern of lung involvement seen in imaging studies and during clinical assessment.

Tuberculosis (TB) is a bacterial infection caused by Mycobacterium tuberculosis. It primarily affects the lungs but can also affect other parts of the body like the brain, spine, or kidneys. TB spreads through the air when an infected person coughs or sneezes, releasing bacteria into the air.

Symptoms of TB may include a persistent cough, chest pain, fatigue, fever, night sweats, and weight loss. It can be latent (asymptomatic and not contagious) or active (symptomatic and contagious).

Treatment for TB typically involves a combination of antibiotics taken for several months to kill the bacteria. Completing the full course of medication is crucial to prevent the development of drug-resistant strains.

Preventive measures include vaccination (BCG vaccine in some countries), identifying and treating active cases promptly, and infection control practices to limit the spread of the disease.

Causes:

Tuberculosis (TB) is caused by a bacterium called Mycobacterium tuberculosis. It spreads through the air when an infected person coughs, sneezes, speaks, or sings, releasing bacteria-containing droplets into the air. Other people nearby can inhale these droplets and become infected.

Factors that increase the risk of TB transmission include spending time with someone who has untreated active TB, living in crowded or unsanitary conditions, having a weakened immune system (due to HIV, malnutrition, certain medications, or other illnesses), and traveling to or living in areas where TB is more common.

Physiotherapy management:

Physiotherapy plays a supportive role in the treatment of tuberculosis (TB) by aiding in the recovery process and minimizing complications. It focuses on exercises to improve lung capacity, breathing techniques, and airway clearance methods to help remove secretions from the lungs.

Physiotherapists may guide patients through deep breathing exercises, chest physiotherapy, postural drainage, and techniques that promote effective coughing to clear mucus from the lungs. These interventions aim to prevent complications, improve respiratory function, and support the overall recovery of individuals undergoing treatment for TB.

What is pleurisy, pleural effusion and pneumothorax?

Pleurisy:

Pleurisy, also known as pleuritis, is the inflammation of the pleura, which is the thin, double-layered membrane surrounding the lungs and lining the chest cavity. The pleura normally allows the lungs to expand and contract smoothly during breathing. When inflamed, the pleural layers rub against each other, causing sharp chest pain, especially during breathing.

Pleurisy can result from various conditions, including respiratory infections (such as pneumonia or tuberculosis), autoimmune disorders like lupus or rheumatoid arthritis, lung diseases, chest trauma, or certain cancers. Treatment aims to address the underlying cause and relieve symptoms, often involving anti-inflammatory medications to reduce pain and inflammation.

Causes:

Pleurisy can be caused by various factors, including:

1. **Respiratory Infections:** Viral or bacterial infections like pneumonia, tuberculosis, orviral pleurisy (caused by viruses such as influenza or adenovirus).
2. **Autoimmune Conditions:** Diseases like lupus, rheumatoid arthritis, or systemicsclerosis can cause inflammation of the pleura.
3. **Pulmonary Embolism:** Blood clots in the lungs can cause pleuritic chest pain.

4. **Lung Conditions:** Lung diseases such as pulmonary embolism, lung cancer, or pulmonary fibrosis can lead to pleurisy.

5. **Chest Trauma:** Injuries to the chest from accidents or surgeries can cause inflammation of the pleura.

Identifying the underlying cause of pleurisy is crucial for proper treatment, which often involves addressing the underlying condition and managing the symptoms of pain and discomfort.

Management

Physiotherapy for pleurisy focuses on pain management, facilitating optimal breathing, and aiding in the recovery process.

It involves techniques to relieve chest pain, such as positioning adjustments to minimize discomfort and using heat or cold therapy as advised by a healthcare professional.

Breathing exercises aimed at improving lung expansion, such as deep breathing exercises, diaphragmatic breathing, and controlled coughing, can help prevent complications like lung collapse and aid in clearing mucus from the lungs.

However, the specific physiotherapy approach for pleurisy should be tailored to the individual's condition and guided by a healthcare professional to ensure it aligns with the stage and severity of the inflammation.

Pleural effusion:

Pleural effusion is a condition characterized by an abnormal accumulation of fluid in the pleural space, the area between the layers of the pleura (the membranes surrounding the lungs). This accumulation of fluid can result from various underlying causes:

1. **Infections:** Such as pneumonia, tuberculosis, or lung abscesses.

2. **Heart Failure:** Increased pressure in the blood vessels surrounding the lungs can

cause fluid to leak into the pleural space.

3. **Cancer:** Certain cancers, particularly lung cancer, breast cancer, or lymphomas, can lead to pleural effusion.
4. **Kidney Disease:** Conditions affecting kidney function can lead to fluid retention and pleural effusion.
5. **Liver Disease:** Liver conditions like cirrhosis can cause fluid accumulation in the abdomen, which can then move into the pleural space.
6. **Pulmonary Embolism:** Blood clots in the lungs can cause pleural effusion.
7. **Autoimmune Disorders:** Conditions like lupus or rheumatoid arthritis can contributeto pleural effusion.

Symptoms may include chest pain, shortness of breath, cough, and sometimes fever. Treatment involves addressing the underlying cause and may include draining the fluid from the pleural space, either through medication, needle aspiration, or chest tube insertion, depending on the amount of fluid and the patient's condition.

Physiotherapy:

Physiotherapy for pleural effusion primarily focuses on optimizing lung function, aiding in the re-expansion of the lung, and promoting drainage of the accumulated fluid.

Techniques may include breathing exercises to enhance lung capacity and retrain breathing patterns, chest physiotherapy to assist in mobilizing and clearing secretions, and postural drainage techniques to facilitate the movement of fluid toward the drainage area. However, the approach to physiotherapy for pleural effusion needs to be tailored to the individual's condition and guided by healthcare professionals to ensure it aligns with the stage and severity of the effusion and the overall health status of the patient.

What is pneumothorax?

Pneumothorax is a condition characterized by the presence of air in the pleural space, the area between the lung and the chest wall. This accumulation of air causes pressure on the lung, leading to its partial or complete collapse.

There are different types of pneumothoraces:

Spontaneous Pneumothorax: This occurs without any traumatic injury and is oftendue to the rupture of small air-filled sacs (blebs) on the lung surface. It can happenin people with lung conditions like emphysema or without any known lung disease.

1. **Traumatic Pneumothorax:** Caused by chest injuries from blunt force trauma, penetrating wounds (such as stab or gunshot wounds), or medical procedures like lung biopsies or mechanical ventilation.

2. **Tension Pneumothorax:** A rare but life-threatening type where air continues to enter the pleural space, increasing pressure on the affected lung and pushing it toward the other side of the chest, compromising breathing and circulation.

Symptoms of pneumothorax can include sudden chest pain, shortness of breath, rapid breathing, and in severe cases, cyanosis (bluish discoloration of the skin due to lack of oxygen). Treatment often involves removing the air from the pleural space, either by inserting a chest tube to allow the air to escape or, in some cases, with needle aspiration.

Physiotherapy:

Physiotherapy for pneumothorax primarily aims to assist in lung re-expansion and promote optimal recovery after the condition has been treated medically.

After the air has been removed from the pleural space, physiotherapy may involve breathing exercises to improve lung capacity and retrain proper breathing patterns. Techniques like deep breathing exercises, incentive spirometry, and controlled coughing can help re-expand the affected lung and prevent complications like atelectasis (partial lung collapse).

However, it's crucial that physiotherapy interventions are tailored to the individual's condition and guided by healthcare professionals to ensure they are appropriate for the stage of recovery and the specific circumstances of the pneumothorax.

What is Respiratory Failure?

Respiratory failure occurs when the lungs can't adequately perform the essential function of oxygenating the blood and removing carbon dioxide. This condition can be acute (sudden and severe) or chronic (developing over time).
There are two types of respiratory failure:

1. **Hypoxemic Respiratory Failure:** This occurs when the oxygen levels in the blood are dangerously low, leading to a lack of oxygen in the tissues and organs. It can be caused by conditions such as pneumonia, acute respiratory distress syndrome (ARDS), pulmonary embolism, or severe asthma.
2. **Hypercapnic Respiratory Failure:** In this type, the carbon dioxide levels in the bloodbecome too high due to inadequate exhalation. It can result from conditions that affect the ability to remove carbon dioxide from the body, such as chronic obstructive pulmonary disease (COPD), neuromuscular diseases, or severe chest wall deformities.

Symptoms of respiratory failure include shortness of breath, rapid breathing, confusion, bluish tint to the skin (cyanosis), and in severe cases, unconsciousness.

Physiotherapy:

In acute cases, physiotherapy may involve techniques such as

- Chest physiotherapy
- Positioning to facilitate lung expansion
- Assisted coughing to clear secretions

For chronic respiratory failure, physiotherapists often design individualized exercise programs to improve respiratory muscle strength and endurance, along with breathing exercises to enhance lung capacity and efficiency.

Role of physiotherapy assistant in positioning and Management of Respiratory Failure:

Physiotherapy assistants play a crucial role in supporting the management of respiratory diseases, particularly in assisting with positioning and certain aspects of patient care.

1. **Positioning:** Physiotherapy assistants assist in positioning patients correctly to optimize lung expansion and comfort. They help patients assume positions that facilitate breathing and aid in the drainage of secretions from the lungs. Proper positioning can improve ventilation and prevent complications like atelectasis or pneumonia.
2. **Mobility Support:** They assist patients in performing mobility exercises as directed by physiotherapists, helping them move, turn, or change positions to prevent muscle weakness and improve lung function.
3. **Breathing Exercises:** Physiotherapy assistants often guide patients through prescribed breathing exercises, ensuring they understand and perform them correctly.
4. **Equipment Setup:** They assist in setting up equipment used in respiratory therapy, such as incentive spirometers or chest physiotherapy devices, ensuring they are ready for use by patients.
5. **Patient Education:** They reinforce information and techniques provided by physiotherapists, ensuring patients understand and correctly perform exercises or positioning methods.

While physiotherapy assistants play a significant role in patient care and support, they work under the guidance and direction of physiotherapists, who assess patients, establish treatment plans, and supervise their care to ensure optimal management of respiratory diseases.

3.15 FRACTURES.

3.8 Types, sites and its physiotherapy management.

A fracture refers to a break or crack in a bone or hard tissue, often caused by physical force, injury, or underlying medical conditions. It can vary in severity, from a hairline crack to a complete break.

Sign and symptoms of fracture

Fractures can exhibit various characteristics:

- Pain
- Swelling
- Bruising
- Deformity
- difficulty moving the affected area
- And in severe cases, bone protrusion or an open wound.

Fractures can manifest through various characteristics:

1. **Location:** Indicates where in the bone the break has occurred.
2. **Type:** Can be categorized based on the pattern or shape of the break (e.g., transverse, spiral, comminuted).
3. **Severity:** Ranges from hairline fractures to complete breaks, affecting treatment and recovery time.
4.
5. **Displacement:** Refers to whether the bone fragments have moved out of alignment.

6. **Open or closed:** Whether the broken bone has pierced the skin (open) or not (closed).
7. **Stability:** Determines how stable the fracture is and if it requires external support for healing.
8. **Healing process:** Varies based on factors like age, overall health, and proper treatment adherence.

These characteristics can vary depending on the type and severity of the fracture.

Clinical features of fracture:

1. **Pain and tenderness:** Severe pain at the fracture site, especially upon movement or touch.
2. **Swelling and bruising:** Tissues around the fracture might swell and bruise due tobleeding and inflammation.
3. **Deformity or misalignment:** The affected limb or area might appear deformed orout of its normal alignment.
4. **Inability to bear weight or move:** Difficulty or inability to use the injured part due topain or loss of function.
5. **Visible or palpable abnormalities:** Bones may protrude or cause a visible

6. **Abnormality**

7. **Restricted mobility or range of motion:** Limited movement or inability to move theinjured area normally.

Complications of fracture:

Fractures can lead to several complication such as

- Nerve or blood vessel damage
- Infection
- delayed healing
- malunion (improper healing resulting in misalignment)
- nonunion (failure of bone ends to heal)
- compartment syndrome (increased pressure within muscles)
- Long-term joint stiffness or arthritis.

Different fracture sites and physiotherapy management of fractures

Fracture sites:

Fractures can occur in various parts of the body. Some common fracture sites include:

1. **Arm and Hand:** Radius, ulna, wrist bones, metacarpals, and phalanges.
2. **Leg and Foot:** Femur, tibia, fibula, ankle bones, metatarsals, and phalanges.
3. **Spine:** Vertebrae fractures can occur due to injury or conditions like osteoporosis.
4. **Skull:** Fractures to the skull can result from head injuries.
5. **Pelvis:** Pelvic fractures often occur due to high-energy impacts like accidents or falls.
6. **Ribs and Chest:** Fractures to the ribs can happen due to trauma or accidents.
7. **Collarbone (Clavicle):** Commonly fractured from a fall on an outstretched arm.

8. **Facial Bones:** Nasal, orbital, or jaw fractures due to accidents or trauma.

Physiotherapy management of fracture

Physiotherapy plays a crucial role in the recovery process after a fracture. Here are some aspects of physiotherapy management:

Immobilization Phase: Initially, the focus is on protecting the fracture site.Physiotherapy may involve educating the patient about proper immobilization techniques and using assistive devices like slings, braces, or casts to support theinjured area.

1. **Pain Management:** Physiotherapists may employ various techniques like ice, heat, or electrical stimulation to manage pain and swelling around the fracture.

2. **Range of Motion Exercises:** Once healing progresses, gentle exercises are introduced to maintain and restore joint flexibility and prevent stiffness in the surrounding muscles and joints.

3. **Strength Training:** Gradual strengthening

3.16 DEFORMITIES:

3.9 Acquired and congenital, General Principles of physiotherapy treatment.

Congenital deformities are structural abnormalities present at birth. Here arevarious types:

1. **Clubfoot (Talipes Equinovarus):** An abnormality where the foot is twisted inwards and downwards.

2. **Cleft Lip and Palate:** A separation or gap in the upper lip and/or roof of the mouth, which can affect feeding, speech, and appearance.

3. **Congenital Dislocation of the Hip (CDH):** The hip joint is partially or completely dislocated at birth.

4. **Spina Bifida:** A neural tube defect where the spinal column doesn't close

completely, leading to varying degrees of spinal cord damage and neurological issues

Hip deformities:

Hip deformities can encompass various conditions affecting the structure and function of the hip joint. Some common hip deformities include:

1. **Hip Dysplasia:** A condition where the hip socket is too shallow, causing instability and potential dislocation of the hip joint. It's often present at birth but can develop over time.
2. **Femoroacetabular Impingement (FAI):** An abnormality in the shape of the hip jointbones, leading to friction and damage within the joint during movement.
3. **Developmental Dysplasia of the Hip (DDH):** Refers to a spectrum of hip abnormalities ranging from mild instability to complete dislocation that occurs during fetal development or infancy.
4. **Perthes Disease:** A condition where the blood supply to the ball portion of the hip joint (femoral head) is temporarily disrupted, leading to bone death and deformity.
5. **Slipped Capital Femoral Epiphysis (SCFE):** A condition in adolescents where thefemoral head slips off the femoral neck due to weakness in the growth plate.
6. **Hip Osteoarthritis:** Degenerative changes in the hip joint due to wear and tear over time, leading to pain, stiffness, and reduced mobility

Treatment:

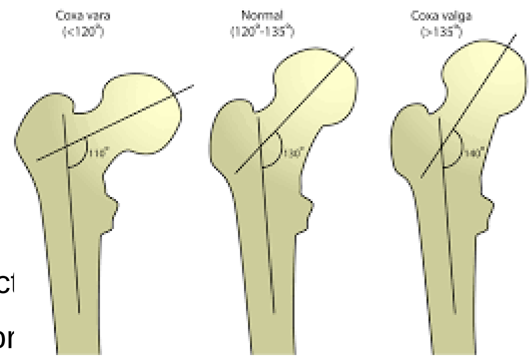
Treatment for hip deformities depends on the specific condition, its severity, and the age of the patient. It may involve non-surgical methods such as braces, physical therapy, or surgical interventions like osteotomies, joint reconstruction, or hip replacement in severe cases. Early detection and intervention are crucial for better outcomes in managing hip deformities.

Coxa vara and coxa valgus deformities:

Coxa vara:

Coxa vara is a deformity of the hip where the angle between the head of the femur (thigh bone) and its shaft is reduced, leading to a decreased neck-shaft angle. This results in a more obtuse angle than the usual 135 degrees. This condition can be congenital or acquired and can affect one or both hips.

There are two main types of coxa vara:



1. **Congenital Coxa Vara:** Present at birth, this condition might be due to abnormal development of the hip joint during fetal growth.
2. **Acquired Coxa Vara:** This can develop due to various fact bone disorders, or growth disturbances affecting the femor
3. Coxa vara can lead to problems with gait, hip pain, limping, and reduced range of motion in the affected hip. In severe cases, it may predispose individuals to hip arthritis or fractures.

Management:

Treatment options depend on the severity of the condition. Mild cases might be managed with observation and physical therapy to improve strength and flexibility. However, more severe cases might require surgical intervention, such as osteotomy (surgical cutting and realignment of the bone) to correct the angle and improve hip function. Early diagnosis and appropriate treatment can help prevent complications and improve long-term outcomes for individuals with coxa vara.

Coxa valgus:

Coxa valgus is a deformity of the hip where the angle between the head of the femur (thigh bone) and its shaft is increased, resulting in a greater neck-shaft angle than the usual 135 degrees. This deviation causes the knees to move closer together while the feet are farther apart when standing, often termed as "knock-knees."

There are two main types of coxa valgus:

1. **Congenital Coxa Valgus:** Present at birth, this condition might be due to abnormal development of the hip joint during fetal growth.
2. **Acquired Coxa Valgus:** This can develop due to various factors, including injury, bone disorders, or growth disturbances affecting the femoral neck.

Coxa valgus can lead to gait abnormalities, instability in the hip joint, and an increased risk of hip dislocation. It can also cause stress on the knee joint, leading to knee pain or problems

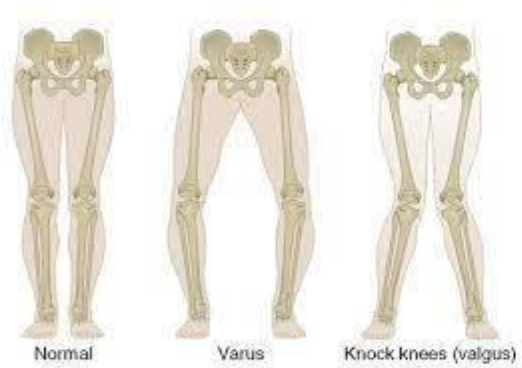
Management:

Treatment options depend on the severity of the condition. Mild cases might be managed with observation and physical therapy to improve strength and flexibility. However, severe cases might require surgical intervention, such as corrective osteotomy (surgical cutting and realignment of the bone) to correct the angle and improve hip and knee function.

Regular monitoring and early intervention are essential for managing coxa valgus to prevent complications and improve the overall function and alignment of the hip and knee joints.

Knee deformities:

Knee deformities can encompass various structural abnormalities affecting the alignment, shape, or function of the knee joint. Some common knee deformities include:



1. **Genu Valgum (Knock-Knees):** Characterized by the knees bending inward, causing the lower legs to angle outward. It can be due to developmental factors or underlying conditions.

2. **Genu Varum (Bow Legs):** The knees bend outward, causing the lower legs to curve inward. It might be a normal variation in infants or can be caused by conditions affecting bone growth.
3. **Genu Recurvatum:** A condition where the knees hyperextend backward, causing the lower legs to be positioned behind the body's vertical line.

Management

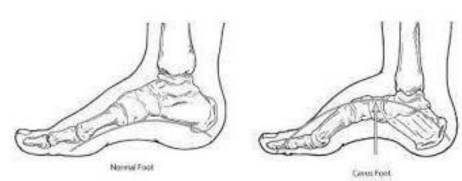
Intervention is crucial for managing knee deformities and preventing furthercomplications. Treatment for knee deformities depends on the specific condition, its severity, and its underlying cause. It may involve conservative approaches like physical therapy, bracing, or orthotic devices to correct alignment. In more severe cases or when conservative measures are insufficient, surgical interventions like osteotomy (bone realignment), ligament reconstruction, or patellar realignment surgeries might be necessary to correct the deformity and restore proper knee function. Early diagnosis andappropriate

Foot deformities

Talipes equinovarus and flat feet:

Foot deformities encompass a range of structural abnormalities affecting the shape, alignment, or function of the foot. Some common foot deformities include:

1. **Pes Planus (Flat Feet):** The arch of the foot collapses, causing the entire sole to touch the ground when standing. It can be congenital or develop over time due to various factors.
2. **Pes Cavus (High Arches):** Characterized byan unusually high arch in the foot, causing excessive weight distribution on the ball and heel. It can lead to instability and foot pain.



3. **Talipes equinovarus:** Talipes equinovarus, also known as clubfoot, is a

congenital condition where a baby's foot is turned inward and downward. Treatment often involves gentle stretching, casting, and sometimes surgery to correct the positionof the foot. Early intervention can lead to good outcomes and normal developmentof the affected foot

Deformities of spine:

Scoliosis:

Scoliosis is a condition characterized by an abnormal sideways curvature of the spine. It can occur in various degrees of severity and might be caused by factors like genetics, neuromuscular conditions, or unknown reasons (idiopathic). Treatment options depend on factors like the patient's age, the degree of curvature, and potential progression. Observation, bracing, physical therapy, or in severe cases, surgery might be recommended to manage scoliosis and prevent further curvature progression. Early detection, especially during adolescence when growth spurts occur, is important for effective management.

Physiotherapy:

Physiotherapy plays a significant role in managing scoliosis by focusing on exercises to improve muscle strength, flexibility, and overall posture. These exercises are tailored to the individual's condition and help stabilize the spine, reduce pain, and potentially prevent further progression of the curvature. Specific exercises might include stretches, core strengthening, and muscle-balancing routines. Physiotherapy aims to improve spinal alignment, enhance mobility, and promote better function, often in conjunction with other treatments like bracing or observation, depending on the severity of the scoliosis.

Kyphosis:

Kyphosis refers to an excessive outward curvature of the spine, leading to a rounded or hunched back appearance. This condition can occur at any age and may result from various factors, such as poor posture, developmental issues, degenerative diseases like osteoporosis, or trauma. Kyphosis can range from mild to severe and might cause discomfort, stiffness, or pain. Treatment options depend on the cause and severity and may include exercises, bracing, or in severe cases, surgery to correct the curvature and alleviate symptoms.

Physiotherapy

For kyphosis involves exercises and techniques aimed at improving posture, strengthening core muscles, increasing flexibility, and reducing pain or discomfort associated with the condition. These Physiotherapy:

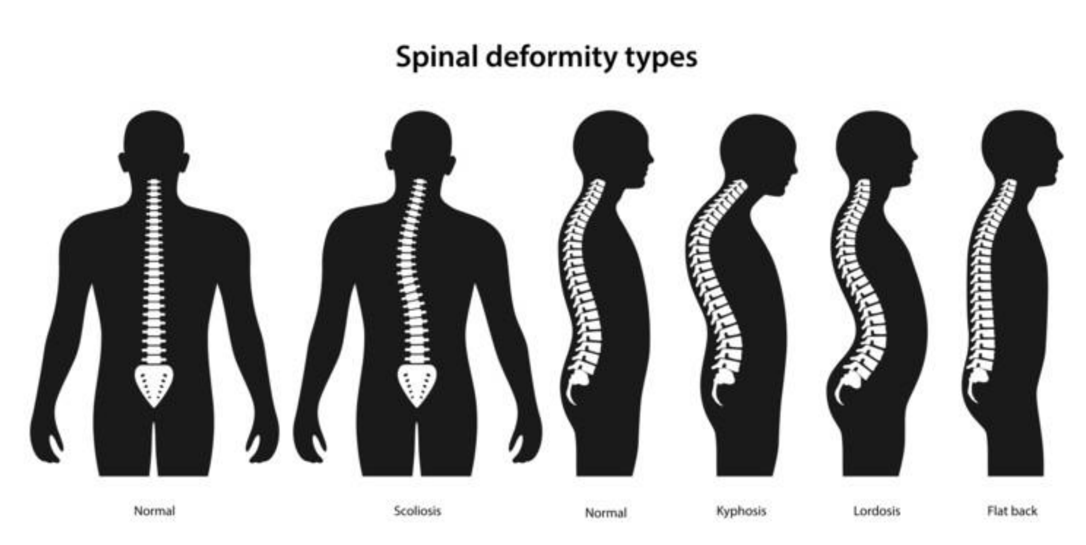
Exercises often focus on stretching tight muscles, strengthening the back and abdominal muscles to support the spine, and improving overall body alignment. Postural training and specific exercises tailored to the individual's needs can help manage symptoms and prevent further progression of the curvature. Physiotherapy for kyphosis aims to enhance spinal mobility, alleviate pain, and improve functional ability.

Lordosis:

Lordosis is an inward curvature of the spine, typically found in the lower back (lumbar) or the neck (cervical). This natural curve is essential for spinal flexibility and shock absorption. However, an exaggerated inward curvature can result in excessive arching, leading to what's commonly called "swayback" or "hollow back." It can be caused by various factors, including poor posture, obesity, muscle imbalances, certain conditions like spondylolisthesis, or developmental issues. Treatment often involves exercises to strengthen core muscles, improve posture, and address underlying causes to alleviate discomfort or pain associated with exaggerated lordosis.

Physiotherapy:

Physiotherapy for lordosis typically involves exercises aimed at strengthening and stretching specific muscle groups to address imbalances and improve posture. These exercises focus on core muscles, including the abdominal and back muscles, to help support the spine and promote better alignment. Stretching exercises for tight muscles and strengthening exercises for weaker muscles are tailored to the individual's needs. Physiotherapy also includes postural training and ergonomic advice to help individuals maintain proper alignment in daily activities, reducing strain on the spine and alleviating discomfort associated with exaggerated lordosis.



Role of physiotherapist assistant in fracture and deformities

- Assistants in physiotherapy play a crucial role in the rehabilitation of fractures and deformities.

- They assist licensed physiotherapists by helping patients perform exercises, providing guidance on mobility aids, and ensuring proper techniques during rehabilitation sessions.

- In the case of fractures, they may assist in exercises that aid in regaining strength, flexibility, and mobility in the affected area after the initial healing phase.

- They help patients with proper techniques to prevent muscle atrophy and stiffness while ensuring exercises are within safe limits to avoid re-injury.

- For deformities like scoliosis, kyphosis, or post-fracture deformities, they assist in implementing specific exercise programs designed by the physiotherapist.

- These exercises aim to improve posture, strengthen supportive muscles, and enhance mobility while monitoring progress and adapting the program as needed.

- Assistant physiotherapists also provide support in educating patients about self-care techniques, assistive devices, and lifestyle adjustments to manage pain, improve functionality, and prevent further complications.

3.17 GENERAL PRE OPERATIVE AND POST OPERATIVE CARE OF PATIENTS IN PHYSIOTHERAPY.

3.10 Lobotomy

3.11 Premumonectomy.

3.12 DVT (Deep Vein Therapy)

Deep Vein Thrombosis (DVT) is a condition characterized by the formation of blood clots (thrombi) in the deep veins, usually in the legs. These clots can impede blood flow and pose serious health risks if they break loose and travel to the lungs, causing a potentially life-threatening condition known as pulmonary embolism**.**

8.6.1 : Causes of DVT:

1. Immobility

2. Surgery or Trauma

3. Conditions like cancer, obesity, and certain blood disorders can predispose individuals to DVT.

4. Smoking and Age:

8.6.3 : Symptoms:

- Swelling, pain or tenderness, warmth, and red or discolored skin in the affected leg.
- However, some individuals with DVT may not exhibit any noticeable symptoms.

8.6.4 : Complications:

- Pulmonary embolism

- Chronic complications may include post-thrombotic syndrome, characterized by pain, swelling, and skin changes in the affected limb.

8.6.5 : Treatment:

- anticoagulant medications (blood thinners) to prevent further clot

- thrombectomy or the insertion of a vena cava filter may be necessary.

8.6.5 : Prevention:

- maintaining an active lifestyle, especially during long periods of immobility
- using compression stockings
- addressing risk factors such as obesity and smoking.

8.6.8 : How a Physical Therapy technician can help:

1. **Mobility and Exercise:**
    - Early Mobilization.
    - Exercise Programs
2. Compression Therapy:
    - Compression Stockings: PTAs may assist in the application of compression stockings.
3. Education:
    - PTAs play a crucial role in educating patients about DVT risk factors and the importance of mobility, hydration, and adherence to prescribed medications.
4. Monitoring and Assessment:
    - PTAs are trained to monitor patients for signs and symptoms of DVT, such as swelling, pain, or discoloration in the affected limb. Early detection is vital for timely intervention.

5. Positioning Techniques:

- PTAs can teach patients proper positioning techniques, especially after surgery or during periods of prolonged immobility, to optimize blood flow and reduce the risk of clot formation.

6. Referral and Communication:

- **Other healthcare providers.** Communication with Healthcare Team: PTAs collaborate with other healthcare professionals, including physical therapists and physicians, to ensure proper care for patients at risk of DVT. If they observe concerning signs, they can communicate effectively for immediate treatment.

8.4 : Total Hip replacement

Total Hip Replacement (THR), also known as hip arthroplasty, is a surgical procedurein which a damaged or diseased hip joint is replaced with an artificial joint or prosthesis.

8.7.1 : Indications:

- Osteoarthritis:
- Rheumatoid Arthritis:
- Avascular Necrosis:
- Hip Fractures:
- Hip Dysplasia:
- Tumor:
- Traumatic Arthritis:

8.7.2 : Exercise Precautions for THR:

- Avoid High-Impact Activities:
- Be Cautious with Hip Flexion:

- Limit Rotational Movements:
- Gradual Progression:
- Balance and Stability Training:
- Appropriate Warm-Up:

8.7.4 : Role of a Physical Therapy technician in Total Hip Replacement Rehabilitation:

1. Implementation of Rehabilitation Plans:

2. Early Mobilization and Exercise Programs:

3. Gait Training and Assistive Device Education

4. Teach Pain Management Strategies

5. Monitoring Progress and Adapting Plans

6. Joint Protection Education

7. Teach Home Exercise Programs:

8. Assistance with Activities of Daily Living (ADLs)

9. Communication with Healthcare Team

8.5 : Total Knee replacement:

Total Knee Replacement (TKR), also known as total knee arthroplasty, is a surgical procedure in which a damaged or diseased knee joint is replaced with an artificial joint or prosthesis. This procedure is performed to relieve pain, restore function, and improve the quality of life for individuals with severe knee joint arthritis or other conditions.

8.8.1 : Indications:

- Osteoarthritis:

- Rheumatoid Arthritis:

- Post-Traumatic Arthritis:
- Meniscus Tears:
- Deformities:
- Failed Previous Surgeries:
- Tumor:

- Inflammatory Arthritis**:**

8.8.2 : Exercise Precautions for TKR:

- Avoid excessive bending or hyperextension
- Limit Impact Activities:
- Caution with Stairs:
- Avoid Deep Squats:
- Gradual Strength Training:
- Controlled Movements:

8.8.3 : Role of a PT technician in Total Knee Replacement Rehabilitation:

1. Implementation of Rehabilitation Plans:
2. Early Mobilization and Exercise Programs:
3. Gait Training and Assistive Device Education
4. Teach Pain Management Strategies
5. Monitoring Progress and Adapting Plans
6. Joint Protection Education

7. Teach Home Exercise Programs:

8. Assistance with Activities of Daily Living (ADLs)

3.13 Implanted Patients (Total Hip Joint Replacement)

3.18 PHYSIOTHERAPY IN CHEST SURGERY

- **Lobectomy** - **Premumonectomy**

Lobotomy, also known as leucotomy, is a surgical procedure that involves the severing or disconnecting of connections between the prefrontal cortex and the rest of the brain. The procedure was historically performed as a treatment for various psychiatric disorders, especially in the mid-20th century. Portuguese neurologist António Egas Moniz and his colleague Walter Freeman developed and popularized the procedure.

Key Points about Lobotomy:

1. **Purpose:**

- Lobotomy was initially intended as a treatment for severe mental illnesses, including schizophrenia, depression, and bipolar disorder.

2. **Procedure:**

- The procedure involved cutting or disrupting the connections (nerve fibers) between the prefrontal cortex and the rest of the brain.
- Two main types of lobotomy were performed: prefrontal lobotomy and transorbital lobotomy.

3. **Prefrontal Lobotomy:**

- Involved drilling holes into the skull and severing connections in the frontal lobes of the brain.
- The surgical instrument was inserted through the holes to cut or scrape the connections.

4. **Transorbital Lobotomy:**

- A less invasive technique where an instrument was inserted through the eye sockets (above the eyeball) to reach the frontal lobes.

- The instrument was then used to sever the connections.

5. **Historical Context:**

- Lobotomy gained popularity in the 1940s and 1950s as a supposed treatment for mental illnesses when other therapies were limited.
- The procedure was performed widely, sometimes without thorough evaluation or consent.

6. **Controversy and Ethical Concerns:**

- Lobotomy became highly controversial due to its irreversible and often unpredictable effects on patients.
- Critics raised concerns about ethical issues, lack of informed consent, and the significant risks associated with the procedure.

7. **Side Effects:**

- Lobotomy often led to personality changes, cognitive deficits, and a blunting of emotional responses.
- Some patients experienced severe and permanent impairment in cognitive and social functioning.

8. **Decline:**

- As the negative outcomes and ethical concerns associated with lobotomy became more apparent, the procedure fell out of favor in the 1950s and 1960s.

9. **Legacy:**

- Lobotomy is now viewed as an outdated and controversial approach to psychiatric treatment.
- Advances in psychopharmacology and other therapeutic modalities have replaced lobotomy in the treatment of mental disorders.

PNEUMONECTOMY:

Pneumonectomy:

A pneumonectomy is a surgical procedure in which one entire lung is removed. This operation is usually performed to treat certain lung diseases or conditions, such as lung cancer, extensive infections, or severe lung damage. Removing a lung is a major surgery and is typically considered when other treatments have not been successful.

There are two main types of pneumonectomy:

1. **Standard Pneumonectomy:**

- In a standard pneumonectomy, the entire lung on one side is removed. This involves making an incision between the ribs and accessing the chest cavity to remove the lung.

2. **Extrapleural Pneumonectomy:**

- This procedure is more extensive and involves removing not only the lung but also portions of the diaphragm, pericardium (the sac around the heart), and pleura (the membrane lining the chest cavity).

Indications for Pneumonectomy:

- Lung cancer, especially when it's localized to one lung.
- Extensive infections that cannot be controlled with antibiotics.
- Severe lung damage from conditions such as chronic obstructive pulmonary disease (COPD) or fibrosis.

Complications and Considerations:

- **Breathing Function:** After a pneumonectomy, the remaining lung has to compensate for the loss of the other. Breathing function may be affected, and pulmonary rehabilitation is often recommended.
- **Cardiovascular Changes:** The heart may shift slightly due to the vacant space in the chest, and this can impact blood circulation.

- **Postoperative Care:** Recovery involves managing pain, preventing infection, and gradually returning to normal activities. Close follow-up with healthcare providers is essential.

3.19 PHYSIOTHERAPY IN TRAUMATIC CONDITIONS

Joint sprain:

Joint sprains are typically caused by sudden or excessive force applied to a joint, leading to the stretching or tearing of ligaments. This can happen during physical activities, sports, falls, or accidents. Common sites for sprains include ankles, knees, wrists, and thumbs

Causes of joint sprain:

Joint sprains typically occur due to sudden or excessive force applied to a joint, leadingto the stretching or tearing of ligaments. Common causes include:

1. **Sports Injuries:** Twists, falls, or impacts during sports activities can cause joint sprains, especially in high-impact sports like basketball, soccer, or skiing.
2. **Accidents or Falls:** Trips, slips, or falls can result in sprained joints, particularly theankles and wrists.
3. **Lifting Heavy Objects:** Improper lifting techniques or carrying heavy loads can strain or sprain joints like the back or knees.
4. **Repetitive Movements:** Certain occupations or activities that involve repetitive motions can contribute to joint sprains over time.
5. **Weak Muscles or Ligaments:** Insufficient muscle strength or ligament flexibility maymake joints more susceptible to sprains.

Understanding the causes can help in taking preventive measures, such as proper warm-ups before physical activities, using protective gear, maintaining good posture, and avoiding overexertion, to reduce the risk of joint sprains.

Treatments

Treatment for joint sprains often involves the R.I.C.E. method:

Rest: Avoiding activities that aggravate the injury to allow the ligaments to heal.

Ice: Applying ice packs to the affected area for 15-20 minutes every few hours to reduce swelling and pain.

Compression: Wrapping the injured joint with an elastic bandage to reduce swelling and provide support.

Elevation: Keeping the injured joint elevated above heart level to minimize swelling.

For mild sprains, self-care with the R.I.C.E. method might be sufficient. However, moderate to severe sprains might require medical attention. This can involve using crutches, braces, or splints for support, medications for pain and swelling, and, in some cases, physical therapy to regain strength, flexibility.

Pain Management:

Over-the-counter pain relievers can help manage discomfort.

Rehabilitation:

Physiotherapy exercises to regain strength, flexibility, and stability in the joint. This might involve specific exercises, stretches, and gradually reintroducing activities to restore full functionality.

In more severe cases, like a complete ligament tear, surgery might be necessary to repair the damaged ligament. However, most sprains can be effectively treated with rest, self-care measures, and rehabilitation exercises under the guidance of a healthcare professional.

Joint strain;

Joint strain refers to an injury affecting muscles or tendons surrounding a joint. It occurs when these tissues are stretched or torn due to overuse, sudden movements, or excessive force applied to the joint.

Similar to a sprain, a strain can range from mild to severe, causing pain, swelling, limited mobility, and in more severe cases, muscle spasms or weakness. Commonly affected areas include the back, neck, shoulders, and hamstrings

Causes of joint strain:

. Joint strains can be caused by various factors, including:

1. **Overuse or Repetitive Movements:** Engaging in activities that involve repetitive motions or overuse of a joint, such as lifting heavy objects with poor technique or performing the same movement continuously, can strain the muscles and tendons around the joint.
2. **Sudden Movements or Forceful Impact:** Abrupt movements or forceful impacts, such as sudden twists or jerks, can strain the muscles and tendons supporting a joint.
3. **Poor Posture or Body Mechanics:** Incorrect posture or body mechanics during activities, like sitting for long periods with poor posture or lifting heavy objects improperly, can strain the muscles and tendons around the joints.
4. **Weak Muscles or Lack of Flexibility:** Weakness in the muscles supporting a joint or insufficient flexibility in the surrounding tissues can increase the risk of strain during physical activities.

Understanding the causes of joint strain can help in taking preventive measures, such as maintaining proper form during physical activities, incorporating regular stretching and strengthening exercises, and avoiding overexertion, to reduce the risk of muscle and tendon strains around the joints.

Treatment;

Treatment for joint strains often involves rest, ice, compression, elevation (similar to the

R.I.C.E. method used for sprains), pain management, and gentle exercises to gradually restore strength and flexibility in the affected muscles or tendons. In some cases, physical therapy may be recommended to aid in rehabilitation and prevent re-injury by improving muscle strength and joint stability.

Physiotherapy of joint strain:

Physiotherapy for joint strain focuses on reducing pain, promoting healing, and restoring function through targeted exercises and therapies.

Initially, the physiotherapist assesses the extent of the strain and designs a personalized treatment plan. This plan typically includes:

1. **Pain Management:** Techniques like ice or heat therapy, ultrasound, or electrical stimulation to alleviate pain and reduce inflammation.

2. **Restoration of Mobility:** Gentle movements and stretches aimed at gradually restoring range of motion without exacerbating the strain.

3. **Strength and Flexibility Exercises**: Specific exercises targeting the affected muscles and tendons to regain strength, flexibility, and stability around the joint. These exercises aim to improve muscle function and prevent future injuries.

4. **Manual Therapy:** Hands-on techniques such as massage, joint mobilization, or manipulation to reduce muscle tension, improve circulation, and enhance healing.

5. **Functional Training:** Activities and exercises tailored to simulate daily tasks or sports-specific movements to help regain functional abilities and prevent re-injury.

6. **Education and Prevention:** Guidance on proper body mechanics, posture, and techniques to prevent future strain. Patients are often advised on home exercises and self-care strategies to manage symptoms and maintain progress between physiotherapy sessions.

The goal of physiotherapy in joint strain cases is to optimize recovery, prevent complications, and restore full function and mobility to the affected joint and surrounding structures.

What is synovitis

Synovitis refers to the inflammation of the synovial membrane, which lines the joints. It's often caused by injury, overuse, infection, autoimmune disorders (such as rheumatoid arthritis), or underlying conditions affecting the joints

Causes:

1. **Injury or Trauma:** Joint injuries, such as sprains, fractures, or repetitive stress injuries, can lead to synovitis due to the body's inflammatory response to the trauma.
2. **Infection:** Bacterial, viral, or fungal infections within a joint can cause inflammation of the synovial membrane, resulting in synovitis.
3. **Autoimmune Disorders:** Conditions like rheumatoid arthritis, lupus, or psoriatic arthritis trigger the body's immune system to attack its tissues, including the synovial membrane, leading to chronic synovitis.
4. **Crystal Deposition Diseases:** Conditions like gout or pseudogout, characterized by the accumulation of crystals within the joint, can cause irritation and inflammationof the synovial lining.
5. **Degenerative Joint Diseases:** Conditions such as osteoarthritis can cause chronicirritation and inflammation of the synovial membrane due to joint wear and tear

Management:

Understanding the underlying cause of synovitis is crucial for determining the appropriate treatment approach, which may include medication, rest, physiotherapy, or other interventions aimed at reducing inflammation and managing the condition.

Physiotherapy for synovitis aims to reduce pain, inflammation, and restore joint function. The approach may include:

1. **Rest and Immobilization:** Initially, resting the affected joint and using

immobilizationtechniques (such as splints or braces) can help reduce stress on the inflamed tissues and promote healing.

2. **Ice and Heat Therapy:** Alternating between ice packs and heat application can help alleviate pain and reduce inflammation in the affected joint.
3. **Range of Motion and Strengthening Exercises:** Gradual and controlled exercises to improve joint mobility, strengthen surrounding muscles, and restore normal movement patterns. These exercises are tailored to the individual's needs and theseverity of synovitis.
4. **Manual Therapy:** Techniques like gentle joint mobilization or soft tissue manipulation by a physiotherapist to reduce pain, improve flexibility, and restore normal joint mechanics.
5. **Ultrasound or Electrical Stimulation:** These modalities might be used to promote healing and reduce inflammation in the affected joint.
6. **Education and Home Exercise Program:** Teaching proper techniques for exercisesand activities, along with providing guidance on managing symptoms and preventing future flare-ups.

The focus of physiotherapy in synovitis cases is to manage symptoms, restore joint function, and prevent further complications. The treatment plan is individualized based on the underlying cause and the patient's specific condition and needs.

What is bursitis and its physiotherapy plan?

Bursitis is the inflammation of the bursae, small fluid-filled sacs that cushion and reduce friction between bones, tendons, and muscles near joints. It commonly occurs in areas like the shoulders, elbows, hips, or knees. Bursitis can result from repetitive motion, injury, or underlying conditions such as arthritis

Causes:

1. **Repetitive Movements or Overuse Activities:** Activities involving repetitive motions or prolonged pressure on a joint, such as frequent kneeling (knee bursitis), throwing(shoulder bursitis), or leaning on elbows (elbow bursitis), can lead to irritation andinflammation of the bursa.

2. **Injury or Trauma:** Direct trauma to a joint, like a fall or blow, can cause bursitis. Additionally, sudden movements or impacts can irritate the bursa and trigger inflammation.

3. **Underlying Medical Conditions:** Conditions like rheumatoid arthritis, gout, osteoarthritis, or infection can lead to bursitis or increase the risk of developing it due to the body's inflammatory response.

4. **Poor Posture or Biomechanics:** Incorrect posture during activities or poor body mechanics can place undue stress on certain joints, leading to bursitis over time.

5. **Age and Overweight**: Aging can affect the bursae, making them more prone to inflammation. Excess body weight can also increase pressure on the bursae, leading to irritation and bursitis.

Understanding the potential causes of bursitis can help individuals take preventive measures, such as proper warm-ups, using protective gear, maintaining good posture, and avoiding overexertion, to reduce the risk of developing or exacerbating bursitis.

Physiotherapy:

Physiotherapy for bursitis typically involves:

1. **Pain and Inflammation Management:** Initially, the focus is on reducing pain and inflammation through techniques like ice or heat therapy, ultrasound, or electrical stimulation.

2. **Rest and Immobilization:** Resting the affected joint and avoiding activities that aggravate symptoms to allow the inflamed bursa to heal. Immobilization using splints or braces might also be recommended.

3. **Range of Motion Exercises:** Gradual and controlled exercises to maintain or restore joint mobility without exacerbating the inflammation.

4. **Strengthening Exercises:** Targeted exercises to strengthen the muscles around the affected joint, which helps provide better support and reduces stress on the bursa.

5. **Manual Therapy:** Techniques such as gentle joint mobilization, soft tissue massage, or stretching to improve joint mobility and reduce pain.
6. **Posture and Movement Education:** Teaching proper body mechanics and techniques to avoid further irritation of the bursa during daily activities.
7. **Gradual Return to Activities:** As symptoms improve, a gradual return to regular activities with modifications to prevent re-injury or exacerbation of bursitis.

The physiotherapy plan is tailored to the individual's specific condition, symptoms, and needs. It aims to alleviate pain, reduce inflammation, restore function, and prevent future flare-ups of bursitis. Regular follow-ups with a physiotherapist can ensure the effectiveness of the treatment plan and address any changes or progress in the healing process.

What is Tendonitis and its physiotherapy plan?

Tendonitis refers to the inflammation or irritation of a tendon, which is the tissue that connects muscles to bones. It often causes pain, swelling, and tenderness in the affected area. Overuse, injury, or repetitive movements can contribute to its development.

Causes

Tendonitis can be caused by several factors, including repetitive movements, overuse of a particular tendon during activities, sudden injury or trauma, improper technique during exercise or work, and age-related changes in tendons. Additionally, poor conditioning, inadequate rest between activities, and certain medical conditions can also contribute to its development.

Physiotherapy for Physiotherapy plan:

Tendonitis involves various techniques tailored to the specific tendon affected and the severity of the condition. It typically includes:

1. **Rest and Activity Modification:** Limiting activities that aggravate the tendon andmodifying movements to reduce strain.

2. **Exercise:** Specific exercises to strengthen muscles around the affected tendon, improving flexibility, and gradually reintroducing movement.
3. **Manual Therapy:** Hands-on techniques such as massage, stretching, or joint mobilization to reduce pain and improve flexibility.
4. **Modalities:** These include ice or heat application, ultrasound, or electrical stimulation to reduce inflammation and alleviate pain.
5. **Education and Lifestyle Modifications:** Learning proper techniques, ergonomicadjustments, and lifestyle changes to prevent re-injury.
6. **Gradual Return to Activity:** A structured plan to reintroduce activities gradually toavoid overloading the tendon during the healing process.

The treatment plan may vary based on the individual's condition and the specific tendon affected.

3.20 INTRODUCTION TO HYDROTHERAPY, OUTLINE OF METHODS. USED, TECHNIQUES, TYPES OF BATHS EFFECTS AND USES.

4 **Introduction to paraffin baths, its application, effects and uses.**

Hydrotherapy, also known as aquatic therapy or water therapy, is a form of physical therapy that involves the use of water for therapeutic purposes.

9.1.1 : WHIRLPOOL BATH

- Use of whirlpool bath has become an increasingly valuable means of physiotherapeutic treatment.

- The principle of whirlpool bath therapy is to combine the effects of temperature with the mechanical effects of the water.
- The warm whirlpool is an excellent post-surgical modality to increase systemic blood flow, removing waste products and thus reduces pain.
- It is effectively used in sports medicine for relaxation after practice or competition and for the treatment of various injuries.
- To maintain proper hygiene, whirlpool baths need to be cleaned frequently. Some disinfectant or

Figure 5: Whirlpool therapy unit

antimicrobial agent should be used for cleaning the tank, turbine and jet or nozzle. Contraindications are open wounds, recent hemorrhage, skin allergy, eczema or infection

9.1.2 : 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 hot and in cold water tanks

Effects:

- The alteration in warm and cold leads to vasodilatation and vasoconstriction at regular intervals. It leads to reduction in edema and is beneficial in various chronic peripheral circulatory disturbances.
- The regular change in temperature also leads to considerable change in the sensory stimulus.

Contraindications

Are open wounds, recent hemorrhage, skin allergy, eczema or infection.

Figure 6: Contrast bath

Paraffin wax bath therapy

- **Paraffin wax bath therapy** is an application of molten paraffin wax over the body parts. The temperature of the paraffin wax is maintained at 40–44ºC, whereas its melting point is 51–55ºC.
- The **composition of solid wax**: liquid paraffin: petroleum jelly is 7: 3: 1 or solid wax:liquid paraffin or mineral oil is 7: 1.
- The **mode of transmission of heat** from paraffin to the patient skin is by means of conduction

Figure 4: Paraffin Wax unit

9.1.3 : Paraffin Wax Bath Unit

Methods

- The part to be treated must be cleaned with soap and water.
- Moisture is to be soaked with towel.
- Position of the patient should be such that the part to be treated comes closer to the wax bath container.
- Before application one must ensure that there should be no moisture over the body tissues otherwise burn could occur.
- The warm wax is placed on body tissues by various techniques and the treatment is given for about 10–20 minutes.

Techniques of application

Various techniques used for the application of paraffin wax are as follows:

1. Direct pouring method

2. Brushing method

3. Direct immersion or dipping method

4. Toweling or bandaging method

Effects and Uses

Paraffin wax bath therapy provides superficial heating to the tissues. It increases the local circulation to the area, increases the pliability of the skin, and reduces stiffness and thus pain. Indications Paraffin wax therapy is used for the treatment of:

- Rheumatoid arthritis
- Osteoarthritis
- Joint stiffness, adhesions
- Post immobilization stiffness, scars on the skin, etc.

Contraindications:

Paraffin wax bath therapy should not be used in the cases of:

i. Open wounds

ii. Skin rashes

iii. Allergic conditions

iv. Impaired skin sensation

v. Defective arterial supply.

3.21 MANUALAL THERAPY:-

Post operative physiotherapy.

Chest physiotherapy in orthopedics.

Complications in manual therapy.

Physiotherapy in peripheral nerve therapy.

Physiotherapy for hemi-pelagic patient.

Mobilization and gait training .

Physiotherapy for paraplegic patients, exercises, bed positioning, complication ,loss of sensations and management.

3.22 Wax therapy

Uses of wax therapy

9.2 Paraffin wax bath therapy

- **Paraffin wax bath therapy** is an application of molten paraffin wax over the body parts. The temperature of the paraffin wax is maintained at 40–44ºC, whereas its melting point is 51–55ºC.
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Figure 4: Paraffin Wax unit

9.2.1 : Paraffin Wax Bath Unit

Methods

- The part to be treated must be cleaned with soap and water.
- Moisture is to be soaked with towel.
- Position of the patient should be such that the part to be treated comes closer to the wax bath container.
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Contraindications:

Paraffin wax bath therapy should not be used in the cases of:

vi. Open wounds

vii. Skin rashes

viii. Allergic conditions

ix. Impaired skin sensation

x. Defective arterial supply.

Combination, diagram of the tub, and contraindication.

Temperature setting and preparation of the patient.

Alternative of wax therapy.

3.23 MECHANICAL SYSTEMS IN PHYSIOTHERAPY:-

Study the diagram of pulley and rope system .

Study and uses of Captain wheel.

The human body utilizes pulley-like systems in various ways, such as the patellar (knee) and Achilles (ankle) tendons. These structures change the direction of the applied force, providing mechanical advantages in movements like walking and jumping.

2.1.18 Angle of Pull: The angle at which a force is applied to a lever or pulley system affects its effectiveness.

Angle of Pull in Exercise:

In weightlifting, the angle at which a muscle pulls on a bone affects the force applied. For instance, changing the grip or stance in a bicep curl can alter the angle of pull and target different parts of the muscle.

2.1.19 Suspension

"Suspension" in the context of the human body typically refers to the system of structures, such as ligaments and tendons that support and stabilize joints. It plays a crucial role in allowing movement while maintaining stability. Some key aspects and applications of suspension in the human body are:

2.1.19.1 Joint Stability:

Ligaments and tendons work together to provide stability to joints. They limit the range of motion and prevent joints from moving beyond their normal physiological limits. Example: The anterior cruciate ligament (ACL) in the knee prevents excessive forward movement of the tibia relative to the femur.

2.1.19.2 Shock Absorption:

Ligaments and tendons also act as shock absorbers, helping to dissipate forces and protect the joints from excessive impact during movement. Example: The Achilles tendon in the ankle absorbs and transmits forces during activities like running and jumping.

2.1.19.3 Muscular Suspension:

Muscles play a crucial role in suspension by providing dynamic support to joints. They contract to stabilize joints during movement and maintain posture. Example: The muscles of the core, such as the abdominal and back muscles, contribute to the suspension and stability of the spine.

2.1.19.4 Skeletal Alignment:

Ligaments and tendons contribute to maintaining proper skeletal alignment. They guide the direction of joint movement and prevent misalignment. Example: The ligaments of the hip joint help maintain the proper alignment of the femur in the acetabulum.

2.1.19.5 Injury Prevention:

A well-functioning suspension system is essential for injury prevention. Ligaments and tendons reduce the risk of joint dislocations, sprains, and strains. Example: Adequate muscle strength and flexibility, along with proper ligament and tendon function, contribute to preventing injuries during physical activities.

2.1.19.6 Joint Flexibility:

While ligaments provide stability, they also allow for controlled flexibility in joints. This flexibility is crucial for various movements.

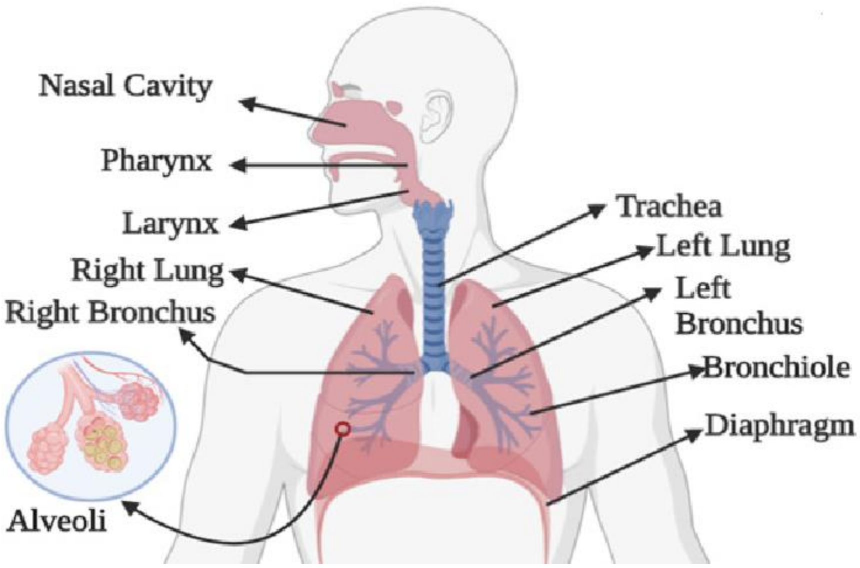
Example: The flexibility of ligaments in the spine allows for controlled movement and bending.

3.25 CHEST PHYSIOTHERAPY

1. **To study Conditions, effects and diagram showing trachea, bronchi and lungs.**

Chest physiotherapy, a specialized field in physiotherapy, focuses on assessing and managing respiratory conditions like COPD, asthma, and pneumonia.

8.2 Methods to increase lung volume



Increasing lung volume in chest physiotherapy reduces airway resistance and enhances the area available for gas exchange.

8.2.1 Controlled mobilization

The most effective way to boost lung volume is through exercise, especially for patients who can be mobile. Controlled activity, like walking or transferring from bed to chair, helps deepen breathing

8.2.2 Positioning

Lung volume is related to displacement of the diaphragm and abdominal contents, and most volumes are responsive to positioning.

The following principles apply:

1. Patients who are confined to bed should spend a proportion of their time on their side, lying well forwards so that their diaphragm is free from abdominal pressure.

2. As they slip down the bed, most patients quickly go from half-lying to a slumped posture. Unless absolutely required for a particular medical reason or to lessen pain, this should be avoided. Deep breathing and other volume-boosting techniques are useless when half-lying.

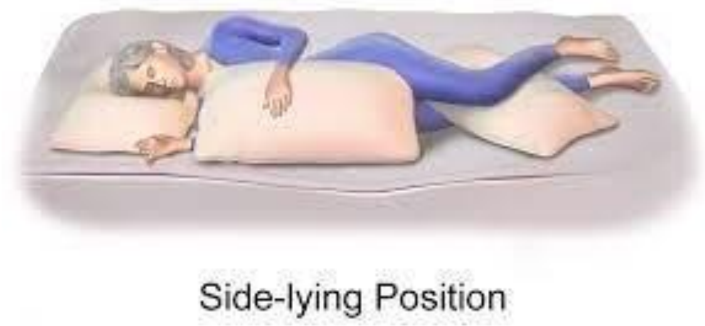


Figure 1

3. The supine position is least helpful for lung volume, especially in elderly people and those with respiratory disease.

4. When sitting a patient out after treatment, a foot stool is inadvisable unless the patienthas ankle oedema, a recent vein graft or requests it.

After treatment, the physiotherapist should inform the nursing staff about the patient's specific position, which should be maintained until the patient wants to move or it's time to turn. Proper positioning and regular changes should be part of the patient's 24-hour management plan.

3.26 TRACTION APPARATUS

Traction is a therapeutic technique used in physical therapy to treat various musculoskeletal conditions, especially those affecting the spine. It involves the application of a pulling force to specific parts of the spine, typically the cervical (neck) or lumbar (lower back) regions. The aim of traction is to create space between vertebrae, reduce pressure on spinal discs, and alleviate symptoms such as pain and nerve compression. Here's an overview of cervical and lumbar traction:

2.2.5.1 Cervical Traction:

Indications:

Cervical traction is commonly used for conditions such as cervical radiculopathy, herniated discs, degenerative disc disease, and neck pain.

Types of Cervical Traction:

Mechanical Traction: Involves the use of a mechanical device, often in the form of a traction table or a head halter attached to a pulley system.

Manual Traction: Applied by a physical therapist using their hands to gently stretch and decompress the cervical spine.

Mechanism of Action:

Traction creates a pulling force on the cervical spine, which may help to: Increase the intervertebral space. Reduce pressure on cervical discs and nerve roots. Improve blood flow to the affected area.

Relieve muscle spasms.

Application:

Patients may lie down on a traction table or sit with their head secured in a head halter connected to a traction device. Traction force is applied gradually, and the therapist monitors the patient's response to adjust the intensity.

Duration and Frequency:

The duration and frequency of cervical traction sessions depend on the specific condition and the individual's response to treatment. Sessions typically last for a specific duration, such as 15 to 20 minutes, and may be repeated several times a week.

2.2.5.2 Lumbar Traction

Indications:

Lumbar traction is commonly used for conditions such as lumbar disc herniation, sciatica, spinal stenosis, and lower back pain.

Types of Lumbar Traction:

Mechanical Traction: Involves the use of a traction table or a pelvic harness attached to a mechanical device.

Manual Traction: Applied by a physical therapist using their hands to provide controlled traction.

Mechanism of Action:

Lumbar traction aims to: Create space between lumbar vertebrae. Relieve pressure on the spinal discs and nerve roots. Stretch and relax the muscles surrounding the lumbar spine. Improve mobility and reduce pain.

Application:

Patients may be positioned on a traction table, and a harness is secured around the pelvis. Traction force is applied gradually, and the therapist monitors the patient's response.

Duration and Frequency:

Similar to cervical traction, the duration and frequency of lumbar traction sessions depend on the specific condition and individual response. Sessions may last for a set duration, such as 15 to 20 minutes, and may be repeated several times a week.

3.27 MYOLOGY

- **demonstration of muscles (different groups with their**

function)

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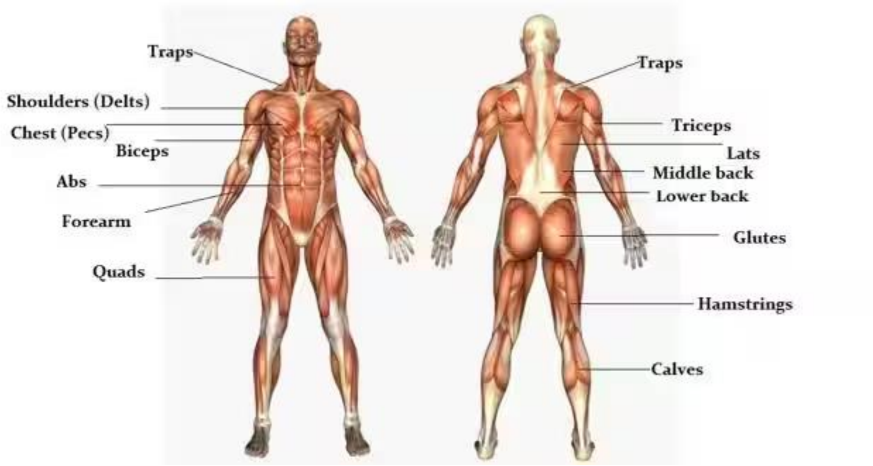
-
-



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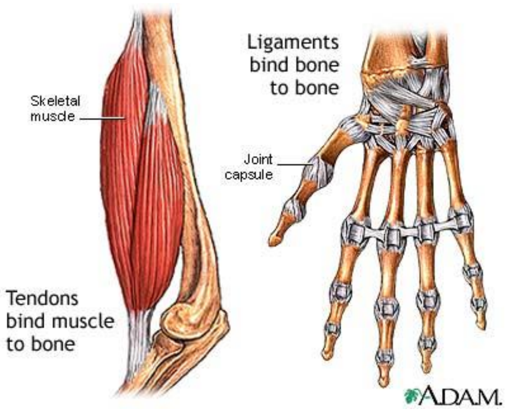
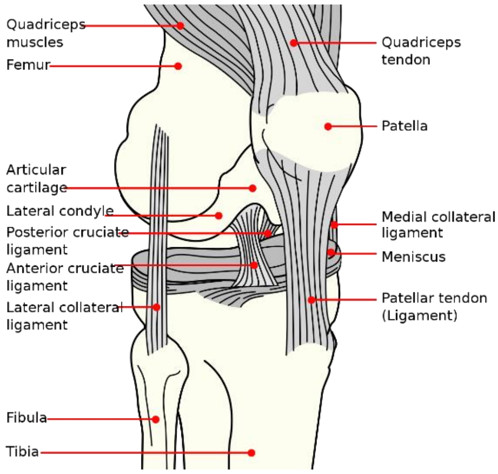
- **Demonstration of ligaments**





- **Exercises – Physiotherapy of Sensory organs especially skin, briefly other organs, to demonstrate on flip charts or projectors.**
- **Surface Marking (surface anatomy / General anatomy)**