JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

PHYSIOLOGY-II

BPT II

List of Practical

Physiology-II (23A202P)

PRACTICAL NO. 1

Aim: To learn practical approach of sensory examination.

Objective: To assess and evaluate the sensory functions (pain, temperature, touch, pressure, and proprioception) of the body using standardized tests and equipment, and to understand the underlying mechanisms of sensory processing and dermatome distribution.

Requirements:

Cotton

Pin

2 Test tubes with stopper

Reflex hammer

Tuning fork (128 Hz)

Different texture cloth piece (10*10 cm)

Daily use objects (Comb, Brush etc.)

Theory:

Description of Sensory System

- The sensory system receives and processes information that generates an individual's awareness of their environment. Various sensory perceptions then influence voluntary and involuntary motor activity to facilitate interaction with the environment.
- Sensation divide into two categories: General and special senses. General senses include touch, pain, temperature, proprioception, vibration and pressure. Special Senses include vision, hearing Special taste and smell. Senses are processed via cranial nerve and differ from the pathway utilized in processing general senses.

DERMATOMES

- The term dermatome (or skin segment) refers to the skin area supplied by one dorsal root.
- Peripheral nerve Injuries generally present sensory impairment that parallel the distribution of the involved nerve and correspond to its pattern of innervations.
- For example, if a patient presents with complaints of numbness on the ulnar half of the ring finger, the little finger, and the ulnar side of the hand, the therapist would be alerted to carefully address ulnar nerve (C8&T1) integrity during the sensory examination.

Figure 1 depicting the dermatomes on a) Anterior b) Posterior aspect

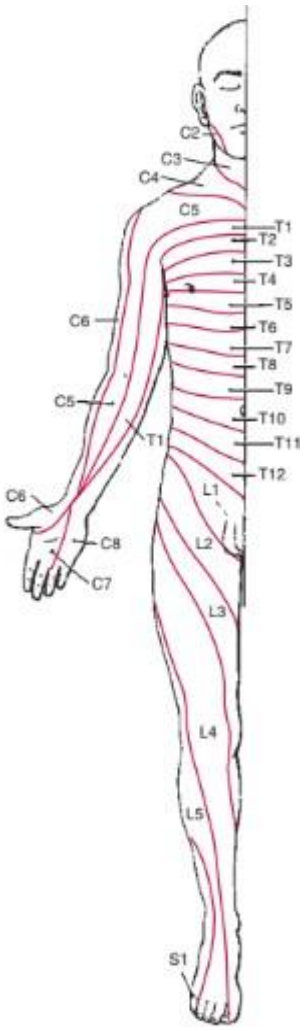


Fig. 1A

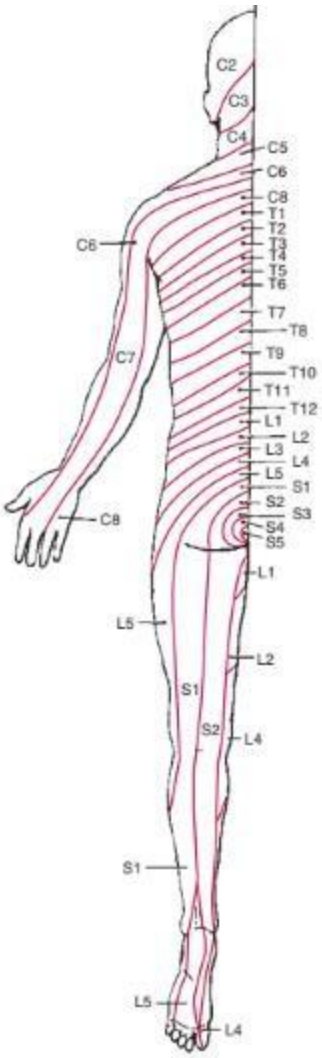


Fig. 1B

CLASSIFICATION OF SENSORY SYSTEM

Superficial Sensation

Exteroceptors are responsible for the superficial sensations. They receive stimuli from the external environment via the skin and subcutaneous tissue. They are responsible for the perception of pain, temperature, light touch, and pressure.

Deep Sensation

Proprioceptors are responsible for the deep sensations. Receptors receive stimuli from muscles, tendons, ligaments, joints, and fascia, and are responsible for position sense and awareness of joints at rest, movement awareness (kinaesthesia), and vibration.

Combined Cortical Sensations

The combination of both the superficial and deep sensory mechanisms makes up the third category of combined sensations. These sensations require information from exteroceptive and proprioceptive receptors as well as intact function of cortical sensory association areas.

The cortical combined sensations include stereognosis, two-point discrimination, barognosis, graphesthesia, tactile localization, recognition of texture and double simultaneous stimulation.

Testing Environment:

- The sensory examination should be administered in a quiet, well-lighted area.
- Depending on the number of body areas to be tested, either a sitting or recumbent position may be used.
- If full body testing is indicated, both prone and supine positions will be required and use of a treatment table is recommended to allow examination of each side of the body.

Patient Preparation:

- A full explanation of the purpose of the testing should be provided.
- The patient also should be informed that cooperation is necessary to obtain accurate test results.
- It is of considerable importance that the patient be requested not to guess if uncertain of the correct response
- During the examination, the patient should be in a comfortable relaxed position. Preferably, the tests should be performed when the patient is well tested.
- Considering the high level of concentration required, it is not surprising that fatigue has been noted to affect the sensory tests adversely.

Superficial Sensations:

PAIN PERCEPTION

- Indicates function of protective sensation.
- To test pain awareness, the sharp and dull ends of a large headed safety pin, a reshaped paper clip can be used.
- The Instrument should be carefully cleaned before administering the test and disposed of immediately afterward.
- The sharp and dull ends of the instrument are randomly applied perpendicularly to the skin.
- To maintain a uniform pressure with each successive application of stimuli, the pin should be held firmly and the fingers allowed to "slide" down the pin once in contact with the skin.

Response:

The patient is asked to verbally indicate sharp or dull when a stimulus is felt. All areas of the body may be tested.

TEMPERATURE AWARENESS

- This test determines the ability to distinguish between warm and cool stimuli.
- Test tubes with stoppers are required for this examination.
  1- Warm water and
  2- Cold water
- Ideal temperatures:
  Cold-between 41°F (5°C) and 50°F (18°c) and
  Warm between 104°F (40°c) and 113°F (45°c)
- The side of the test tubes should be placed in contact with the skin (as opposed to only the distal end).
- All skin surfaces should be tested.

Response: The patient is asked to reply hot and cold after each stimulus application.

TOUCH AWARENESS

- This test determines perception of tactile touch input.
- A camel-hair brush, piece of cotton (ball or swab), or tissue is used.
- The area to be tested is lightly touched or stroked.

Response: The patient is asked to indicate when he or she recognizes that a stimulus has been applied by responding “yes” or “no.

PRESSURE PERCEPTION

- The therapist’s or a double-tipped cotton swab is used to apply a firm pressure on the skin surface.
- This pressure should be firm enough to indent the skin to stimulate the deep receptors.

Response: The patient is asked to indicate when an applied stimulus is recognized by responding "yes" or "no".

Deep Sensations:

KINESTHESIA AWARENESS

- Awareness of movement
- The extremity or joint(s) is moved passively through a relatively small range of motion (ROM).
- The therapist should identify the range of movement being examined (e.g., initial, mid- or terminal range).
- A trial run or demonstration of the procedure should be performed prior to actual testing.
- The therapist's grip should remain constant and minimal (fingertip grip over bony prominences), to reduce tactile stimulation.

Response:

- The patient is asked to describe verbally the direction (up, down, in, out and so forth) and range of movement while extremity is in motion.
- The patient may also respond by simultaneously duplicating the movement with the contralateral extremity.

PROPRIOCEPTIVE AWARENESS (JOINT POSITION SENSE AND THE AWARENESS OF JOINTS AT REST)

- The extremity or joint(s) is moved through a ROM and held in a Static position.
- As with kinaesthesia, caution should be used with hand placements to avoid excessive tactile stimulation.

Response: While the extremity or joint(s) is held in a static position by the therapist, the patient is asked to describe the position verbally or to duplicate the position of the extremity or joint(s) with the contralateral extremity.

VIBRATION PERCEPTION

- This test requires a tuning fork that vibrates at 128 Hz.
- Test-place the base of a vibrating tuning fork on a bony prominence (such as sternum, elbow or ankle).
- The tuning fork base (the "handle" of the fork) is held between the examiner's thumb and index finger without making contact with the tines.
- The tines are then briskly hit against the open palm of the examiner's opposite hand to initiate the vibration.
- The base of the fork in then placed over a bony prominence.
    - If vibration sensation is intact, the patient will perceive the vibration.
    - If there is impairment, the patient will be unable to distinguish between a vibrating and non-vibrating tuning fork.
- Therefore, there should be a random application of vibrating and non- vibrating stimuli.

Response: The patient is asked to respond by verbally identifying or otherwise indicating it the stimulus is vibrating or non-vibrating each time the fork makes contact.

Combined Cortical Sensations:

STEREOGNOSIS PERCEPTION (ABILITY TO RECOGNIZE THE FORM OF OBJECTS BY TOUCH)

- A variety of small, easily obtainable, and culturally familiar objects of differing size and shape are required. E.g.-keys, coins, combs, safety pins, pencils, and so forth.
- A single object is placed in the hand, the patient manipulates the object; and then identifies the item verbally.

Response: The patient is asked to name the object verbally. (For patients with speech impairment, the item manipulated can be identified from a group of Images presented after each test).

BAROGINOSIS (RECOGNITION OF WEIGHT)

- The ability to recognize different weights.
- A set of discrimination weights consisting of small objects of the same size and shape but of gradual weight is used.

Response: When the objects are placed (or picked up) in both hands simultaneously the patient is asked to compare the weight two objects. The patient responds by indicating that the object is "heavier" or "lighter".

TACTILE LOCALIZATION

- This test determines the ability to localize touch sensation on the skin (topognosis).
- The patient is asked to identify the specific point of the application of a touch stimulus using a cotton swab or fingertip.
- After each application of a stimulus the patient is given time to respond.

Response:

The patient is asked to identify the location of the Stimuli by pointing to the area or by verbal description.

The distance between the application of the stimulus and the site indicated by the patient can be measured and recorded.

TWO-POINT DISCRIMINATION

- The ability to perceive two points applied to the skin simultaneously.

- It is a measure of the smallest distance between two stimuli (applied simultaneously and with equal pressure) that can still be perceived as two distinct stimuli.
- As this sensory function is most refined in the distal upper extremities, this is the typical site for testing.
- The aesthesiometer and the circular two-point discriminator are the most common devices used for measurement.
- The two tips of the instrument are applied to the skin simultaneously with tips spread apart.
- To increase the validity of the test, alternate the application of two stimuli with the random application of only a single stimulus.
- With each successive application, the two tips are gradually brought closer together until the stimuli are perceived as one.
- The smallest distance between the stimuli that is still perceived as two distinct points is measured.

Response: The patient is asked to identify the perception of “one” or “two” stimuli.

DOUBLE SIMULTANEOUS STIMULATION

The ability to perceive simultaneous touch stimuli (double simultaneous stimulation (DSS)).

- The therapist simultaneously (and with equal pressure) touches:-
- Identical locations on opposite sides of the body.
- Proximally and distally on opposite sides of the body, and/or
- Proximal and distal locations on the same side of body.

Response: The patient verbally states when he or she perceives a touch stimulus and the number of stimuli felt.

GRAPHESTHESIA (TRACED FIGURE IDENTIFICATION)

- This test determines the ability to recognize letters, number, or designs “written” on the skin.
- Using a fingertip on a pencil, a series of letters, numbers or shapes is traded on the palm of the patient’s hand.

Response:

- The patient is asked to identity verbally the figures drawn on the skin.
- For patients with speech or language impairments, the figures can be selected (pointed to) from a series of line drawings.

RECOGNITION OF TEXTURE

- This test determines the ability to differentiate amongst various textures.
- Textures like silk, cotton, wool or burlap are placed individually in the patient’s hand.
- The patient is allowed to manipulate the sample texture.

Response:

- The patient is asked to identify the individual textures as they are placed in the hand
- They may be identified by name (e.g., silk, cotton) or by texture (e.g., rough, smooth).

Conclusion: The sensory examination effectively evaluates the integrity of sensory modalities, including pain, temperature, touch, pressure, and proprioception. It aids in identifying sensory deficits and understanding dermatome distribution, supporting the diagnosis and management of neurological conditions.

PRACTICAL NO. 2

Aim: To learn the process of cranial nerve examination for assessing sensory, motor, and reflex functions.

Objective: To perform a thorough cranial nerve examination to assess sensory, motor, and reflex functions for identifying neurological abnormalities.

Requirements:

- Non-noxious essence (Vanilla, rose etc.)
- 2 standard test tube with stopper
- Torch
- Ishihara Chart
- Snellen chart
- Reflex hammer
- Pin
- Cotton
- Different flavor solution (Sweet, salty, sour etc.)
- Cotton bud
- Tuning fork (256 Hz, 512 Hz)
- Ice cream Stick

Theory:

Description of cranial nerves

Cranial nerves are the nerves that emerge directly from the brain (including the brainstem), of which there are conventionally considered twelve pairs.

The 12 pairs of cranial nerves supply muscles of eyeball, face, palate, pharynx, larynx, tongue and two large muscles of neck, lungs, heart and most of the parts of gastrointestinal tract including special senses of vision, taste, smell, etc. The cranial nerves emerge from the central nervous system above the level of first vertebra of the vertebral column.

Some nerves form the afferent loop and others form the efferent loop of the reflex arc.

The 12 pairs of cranial nerves are described with Roman numerals I-XII.

These are numbered based on their position from front to back of their position on the brain.

Cranial nerves are considered components of the peripheral nervous system (PNS, although on a structural level of the olfactory (1), optic (II) and trigeminal (1) nerves are more accurately considered part of central nervous system (CNS).

CRANIAL NERVES

i. Olfactory Nerve: Sensory
ii. Optic Nerve: Sensory
iii. Occulomotor Nerve: Motor
iv. Trochlear Nerve: Motor
v. Trigeminal Nerve: Sensory & Motor
vi. Abducens Nerve: Motor
vii. Facial Nerve: Sensory & Motor
viii. Vestibulocochlear Nerve: Sensory
ix. Glossopharyngeal nerve: Sensory & Motor
x. Vagus Nerve: Motor
xi. Spinal accessory verve: Motor
xii. Hypoglossal Nerve: Motor

OLFACTORY NERVE (Cranial No. I)

Function- Smell

Test sense of smell on each side (close off other nostril) with the help of odor of common items such as coffee, vanilla etc.

Abnormal findings: Anosmia (inability to detect smells), seen with frontal lobe lesion.

OPTIC NERVE (Cranial No. II)

Function-Vision

Test visual acuity

Central: Snellen eye chart; test each eye separately, test at distance of 20ft. Note the number of line which patient can clearly see.

Test peripheral vision by confrontation method. Each quadrant is checked by asking the patient to fix his gaze straight forward therapist showing different numbers with fingers in each quadrant which patient has to identify.

Abnormal findings: blindness, myopia, presbyopia.

OCCULOMOTOR NERVE (Cranial No. III)

Function-Pupillary reflex

Pupillary reaction is tested by having the patient stare into the distance as the examiner shines penlight oblique into each pupil.

Abnormal findings-absence of pupillary constriction.

Examine pupillary size / shape Anisocoria (Unequal pupils)

TROCHLEAR (Cranial No. IV)

Function- Extra-ocular Movements

Patient is asked to look in each direction and follows moving finger in the figure of H without moving the head.

Abnormal findings Strabismus, double vision, impaired eye movements.

TRIGEMINAL NERVE (Cranial No. V)

Function – Sensory (Face)

Test pain, light touch sensations – forehead, cheek, Jaw simultaneously on both sides.

Test corneal reflex-touch lightly with wisp of cotton in the outer corner and blinking occurs

Abnormal findings – loss of facial sensation, Trigeminal neuralgia.

Function-Motor Muscles of mastication

Palpate temporal and masseter muscles.

Have patient clench teeth, or hold jaw against resistance

Abnormal: Weakness, wasting of muscles when opened, deviation of jaw to ipsilateral side.

ABDUCENS NERVE (Cranial No. VI)

Function- Extra-ocular Movements

Patient is asked to look in each direction and follows moving finger in the figure of H without moving the head.

Abnormal findings Strabismus, double vision, impaired eye movements.

FACIAL NERVE (Cranial No. VII)

Function- Motor – Facial Expression

Test- motor function of facial muscles. Raise eyebrows, frown, show teeth, smile, close eyes tightly, puff out both cheeks.

Abnormal findings: paralysis – inability to close eye, drooping of corner of mouth difficulty with Speech articulation.

Function-Sensory – Taste to anterior two-thirds of tongue.

Test- Apply saline solution and sugar solution using a cotton swab.

Abnormal findings – incorrectly identifies solution.

VESTIBULOCOCHLEAR NERVE (Cranial No. VIII)

Function- Vestibular functions

Test eye-head coordination: vestibular ocular reflex (VOR)

With patient's eyes fixed, rotate head by 20 degree and take back to midline rapidly. Look for the movement of eyes.

Abnormal findings – vertigo, disequilibrium, gaze instability with head rotation, nystagmus.

Function- Cochlear functions

Weber Test

Rinne Test

Abnormal findings – Unilateral or bilateral conductive loss.

GLOSSOPHARYNGEAL (Cranial No. IX) & VAGUS NERVE (Cranial No. X)

Function-Phonation and Swallowing

Test- Listen to voice quality

Abnormal Findings – Dysphonia: hoarseness denotes vocal cord weakness.

Examine Swallowing function

Abnormal findings – Dysphagia

Function – Palatal, Pharyngeal control

Test- Have patients say 'ah' observe motion of soft palate and position of uvula.

Abnormal findings – Palate fails to elevate – Lesion of cranial nerve X; Asymmetrical elevation with unilateral paralysis.

Gag reflex-

Test- Stimulate back of the throat lightly on each side- reflex contraction of back and throat to remove the stimulus out.

Abnormal findings- absent reflex (Lesion of cranial nerve IX and X)

SPINAL ACCESSORY INERVE (Cranial No. XI)

Function: motor supply to trapezius and sternocleidomastoid muscle

Trapezius muscle

Test- Shrug both the shoulder against resistance.

Abnormal findings: inability to shrug ipsilateral shoulder, Shoulder droop.

Sternocleidomastoid muscle

Test- Turn head each side against resistance for checking strength of muscle on opposite side.

Abnormal findings – inability to turn the head to opposite side, Weakness of ipsilateral sternocleidomastoid and contralateral trapezius

HYPOGLOSSAL NERVE (Cranial No. XII)

Function: Tongue movement

Test- Listen to patient's articulation

Abnormal findings – dysarthria

Test- Ask the patient to protrude tongue, move side to side.

Abnormal findings – Impaired movements, deviation to weak side.

Conclusion: Cranial nerve examination is essential for assessing the integrity of the nervous system, evaluating sensory and motor functions, and detecting abnormalities related to brainstem activity. It plays a key role in diagnosing neurological disorders.

PRACTICAL NO. 3

Aim: To learn practical approach of pulse rate, respiratory rate and measurement of blood pressure.

Objective: To develop practical skills in assessing vital signs, specifically pulse rate, respiratory rate, and blood pressure, using standard clinical methods and equipment for accurate evaluation of cardiovascular and respiratory function.

Requirements:

- Sphygmomanometer
- Stethoscope
- Blood pressure cuff of appropriate size

Theory:

PULSE

- Pulse is a wave of blood created by the contraction of left ventricle.
- Pulse reflects the heart beat
- Stroke volume and the compliance of arterial wall are the two important factors influencing pulse rate.
- Pulse rate is regulated by autonomic nervous system.
- Peripheral Pulse is a pulse located in of the body, e.g., in the foot and or neck.
- Apical Pulse (central pulse) = It is located at the apex of the heart.
- The pulse rate is expressed in beats/minute (bpm).
- The difference between peripheral and apical pulse is called pulse deficit, and it is usually zero.
- Pulse is assessed for

➢ Rate (60-100 bpm),
➢ Rhythm (regularity or irregularity),
➢ Volume
➢ Elasticity of arterial wall.

- Pulse is commonly assessed by palpation (feeling) and auscultation (hearing using a stethoscope).

PULSE SITES

Carotid: The pulse is taken at the side of the neck below tube of the ear (where the carotid artery runs between the trachea and the sternocleidomastoid muscle).

Temporal: The pulse is taken at temporal bone area.

Apical: at the apex of the heart. Routinely used for Infant and children <3 years

In adults – Left mid-clavicular line under the 4^{th}, $5^{th,}$ 6^{th} Intercostal space

Brachial: at the inner aspect of the biceps muscle of the arm or medially in the antecubital space (elbow crease)

Radial: on the thumb side of the inner aspect of the wrist readily available and routinely used.

Femoral: along the inguinal ligament. Used for infants or children.

Popliteal: behind the knee by flexing the knee slightly.

Posterior tibial: on the medial surface of the ankle.

Pedal (Dorsal Pedis): palpated by feeling the dorsum (upper surface) of foot.

[Figure 3.1 – Location of peripheral pulse]

[Figure 3.2 – Location of Apical pulse]

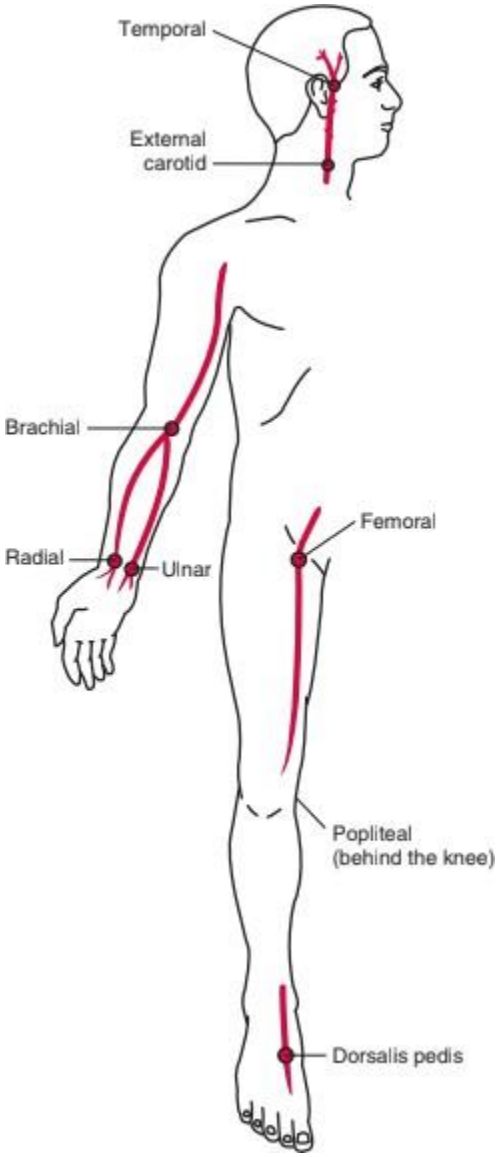

Temporal
External carotid
Brachial
Radial
Ulnar
Femoral
Popliteal (behind the knee)
Dorsalis pedis

Fig. 3.1

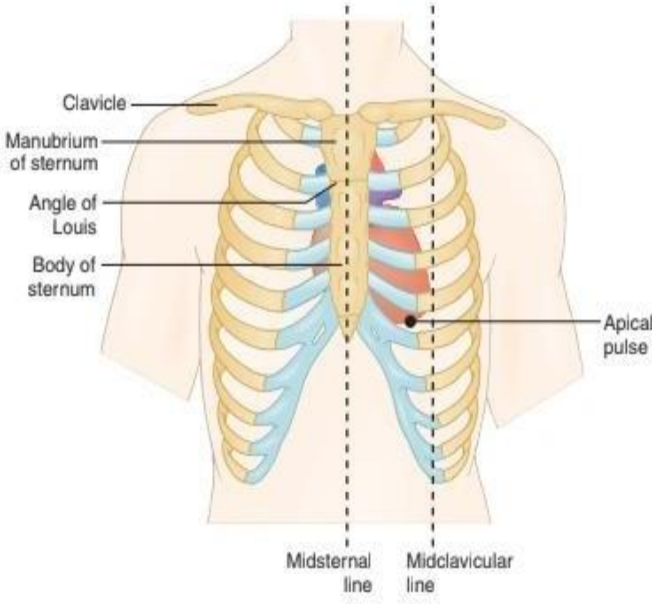

Clavicle
Manubrium of sternum
Angle of Louis
Body of sternum
Apical pulse
Midsternal line
Midclavicular line

Fig 3.2

Method of Assessment:

Pulse is commonly assessed by palpation (feeling) or auscultation (hearing).

The middle 3 fingertips are used with moderate pressure for palpation of all pulses except apical;

Assess the pulse palpation for:

Rate

Rhythm

Volume

Elasticity of arterial well.

PULSE RATE

Normal 60-100 b/min (80/min)

Adult PR> 100 BPM is called tachycardia

Adult PR < 60 BPM is called bradycardia

PULSE RHYTHM

The pattern and interval between the beats, random, irregular beats- dysrhythmia

PULSE VOLUME

The force of blood with each beat.

A normal pulse can be felt with moderate pressure of fingers.

Full or bounding pulse destroys with difficulty.

Weak, feeble readily destroy with pressure from fingertips.

RESPIRATION

- Respiration Rate (RR) – Respiration is the act of breathing and includes the intake of oxygen and removal of carbon dioxide.
- Ventilation is also another word which refers to movement of air in and out of the lung.
- Hyperventilation is a very deep, rapid respiration.
- Hypoventilation is very shallow respiration.

TYPES OF BREATHING

a. Costal (thoracic) – Observed by the movement of the chest upward and downward. Commonly used for adults.
b. Diaphragmatic (abdominal) – Involves the contraction and relaxation of the diaphragm, observed by the movement of abdomen. Commonly used for children.

Procedure:

- Position the Client: Ensure the client is at rest, seated comfortably or lying down, in a relaxed state.
- Observe Respiratory Movements: Watch the chest or abdomen for visible movements that indicate the type of breathing (costal or diaphragmatic). (Ensure the client is unaware of the assessment to prevent altered breathing patterns).
- Assess Respiratory Rate (RR):
    - Count the number of breaths (inhalation and exhalation) per minute.
    - For a regular rate, count for 30 seconds and multiply by 2. For irregular or abnormal rhythms, count for a full minute.
    - Normal respiratory rate for an adult is 15-20 breaths per minute.
- Evaluate Respiratory Rhythm:
    - Observe the regularity of inspiration and expiration (should be even and effortless).
    - Note any irregularities, such as pauses, uneven breathing, or laboured breathing.
- Assess Depth of Breathing:
    - Determine if the breathing is normal, shallow, or deep.

- *Normal:* Adequate volume of air is exchanged.
- *Shallow:* Small volume of air exchanged with minimal lung involvement.
- *Deep:* Large volume of air is exchanged, involving the full lung capacity.

- Look for Special Characteristics:
  - Note any unusual breathing patterns such as hyperventilation (rapid, deep breathing), hypoventilation (slow, shallow breathing), or apnoea (temporary cessation of breathing).
  - Document any other characteristics such as sighs, gasping, or wheezing.

BLOOD PRESSURE

It is the force exerted by the blood against the walls of the arteries in which it is flowing.

It is expressed in terms of millimeters of mercury (mm of Hg).

Systolic pressure is the maximum pressure of the blood against the wall of vessel following ventricular contraction.

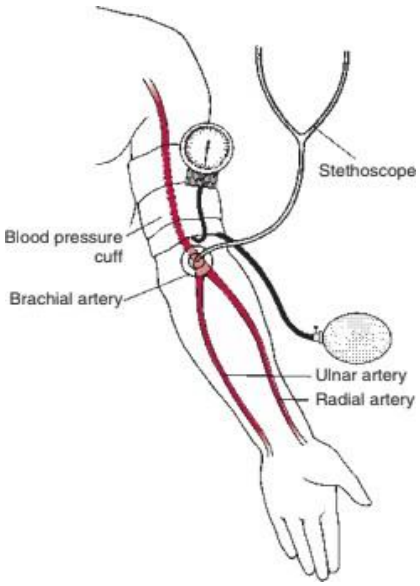
Diastolic pressure is the minimum pressure of the blood against the wall of the vessels following closure of aortic valve (ventricular relaxation).

Procedure:

1. Direct method – An oscilloscope is used for this method. This is a continuous method which measures mean pressures. A needle or catheter is inserted into the brachial, radial or femoral artery and oscilloscope displays arterial pressure in wave form.
2. Indirect method-Taking blood pressure by using sphygmomanometer. Following types of measuring device is available:

- Mercury manometer
- Aneroid manometer
- Electronic BP device

[Figure 3.3 – Placement of sphygmomanometer and stethoscope for the measurement of blood pressure in brachial artery]



- Explain the procedure to the patient and remove any light cloth from patient's arm.
- Make sure that the client has not smoked or ingested caffeine within 30 minutes prior to measurement.
- Position the patient on lying, sitting or standing position but always ensure that the sphygmomanometer is at the level of the heart with the arm supported and the palm facing upwards.
- Apply cuff snugly/securely around the arm, 2.5cm above the antecubital space/ fossa, at the level of heart (for every centimetre the cuff sites above or below the level of heart, the BP varies by 0.8 mmHg).
- Palpate the radial pulse and inflate the cuff until the radial pulse can no longer be felt, this provides an estimation of systolic pressure.

- Palpate the brachial artery and place the bell of the stethoscope over the site and the ear pieces on ear, apply enough pressure to keep the stethoscope in place (the bell of Stethoscope is designed to amplify / intensify low frequency sounds)
- Deflate the cuff 2-4mm Hg per second.
- The first pulse heard is systolic reading, continue to deflate until there is a charge in tone to a muffled bead, this is diastolic reading.
- Deflate and remove cuff, roll neatly and replace.
- Record the systolic and diastolic pressure and keep the record for future reference.
- Clear ear pieces and bell of the stethoscope with antiseptic swab and return all equipment.

Conclusion: Accurate measurement of pulse, respiration, and blood pressure is essential for assessing a patient's vital physiological status. Mastery of these techniques ensures early detection of abnormalities, supports clinical decision-making, and enhances overall patient care.

PRACTICAL NO. 4

Aim: To learn practical approach of auscultation.

Objective: To understand and perform the clinical technique of auscultation using a stethoscope, for assessing normal and abnormal sounds of the respiratory, cardiovascular, and gastrointestinal systems.

Requirement:

Stethoscope

Theory:

Description of auscultation

The Auscultation is the act of listening to sounds made by internal organs and vessels of the human body.

This is usually done with a device called stethoscope.

It is a technique used to examine the respiratory system (breath sounds), cardiovascular system (heart sounds and vascular bruits) and gastrointestinal system (bowel sounds).

STETHOSCOPE

Four parts:-

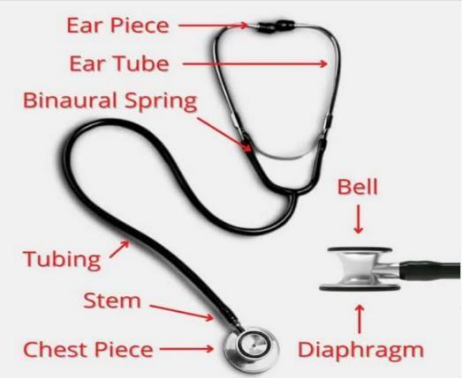
Bell: Low-pitched heart sound

Diaphragm: high-pitched lung sound, press firmly.

Tubing: not too long or too short

Earpieces: point away.

[Figure 4: Parts of Stethoscope]



NORMAL BREATH SOUNDS

a. Bronchial
b. Broncho vesicular
c. Vesicular
d. Tracheal

ADVENTITIOUS SOUNDS

Discontinuous lung sound

- Coarse crackle (rales)
- Pleural rub

Continuous Lung sound

- Wheeze
- Stridor

HEART SOUND

- Heart sounds are caused by the closure of heart valves. The first sound you hear is S1 and is caused by the closure of the atrioventricular valves (AV) [TRICUSPID AND MITRAL VALVES]. This sounds like “LUB”-S1
- The second sound you hear is S2 and is caused by the closure of the semilunar valves (SL) [AORTIC AND PULMONIC VALVES].This sounds like “DUB”- S2

- S3- associated with blood flowing into the ventricles
- S4- associated with atrial contraction

Four hearts sounds can be recorded by phonocardiography, but normally, only the first and the second heart sounds are audible through a stethoscope.

Procedure:

- Listen to both the anterior and posterior sides of the chest.
- Start at the top and work your way to the bottom the chest while comparing sides.
- When listening note the following:
- A full inspiration and expiration Cycle
- The inspiration and expiration sound is pitch, quality, duration, and if it is sounding normal.
- Is there anything “”weird” heard along with the inspiration and expiration.
- Have the patient sitting up with arms resting on lap. When listening to posterior side of the chest, the arms need to definitely be in lap so the scapulae are separated.
- Use the diaphragm of the stethoscope, to auscultate at various locations
- Have patient breathe in and out through mouth slowly while listening. Allow the patient to set the pace to prevent hyperventilation, especially patients with breathing disorders like COPD.

Conclusion: Auscultation is a vital clinical skill that aids in detecting normal and adventitious sounds within the body. Proficiency in using the stethoscope and interpreting breath and heart sounds is essential for early identification of underlying medical conditions and effective patient assessment.

PRACTICAL NO. 5

Aim: To learn ECG (Electrocardiogram).

Objective: To understand the principles of electrocardiography (ECG), including heart electrical activity, lead system, and waveform components, and to learn how to record and interpret ECG patterns for assessing cardiac function.

Theory:

Description

An ECG is a recording of waveforms that reflect the electrical activity of the heart.

An Electrocardiogram is a graphic record of the electrical Impulses generated by depolarization and repolarization of the myocardium.

The Electrical activity of the Heart

The contraction of any muscle is associated with electrical changes called “depolarization” and these changes can be detected by electrodes attached to the surface of the body.

ECG

A galvanometer and electrodes with six limb leads and six chest chest leads Recorded with divisions on graph paper

Electrocardiographic paper

A graph paper 1mm x 1mm. With each small square measuring

ECG recorders and monitors are standardized at a speed of 25 mm/sec. Time is measured on horizontal axis and voltage on vertical axis.

Each small square represents 0.04 seconds. Five small squares make up one large square representing 0.2 seconds.

ECG Pattern

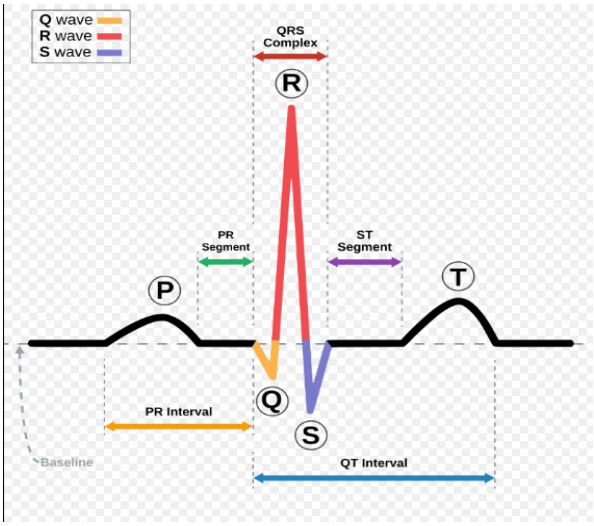
The baseline is the iso-electric line. It occurs when there is no current flow.

If the current flows toward the lead, a positive deflection is seen above the baseline.

If the current flows away from the lead, a negative deflection is seen below the baseline.

Left ventricle has more Influence on the ECG, because of the increased muscle mass.

[Figure 5: Normal ECG wave pattern]



Lead System

A 12-lead ECG provides multiple electrical views of the heart along a ventricle and horizontal plane.

The ECG recorder compares the electrical activity detected in different electrodes, and the electrical picture so obtained is called a “lead.” For example, when the recorder is set to ‘lead I’, It is comparing the electrical events detected by the electrodes attached to the right and left arms. The ECG is made up of 12 characteristic views of the heart, six obtained from the limb leads and six from the chest leads.

Limb Leads

3 Bipolar limb leads (Standard limb leads) – I, II and III.

3 Unipolar Augmented Leads (aVR, aVL and aVF) obtained through 4 electrodes placed on the right arm, left arm, right leg and left leg.

Leads Placement (V1, V2, V3, V4, VS and v6)

V1- 4th Intercostal space, right sternal border.

V2- 4th Intercostal space, left sternal border.

V3- Midway between V2 and V4.

V4- 5th Intercostal space, midclavicular line.

V5- between V5 & V6, anterior axillary line.

V6- midaxillary line lateral to V4 & V5

Conduction Pathways

P wave = atrial depolarization

PR Interval = Impulse from atria to ventricles.

QRS Complex = ventricular depolarization.

ST Segment = isoelectric part of repolarization

T Wave = usually same direction as QRS – ventricular repolarization

QT Interval = This Interval spans the onset of depolarization to the completion of repolarization of the ventricles.

Conclusion: ECG is an essential diagnostic tool for evaluating the heart's electrical activity, helping to identify rhythm abnormalities and conduction issues. Understanding the lead system and waveform interpretation is crucial for accurate cardiac assessment.