

Consensus
on
Clinical Examination
Methods

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Department of Internal Medicine
Medical College
Trivandrum

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Preface

I am writing this preface with a deep sense of satisfaction and pride. Clinical examination method varies from physician to physician and from department to department. Under the circumstances it is appropriate to have a consensus of physical examination methods with in the department. This will help the under graduates and post graduates to follow the same method of examination. This will help the department to have a uniform methods. This will also help the students in the University examination, during which the department can submit the Consensus to the external examiners, who will have to adjust to our Consensus.

This is not a substitute for a text book of clinical methods of examination as it is only a pointer to the main organ systems ie Respiratory, Cardiovascular, Gastrointestinal and Nervous system. There have been gruelling hours behind the preparation of this book. All the staff of the department and post graduates have spend many hours for this consensus.

The consensus has been derived after consulting many standard text books of clinical examinations. Where ever there were more than one method of examination the most appropriate one was chosen for the consensus.

I would also thank the experts of speciality units, Prof Bahuleyan, Prof Ghosh, Chandra and Dr. Krishnadas for giving the necessary help and advice.

I am sure this book would be of immense help to many hundreds of students and P.G's.

*Prof & Head
Department of Medicine and Staff.*

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1. Built

Assess the skeletal framework of the individual and compare it with the normal for his/ her age. Comment as poorly/ moderately/ well built.

2. Nourishment

Calculate the Body Mass Index using the formula
 $BMI = \text{weight (kg)} / \text{height (m)}^2$

Comment as poorly / moderately/ well nourished.

3. Physical attitude

Patient is in the standing / sitting/ supine position. Look whether patient is comfortable or in distress.

4. Pallor

Inspect lower palpebral conjunctiva, tongue, oral mucosa, hard palate, nail beds, palm (including skin creases) and sole. Comment as pallor/ no pallor. If the palmar crease colour is lighter than the surrounding skin, when the hand is hyperextended, it indicates a Hb level <7 g/dL.

5. Icterus

Examine in good sunlight as icterus can be missed if patient is examined in artificial light. Inspect upper sclera, under aspect of tongue, palms, nails, skin. Comment as icterus/ no icterus. Scleral icterus indicates a serum bilirubin of atleast 2.5 mg/dL. Lemon yellow jaundice is seen in hemolytic anemia, orange yellow in hepatocellular jaundice and greenish yellow in obstructive jaundice.

6. Cyanosis

Inspect tongue, lips, ear lobes, tip of nose, nail beds , tips of fingers and toes. Look for differential cyanosis. Comment as central/ peripheral/ differential cyanosis. Methemoglobinemia, sulfhemoglobinemia,

or carboxy hemoglobinemia may be mistaken for cyanosis. But in these condition patient will not be dyspnoeic . Dark pigmentation of tongue can be differentiated from cyanosis by pressing the tongue with a glass slide. Cyanosis will blanch while pigmentation will not. Cyanosis becomes apparent when the concentration of reduced Hb in capillary blood exceeds 5g/dL.

7. Clubbing

Inspect the nail bed angle of the index finger of the nondominant hand by keeping the finger at the eye level of the examiner. Inspect for bulbous enlargement of the tips of fingers and toes. Inspect and palpate wrists and ankles for swelling and tenderness. Look for differential clubbing. Comment as pan clubbing present or differential clubbing present or no clubbing. Consensus: clubbing need not be graded

8. Lymph node enlargement

Patient is in sitting position for examination of cervical and axillary nodes and supine position for abdominal and inguinal nodes.

Inspect for enlarged nodes. Palpate one site and then palpate the corresponding site on the opposite side. Note- site, number, size, consistency, tenderness, mobility, matted/ discrete, fixity to skin, condition of overlying skin and area of drainage.

For examining the cervical nodes first stand behind the patient ; keep the neck slightly flexed forwards and sideward towards the side of examination; palpate- submental, submandibular, preauricular, jugulodigastric, supraclavicular and deep cervical.

Scalene node examined by dipping the palpating finger behind the clavicle through the clavicular insertion of sternomastoid while standing behind the

patient or by standing in front of the patient and palpating the node behind the clavicular head of sternocleidomastoid with thumb and index finger.

Now stand in front of the patient and examine posterior auricular and occipital nodes.

To examine epitrochlear nodes ; lift the arm and flex the elbow to a right angle. Palpate the nodes with flat of the thumb of the opposite hand.

To examine the right axillary nodes support the patient's right arm with the left hand of the examiner and palpate the axilla with the left hand.

Abdominal nodes can be looked for by deep palpation of the abdomen.

To examine the inguinal nodes patient positioned supine with thigh flexed to 10°. Palpate the horizontal group and the vertical group.

Popliteal nodes are examined by palpating deep in the popliteal fossa with knee flexed using both hands of the examiner.

Widening of the dullness of the upper mediastinum on light percussion of chest may indicate the presence of enlarged mediastinal nodes.

9. Oedema

Patient is supine or left lateral position. Inspect the lower extremities and the presacral region. The skin will be stretched and shiny and the normal wrinkles are obliterated. Apply gentle pressure with the flat of the thumb for 30seconds over the bony area (shin of tibia, medial malleolus, sacrum) and look for pitting. Comment as pitting/ nonpitting edema. Anasarca refers to gross generalised oedema.

10. General examination with relevance to particular systems

May be done according the relevance of the situation.

11. Vital signs

- a. *Pulse* : discussed with CVS
- b. *Blood pressure*: discussed with CVS
- c. *Respiratory rate*: discussed with respiratory system
- d. *Temperature* :

Use thermometer with centigrade or Fahrenheit scale.

In adults take axillary or oral temperature. In children take rectal temperature or at the fold of the groin with thigh flexed.

Clean the thermometer with antiseptic solution. Shake it so that the mercury column falls below the mark. Keep it for at least one minute in the oral cavity. Patient shouldn't take any hot or cold fluid immediately before recording the oral temperature. Lips should be closely shut and patient should breathe through the nose. In the axilla the skin must not be moist with perspiration.

Normal oral temperature is $37.2 \pm 0.5^{\circ}\text{C}$. Axillary temperature is 0.5°C lower than the oral temperature. Core temperature is 0.5°C higher than the oral temperature.

Comment as Temp= _____ $^{\circ}\text{C}$ / $^{\circ}\text{F}$ in _____ site at _____ time.

**EXAMINATION OF
RESPIRATORY SYSTEM**

EXAMINATION OF UPPER RESPIRATORY TRACT

Nose: *Look for*

- Deviation of nasal septum
- Colour of the nasal mucosa
- Discharge
- Obstruction: Ask the patient to sniff through each nostril after closing the other nostril. (Use tongue depressor (steel) and inspect for the humid mist)
- Polyps
- Whether alae nasi working or not.

Paranasal Sinuses:

- Inspection : for erythema and swelling over sinus
- Palpate frontal and maxillary sinus and ethmoid sinuses for tenderness

Oral Cavity:

Should also be included under examination of upper respiratory tract. Always use a tongue depressor.

Look for:

- Oral hygiene
- Caries teeth
- Tonsils
- Posterior pharyngeal wall
- Postnasal dripping.

EXAMINATION OF CHEST

INSPECTION

Inspection should be carried out in sitting, standing and supine positions with examiner standing at one and half metre away from the patient.

Sitting position:

- Patient should sit straight, preferably on a stool
- Chest should be exposed down to the waist
- Chin should be in the midline

Inspection should be carried out from the

- Front:* Look for shape, symmetry of chest, respiratory movements, swelling, pulsations and drooping of shoulder.
- Back:* Look for kyphosis, scoliosis, drooping of shoulder, prominence of the medial border of scapula and spinoscapular distance (distance between inferior angle of scapula and vertebral spine).
- Sides:* Anteroposterior diameter & kyphosis
- Behind and above the shoulder:* With the examiner standing behind the patient and the patient sitting with head slightly flexed, look at the apical regions for flattening, retraction of chest and respiratory movements. Make sure that the patient doesn't shrug his shoulders.
- Axillary regions :* Patient should sit with hands on his head. Look for lateral and outward movements.

Recumbent position:

- Look tangentially from the foot end of the bed - upper, middle and lower parts of both sides of chest - for shape, symmetry, movements, prominence and retraction.

- b. Look from the sides, eyes of the kneeling examiner being at the level of the anterior chest wall.
- c. The patient lies recumbent with his hands behind his head. The examiner stands facing the patient, making an angle of 20 degrees with the long axis of the patient. Ask the patient to take deep breaths, with the mouth open. The lower intercostal spaces are examined on each side for assessing diaphragmatic movements

SCHEME OF EXAMINATION

INSPECTION

1. Shape of the chest

Normal or not. Mention about drooping of the shoulder and hollowing (suggest volume loss), prominence (in pleural effusion or pneumothorax), kyphoscoliosis (in long standing volume loss of lungs) and retraction.

Drooping of the shoulder : The patient should be asked to stand and he should be examined from the back. A lower level of the shoulder, shorter spinoscapular distance and prominent medial borders of the scapula are present at the back on the side of drooping. There is drooping if two out of the above three are present. Pseudo drooping disappears on walking or stooping forward.

2. Position of the trachea

Inspect for apparent deviation of trachea. Look for Trail's sign. (Trachea is deviated to the side where the sternomastoid is prominent.)

3. Position of apex beat

Examine in the recumbent position.

4. Respiratory movements

Equal or diminished in the upper or lower part of the chest anteriorly and posteriorly. Examined during normal respiration and also during slow inspiration at a frequency of 12 – 16 per minute.

5. Respiratory rate

Observe the abdominal movements for full one minute with out the patient being aware that respiration is being examined.

6. Rhythm of respiration

- a. *Regular*: Examples include normal respiration, Kussmaul's breathing and central neurogenic hyper ventilation (rapid, regular, deep breathing seen in pontine lesions).
- b. *Irregular*: Examples include Cheyne Stokes breathing (Regularly irregular), Biots breathing, Apneustic breathing (cycles of inspiratory pause followed by expiratory pause seen in pontine lesions), and Ataxic breathing- irregular shallow breathing seen in medullary lesion.

7. Type of breathing

Abdominothoracic (males) or thoracoabdominal (Females)

8. Intercostal retraction

See whether accessory muscles of respiration are working.



Cheyne Stokes breathing

9. Dilated veins, Visible pulsations, scars, sinuses or edema of the chest wall

If dilated veins are seen, find out the direction of flow. With the patient in the standing position, occlude the distal part of the vein with the index finger of the right hand and milk out the vein with the index finger of the left hand. Remove the lower finger. If the vein gets filled quickly, then the flow is from below upwards. If it doesn't fill, milk out the vein again and remove the upper finger. Look for rapid filling of the vein indicative of flow from above downwards. Look for redness of overlying skin in emphysema.

PALPATION

1. Position of the trachea

Patient should be in sitting position, neck slightly flexed and not rotated so that chin remains in the midline of the body. The examiner's index and ring finger placed on sternoclavicular joints serve as reference points. Palpate tracheal rings from above downwards with the middle finger and look for any tracheal shift. Insinuate three fingers (index, middle and ring fingers) between the trachea and the sternomastoid, compare the two sides. A larger space on one side indicates tracheal deviation to the opposite side. (Sometimes trachea is deviated to right side even in normal individuals)

Tracheal tug and tracheal descent (for post graduates)

- a. *Tracheal tug: Stand behind the patient. Chin should be slightly raised. The cricoid cartilage is held up during the deglutition with three fingers of both hands on either side. A downward tug is felt by the finger during each cardiac systole. (Seen in aortic aneurysm and emphysema)*
- b. *Tracheal Descent: A downward descent is felt by the finger during each respiratory cycle. (Seen in COPD).*

2. Apex beat

Palpate in the supine position. (comment on intercostal space number and distance from midclavicular line)

3. Respiratory movements

Examine upper and lower parts of anterior and posterior aspects of the chest.

- a. *Examination of the upper posterior part of the chest wall:* With the patient in the sitting position, the examiner stands behind the patient and places both hands over the patient's shoulder, with the extended thumbs held vertically and parallel to each other, in the midline. Compare the upward movements of thumbs during both normal inspiration and deep inspiration.
- b. *Examination of lower posterior part of the chest wall:* Ask the patient to sit erect with the hands hanging down the sides of the body. The examiner should grasp the chest from behind with the two hands. Bring the tip of the outstretched thumbs together in the region of the tenth thoracic spine, ensuring that there is a loose fold of skin between the two thumbs. Ask the patient to take a deep inspiration and compare the lateral movements of both sides.
- c. *Examination of the upper anterior part of the chest wall:* Patient should be in the sitting position. The examiner should sit in front of the patient, place both hands in the infraclavicular fossae with thumbs horizontally near the midline. Look for antero posterior movements.
- d. *Examination of the lower anterior part of the chest wall:* Patient should be in the sitting position. The examiner should sit in front and place his hands symmetrically on each side

of the chest such that the thumbs meet each other horizontally in the midline. With each inspiration, the thumbs should move apart.

4. Chest expansion

Roughly, In males at the level of the nipples. In females below the level of nipples (Ask for female bystander to help).

- a. *Total expansion*: Mark the midsternal line with a skin marking pencil. The examiner should stand in front of the patient. Using an inch tape, measure the total expansion at the level of the 4th intercostals space. Ask the patient to expire fully and then take a deep inspiration and measure the expansion. Normal chest expansion is >5cm. A measurement of < 3 cm in a male and < 2.5 cm in a female are abnormal in the Indian scenario.
- b. *Differential expansion*: The patient should sit with his hands held over the head. Place one end of the tape over the vertebral spine (fixed point). Ask the patient to take a deep expiration followed by a deep inspiration, during which the examiner measures the expansion of the hemithorax, with reference to the midsternal line.

5. Anteroposterior and transverse diameters

Measure the anteroposterior diameter and transverse diameters at the level of 4th intercostal space, with the help of books applied to the chest wall. (Call skilled assistant for measurements).

5. Vocal fremitus

Also called Tactile Vocal Fremitus.

Ask the patient to say a convenient phrase like “one , two, three ...” or “ninety nine...” . Place the ulnar border of the hand horizontally in the intercostal space. Palpate simultaneously for variations of the

sound, intercostal space by intercostal space, comparing the two sides. Palpate for vocal fremitus over the anterior and posterior aspects of the chest.

Increased in consolidation. Decreased in effusion& Pneumothorax .Normal in collapse& cavity

6. Intercostal narrowing

With the patient in sitting or standing position, the examiner should stand behind and compare the intercostal spaces by sliding his fingers along the lower intercostal spaces of both sides.

PERCUSSION

Rules and techniques:

- Middle finger of the examiner’s left hand is used as the pleximeter finger. It must be firmly applied to the chest wall so that no air pockets are interposed between the finger and chest wall . The greater the thickness of the chest wall, greater must be the pressure with which the pleximeter finger is apposed to the surface percussed.
- The other fingers of the examiners left hand must be well clear of the chest wall to prevent any dampening of the vibrations.
- Middle finger of the right hand is used as the plexor finger. It is kept flexed at a right angle and must strike firmly the middle part of the middle phalanx of the pleximeter finger perpendicularly, with the pad – not the tip of finger.
- Percussion stroke must be sudden, the plexor finger being withdrawn immediately after the stroke to prevent dampening of the note.
- Perform with follow through action from a relaxed wrist (not elbow or forearm)

- Ideally the force of the stroke should be just strong enough to elicit a clear and audible note. Force of the stroke should be absolutely constant when comparing symmetrical areas of chest.
- Heavy percussion should be avoided. It involves a large area of lung at each stroke.
- If an area of dullness is found, then its limits are demarcated by percussion from a resonant to dull area.
- When delineating the border of an organ such as heart or liver, the pleximeter finger should be placed parallel to the expected border of that organ.
- During percussion of the chest, keep the pleximeter finger along the intercostal spaces.
- The areas percussed must be more or less equidistant from the two ears of the examiner.

Position of the patient

Sitting up position is preferred. Recumbent position is used only in severely ill or moribund patients who are too ill to sit or stand. Comparative percussion of the two sides of the chest is not possible in recumbent position. If the chest has to be percussed in the lying position, it must be percussed in both right and left lateral position.

Standing position is satisfactory but it is tiring for both patient and examiner.

Percussion of the anterior chest wall

The patient is asked to sit on a stool, facing the examiner, with body upright and chest bracing forwards with arms extended at the shoulders – bracing position.

Percussion of the back

Patient is asked to sit on a stool with head slightly flexed and arms across the chest with the hands touching the opposite shoulder tips.

Percussion of the axilla

Patient is instructed to keep both hands on the head.

Method: First percuss the clavicle, one need not stretch the skin over the clavicle. Then percuss over the apices of the lungs, with pleximeter finger kept perpendicular to the clavicle. Percuss symmetrical areas of the anterior, posterior and lateral chest wall. Percuss your way down, intercostal space by intercostal space. The supraclavicular area is percussed with fingers kept vertically. Percuss medial, middle and lateral parts. Physiologically normal differences in percussion note on the two sides, due to the presence of heart and stomach on the left side and the liver on the right side, should be kept in mind while interpreting the results.

- Liver dullness* is percussed in the 5th right intercostal space in the midclavicular line, 7th right intercostal space in the mid axillary line and 9th right intercostal space in the scapular line.
- Traube's space*: It's superior boundary is formed by horizontal line extending laterally from the apex, laterally by the left midaxillary line, inferiorly by the left costal margin and medially by the lower border of the liver. During normal breathing the space is percussed out from the medial to lateral, yielding resonant note. Traube's space is dull in:
 - Left pleural effusion
 - Splenomegaly
 - Carcinoma stomach
- Kronig's isthmus*: Percuss the Kronig's isthmus (bounded by the structures in the root of the neck medially, clavicle in front, upper border of scapula at the back and acromioclavicular joint

laterally) from behind with fingers kept over the isthmus and compare medial, middle and lateral parts. (The normal resonance is lost in Pancost tumour)

Interpretation of results:

- Tympanic note: Drum like note, usually elicited normally over the stomach.
- Hyperresonance: A note intermediate in pitch between lung resonance and tympany (in Pneumothorax)
- Normal
- Impaired resonance(in fibrosis)
- Dull (in consolidation)
- Stony dull: As if percussing over the thighs, suggestive of fluid underneath. (in pleural effusion, empyema)

Percussion of the mediastinum

To detect widening as evidenced by dullness on either side of sternum.

Look for dullness confined to manubrium. This is done by light percussion over the manubrium.

Tidal percussion

To distinguish whether the cause of dullness over lower right intercostal spaces (eg: 3rd, 4th right intercostal spaces) is due to intrathoracic pathology or subdiaphragmatic pathology.

On the right side: Percuss the upper border of liver dullness, anteriorly in the midclavicular line, during deep inspiration and expiration.

On the left side: Percuss the lower border of lung resonance posteriorly in the scapular line, during deep inspiration and expiration.

Normally during deep inspiration, liver dullness

descends down. If due to intrathoracic causes, dullness doesn't shift with inspiration, whereas in subdiaphragmatic causes, it descends down (i.e; previously dull area becomes resonant in subdiaphragmatic causes) Hence we are looking for the extent of movement of diaphragm. Dullness should shift by a minimum of 5 cm or 2 intercostal spaces.

Shifting dullness

Seen in hydropneumothorax. In the sitting position percuss in the axilla, mark the area of dullness by keeping the pleximeter finger there. Ask the patient to lie down on the healthy lateral side, wait for 30 seconds and percuss again. If shifting dullness is positive, marked area plus one space below must become resonant. Now percuss towards the spine to find the upper border of dullness in the paraspinal region.

AUSCULTATION

Position of the patient: Ideally upright, either standing or sitting.

For examination of the back, the patient should slightly lean forwards with head flexed and arms across the chest. For examination of seriously ill or bed ridden patient recumbent or lying down position can be used.

Method of breathing: forced or deep breathing through the mouth. Method of breathing must be clearly explained or demonstrated to the patient.

Auscultatory areas

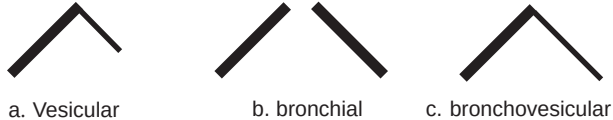
- Anterior chest
 - Supraclavicular area(upper lobe)
 - Infraclavicular area(upper lobe)
 - Mammary area(below 3rd rib)
- Lateral chest
 - Axillary area (all lobes)

Infra axillary area (Below 5th rib, lower lobe)

- Posterior chest
 - Suprascapular area(upper lobe)
 - Interscapular area(lower lobe)
 - Infrascapular area

1. Breath sounds

- *Intensity of breath sounds:*
 - Normal and equal bilaterally
 - Diminished
 - Absent
- *Type of breath sounds:*



- Vesicular breath sounds:* Inspiration > expiration. No pause in between.
- Bronchial breath sounds:* Expiration is either equal to inspiration or prolonged with a pause in between. Types of bronchial breath sound-
 - Tubular - High pitched bronchial breathing seen in consolidation & upper level of effusion.
 - Cavernous - low pitched bronchial breathing seen in a cavity.
 - Amphoric - low pitched with high pitched overtones. seen in Bronchopleural fistula, cavity communicating with a bronchus.
- Bronchovesicular breath sounds:* normal breathing with prolonged expiration with no pause in between.

2. Adventitious sounds

Rhonchi and crepitations (crackles)

For post graduates: if rhonchi are present, specify whether monophonic or polyphonic. For crepitations, specify fine or coarse and if inspiratory specify whether early, mid or end inspiratory crepitations.

- *Early inspiratory (coarse) - Bronchiectasis*
- *Late inspiratory (fine) - Pulmonary edema, ILD*

3. Vocal resonance

Ask the patient to repeat some common phrases like “one- one- one” “or”one- two- three”. Simultaneously auscultate over the corresponding areas of the chest. Normally sounds are heard over the chest as a weak, muffled and distant rumble with the individual syllables slurred and indistinguishable. Comment as vocal resonance normal, increased, decreased or absent.

4. Miscellaneous sounds

- Bronchophony:* Vocal resonance appears unduly loud or intense, clear and close to the ear but individual words or syllables are indistinguishable.
- Aegophony:* Bleating, tremulous, nasal quality in the vocal resonance; easily appreciated by asking the patient to say ‘e-e-e’ which will be appreciated as ‘a-a-a’ over the chest.
- Whispering pectoriloquy:* Ask the patient to whisper phrases like “one-one-one” or “ one-two-three” and auscultate symmetrical areas of the chest wall. Whispered sounds are normally inaudible over the lung parenchyma.

Whispering pectoriloquy is said to be present if the whispered sounds are transmitted to the chest wall with sufficient clarity to maintain the syllabic character and the individual syllables or words being clearly distinguishable as if uttered directly into the examiner’s ear.

- d. *Pleural friction rub*: Superficial, scratchy, creaky, leathery sound due to pleural inflammation. May be heard during both inspiration and expiration. Best heard in the infra axillary region.
- e. *Coin sound*: Ask an assistant to place a coin flat on the affected side of the chest and percuss with a second coin. The examiner should auscultate at a point diametrically opposite on the same side of the chest. Normally the lungs do not transmit the metallic ringing sounds distinctly. If clear metallic ringing sound similar to chiming of church bell or sound of hammer on anvil are heard, it indicates pneumothorax.
- f. *Post tussive suction*: Heard at the site of cavernous or amphoric breathing. Look for low pitched sucking noise produced during the long inspiration following a bout of cough (in cavity).
- g. *Post tussive crepitations*: (in cavity with fluid)
- h. *Succussion splash*: (Seen in hydro Pneumothorax). There are two methods –
 - Ask the patient to lie down with healthy side in the dependent position. Percuss and determine the air fluid level in the paraspinal region. Grasp the nondependent shoulder and shake it suddenly while auscultating over that area. You can hear a splashing sound which is the succussion splash.
 - Patient is asked to sit. Percuss out the air fluid level in the paraspinal region. Place the stethoscope over that region. Opposite shoulder is fixed by the assistant. Grasp the shoulder on the same side and shake it suddenly. Splashing sound indicates succussion splash.

- i. *Hamman's mediastinal crunch*: a crunching or clicking sound synchronous with the heart beat, heard over the lower retrosternal area. Indicates presence of pneumomediastinum

References:

Harrisons Principles of Internal Medicine (18th ed)

Hutchisons Clinical Methods

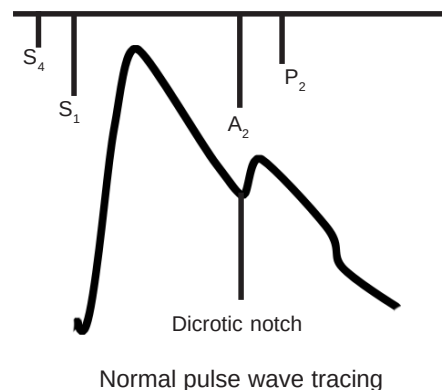
Macleod's Clinical Examination.

**EXAMINATION OF THE
CARDIOVASCULAR SYSTEM**

For a clinician there is much to be gained from a sequential and orderly examination of the cardiovascular system. Examination of the arterial and venous pulses, the blood pressure and the precordium (inspection, palpation and percussion) should always precede auscultation.

EXAMINATION OF THE ARTERIAL PULSE

Arterial Pulse is an expansile impulse transmitted along the blood vessels due to ejection of blood from left ventricle to partially filled aorta, which is transmitted along the vessel wall ahead of the blood column and is felt in the peripheral arteries against bony prominences.



Most of the information can be obtained by examination of the radial artery. Stand on the right side of the supine patient. Slightly flex the patient's semipronated forearm at the elbow and wrist and support the patient's right hand with the examiner's right hand. Palpate the radial artery against the head of the radius using the fingers of the left hand. The right hand may also be used for palpating the pulse. The arterial pulse should be examined for evaluation of:

1. Rate

Expressed in beats per minute. Pulse rate should be counted for one full minute in the right radial artery.

2. Rhythm

Rhythm is the regularity with which one beat follows the other. It is examined in right radial artery. Comment as regular or irregular, regularly irregular or irregularly irregular. If the pulse is irregular also look for the pulse deficit. The heart rate is auscultated by the examiner while the pulse rate is counted by another person for the same minute.

3. Volume

Volume of the pulse is defined as the amplitude of expansion of vessel wall produced by the pulse wave. It is assessed by palpating the carotid artery. Comment as normal volume, low volume, high volume. Pulsus alternans and pulses paradoxus are volume abnormalities (described later).

4. Character

Character or wave form of the pulse is examined in right carotid artery. Wave can also be examined in the radial artery. The normal pulse wave form is cataplectic. The abnormalities in pulse character are:

- Anacrotic Pulse: (Pulsus parvus et tardus) Slow rising and late peaking.
- Dicrotic Pulse: Single pulse wave with one peak in systole and one peak in diastole.
- Bisferiens Pulse: Examined in Radial artery/Branchial artery. Single pulse wave with two peaks in systole.
- Water Hammer/Corrigans Pulse/Collapsing Pulse: It is a large volume pulse with a rapid upstroke and rapid fall. For the examination of collapsing pulse, feel for the radial artery with the distal aspect of the examiner's right palm.

Elevate the limb vertically up to 90° swiftly, to feel for a thud or collapse.

- Pseudocollapsing pulse: It is a normal or small volume, quick rising and poorly sustained pulse. The thud or collapse is not very characteristic as found in a collapsing pulse.

5. Condition of the vessel wall

Palpate the radial artery with three fingers. Compress the artery with the proximal finger and empty the vessel by squeezing distally with the distal finger, and roll the vessel over the head of the radius with the middle finger to feel the walls of the empty vessel.

6. Radio femoral delay

With the patient lying supine with one arm kept close to the body, palpate the right radial artery with fingers of the left hand and the right femoral artery with the right hand and feel for the delay. Normal delay of the pulse from the central aorta to the radial artery is 80 ms and to the femoral artery is 75 ms with the femoral coming ahead of the radial pulse.

7. Palpation of peripheral vessels

- a. *Carotid artery*: With the patient lying supine gently palpate the carotid artery with three fingers of the right hand or with the left thumb at the level of the thyroid cartilage against the transverse processes of the cervical vertebrae (C 6). Both carotids shouldn't be palpated simultaneously. For examination of the left carotid use the right thumb and viceversa.
- b. *Femoral artery*: Palpate for the artery with the thumb or fingers at the mid point between anterior superior iliac spine and the pubic symphysis.
- c. *Popliteal artery*: These are best examined by placing the Patient's knees flexed at 120

degrees. The finger tips of both hands are placed on the popliteal fossa with the thumbs resting on the patient's patella.

- c. *Posterior tibial artery*: These are palpated at a distance of 1 cm behind the medial malleolus with the foot relaxed between plantar and dorsiflexion.
- d. *Dorsalis pedis artery*: These are palpated against the tarsal bones in the first intermetatarsal space proximally.

Grading of arterial pulsation

- Grade 0 - absent
- Grade 1+ - feeble/low
- Grade 2+ - normal
- Grade 3+ - high/bounding

EXAMINATION OF ARTERIAL BLOOD PRESSURE

Blood pressure is the lateral force exerted by the blood column per unit area of vascular wall, that is expressed in mm of Hg.

Ideally patient should be resting and relaxed in sitting or supine position. Avoid bladder distension, caffeine, eating and smoking half an hour before the examination. The BP cuff should be applied closely to the arm with the lower border about 2.5 cm from the cubital fossa. The width of the cuff should be 40% of the arm circumference and length 80% of the arm circumference. The palpatory method of BP recording should always precede the auscultatory method. Palpate the right radial artery and inflate the cuff. Note the pressure at which the radial arterial pulse is obliterated. Inflate the cuff 30mm of Hg above this pressure. Place the diaphragm lightly over the brachial artery and deflate the cuff slowly at 2-3 mm Hg/Sec until the Korotkoff sounds are heard. Phase

1 or clear tapping denotes the systolic BP while phase 5, i.e., the disappearance of the sounds denotes the diastolic BP. Phase 4 is taken as diastolic BP if phase 5 is very low and the difference between phase 4 and phase 5 BP is more than 10 mm of Hg. If the sounds are inaudible, repeated opening and closing of the fist can accentuate them. A difference in systolic BP of more than 10 mm of Hg or diastolic BP of more than 6 mm of Hg between the right and left upper limbs is significant.

To examine the blood pressure in the lower limb at the mid thigh level, patient should lie in the prone position, and the cuff should be rolled diagonally across the thigh to keep the edges snugged against the skin. Hold the knee slightly flexed to relax the muscles around the popliteal fossa. Palpate the popliteal artery and then auscultate it. For measuring the blood pressure in the calf, tie the cuff in mid calf diagonally and palpate the posterior tibial and auscultate it. Hills sign is positive if the difference in upper limb and lower limb BP is > 20mm Hg

BP in atrial fibrillation

An average of 2-3 BP measurements is ideal in atrial fibrillation.

Orthostatic hypotension

Orthostatic hypotension is defined as a sustained drop in systolic (≥ 20 mm Hg) or diastolic (≥ 10 mm Hg) BP after 3 minutes of standing up. Postural hypotension occurs when >30% of blood volume is lost rapidly.

Pulsus paradoxus

Patient lies in the supine position and cuff is inflated 15 mm Hg above the systolic level. Deflate slowly until the Korotkoff sounds start appearing, initially only during expiration. Note the blood pressure. Deflate

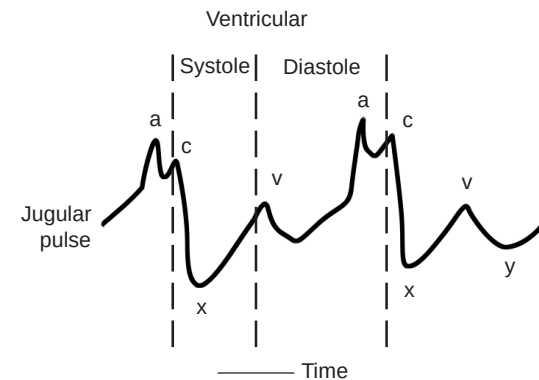
further slowly until sounds are heard during both inspiration and expiration. If the difference between the two readings is more than 10mm Pulsus paradoxus is present. If it is more than 20 mm the difference is apparent in the palpation of the pulse.

Pulsus alternans

Patient lies in the supine position and cuff is inflated 15 mm Hg above the systolic level. Deflate slowly until the Korotkoff sounds are heard. Hold at that point in normal respiration. Sounds produced by the higher volume pulse alone are heard. Slowly deflate further until there is a doubling of the sounds as sounds produced by the lower volume pulse are also heard. Note the BP difference. If the difference is more than 20 mm of Hg it is appreciated in the pulse as alternate low and high volume pulse.

EXAMINATION OF THE JUGULAR VENOUS PRESSURE

Patient should lie comfortably at an angle of 45 degree with the horizontal. But if the pressure is high a higher inclination of 60-90 degree is required to see the top of the pulsating venous column. Head should



Jugular venous pressure tracing

rest on a pillow but at no sharp angulation with the trunk. Tangential light across the neck can silhouette the neck veins to great advantage. Elevate the chin slightly to stretch the skin over lower neck and supraclavicular area. Chin should be in the midline.

Jugular venous pressure is defined as the height of the vertical column of blood in the internal jugular vein, above the angle of Louis or sternal angle measured in cm. The measurement is to be taken in semi recumbent position. To measure the jugular venous pressure a scale is placed vertically from the sternal angle and a second scale is placed horizontally at the upper level of vertical oscillating column of blood. The distance from the angle of Louis to the horizontal scale is measured in centimeters. The normal JVP is upto 4 cm. A reading of more than 4 cm denotes increased venous pressure. Next, try to identify the waves in the JVP. For this the examiner should stand on the right side of the patient who is inclined at an angle of 45 degrees. First identify the pulsations and time the waves with the carotid pulse by simultaneously palpating the left carotid artery with the left hand, which is passed behind the patient's neck. The 'a' wave comes just before the carotid pulse while the v wave comes with the carotid or follows the carotid pulsation. The 'a' wave is identified as a sharp flickering while the v wave has an undulating character.

Hepatojugular reflux

For examining the hepatojugular reflux, the patient should lie at 45 degree inclination. The examiner, standing on the right side of the patient should apply firm pressure over the mid abdomen for atleast 30 seconds. Patient should be asked to breathe normally and not to strain during the procedure; otherwise Valsalva maneuver may be

elicited inadvertently. In normal individuals the rise is less than 3cm and it is not sustained, returning to normal in less than 3 cardiac cycles. In right heart failure a sustained elevation of more than 3cm is obtained. False elevation can occur in COPD due to altered intrathoracic pressure and in conditions associated with generalized vasoconstriction.

EXAMINATION OF THE CARDIOVASCULAR SYSTEM

INSPECTION

The patient, undressed up to the waist, should lie relaxed on an examination couch in the supine position or at 45 degree to the horizontal. Daylight is sufficient but tangential light across the chest can accentuate the pulsations over the chest.

1. Shape of the precordium

Bulging, Retraction.

2. Position of the apical impulse

Mention the position in relation to nipple in male.

3. Visible pulsations

Visible pulsations should be looked for at the supraclavicular, suprasternal, 2nd intercostals spaces and other areas of the precordium and in the epigastric region.

4. Visible Scars

Midline Sternotomy, lateral thoracotomy

PALPATION

Ideally palpation should be carried out in warm room. Patient should be comfortable and undressed upto the waist. The finger tips are used to feel pulsations, the base of the fingers for thrills and proximal palm for heave.

1. Palpation of the apex beat

It is the lower most and outer most point of definite cardiac impulse. Apex beat should be located with the patient in the supine position only. Palpation should be started from the axilla using whole of the palm. Once a definite precordial pulse is felt the apex should be located with the index finger. If there is a difficulty in locating the apex, efforts should be made to palpate the apex beat at the end of expiration. Left lateral decubitus position and sitting position can be used to find out if the apex beat is on the left side, when it is not palpable in the supine position. If still not palpable finally look on the right side. The character of the apex should be described in the supine position only, palpating with a finger.

Describe the findings as

The apical impulse is felt in the ——— (left or right) intercostals space ——— cm inside or outside the midclavicular line or in the midclavicular line and it is ——— in character. It may also be expressed as ——— cm from the midline in the ——— intercostal space.

Midclavicular line: is a perpendicular line drawn from the mid point of another line joining middle of the suprasternal notch and the tip of the acromion.

Character of apex can be

- Normal: when the palpating finger is elevated but not above the adjacent ribs. It is confined to one intercostal space, in a area less than 2.5cm square. The duration of the impulse is less than half of systole.
- Tapping: When the palpating finger is not lifted Here the loud S1 is felt as definite tap.
- Forceful: When the palpating finger is elevated above the adjacent ribs but not sustained.

- Heaving: When the palpating finger is elevated above the adjacent ribs and the lift is sustained for more than half of systole.
- Diffuse: When the apex beat is palpated over an area more than 3 cm square or more than one intercostal space.

Examine for a palpable S3 or S4 and for other events like an ejection click or late systolic bulge of HCM or apical thrills in the left lateral position.

2. Left parasternal heave

LPH is due to right ventricular hypertrophy. With patient in supine position palpate pulsations with the ulnar border of hand in the left parasternal region over the lower costal cartilages. Then press firmly with the proximal palm and try to obliterate the pulsations.

Left parasternal heave should be graded

- Gr 1 Pulsations are just felt
- Gr 2 Systolic elevation of costochondral junctions obliterated by pressure
- Gr 3 Systolic elevation of costochondral junctions not obliterated by pressure

Left parasternal pulsations may be due to left atrial impulse (as in severe Mitral regurgitation) which occurs after the apical impulse. In such case there will also be prominent pulsation of right 4th and 5th intercostal spaces close to the sternum.

3. Sub xiphoid pulsation (epigastric)

This is done with extended index finger kept at the epigastrium and the patient is asked to take a deep inspiration. In right ventricular hypertrophy the impulse will strike your finger tips while aortic pulsations will be felt on the pulp of the fingers. A right ventricular S3 or S4 can also be felt at this site.

4. Palpation of pulmonary arterial pulsation

Firm palpation with index finger over the 2nd left intercostals space is required. Pulsations as well as palpable P2 may be felt. Alternatively palpation can be done using the tips of the fingers.

Palpation over the 3rd left intercostal space may reveal right ventricular outflow tract pulsation as in Ebstein anomaly.

5. Other palpable events

Palpate over other areas of the precordium. Prominent aortic pulsations in aortic aneurysm may be felt in upper sternum, 1st and 2nd right intercostal space and both sternoclavicular joints. Pulsation of left ventricular aneurysm or dyskinetic segment may be felt above and medial to the apex.

6. Thrills

Thrills are palpable murmurs. Thrills should be looked for in the entire precordium. They are felt using base of the fingers. Thrill of Mitral middiastolic murmur is better felt in the left lateral position. Location of thrill should be commented only at the exact anatomical site and not at the auscultatory areas. After identifying the thrill, it should be timed with the carotid pulse or the apex beat. Thrills occurring with the carotid pulse or apex beat are systolic and others are diastolic.

PERCUSSION

Percussion is useful to identify pericardial effusion and right atrial enlargement.

The patient lies supine. Percussion is started from the left mid axillary line and carried out medially along the 4th or 5th intercostals space to reach the apex. The upper border of liver is then percussed out. Percussion of right border of heart is then carried out from the right midclavicular line medially, one

space above the liver dullness or along the 3rd or 4th intercostal space. Percussion of the great arteries should be carried out medially from the midclavicular line on either side along the 2nd intercostals space.

Normally the percussion findings should be described as:

The left border of the heart corresponds to the apex beat in the ———intercostal space———cm medial or lateral to the midclavicular line or in the midclavicular line, the right border to the right sternal edge and the dullness in the 2nd space do not extend beyond 2.5cm on either side of the sternum.

AUSCULTATION

Ideally auscultation should be done in a sound proof room (noise level 35 db) with an ideal stethoscope. The earpieces should fit properly without air leak

Areas for auscultation

Classically there are five areas of auscultation.

- Mitral area- area overlying the apex.
- Tricuspid area: lower end of the sternum on the left side
- Pulmonary area: 2nd left intercostal space close to the sternum
- 1st aortic area: 2nd right intercostal space close to the sternum
- 2nd aortic area: 3rd left intercostal space close to the sternum

First, count the heart rate and look for pulse deficit especially if the rate is irregular.

Auscultate the areas in the above order. Description of the findings of auscultation can be done in two ways;
- Event wise auscultation or Area wise auscultation.

First the heart sounds and then the murmurs are described.

S1

S1 is best heard in the apex, splitting of S1 may be appreciated in the tricuspid area.

S2

Ideal site for auscultation is the pulmonary area where A2 and P2 are well heard. In pulmonary area if P2 is as loud as A2 or is louder, then P2 is abnormal (with normal intensity of A2). P2 is also loud if it is heard well in other areas ie, Mitral, tricuspid areas.

Splitting of S2 is examined by asking the patient to breathe slowly and regularly. Normally the split of S2 is well heard in the pulmonary area. The split is heard clearly during inspiration only.

Abnormalities of splitting of S2

- Single S2: only a single sound is heard
- Narrow split: gap is less than 30 msec in inspiration.
- Wide split (Split in expiration): If S2 is split in expiration, patient should be asked to stand while auscultating for the split. Some of the splits may disappear and if there is expiratory splitting during standing it is abnormal. Types of wide split.
 - a. Wide variably split
 - b. Wide fixed split
- Paradoxical (reverse) split: To look for paradoxical splitting auscultate for several cycles, it will be found that the splitting occurs during expiration and that S2 is fused during inspiration. In paradoxical split the split widens during the strain phase of Valsalva maneuver.

S3 and S4

They are low frequency sounds best heard with the bell. S3 is heard in the early part of the diastole and S4 is heard as presystolic sound. They are highly localized. The left ventricular S3 and S4 are heard best over the apex in the left lateral position. Maneuvers like passive leg raising, coughing and Valsalva release may augment the sounds.

Right ventricular S3 and S4 are best heard in the tricuspid area, they have inspiratory augmentation and may be heard in epigastric area in emphysematous patients.

Ejection sounds

They are high frequency sounds; aortic sounds are heard best in aortic area and sometimes in the apex while the pulmonary sound is best heard in the pulmonary area and it is phasic (decreases in inspiration) if they are of valvular origin.

Other sounds that should actively be looked for include opening snap and MVP click (non ejection click). The opening snap is heard immediately after S2 in the early part of diastole. It is a high pitched sound and widely conducted.

Other Sounds:

- Pericardial rub
- Tumor plop
- Prosthetic Valve sounds.

Murmurs

Murmurs are due to turbulence of blood at or near a valve or an abnormal communication with in or outside the heart. Murmur over an artery is called bruit. Bruit may be due to arterial stenosis (narrowing) or turbulent arterial blood flow. The following points are to be ascertained in a murmur.

Timing and duration

Based on this, murmur is classified into

- Systolic (murmur heard between S1 and S2)
 - ❖ Ejection systolic
 - ❖ Pan systolic
 - ❖ Early systolic
 - ❖ Late systolic
- Diastolic (murmur heard between S2 & S1)
 - ❖ Early diastolic
 - ❖ Mid diastolic
 - ❖ Late diastolic
- Continuous (murmur heard both during systole and diastole without any relation to the heart sounds)

Point of maximum intensity

Describe the area where the murmur is maximally heard.

Frequency (Pitch) and shape and character

Murmurs can be low, medium or high pitched. The murmur shapes also vary. An ejection systolic murmur has a crescendo decrescendo shape; late peaking of such a murmur indicates the organic nature of the murmur. An early diastolic murmur of AR has decrescendo shape. Usually the high pitched murmurs are soft and blowing in character, whereas low pitched murmurs are rough and some of them are rumbling. A continuous murmur is sometimes described as a machinery murmur.

Intensity

Based on the intensity, murmur is graded as follows: (Levine and Freeman's grading)

- Gr1 Murmur which is not heard immediately on auscultation requires a quiet

surrounding and an experienced listener and repeated auscultation.

- Gr 2 A soft murmur immediately audible in quiet surroundings
- Gr 3 A prominent murmur
- Gr 4 A loud murmur with a thrill
- Gr 5 A still louder murmur can be heard with the edge of the steth touching the chest.
- Gr 6 A murmur audible with the steth held off the chest or without the steth.

Conduction and transmission

Conduction means the selective propagation of a murmur along a line so that it is heard with the same or sometimes greater intensity.

Transmission or radiation means that the murmur is heard with lesser intensity away from the original site.

Dynamic Auscultation

These are required in selected cases like HCM or when it is needed to differentiate between common murmurs.

1. Variation with respiration

This should always be looked for with slow regular respiration. Murmurs generated in right heart, RVS3 and RVS4 increase in intensity with inspiration.

Pulmonary ejection click decrease during inspiration.

2. Passive leg raising

With patient lying supine an assistant is called to lift up one leg while auscultating.

3. Squatting and standing

Here while auscultating, the examiner also has to move with the patient to the squatting position (or sit on a stool) and back.

4 . Valsalva

The patient is asked to blow into the tubing of a BP cuff to elevate the mercury column upto 40 mm Hg (for at least 15 seconds for the characteristic hemodynamic changes to occur). Look for changes during the strain phase and soon after release of pressure.

5. Isometric Hand grip

Auscultation should also be carried out over other areas of chest including back and supraclavicular areas.

References:

Heart disease- Braunwald

Text Book of Cardiovascular Medicine – Abrams

Harrisons Principles of Internal Medicine (18th edition)

Hutchinsons Clinical methods.

EXAMINATION OF THE GASTROINTESTINAL SYSTEM

GENERAL EXAMINATION

In addition to the points in general examination, mention (only if present)

Signs of chronic liver disease

Signs of liver failure

EXAMINATION OF THE UPPER GI TRACT

- *Patient should be sitting up in bed*
- *Use torch and tongue depressor*

INSPECTION

1. Lips

Look for scar of repaired cleft lip, cracks or fissures, cheilosis, rhagades, cheilitis, vesicles, cysts, ulcer, nodule, circumoral pigmentation, chancre, telangiectasia and aphthous ulcers(after everting lips)

2. Gums

Look for gingivostomatitis, stippled blue line, swelling, bleeding, hypertrophy, epulis (any swelling arising in the gum of the maxilla or mandible)

3. Teeth

Look for tartar, stains, maldon teeth (chalky white patches or a dull unglazed appearance sometimes with pitting and brown staining – endemic fluorosis), Hutchinson's teeth, loss of central incisors, ridging, widely spaced lower teeth.

4. Tongue

Look for ankyloglossia or tongue tie (inability to protrude tongue fully), deviation, size, tremor, colour, moistness, fur, papillae, leukoplakia, lingual thyroid, geographical tongue, sides and undersurface of tongue for carcinoma, ranula, sublingual dermoid, ulcer, thrush, macroglossia.

5. Buccal mucosa

Look for parotid duct opening (vestibule of mouth next to maxillary second molar tooth), Koplik's spots

(bluish white area surrounded by a red areola), slate grey/blue pigmentation (suggestive of Addison's disease), ulcers, white opalescent patches (leucoplakia, lichen planus), thrush.

6. Palate, fauces, tonsils and pharynx

Look for ulcer, erythema, vesicles, swelling, perforation, petechiae, tonsillar exudates, peritonsillar/retropharyngeal abscess, ectopic salivary gland.

7. Breath

Look for halitosis (caries teeth, gingivitis, stomatitis, retention and decomposition of secretion in enlarged tonsils) and characteristic odours(fruity-ketosis, fishy-uraemia, mousy-hepatic failure, putrid-suppurative lung diseases)

PALPATION

For post graduates: *Palpate sides of tongue, floor of mouth, tonsillar region and buccal mucosa*

EXAMINATION OF OESOPHAGEAL FUNCTION

Look for ability to swallow solids and fluids – if any abnormality, mention.

EXAMINATION OF ABDOMEN

The abdomen is divided into 9 regions by 4 planes

Two vertical planes: Midclavicular lines.

Two horizontal planes: Subcostal, connecting the lowest points of the costal margins and inter tubercular, connecting the tubercles of the iliac crest.

INSPECTION

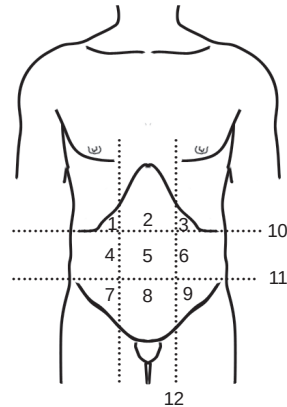
Patient lying flat on his back on a firm couch/mattress with arms by side.

Abdomen including groins and external genitalia, upto mid thigh fully exposed.

Observe from different positions for the following:

Nine quadrants of abdomen

1. Right hypochondrium
2. Epigastric
3. Left hypochondrium
4. Right Lumbar
5. Umbilical
6. Left Lumbar
7. Right Iliac fossa
8. Hypogastrum
9. Left Iliac fossa
10. Subcostal plane
11. Transtubercular plane
12. Midclavicular line



1. Shape

- Normal: Flat / slightly depressed
- Scaphoid: Malnutrition, malignancy
- Fullness: Mention whether generalized / localized / fullness in flanks

2. Umbilicus

- Normal: Slightly retracted and inverted
- Look for eversion / omphalolith / hernia.

3. Movements of abdominal wall

- With respiration (look after shining a light across abdomen). Mention whether normal and free / absent / reduced.
- Look for visible peristalsis and visible pulsations.

4. Skin and surface of abdomen

- Look for striae atrophica / striae gravidarum / purple striae / scars.
- Pigmentation of abdominal wall. Localised bulging or retraction

5. Superficial veins

Observe with the patient in standing posture. Direction of flow to be mentioned by milking method of palpation. Direction of flow is from above downwards in SVC obstruction, below upwards in IVC obstruction and away from umbilicus in portal hypertension. Look for Caput Medusae, Flank veins / veins over back (IVC obstruction), localised (over areas of inflammation / malignancy).

Look for Hernial Orifices and External Genitalia

PALPATION

(conventional method is to palpate the organs (liver and spleen) which are enlarged commonly and then to palpate other organs)

Patient relaxed and breathing quietly. Enquire about any site of pain and come to this site last. Knees flexed (optional) with head turned to opposite side, take deep breath through mouth. Look at the face of the patient while looking for tenderness.

Types of Palpation

- Superficial
- Deep
- Dipping palpation (when there is ascites).

In an obese or very muscular patient, putting the left hand on top of the right will allow you to exert increased pressure.

Superficial palpation

Tenderness / temperature / doughy feel / Sister Joseph nodule / rigidity/guarding and also to gain confidence of the patient.

For palpation of organs, an optional scheme is suggested.

Start in the left iliac region palpating lightly. Work anticlockwise to end in the supra pubic region. Feel in

order for left kidney, spleen, right kidney, liver, urinary bladder, aorta, paraaortic glands and common femoral vessels.

1. Left kidney

Right hand anteriorly in the left lumbar region, left hand posteriorly in the left loin. Ask the patient to take a deep breath in. Press left hand forwards, right hand backward, upward and inward. Left kidney not palpable unless low in position or enlarged. If palpable, look for bimanual palpability and ballotability.

2. Spleen

Start palpating from right iliac fossa and move up to the left costal margin. With each inspiration, look out for splenic enlargement. If not felt, move upwards on each occasion. If not palpable in the supine position ask the patient to lie on his right lateral side, ask him to relax backwards on the examiner's left hand which is now supporting the left lower ribs and repeat the examination. Place the right index finger parallel to the left costal margin and ask the patient to take deep inspiration.

Middleton's Hooking Maneuver: With the patient supine, approach the patient from the left side, hook your fingers under the left costal margin. Ask the patient to breath in, and feel for the spleen tip.

Describe size, surface, consistency, tenderness and distance from the left costal margin. Look for splenic notch.

Splenomegaly:

- upto 2 cm – mild
- 2-7 cm – moderate (or upto umbilicus in midline)
- >8cm – massive (or crossing the midline)

3. Liver

Start from the right iliac fossa and ascend upwards

to right costal margin in order not to miss the edge of a massive liver. Place right hand below and parallel to the costal margin. Ask the patient to breathe in deeply and at the height of inspiration press the fingers firmly inwards and upwards. If the liver is palpable it will be felt as a sharp regular border which rides beneath the fingers. Repeat the manoeuvre from lateral to medial to trace the liver edge.

Describe the size as palpable ___cm below right costal margin in the midclavicular line, midaxillary line and midsternal line.

Mention about consistency, surface, border, tenderness, pulsatility and liver span. Look for Reidel's lobe also.

Firm consistency goes with sharp border and soft consistency with rounded border.

For pulsatility, patient lies supine, one hand of the examiner placed over the right lower ribs posteriorly and the other over the liver in the right upper quadrant, anteriorly. The two hands tend to separate with each expansile pulsation of the liver. A second method is to maintain pressure with a closed fist over the ribs overlying the anterolateral surface of the liver; with each pulsation, the fist moves upwards and outwards.

4. Right Kidney

Right hand placed horizontally in the right lumbar region anteriorly. Left hand placed posteriorly in the right loin. Push forwards with the left hand, ask the patient to take a deep breath in and press the right hand upwards and inwards. Unlike the left kidney the lower pole of the right kidney is frequently palpable in thin individuals.

5. Gall Bladder:

Palpated in the same way as liver. Normally, GB cannot be felt. When distended, GB is felt as a firm,

smooth, rough or globular swelling with distinct borders just lateral to the edge of rectus abdominis near the tip of the 9th costal cartilage. Moves with respiration, upper border is not felt and not bimanually palpable. Better seen than felt.

Murphy's sign: In acute cholecystitis- keep the examiner's right hand at the lateral border of rectus abdominis at the junction with the 9th costal cartilage. Ask patient to take deep inspiration. Murphy's sign is said to be positive if patient suddenly halts breath in mid inspiration due to pain.

6. Urinary bladder

Is not normally palpable. In urinary retention, it may be felt as mass in the suprapubic region with distinct upper and lateral borders. The lower border is not made out. Pressure over it gives a desire to micturate.

7. Aorta and common femoral vessels

Aorta is not readily palpable in most adults. Extended fingers of both hands held side by side are pressed deeply into the abdominal wall a little above and to the left of umbilicus. When an aortic aneurysm is present, its expansile nature is made out by placing a finger on either side of it and the width between the fingers increases with each pulsation.

Also, palpate along the left border of Aorta to look for paraaortic nodes.

The common femoral vessels are felt just below the inguinal ligament at the midpoint of anterior superior iliac spine and pubic symphysis. Use pulp of index, middle and ring fingers of the right hand. Compare the strength and character on both sides.

8. Palpable mass

Describe its site, shape, surface, edge, consistency, mobility and attachments, whether bimanually palpable or not and whether pulsatile or

not. Comment whether retroperitoneal, intra abdominal or parietal. Also mention whether you are able to get above and get below the swelling.

9. Dipping palpation

Done in ascites. The palm of hand is placed firmly on the abdominal wall and the organs below are palpated by sharp, flexing movements of the palm at metacarpophalangeal joint. The sharp movement displaces fluid and fingers feel the organ.

10. Abdominal girth

In patients with ascites (at level of umbilicus).

PERCUSSION

To detect the boundaries of abdominal organs and masses.

To detect ascites and differentiate from ovarian cyst and intestinal obstruction.

1. Liver

Start from the 2nd right intercostal space. Go vertically down. Dull note at the 5th right intercostal space in the midclavicular line, 7th right intercostal space in the midaxillary line and 9th right intercostal space in the scapular line is the normal upper border. This dullness extends down to the lower border found at or just below the right subcostal margin.

Light percussion from below upwards to detect lower border of an enlarged liver.

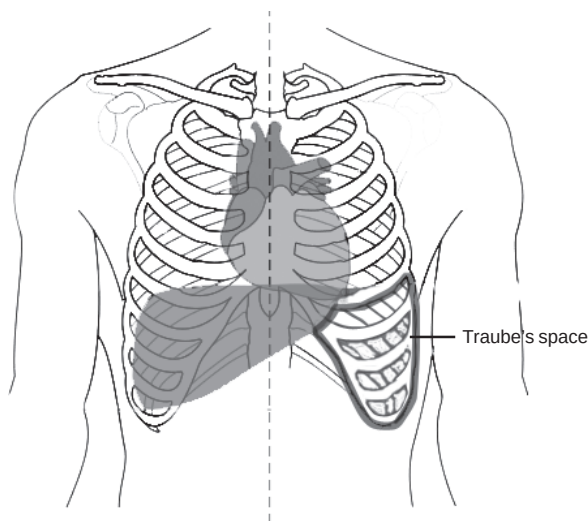
Normal liver span: 10-12cm in males; 9-11cm in females.

2. Spleen

Traube's space is more sensitive for splenic enlargement. It's superior boundary is formed by horizontal line extending laterally from the apex, laterally by the left midaxillary line, inferiorly by the left costal margin and medially by the lower border of the

liver. During normal breathing the space is percussed out from the medial to lateral, yielding resonant note.

- a. *Nixon's method*: The patient is placed on the right side so that the spleen lies above the colon and stomach. Percussion begins at the lower level of pulmonary resonance in the posterior axillary line and proceeds diagonally along a perpendicular line toward the lower midanterior costal margin. The upper border of dullness is normally 6–8 cm above the costal margin. Dullness >8 cm in an adult is presumed to indicate splenic enlargement.
- b. *Castell's method*: With the patient supine, percussion in the lowest intercostal space in the anterior axillary line (8th or 9th) produces a resonant note if the spleen is normal in size. This is true during expiration or full inspiration. A dull percussion note on full inspiration suggests splenomegaly.



Boundaries of Traube's space

3. Bladder

Yield dull note.

4. Other masses:

If there are any other intra abdominal masses, its borders should be percussed out.

5. Ascites

- a. *Puddle sign*: Method for detecting minimal ascites. For puddle sign to be positive, minimum 120ml fluid is required. To elicit this sign, patient lies in the prone position for five minutes after which the patient goes on to knee elbow position so that the middle portion of the abdomen is dependent. One flank is then percussed by repeated flicking at a constant intensity and the diaphragm of stethoscope placed on the most dependent portion of the abdomen. The stethoscope is then gradually moved to the flank opposite the percussion note. A change in the intensity and character of percussion note, as the stethoscope is moved towards the opposite flank, denotes the presence of fluid. The patient then sits up while the examiner holds the stethoscope on what was the most dependent portion of the abdomen. A loud and clear percussion note in this position confirms the initial finding.
- b. *Shifting Dullness*: If flank dullness is present, 1000-1500ml fluid is present. Then look for shifting dullness. Patient in supine position. Examiner keeps the pleximeter finger of the left hand vertically oriented in the midline pointing upwards. The abdomen is then percussed from centre to the flanks. Once dullness is obtained, patient is turned to the opposite side. Wait for 30 seconds keeping the finger over the dull area. Percuss over the finger to elicit resonance

in the previously dull area. Percuss down towards the midline with the patient still in the lateral position till you get a dull note to confirm that the fluid has shifted.

- c. *Fluid thrill*: Patient in supine position. One hand of the examiner is placed over the lumbar region on one side and the opposite side is flicked or tapped with the fingers of the other hand. A distinct vibration will be felt on the palpating hand. To avoid fallacy of an impulse being transmitted through fat, an assistant is asked to place the ulnar border of his hand firmly in the midline of abdomen. This dampens vibration through abdominal wall.

Renal angle percussion: the renal angle is bounded by the 12th rib superiorly and the lateral border of erector spinae. It is normally resonant due to colonic gas. When there is renal enlargement, it becomes dull. Tenderness is elicited in renal abscess and pyelonephritis.

- d. *Ovarian cyst*: flanks resonant, central dullness.
e. *Intestinal obstruction*: resonant throughout and distended abdomen.

AUSCULTATION

1. Bowel sounds

Stethoscope to be placed on one site over the abdominal wall (just to the right of umbilicus is best). Should not be moved from site to site. Wait for 1 minute.

Normal bowel sounds is 3 per minute.

2. Succussion splash

Elicited 3 hours after the patient's last meal. Patient lies supine. Place stethoscope over epigastrium with palm of hand. Roll the patient from side to side. (Seen in gastric outlet obstruction)

3. Bruits

- Aortic: Above and to the left of the umbilicus.
- Renal: Either side of midline in mid abdomen or over the loins- systolodiastolic bruit. (renal artery stenosis).
- Common iliac artery: Iliac fossa
- Common femoral artery: Groin
- Coeliac trunk/ superior mesenteric arteries: Epigastrium.

4. Venous hum

Continuous hum/murmur along a line due to patent umbilical vein in portal hypertension. Heard between umbilicus and right hypochondrium.

5. Hepatic friction rub

In Hepatocellular carcinoma. To and fro scratchy sound with respiratory variation.

6. Hepatic bruit

In Hepatocellular carcinoma, Hemangioma.

7. Splenic rub

In splenic infarct. To and fro scratchy sound with respiratory variation.

8. Uterine souffle

continuous murmur heard over gravid uterus.

EXAMINATION OF GROINS

Inspection and palpation in supine and standing position for inguinal and femoral hernia. Look for impulse on coughing. Also look for any scrotal swelling.

EXTERNAL GENITALIA

Loss of hair, phimosis, epispadias to be mentioned

Testis:

- Note whether both testis are in the scrotum
- Look at the levels- normally left is at a lower level.

- Look for any testicular swelling.
- Look for testicular sensations
- Atrophy - normal size is 3cm diameter. If <2.5cm- atrophy. Ideally measured by orchidometer.

ANUS AND RECTUM

Inspect for fissures, prolapse, skin tag, ulcers, abscesses, condylomata, fistula, pilonidal sinus, perianal haematoma.

PER RECTAL EXAMINATION

Look for Rectal mass. Look for prostate in males. In females look for any mass in Pouch of Douglas, cervix. Look for mucus, pus, blood on withdrawing finger.

Assess tone of anal sphincter when necessary.

References

Hutchison's Clinical Methods

Clinical Medicine- K. V. Krishna Das

EXAMINATION OF THE NERVOUS SYSTEM

- Mental functions
- Examination of cranial nerves
- Motor system
- Sensory system
- Autonomic nervous system
- Signs of meningeal irritation
- Examination of peripheral nerve
- Examination of skull and spine
- Examination of unconscious patient

MENTAL FUNCTIONS

First, note the patient's

1. Educational Status
2. Occupation
3. Handedness
4. Knowledge of languages

Then the actual examination is done in the format given below:

1. Level of consciousness
2. Orientation
3. Attention
4. Memory
5. Speech
6. Intelligence
7. Appearance and behaviour
8. Mood, delusions and hallucinations

1. Level of consciousness

Assess the level of consciousness of the patient and report as per the guidelines given below

- **Alert:** When the patient is fully aware of oneself and surroundings.
- **Confusion:** Patient is unable to think with the customary speed and clarity.
- **Delirious:** When the patient is in a confusional state with increased psychomotor activity.
- **Lethargic/Drowsy:** When the patient is unable to sustain wakeful state in the absence of external stimulus.
- **Obtunded:** When the patient is able to answer only in response to painful stimulus.

- **Stupor:** when the patient groans to painful stimulus.
- **Coma:** when no response is obtained even with deep painful stimuli.

A relatively objective method of assessing the level of consciousness is using the Glasgow Coma Scale given below, which may be used in appropriate situations.

Glasgow Coma scale

Eye Opening Response	Spontaneous opening with blinking	4
	Opens to verbal command, speech or shout	3
	Opens to pain(not applied to face)	2
	Absent	1
Verbal response	Well oriented	5
	Confused conversation, but able to answer questions	4
	Inappropriate responses, words discernible	3
	Incomprehensible speech	2
	Absent	1
Motor response	Obeys commands for movement	6
	Purposeful movements on painful stimulus	5
	Withdraws from pain	4
	Abnormal(spastic) flexion, decorticate posture	3
	Extensor(rigid) response, decerebrate posture	2
	Absent	1

2. Orientation:

It is assessed in three aspects.

- **Time:** ask the patient to tell the approximate time, day, date, month, and year.
- **Place:** See if the patient knows that he/she is in the hospital. Ask the place, floor, town, state, and country where he/she is at present.

- **Person:** Ask the patient about himself, bystanders, the treating doctor, nurse, attendant and co-patients.

3. Attention:

To assess attention

- Observe whether the patient is attentive to questions put to him, to environmental cues and to the bystanders
- Ask the patient to serially subtract 3 / 5 / 7 from 100.

4. Memory:

- **Immediate memory:** Ask the patient . To repeat 5 digits forward and 3 digits backward.
- **Recent memory:** Ask the patient
 - What he had for breakfast.
 - To recall the words “chuvapu”, “kasera”, “sathyasandhatha” .
 - To recall the position of hidden objects
- **Remote memory:** Ask the patient
 - Some personal information like the school in which he studied, his first job etc.
 - About date of social events for eg, “Independence day”
 - About events in the family like son's marriage.

5. Speech

The purpose of assessment of this examination is to detect whether the patient has aphasia, dysarthria, dysphonia or normal speech.

Aphasia: is the loss or impairment of the production and/or comprehension of spoken or written language due to an acquired lesion of the brain.

To detect aphasia, follow the scheme of examination given below and report each of the following parameters as normal or impaired.

(i) Fluency

For assessing fluency in a sample of spontaneous speech the following points are scrutinized.

1. Word Output (normal is 50 - 150 / mt)
2. Word finding difficulty
3. Initiation difficulty
4. Circumlocution
5. Grammar
6. Prosody
7. Paraphasias
8. Neologisms

(ii) Comprehension

To assess comprehension

- Ask the patient to point to fan, light, nose etc. If he is able to point correctly, his single word comprehension is normal.
- Next give the patient multi-step command like ‘Point to nose, shirt and cot’ to check the patient's ability to comprehend sequence of words.
- Then ask the patient questions, which can be answered by Yes or No response like - Is this a hotel?, Is it raining today? Is it daytime?

(iii) Repetition

Ask the patient to repeat the following words.

- Ball
- ഭാരതപ്പുഴ (Bharathappuzha)
- ഞങ്ങൾ എല്ലാവരും അവിടെ ഒരുമിച്ചു പോയി. (Njangal ellavarum avide orumichu poyi)
- രാമൻ ഇവിടെ ഉണ്ടായിരുന്നെങ്കിൽ അവനെ ചന്തയ്ക്ക് പറഞ്ഞു വിടാമായിരുന്നു. (Raman ivide undayirunnengil avane chantheyilekku paranju vidaamayirunnu)

(iv) Naming and Word Finding

The following points regarding naming and appropriate word finding are then checked (as far as possible in colloquial language)

- Ask the patient to identify and name the colours -red, green, blue and yellow.
- Check the ability to name the body parts like eyes, nose, teeth, eyelash, eyebrow etc.
- The ability to name objects in the room like watch,door, shirt, fan etc.

(v) Reading

Confirm whether the patient is literate, and if so, check whether he/she

- Can read words/sentences/paragraphs
- Can comprehend what he is reading (assess by asking simple questions based on the material read)

(vi) Writing

Next the patient's ability to write the following matter is evaluated

- Letters and numbers to dictation - ("Thala, "Aashupathri")
- Short sentence describing the disease
- Copying a sentence - "Njan ee aashupatriyil chikilsakkayi vannu"

Dysarthria

Is speech abnormally produced by defective articulation and enunciation of syllables. The characteristic features of various types of dysarthrias are given below

- **Spastic**
 - ❖ Increased effort
 - ❖ Syllables running into one another

- **Flaccid**

- ❖ Nasal twang is characteristic
- ❖ There can be abnormalities of linguals (*la, tha*), labials (*ma, pa*) and gutturals (*nga*).

- **Ataxic**

- Staccato - undue emphasis on syllables
- Scanning - undue separation of syllables

- **Dyskinetic**

- Unexpected punctuations due to dyskinesia

The aphasic syndromes are classified as

Type of aphasia	Naming	Fluency	Comprehension	Repetition
Nominal	Impaired	Normal	Normal	Normal
Brocas	Impaired	Impaired	Normal	Impaired
Wernickes	Impaired	Normal	Impaired	Impaired
Global	Impaired	Impaired	Impaired	Impaired
TCMA*	Impaired	Impaired	Normal	Normal
TCSA**	Impaired	Normal	Impaired	Normal
Isolation***	Impaired	Impaired	Impaired	Normal
Conduction	Impaired	Normal	Normal	Impaired

* Transcortical motor aphasia

** Transcortical sensory aphasia

*** also called mixed Transcortical aphasia

6. Intelligence:

- Assessed based on the educational status of the patient.
- Intelligence is compared with that of the sibling.
- Assessed based on the vocabulary of the patient.

7. Appearance and behavior

Note whether the patient is

- Well dressed
- Clean / Shabby

- Cooperative
- Indifferent
- Uninhibited

8. Mood

Assess whether the patient is

- Normal
- Euphoric
- Depressed
- Unstable

Delusions: are false beliefs which are continued to be held despite evidence to the contrary.

Hallucinations: are false sensory perception in the absence of any stimulus.

Illusions: misperception of a stimulus.

EXAMINATION OF THE CRANIAL NERVES

I. Olfactory nerve

Make sure that the nostrils are patent. Use only familiar substances like coffee powder and asafoetida for checking odour. Avoid using irritant smells like ammonia which may stimulate the sensory fibers of Trigeminal nerve. Check each nostril separately. Ask the patient to close one nostril and sniff the test substance. Repeat the same with other nostril.

First ask the patient whether he can appreciate any smell and if so identify it. Make a note regarding the presence of Parosmia or Olfactory hallucination.

II. Optic Nerve

1. Visual Acuity

Ideally check with Snellen's chart. A modified bedside chart can be used (Rosenbaum chart and modified Snellen's chart).

Method: Test each eye separately. For checking one eye cover (but do not close) the opposite eye, To assess the vision ask the patient to read a sample printed material at a specified distance, if the patient is literate. If the patient is unable to read it then assess finger counting at one meter. If finger counting is also defective look for perception of hand movement and if even that is impaired look for perception of light.

To assess distant vision ask the patient to read the number on top of the opposite bed

2. Visual field

The purpose of bedside examination of visual field is to chart the visual fields and to detect any scotomata / field defects.

Methods:

- a. Confrontation method: Test each eye separately. Explain the procedure to the patient. The examiner should sit at 1 meter from patient

and the eyes of the examiner and the patient should be at the same level.

To test patient's right eye, ask him to cover his left eye with his left hand eye, pads can be used in hemiplegics) and gaze directly in to your left eye.

Cover your right eye with your right hand and gaze in to patient's right eye. Hold your left hand in a plane midway between you and patient. Move the finger from periphery to centre. Use moving and stationary fingers. Test the field in all 4 quadrants in both eyes (not diagonal). Finally both eyes are tested together, to check for any visual Inattention.

- b. Menace reflex: In bedridden patients, an approximate idea of visual field can be assessed by Menace reflex. Ask the patient to fix gaze on the roof. Bring the hand (kept at an angle) rapidly towards the patient's eye from each quadrant (taking care that not to blow air into the patient's eye) and look for reflex eye closure,
- c. In bedridden patient, ask the patient to fix gaze on the roof and bring the examiner's finger from the sides towards the center and assess when the patient can see them.

3. Colour Vision:

Assess whether the patient can appreciate Red, Green, Yellow and Blue colours. Ideally use Ishihara's letter charts. Coloured papers may be used if letter charts are not available.

4. Optic Fundus:

Examination of fundus provides an unique opportunity to directly visualize the blood vessels and nerves in a live person.

A good quality ophthalmoscope, a dim lit room and a reasonably dilated pupil are essential for a proper examination of the fundus.

Method: Diminish the illumination in the room. Patient can either be in sitting or supine position. Ask the patient to look at a distant point, which is clearly defined and instruct the patient not to look at the light of the ophthalmoscope. Use examiner's right eye for examining the patient's right eye and left eye for examining the left eye. The examiner's eye, aperture of scope and the patient's pupil should all be in a straight line. First, focus on the iris and the pupil and look for red reflex. Bring the scope as close to the patient's eye as possible and direct the beam of light slightly nasally. Take care not to shine the scope directly on to the macula initially, since it can elicit pupillary reflex resulting in constricted pupil rendering further viewing difficult.

Look for:

- 1. Disc - colour, contour, shape margins & vessels crossing
- 2. Optic Cup and cup: disc ratio.
- 3. Peridiscal area
- 4. Retina - Vessels, hemorrhages and exudates
- 5. Macula - Edema, degeneration and star

III. IV. VI (Oculomotor, Trochlear, Abducent)

The actions of these nerves are so closely linked that they are considered together. First you look for abnormalities on inspection of the eyes.

1. Eyelid:

- a. Lid retraction
- b. Partial ptosis (Horner's Syndrome): Look for ptosis, miosis, enophthalmos, anhydrosis and absence of ciliospinal reflex.
- c. Complete ptosis – 3rd nerve palsy
- d. Proptosis
- e. Squint: convergent or divergent.

2. Double vision: (for post graduates)

Is it binocular or uniocular? Is it horizontal separation or vertical separation of images? Diplopia maximum on looking to which direction? Identify the muscles involved by looking at the movement of eyeball.

3. Saccade: (for post graduates):

Ask the patient to look straight at your face and then to the left quickly (left saccade). Then ask the patient to look straight at the examiners face and then to the right (right saccade). Look for the initiation of saccade. We will not be able to follow the eye ball during normal saccadic eye movement.

4. Pursuit: (for post graduates):

Ask the patient to follow your slow moving finger. Look for the smooth pursuit movement of the eyeball.

5. Convergence:

Keep your finger about 22 cm in front of and at the level of the nasion. Patient is initially instructed to look at a distance and then quickly look at the tip of your finger in front of the nasion. Look for the convergence of eyeball. Look for the constriction of the pupil. **(Accommodation reflex)**.

6. Movements of the eyeball:

(in all cardinal directions). Look at a clear and definite point. Look for movements to right, left, up and down in the midline and up and down when the eyes are deviated to one side. Hold each deviation for at least 5 seconds and observe lagging of one or other eye. Now look for any gaze palsy (ask the patient to look in all 4 directions (Right, Left, Up and Down) or internuclear ophthalmoplegia (i.e. while looking for gaze, there will be defective adduction of the affected eye and the abducting eye will show nystagmus).

7. Nystagmus:

Method: First ask the patient to look straight ahead and observe for any nystagmus in the primary position. Then ask the patient to hold the gaze at 45° to the right for 5 to 30 seconds. Then this is repeated to the left side.

See if there is nystagmus. Is it jerky nystagmus or pendular?

Is it pure horizontal, pure vertical or pure rotary? Is it mixed horizontal rotary?

Is it fine or coarse? Is it gaze evoked?

Down beat nystagmus is best elicited in the out and down direction.

8. Pupil

- Size
- Shape
- Equality
- Regularity
- Light Reflex - Direct & Consensual
- **Direct reflex:** Here a bright beam of light is shown suddenly from the sides of the patient, torch should not be shown directly to the pupils first (because it may elicit accommodation). (Afferent 2nd nerve, centre midbrain, efferent 3rd nerve).
- **Consensual reflex:** Here with the help of an assistant, shine a lighted torch from below to provide background illumination, allow some time for the pupil to adapt -then keep a card or book between the two eyes of the patient, and shine light in to one eye and look for pupillary constriction of other eye.

- **Relative Afferent Pupillary Defect (Marcus Gunn pupil):** Use the swinging flash light test. First shine torch in to the abnormal eye, there will not be any direct pupillary reflex nor there will be any consensual reflex on the other eye (since there is afferent defect). Now shine the torch into the normal eye, it will show a direct pupillary reflex and also a consensual reflex will be present in the abnormal eye. Now you swing back the light into the abnormal eye and you can see the pupil dilating since it was already constricted by the consensual reflex.

9. Accomodation reflex (discussed along with convergence)

V. Trigeminal Nerve

1. Motor part

The muscles tested are Temporalis, Masseter and Pterygoids.

Inspection: Note the symmetry of the temporal fossae and the angles of the jaw.

Palpation: While clenching the teeth, palpate the masseters and the temporalis.

Apply resistance while the patient attempts to open his/her mouth to test for pterygoids.

2. Sensory part

Each side of the face is tested separately for pain, light touch and temperature sensations. Care is taken to avoid midline structures. The forehead and upper part of the side of the nose and scalp anterior to the vertex (Ophthalmic division), the malar region and upper lip (maxillary division), the chin (Mandibular division).

3. Reflexes

• Corneal reflex

Method: Explain the procedure to the patient. Ask the patient to look up and out. Support your hand on the malar eminence of the patient. Using a wisp of sterile cotton, touch near the limbus (do not touch the central part of cornea). The response expected normally is a sudden, brisk blinking of same eye lid (direct corneal reflex - afferent 5th nerve and efferent 7th nerve) as well as simultaneous contraction of opposite eye lid (Consensual corneal reflex - afferent 5th and efferent 7th).

If there is ptosis, one can keep the eyelids open using the fingers and elicit the reflex in the same manner and feel for the contraction of the lids.

• Conjunctival reflex

Method: Here you touch the bulbar conjunctiva. The procedure is similar to that of corneal reflex. Cornea is mainly sensitive for pain and conjunctiva is for touch, so in rare cases, dissociation between the two reflexes can occur even though the afferent and efferent are the same. So it is important to look for both these reflexes.

• Jaw jerk

Method: Ask the patient to keep the jaw slightly open. Keep your forefinger or thumb below the lower lip. Tap in a downward direction with a percussion hammer. Normally there is a slight palpable upward jerk. Afferent and efferent 5th nerve. It may be absent in many normal individuals.

VII. Facial Nerve

Observe whether:

- Facial palsy present or not
- Is it unilateral or bilateral

- Upper Motor Neuron (UMN) or Lower Motor Neuron (LMN) type: In UMN facial palsy only the lower half of the face is involved and in LMN palsy both upper and lower half of the face will be involved.
- Localize the level of lesion
- Postulate the etiology

Motor Part

- Muscles of facial expression
- Nerve to stapedius
- Secretomotor

1. Muscles of facial expression

- **Wrinkling of forehead:** Wrinkling of the forehead will be reduced on the affected side in case of a LMN type of facial palsy due to involvement of frontal belly of Occipitofrontalis muscle. Ask the patient to look up or raise the eyebrows and look for the wrinkles on the forehead.
- **Blinking:** Blink rate will be reduced on the affected side in LMN palsy.
- **Bell's phenomenon:** Here you ask the patient to close the eyes and you can see the eye balls rolling upwards and outwards. This will be present in LMN facial palsy. In UMN palsy it will be absent.
- **Forced eye closure:** Ask the patient to close the eyes tight enough to bury the eyelashes. This will be defective in a LMN facial palsy. If the patient can close, try to overcome the closure with your fingers - normally this is not possible. This is a test for the Orbicularis oculi muscle.

- **Naso labial fold:** Will be less prominent on the affected side for both LMN and UMN palsy.
- **Smile/show the teeth:** The angle of mouth will deviate to the side opposite to the side of palsy. (risorius).
- **Blowing the cheek:** Ask the patient to purse the lips and blow the cheek. Look for the symmetry of both sides and try to expel the air by pressing on either side. (Buccinator).
- **Whistling:** Ask the patient to whistle (orbicularis oris).
- **Platysma:** Ask the patient to bare the teeth and open his mouth at the same time, look and palpate for the contraction of platysma along the inferior border of mandible and lateral aspect of neck. The muscle can be seen and felt to stand out. It is better to show the patient how to put platysma into action.
- **Involuntary movements:** Look for any twitching movements or contractures.

Nerve to Stapedius: Ask for hyperacusis. Usually a subjective assessment is enough.

Secretomotor function: Look for any drying of eyes (xerosis). Salivary secretion is not tested.

2. Sensory Part

- **Special Sensation - Taste in the anterior two third of tongue:** Strong solutions of common tastes are used- Sugar, Salt, Sour and Bitter. 2 solutions are enough for bedside testing (Sugar and Salt). Use freshly prepared solutions. Describe the procedure to the patient. Tell the patient to show or write the tastes as 1, 2 and 3 for Sugar, Salt and Don't know respectively. Protrude the tongue of the

patient, you may use a gauze to hold the tongue. Apply one or two drops of sugar solution to one side of the dorsum of tongue. Ask the patient to indicate the taste, without taking the tongue inside the mouth. Keep the tongue outside the mouth during the whole test. Wash the mouth and repeat with the second taste. Taste in the anterior two third of tongue is impaired in lesions of chorda tympani nerve. Each half should be tested separately.

- **Somatic sensation:** Look for any vesicles in the external auditory meatus (Ramsay Hunt Syndrome).

Fallacies:

- Some degree of facial asymmetry may occur normally.
- LMN lesion if long standing, can lead to contractures and angle of mouth may deviate to the affected side.
- UMN lesions may rarely involve some part of the upper face.
- In Bilateral lesions, the upper and lower halves of the face are universally involved. In this situation differentiation between an UMN and LMN type of paralysis can be made on following grounds.
 - a. The absence of Bell's phenomenon, dissociation between emotional and volitional function, the presence of long tract signs and exaggerated facial reflexes indicate an UMN facial palsy.
 - b. Loss of taste in anterior 2/3rd of tongue and hyperacusis favours LMN type of paralysis.

VIII. Vestibulocochlear nerve

Inspection : look in the external auditory meatus for any ear wax , discharge or perforation.

A. Cochlear part

1. Rinne test:

Normally air conduction is better than bone conduction. In conductive deafness, bone conduction will be better than air conduction.

In sensory neural deafness, both air conduction and bone conduction are decreased. But still air conduction is better than bone conduction.

Method: Tuning fork of 512 Hz is used. Explain the procedure to the patient. Activate the tuning fork by hitting on a firm surface. Avoid metallic objects which may dampen the vibrations. Keep the tuning fork over the mastoid bone on one side. Ask the patient whether he can hear anything. If so ask him to indicate when he stops hearing the vibration. Once he stops hearing it, place the tuning fork in front of the ear canal and ask for response. Normally air conduction is better than bone conduction and patient continues to hear the sound - then Rinne is said to be positive. If patient cannot hear the sound then Rinne is negative. Repeat the test in the opposite ear.

Alternate method: keep the vibrating tuning fork on the patient's mastoid process and then near his external auditory meatus and ask him which he appreciates better.

2. Weber test:

Method: Method of activating the tuning fork is similar to Rinne test. Here the base of the vibrating tuning fork is placed on the forehead of the patient in the midline. Ask the patient whether he is hearing the sound equally in both ears (normal) or is appreciated better in one ear ie; lateralized (abnormal).

In Conductive deafness the sound lateralizes to the abnormal ear.

In Sensory neural deafness the sound lateralizes to the normal ear.

3. Absolute Bone Conduction test: (For Post Graduates)

Method: Here the bone conduction of the patient and examiner is compared. Close the opposite ear of the patient with a cotton wool. Apply the vibrating tuning fork to the mastoid of the side being tested. Once the patient stops hearing the sound, apply the tuning fork to your mastoid. If you can continue to hear the sound, patient's bone conduction is defective (provided your bone conduction is normal).

Schwabach test:

Similar to ABC test but the opposite ear is not closed.

B. Vestibular part

Ask for Tinnitus and Vertigo

Look for Nystagmus

IX and X. Glossopharyngeal and Vagus

1. Observe:

Notice the pitch and quality of the patient's voice and cough. Ask if there has been any nasal regurgitation of fluids or history suggestive of aspiration.

2. Position of Uvula

Open the mouth of the patient. Look for the position of the uvula, which is normally central and will be deviated to the normal side in unilateral palsy.

3. Movements of the Palate

Look for the symmetry of the palatal arches. Ask the patient to say "Ah". Palate normally moves symmetrically upwards and backwards. In lesions of 10th nerve it will be defective in the affected side.

4. Gag reflex

Here the afferent is the 9th nerve and efferent is the 10th nerve. Ask the patient to open the mouth. Use a tongue depressor to push the tongue down. Touch the posterior pharyngeal wall (on each side separately) of the patient with a cotton tipped small stick (cotton should be tightly secured). Patient will gag instantaneously. Reflex is decreased or absent in LMN lesions and exaggerated in UMN lesions.

One can ask for the sensations from posterior pharyngeal wall if the reflex is absent, to check for the intact 9th nerve.

5. Palatal reflex

It can be tested similarly by touching the soft palate. Here there will be contraction of palate. The afferent is 5th nerve and efferent is 10th nerve.

Taste in the Posterior 1/3rd of the tongue: not usually examined.

XI. Accessory nerve

Look at Trapezius and Sternomastoid for any wasting.

The position of the head. In bilateral trapezius weakness, head will fall forward. With bilateral sternomastoid weakness head will fall backwards. Observe the patient getting up from lying down position. Normally the head will leave first from the pillow, but with sternomastoid weakness head will lag behind.

Sternomastoid: Ask the patient to turn the neck to opposite side (to the left side for testing the right sternomastoid and vice versa) against resistance.

Both sides can be tested together by asking the patient to flex the neck against resistance.

Trapezius: Stand behind the patient. Ask the patient to raise the shoulders towards the ear. Apply

resistance and assess the power. Sometimes winging of scapula can occur with trapezius weakness while abducting the shoulder.

XII Hypoglossal Nerve

1. Inspection of tongue

Inside mouth: Look for any wasting or fasciculations or fibrillation.

Ask the patient to open the mouth and protrude the tongue and look for any deviation of tongue. Tongue will deviate to the affected side on protrusion.

In UMN lesion, tongue will deviate towards the affected side when it is protruded and will be in midline when kept inside the mouth. In LMN lesions, tongue will deviate towards the affected side when it is protruded and will deviate towards the normal side when kept inside the mouth.

2. Power of tongue muscles

Ask the patient to push against the cheeks and compare both sides with your fingers.

3. Palpate the tongue

To feel for the tone. It will be spastic in UMN lesions and flaccid in LMN lesions.

EXAMINATION OF MOTOR SYSTEM

1. Bulk of Muscle

Muscle bulk is best estimated clinically by inspection and palpation. Minor abnormalities can be detected only by measurement.

Inspection: Examine the patient in the lying down, sitting and standing postures. Compare the two sides by placing limbs in symmetrical position. Inspect

Facial, Neck, Shoulder, Upper arm, Fore arm, Hand (compare the thenar, hypothenar, Interossei on both sides), Hip girdle, Thigh, Calf, Foot, Trunk and Paraspinal muscle wasting. Also look for hypertrophy. Note the affected muscles. It may be true or pseudo-hypertrophy (rubbery consistency).

Palpation: Feel the muscles with your hand. Wasted muscles have a soft and flabby feel except when fibrosed. See whether contractures are present by looking at passive movements of joints.

Measurement: Measure the circumference of the limb using tape at places equidistant from fixed bony points on either side.

- Mid arm - 10 cm above olecranon
- Mid forearm - 10 cm below olecranon
- Mid thigh - 18 cm above upper border of patella
- Mid calf - 10 cm below tibial tuberosity

A difference of up to 1 cm between the dominant and non dominant limbs is not significant.

If wasting is present, see whether

- Symmetrical/ Asymmetrical (in asymmetrical wasting, look for local problems of bones, joints etc.)
- Generalised /Proximal muscle wasting/Distal muscle wasting
- Specific patterns - Facio scapulo humeral, and scapulo-peroneal distribution etc.

Differentiate wasting from thinning - Thinning is not associated with weakness, flaccidity or reflex loss.

2. Tone of Muscle

Tone is the resistance of a muscle to passive stretch.

Position of patient: Patient should be in supine position, lying relaxed. Attention may be distracted by talking to the patient about things of mutual interest.

Test tone of muscles acting on all joints before commenting about the tone of a limb.

In the upper limbs, do flexion and extension of fingers, wrist, elbow; supination and pronation of forearm; and abduction and adduction of shoulder. In the lower limbs, do flexion and extension of hip, knee, ankle; and adduction and abduction of hip.

In case of pyramidal lesion, pronator spasticity (resistance offered on attempted supination of forearm at radio-ulnar joint while doing alternating supination and pronation) and adductor spasticity (resistance on abducting the thigh while doing alternating abduction and adduction), are the most prominent and early appearing signs. Palpate the muscle, hypotonic muscles are flabby and hypertonic muscles are stiff.

Tone is expressed as

- Hypotonia - if reduced and
- Hypertonia - if tone is increased,
- Normal tone.

Hypertonia

- **Spasticity:** Velocity dependent increase in tone. Tone is checked with increasing speed to identify spasticity. Spasticity predominantly affect antigravity muscles i.e; upperlimb flexors and lower limb extensors.
- **Clasp knife phenomenon:** sudden release after reaching a maximum.
- **Rigidity:** Length dependent increase in tone. Resistance is increased in agonist and antagonist muscles. Rigidity is a feature of extra pyramidal lesions.

- **Cog wheel rigidity:** Best elicited in forearm pronation-supination and wrist flexion – extension. There will be intermittent release in increased resistance, due to intermittent tremors superimposed on rigidity.
- **Lead pipe rigidity:** The increase in resistance is uniform throughout the movement and affects both agonist and antagonist muscles. It is usually elicited in the lower limbs.
- **Paratonia/Gegenhalten:** Refers to an increase in resistance through out the range of movement which is proportional to the degree of stretch applied by the examiner. It is seen in frontal lobe dysfunction.

Look for abnormal posturing like decorticate (arms flexed at elbow, legs extended at knee and ankle) or decerebrate (arms extended at elbow, pronated and flexed at wrist and legs extended at knees and ankles)

Hypotonia: is seen in

- LMN lesion
- Neuronal Shock
- Cerebellar lesion
- Chorea

Indirect Methods of testing tone:

- Arms may be raised and allowed to fall on bed. On hypotonic side, limb will fall without any resistance.
- Keep the forearm vertically and allow the hand to dangle. Look for the angle between hand and forearm. Normally the angle is 90°C, while in hypotonia it is acute and in hypertonia it is obtuse.
- Shake the hands by holding forearm. In case of hypotonia number of oscillation at wrist is more than three. Normally one or two

oscillations are seen. In case of hypertonia there is no oscillations.

- Roll the lower limb side by side. If ankle moves loosely side to side, it indicates hypotonia.
- Lift the lower limbs by placing both hands under the thighs: in normal tone ankle drags along the surface for variable distance. In hypotonia ankle drags along the surface of the bed for longer period. In hypertonia, immediate lift of foot from surface occurs.

Myotonia

This is a state, in which muscle contraction continues beyond the period of time required for a particular movement to be made.

Procedure:

- **Grip Myotonia:** Ask the patient to grip the fingers of the examiner and then to suddenly release the hold. In myotonia there is slow relaxation and incomplete extension of fingers on releasing the hold.
- **Percussion Myotonia:** Percuss over the thenar eminence with a percussion hammer. In myotonia there will be prolonged tonic abduction and opposition of the thumb and dimpling of the thenar muscles.

Percussion over the tongue (with a tongue depressor kept between it and the teeth to avoid injury), will produce dimpling which persists for some time.

3. Muscle Power Testing

Pre requisites

- For upper limbs, patient to be in sitting or supine position and for lower limbs supine position is needed,

- Painful condition in the limb will limit the accurate assessment of power
- Proximal joint should be fixed before testing power about a distal joint.
- In suspected UMN lesions main movements about a joint is tested eg. Flexion and extension of hip joints. This is to see if the weakness conforms to a pyramidal distribution.
- In suspected LMN lesion individual muscles should be tested to localize the lesion in the peripheral nervous system. For example to see if the unilateral weakness of abductors of shoulder is due to a root lesion, a brachial plexus trunk lesion, posterior cord lesion or axillary nerve lesion.

Grading of Muscle Power:

Muscle power is graded according to *Medical Research Council (MRC) scale*

- 5 normal power
- 4+ movement against strong resistance
- 4 movement against moderate degree of resistance
- 4- movement against mild degree of resistance
- 3 movement possible against gravity, but not against resistance
- 2 movement possible with gravity eliminated
- 1 a flicker of contraction alone
- 0 complete paralysis

Methods of eliminating gravity

Changing the position in which movement is usually carried out - which is used during routine examination

Muscle groups to be tested

- Flexion and Extension of Neck
- Adduction, Abduction, Flexion, Extension and Rotation of Shoulder joint
- Flexion and Extension of Elbow, Wrist and Fingers
- Hand grip
- Abdominal muscles
- Extensors of Spine
- Adduction, Abduction, Flexion and Extension of Hip
- Flexion and Extension of Knee
- Dorsiflexion, Plantarflexion, eversion and inversion of Ankle
- Flexion and Extension of Great toe

General principles of testing

Patient is asked to hold the limb in a position to be tested eg: abduction of shoulder. Patient is given maximum mechanical advantage eg: patient is asked to hold it at 90° abduction at the shoulder to test the deltoid muscle. Then examiner tries to overcome the limb posture for a second while the patient tries to maintain it. This method is simple and objective.

In lesions of the pyramidal tract, weakness predominantly affects hip flexors, dorsiflexors of foot, shoulder abductors and wrist and elbow extensors.

S.No	Muscle	Nerve	Root Value	Method
1	Supraspinatus	Suprascapular nerve	C5,6	Patient keeps arm abducted to 30 degree and examiner to resist this
2	Infraspinatus	Suprascapular nerve	C5,6	Patient flexes his elbow and holds it close to his side and then moves his flexed forearm outwards and examiner resists this
3	Rhomboids	Nerve to Rhomboids	C5	Patient's hands are put over the hip and he tries to force his elbows back ward against resistance
4.	Serratus Anterior	Nerve to serratus anterior/ long thorace Nerve	C5,6,7	Patient standing pushes his hands against firm resistance like against a wall, look for winging of scapula. In weakness of Serratus anterior, there is winging without rotation of scapula (i.e.medial border of scapula will be parallel to the spine) while in weakness of trapezius, winging with rotation of scapula (i.e. upper part of scapula wings more and scapula is displaced downwards and laterally).
5	Pectoralis major	Lateral and medial Pectoral Nerves	C5, 6, 7, 8, T1	Upper Fibers - Patient keeps the arm outstretched in front, above horizontal level, close together against examiner's effort to separate them. Middle Fibers - above procedure in horizontal level Lower Fibers - above procedure below horizontal level.
6	Latissimus dorsi	Thoraco dorsal nerve	C6,7,8	Patient is asked to clasp his hand behind his back, while the examiner, standing behind the patient, offers resistance to the downward and backward movement.
7	Deltoid	Axillary nerve	C5,6	Arms held in abduction horizontally against examiner's resistance
8	Biceps	Musculocutaneous nerve	C5,6	Patient keeps the supinated fore arm flexed against resistance.

S.No	Muscle	Nerve	Root Value	Method
9	Brachio radialis	Radial nerve	C5,6	Patient keeps forearm (midway between supination and pronation) flexed against resistance.
10	Triceps	Radial nerve	C6,7,8	Patient extends the elbow and keeps it extended against resistance.
11	Wrist Flexors	Median nerve and Ulnar nerve	C7,8	Patient makes a fist and keep the wrist flexed against resistance
12	Wrist Extensors	Radial Nerve	C7	Patient make a fist and keep the wrist extended against resistance
13	FingerFlexors	Median nerve and Ulnar nerve	C7,C8,T1	By hand grip. Ask the patient to squeeze the index and middle finger, placed one above other. Also look for Flexion of middle phalanx for flexor digitorum sublimis and flexion of distal phalanx for profundus
14	Lumbricals	Median nerve (lateral 2) and Ulnar nerve (medial 2)	T1	Patient tries to maintain flexion of the fingers at the metacarpophalangeal joints
15	Dorsal interossei	Ulnar nerve	T1	Place the hand flat on the table. The patient tries to abduct the fingers against resistance
16	Palmar interossei	Ulnar nerve	T1	Place the hand flat on the table. The patient tries to adduct the fingers against resistance
17	Abductor pollicis	Median nerve	C8,T1	Place the hand flat on the table with palm facing up. The patient tries to abduct the thumb against resistance in a plane perpendicular to that of palm.
18	Opponens Pollicis	Median nerve	C8,T1	Patient is asked to touch the tip of the little finger with the palmar aspect of

S.No	Muscle	Nerve	Root Value	Method
				the thumb, while 2 fingers of the examiner is placed over the palm between the thenar eminence and the little finger tries to oppose the movement
19	Extensor pollicis longus	Radial Nerve	C8	Extension of distal phalanx of thumb against resistance
20	Flexor pollicis longus	Median Nerve	C8	Flexion of distal phalanx of thumb against resistance
21	Adductor pollicis	Ulnar Nerve	T1	Patient holds a piece of paper between thumb and palmar aspect of index finger. Examiner tries to pull it out. Not possible in normally. Froment's test*
22	Neck muscles		C3,4,5	Flexion and extension of neck against resistance applied to the forehead and occipital region respectively
23	Intercostal muscles	Intercostal Nerves	T1 to T12	Look for movement of ribs during inspiration and expiration. In intercostals paralysis subcostal angle become narrow.
24	Abdominal muscles	Intercostal, Ilioinguinal Iliohypogastric Nerves	T5-L1	Patient lies on his back and attempt raise his trunk against resistance. If umbilicus is pulled up, it indicates a lesion at or below T10. (Bevor's sign) Simultaneously palpate the abdominal muscles also.
25	Erector spinae	Posterior rami		Patient lies prone and tries to extend head from bed by extending the neck and back
26	Diaphragm	Phrenic Nerve	C3,4,5	Look for paradoxical respiration. Subcostal angle become wide in diaphragm paralysis.
27	Flexors of thigh	Femoral Nerve	L 1,2,3	The patient attempts to flex the thigh against resistance with the knee flexed 90° and the leg resting on the examiner's hand.

S.No	Muscle	Nerve	Root Value	Method
28	Extensors of thigh	Inferior gluteal Nerve	L5-S1	Patient lies on stomach and tries to extend the thigh against resistance.
29	Adductors of the thigh	Obturator Nerve	L2-L4	Patient tries to keep legs together against resistance.
30	Abductors of thigh	Superior gluteal Nerve	L4-S2	Patient tries to abduct the thigh against resistance.
31	Flexors of the knee	Sciatic Nerve	L4,5	Patient lies on the stomach and tries to flex the knee against resistance.
32	Extensors of the knee	Femoral Nerve	L3,4	Patient lies on the back and tries to keep the knee extended against resistance.
33	Dorsiflexion of ankle	Common peroneal Nerve	L4,5	Patient keeps the angle dorsiflexed against resistance.
34	Plantar Flexion of ankle	Tibial Nerve	L5,S1	Patient keeps the ankle plantar flexed against resistance.
35	Extensor and flexors of great toe	Deep peroneal + Tibial	L5,S1	Patient tries to extend and flex the big toe against resistance.

*Froment Test: A card is placed firmly between the thumb and index finger of both hands held together and then pulled. Flexion of terminal phalanx of thumb to hold the card indicates positive test and weakness of Adductor pollicis.

Testing for fatiguability

- Ask the patient to maintain up gaze by looking at an object kept in front and above the level of eyes, without blinking. Fatiguability is manifest as gradual development of ptosis. (Curtain sign)
- To check bulbar muscles ask the patient to count up to 100. Fatiguability is manifest as evidenced by development of nasal twang.
- Single breath count. Normal is more than 30. Indicates fatiguability of respiratory muscles.
- Repeated sitting up from supine position for back muscles.
- Getting up from squatting position 10 times. Patients with lower limb muscle fatiguability will not be able to complete 10 times.
- Forward abduction test - normal is atleast 5 minutes.
- Test the muscle power before and after exerting that group of muscles.

Hoover's sign

With the patient in supine position, place the examiner's palm beneath the heel of the unparalysed limb. Then ask the patient to try to lift the paralysed limb. If the weakness is organic, downward pressure will be exerted on the examiner's palm. If the patient is feigning weakness, this does not happen.

Subtle Pyramidal Signs

- Slow Pronator Sign** -On keeping both upperlimbs outstretched for some time with palm up, there is slow pronation on the affected side.
- Melting Sign** - On the affected side palm drifts down.

- **Abductor Digit Minimi Sign** - Patient keeps both upper limbs outstretched in front. There is slow abduction of little finger in pyramidal lesions.

4. Reflexes:

Some reflexes are elicited in response to a stimulus to look at the integrity of the nervous system. It requires a stimulus, a sensory pathway, a centre, a link with motor unit and a contractile or other effector element.

- Superficial reflexes
- Deep tendon reflexes
- Release reflexes / Primitive reflexes
- Organic / Sphincteric reflexes

Superficial Reflexes:

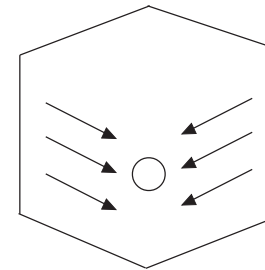
Elicited in response to application of a stimulus to either skin or mucous membrane.

- Corneal
- Conjunctival
- Gag / palatal reflexes
- Abdominal reflexes
- Cremastic reflex
- Plantar reflex.
- Bulbocavernous reflex.
- Anal reflex.

Corneal / Conjunctival / Gag / palatal reflexes - discussed previously.

Abdominal Reflex:

Patient is in supine position. Palpate the abdomen gently to assess the degree of relaxation. Explain the procedure to the patient. Lightly stroke the abdomen with a blunt object from the lateral side towards the midline, without crossing over to the other side. Both the upper and lower abdomen are stimulated; most satisfactorily at the beginning of inspiration.



Normal result : muscle in the stimulated quadrant contracts and the umbilicus moves in that direction.

Segmental innervation : T 7 to T 12.

Epigastric / upper abdominal - T 7 to T 9

Mid abdomen- T9 toT11

Lower abdomen - T 11 to T 12

- **Absent abdominal response**
 - a. Defective technique / relaxation
 - b. Non-neurological causes: Obesity, Multiparous women, distended abdomen, surgical scar.
 - c. Neurological: Break in reflex arc (LMN lesion), Pyramidal lesions above the upper level of segmental innervation.

- **Easily fatigued abdominal reflex:** Diminution of reflex response with repeated stimuli i.e., elicited once or twice and then disappears. In young patients this may be an early sign of pyramidal disease. Lower abdominal reflex is usually the first to be affected.
- **Inverted response:** Seen in unilateral abdominal paralysis when abdominal reflex is absent on one side. Stimulation of the paralyzed side produces muscular contraction of normal side and umbilicus deviated to normal side.
- **Exaggerated abdominal reflex:**
Anxious and psychoneurotic patient.

Cremastic Reflex

Upper inner part of the thigh is stroked in a downward and inward direction with the patient lying down / standing up. Watch for movement of scrotum and testicle.

Normal result : Contraction of cremaster muscle pulls up scrotum and testicle on the side of the stimulus.

Segmental innervation: L1, L2.

Absent response :

- Non neurological
 - (i) In healthy elderly men
 - (ii) Hydrocele
 - (iii) Scrotal surgery.
- Neurological causes:
 - (i) Break in the reflex arc
 - (ii) Pyramidal tract disease

The cremastic reflex should not be confused with the Scrotal Reflex, which is a slow vermicular contraction of the dartos muscle on applying cold or

stroking the perineum. If you get a scrotal reflex, the muscle has to be relaxed before checking the cremastic reflex.

Anal Reflex

This is often combined with per rectal examination. The index finger of the gloved hand is inserted into the anal canal of the patient in lateral decubitus posture and lightly scratch the perianal skin and feel for the reflex contraction of external anal sphincter.

Segmental Innervation: S3 - S5

Bulbocavernous Reflex

In male patients it is combined with per rectal and anal reflex examination. While the index finger is inside the anal canal the thumb of the gloved hand is placed over the perineum of the patient below the root of the penis while the glans penis is pinched with the other hand. Feel for the reflex contraction of the bulbocavernous muscle on the thumb placed below the root of the penis.

Alternately feel for the contraction of the bulbocavernous muscle by right hand placed on the perineum below root of penis while pinching the glans penis with left hand.

Segmental Innervation : S 3 and S4

The Plantar Reflex

Position: The Knee is slightly flexed and thigh externally rotated or alternately with knee extended (preferred position), outer aspect of the foot resting on the couch. Fix the leg on the couch with left hand just above the ankle. Check for the mobility of the big toe. Ask the patient to keep the foot relaxed.

Technique: graded noxious stimulus is applied to the outer aspect of the lateral sole with a blunt point such as a key or the end of a percussion hammer

from the heel towards the little toe and then medially across the metatarsus up to the midtarsus (do not cross the ball of the big toe). The stimulus should be applied slowly.

Observation: Watch the first movement of metatarsophalangeal joint of the great toe and also for the movement and behaviour of the other toes.

Normal result

Flexor plantar response: Great toe will flex at metacarpophalangeal joint. Other toes will flex and adduct.

Mild stimulus: contractions of tensor fascia lata and adductors of thigh and Sartorius. (Minimal plantar response)

Strong stimulus: plus flexion of outer toes.

Much more stronger stimulus: flexion of the great toe at metacarpophalangeal joint, flexion of outer toes, with dorsiflexion of foot and inversion.

Excess stimulation: withdrawal of the limbs.

Segmental innervations: L5-S1

Abnormal Response:

Babinski's extensor plantar response is comprised of extension of big toe at the metatarsophalangeal joint, (dorsiflexion of the big toe) followed by fanning out and extension of other toes. In advanced cases there will be dorsiflexion of ankle, flexion of hip and knee and the contraction of the muscles responsible can be felt.

Significance: Babinski's response indicates disturbance of the function of the pyramidal system. In early pyramidal tract disease, the receptive field for the reflex is restricted to the lateral aspect of the foot. In advanced pyramidal tract disease receptive field enlarges spreading first inwards and over the sole of foot, then upward along the leg to knee or even higher.

Other Responses

- **Crossed Extensor Plantar:** while you elicit plantar on one side the extensor response is obtained on the opposite side. Seen in severe spastic paraplegia.
- **Tonic plantar response:** Toes adduct and flex with persistent plantar flexion of foot for a few minutes. It is a release reflex. The lesion is in the prefrontal cortex and the extrapyramidal system.
- **Flexor spasms:** Exaggerated extensor response where the whole limb is drawn up into flexion. It indicates a pyramidal tract lesion. It is due to constant input to spinal cord in the presence of bedsores / UTI in a patient with cord lesion.
- **Inversion of plantar response:** when short flexors of the toes are paralyzed, unopposed action of extensors causes extension.
- **Mute (absent response):** No response.
- **Voluntary withdrawal:**

In anxious and hypersensitive persons and in plantar hyperesthesia of peripheral neuritis there will be rapid flexion of ankle, knee and hip.

- **False response/Pseudo Babinski's sign:**

Extensor plantar response in the absence of corticospinal system disease e.g. Chorea and athetosis due to associated dyskinesia and dystonia. Here there is no contraction of the hamstrings.

Other methods to elicit plantar response:

- **Oppenheim's reflex:** A firm stroke with the index finger and thumb down either side of the anterior margin of tibia with greater pressure being applied to the medial side from the knee to the ankle.

- **Gordon's Sign:** A hard squeeze of calf muscles.
- **Chaddock's Sign:** A light stroke below the external malleolus on the outer side of foot.
- **Bing Sign:** Flexion of big toe on pricking the dorsum of foot with a pin.

Difficulties and fallacies:

- If the toes are absent or if there is withdrawal of the limb, then look for contraction of hamstrings and tensor fascia lata. If hamstrings contracts more than tensor fascia lata, it indicates extensor plantar response. If tensor fascia lata contracts more than hamstrings, it indicates flexor plantar response.
- In withdrawal response toes will be plantar flexed, while in extensor plantar response toes will be in extension.
- Plantar response can be absent in non-neurological conditions like very thick skin over the sole of foot and thick plantar callosities.
- Deformities that affect the movement of big toe / surgically corrected hallux valgus. In such cases look for the movement of other toes.
- Marked pes cavus and high arched feet make it difficult to assess the movement of toes because of fixed dorsiflexion of the toes.
- In UMN lesion, stroking the middle of the sole evokes a grasp phenomenon due to direct stimulation of short flexor muscles.

Deep tendon reflexes (muscle stretch reflexes)

- Jaw jerk.
- Trapezius jerk.
- Biceps jerk

- Supinator jerk
- Triceps jerk
- Finger flexion reflex
- Pectoral reflex.
- Deep abdominal reflex.
- Knee jerk.
- Ankle jerk.

Prerequisites:

- Good percussion hammer
- Flexible wrists of examiner
- The muscle should be in an optimum position, slightly stretched with plenty of room for contraction.

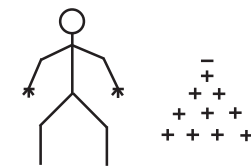
Interpretation of results :

Based on

- Rapidity / speed with which contraction occurs.
- Amplitude and range of movement.
- Duration of contraction.

Deep Tendon Reflexes may be graded as:

- 0 : No contraction even on reinforcement.
- 1+ : Present but diminished: rapidity, amplitude and duration of contraction.
- 2+ : Normal.
- 3+ : Exaggerated : rapidity, amplitude and duration of contraction increased
- 4+ : Exaggerated with clonus



Diagrammatic Representation of DTR

Reinforcement of reflexes:

- By the method of Jendrassik.
- For lower limb reflexes : hook the flexed fingers of the two hands and pull them apart at the time of reflex being stimulated or make a fist forcefully.
- For upper limbs : Clench the teeth or make a fist with the opposite hand.

Biceps Jerk:

Position: Reflex can be elicited with the patient lying down / partially propped up / sitting. Elbow should be flexed semi flexed, forearm semi pronated and hands lying loosely across the abdomen with fingers not touching.

Technique: place your thumb or index finger on the biceps tendon in the anterior cubital fossa and then strike the finger with the hammer.

Normal result: Flexion of elbow with visible contraction of biceps.

Segment Innervation: **C5**, C6

Peripheral Nerve: Musculocutaneous nerve

Supinator Jerk:

Position : same as for biceps

Technique : a blow on the styloid process of radius or lower end of radius 5cm above the wrist. Watch for the movement of forearm and fingers.

Normal result : Flexion of the elbow together with supination.

If the reflex is exaggerated there will be associated flexion of wrist and fingers with supination of forearm.

Segmental innervation: C5, **C6**

Peripheral Nerve : Radial nerve

Inversion of supinator Jerk: On eliciting the supinator jerk, there will be brisk flexion of the fingers, while

the normal response is absent. This is a feature of spinal cord lesion at C6 level.

Triceps Jerk:

Position: Flex the elbow, and draw the arm across the trunk.

Technique: Tap triceps tendon just above olecranon, 5 cm above the elbow.

Normal Result: Extension of elbow and visible contraction of the triceps.

Segmental innervation: C6, **C 7**

Peripheral Nerve : Radial nerve.

Paradoxical Triceps Reflex : Flexion of forearm following stimulation of triceps tendon. The lesion is at C7 spinal level.

Pectoral reflex:

Position: Patient's arm in midposition between abduction and adduction.

Technique: Place the forefinger on the tendon of pectoralis major perpendicularly from below and strike on the finger.

Normal Result : Adduction of arm and visible contraction of pectoralis major muscle

Segmental innervation - C 5 - T1 (**C7**)

Nerves : lateral and medial pectoral

Trapezius Jerk:

Technique : place your finger over patient's trapezius muscle lateral to the neck and the finger is stroked with the percussion hammer.

Normal result: slight elevation of the shoulder.

Segmental innervation: C3, C4

Peripheral nerve : spinal accessory nerve.

Finger Flexion reflex:

Position: Allow the patient's hand to rest palm upwards and the fingers are slightly flexed.

Technique: Examiner places his middle and index finger on the volar surface of the phalanges of the patient's four fingers and tap with the percussion hammer on the fingers.

Normal result: slight flexion of all fingers and of the interphalangeal joints of the thumb.

Segmental innervation: C7, **C8, T1**,

Peripheral Nerves : Median and Ulnar.

Deep abdominal reflex

This reflex may be elicited when superficial abdominal reflex is absent to differentiate between LMN and UMN lesions.

Technique: Press abdominal muscle with index finger to stretch abdominal muscles. Tap over the finger with the reflex hammer. A positive response consists of prompt contraction of muscles and deviation of umbilicus towards the site of stimulus. Only a minimal response is seen in normal people. An exaggerated response is suggestive of pyramidal disease.

Knee jerk:

Methods

1. With patient in supine position, partially flex the knee by placing one hand beneath it and then tap the tendon. The left arm can be used to elevate both knees for comparing two sides.

2. Patient sits on the edge of the table with his legs hanging, so that the feet do not touch the floor. (especially for demonstrating pendular knee jerk)

3. Patient sits with one leg crossed over the other.

Normal Result: Extension of knee with visible contraction of the Quadriceps.

Exaggerated Reflex : Extension of knee with adduction of thigh.

Segmental innervations : L2 **L3** L4

Peripheral Nerves: femoral nerve

Suprapatellar Reflex : (Epi patellar reflex)

Technique: place the examiner's index finger over patient's Quadriceps femoris tendon just above the patella and strike it with the hammer.

Normal result: brisk upward movement of the tendon together with pulling up of Patella.

Patellar clonus:

Grasp patella between index finger and thumb. Make a sudden, sharp downward displacement. It will produce a series of rhythmic up and down movements of Patella.

Ankle jerk:

Position: Patient is lying supine on the couch. Patient's thigh should be abducted, externally rotated and knee flexed. Dorsiflex the patient's foot with examiner's left hand.

Alternate positions:

- a. Ask the patient to kneel on his knees on a cushioned or blanketed chair.
- b. Patient in prone position with ankle kept in moderate dorsiflexion.

Technique : Achilles tendon is struck.

Normal Result: Plantar flexion of foot and contraction of gastrocnemius.

Segmental Innervation : **S1**, S2

Peripheral Nerve : Medial Popliteal Nerve

Ankle Clonus:

Position : Patient lies supine in the bed, both hip and knee flexed to 90°

Technique: Support the leg with left hand under the knee (not under the gastrosoleus), quickly dorsiflex ankle with slight eversion of foot and maintain the pressure on the sole at the end of movement. The foot goes into clonic movements as long as the stimulus is given.

Wrist Clonus: Suddenly hyperextending the wrist and maintain the stretch on the long flexors of the hand.

Plantar equivalents in upper limb:

1. **Hoffman reflex:** Support the patient's hand, extended at the wrist so that it is completely relaxed and fingers are partially flexed. Middle finger is partially flexed and its distal phalanx is grasped firmly between the examiner's index finger and thumb and middle finger is flexed downwards causing a forcible increased flexion followed by sudden release. In pyramidal lesion there is flexion and adduction of thumb, with flexion of index and other fingers.
2. **Tromner reflex:** Hold the patient's hand in relaxation by grasping either the proximal or middle phalanx of the partially flexed middle finger between left thumb and index finger. With the middle finger of right hand, tap the volar surface of distal phalanx of middle finger. Interpretation same as Hoffman Sign.
3. **Wartenberg's reflex:** Patient supinates his forearm and slightly flexes the fingers. The examiner hooks the flexed fingers of the patient with his fingers and pulls them apart. The patient's hand flexes and adducts. If present unilaterally it indicates early stage of pyramidal tract disease.

Release reflexes :

1. Grasp reflex
2. Avoidance reflex
3. Palmomental reflex
4. Sucking reflex
5. Snout reflex
6. Rooting reflex
7. Glabellar reflex

The grasp reflex :

Patient's palm is touched on the radial border between the thumb and index finger. The patient's fingers involuntarily flex and grasp examiner's fingers.

Avoidance reflex:

On touching the skin of the ulnar border of hand, patient's hand reflexively move away from the stimulus.

Palmomental reflex:

Stroking the skin on thenar eminence of hand with a blunt object producing puckering of the chin on the same side due to contraction of mentalis muscle.

Sucking reflex :

When the corner of the mouth is touched with the index finger, involuntary opening of mouth occurs.

Rooting reflex :

When the corner of the mouth is touched with the index finger the patient turns the head to the same side.

Snout reflex :

Lightly tap on the upper lip. Puckering and protrusion of lip occurs.

Glabellar reflex :

Tap the glabella (root of the nose) repeatedly with the examiner's finger brought from above and behind

the patient's head. Normal individual respond by blinking for first 2 to 3 taps and then there is no response. A positive glabellar tap is called Meyerson's sign.

Organic reflexes / sphincteric reflexes :

1. Swallowing
2. Defecation
3. Micturition

Co-ordination

Pre requisites:

Patient should have adequate muscle power-grade 4 and above,

Rigidity, spasticity or associated involuntary movements will affect accuracy.

Anxiety and agitation may hinder the ability to perform well, especially the heel knee test.

Normal tests in the supine position does not exclude a cerebellar lesion.

Aim of testing

To bring out incoordination due to cerebellar or proprioceptive defects.

Upper Limb Co-ordination

1. Finger - nose test
2. Finger to finger nose - test
3. Rebound Phenomenon
4. Past - pointing
5. Dysdiadochokinesia
6. Additional tests –
 - Hand tapping
 - Spiral drawing
 - Tapping in a circle
 - Handwriting

1. Finger Nose Test :

Patient should be standing or sitting. Abduct one upper limb to the horizontal position (not straight forward). Touch the tip of nose with the palmar aspect of the tip of the index finger. Speed, smoothness or side to side swaying of the hand is looked for. Also look for the steadiness with which the finger is held on to the nose. In proprioceptive defects, eye closure will exaggerate the defect.

2. Finger To Finger Nose Test :

The patient attempts to touch the examiner's finger and then the tip of his nose. Examiner's finger is shifted to different positions within the patient's reach. Both sides are tested separately. This is more sensitive than the finger nose test.

3. Rebound Phenomenon:

Patient sitting or standing. Arm adducted at the shoulder, forearm supinated and semi flexed at the elbow, hand made into a fist. Patient is asked to flex his elbow against resistance. Examiner suddenly releases the resistance. If patient is unable to check the flexion of the elbow it is abnormal, and is described as a positive rebound Phenomenon.

4. Past-pointing:

Patient sits or stands opposite to the examiner; holding his arms forward horizontally, so that his fingers touch the tip of the examiner's finger. Then he is asked to raise his hand vertically upwards, and bring it down to its original position, ie. the tip of the examiner's finger. First with eyes open, then with eyes closed. In unilateral cerebellar lesions, the ipsilateral hand deviates laterally. In unilateral vestibular lesions, ipsilateral and contralateral hand deviates to affected side.

5. Dysdiadochokinesia:

Rapid alternating movements. Patient sitting, arms flexed at elbow, with palms facing each other patient is asked to alternately pronate and supinate the forearm rapidly. Both sides are tested separately.

Additional Tests:

- Tapping in a circle 1 cm diameter
- Rapid hand tapping
- Spiral drawing
- Handwriting

Lower Limb Co-ordination

- Heel - knee test
- Toe finger test

1. Heel - knee test:

Patient lies supine. He is asked to place the heel of one foot on the opposite knee and slide it down along the shin and over the dorsum of foot towards the big toe. The test is repeated by asking him to lift his heel off the opposite foot and bring it down to the starting point. Look for heel overshooting the knee and oscillation of the heel from side to side. In sensory ataxia, the patient may raise his head to look at the legs during testing.

1. Toe finger test

Patient lies supine. Examiner's finger is held about 60cm above the bed within reach of the patient's foot. Patient is then asked to touch the examiner's finger with his foot. Both sides are compared for speed, smoothness and direction of movement.

Other signs of cerebellar dysfunction

- Hypotonia
- Dysarthria

- Nystagmus
- Pendular knee jerk
- Ataxic gait

Tandem Walking

Patient is asked to walk in a straight line by placing one heel directly in front of the opposite toes with eyes open and then with eyes closed, In unilateral cerebellar lesions, patient falls to the same side. In sensory ataxia, patient does better with eyes open.

Romberg's sign

(It is better tested along with posterior column sensations). Patient stands erect with feet close to each other, first with eyes open, then with eyes closed. Look for tendency to fall rather than swaying, which can be normal.

Involuntary movements

Assess the different characteristics of the movement first and then fit it into an already described pattern of hyperactive movement disorder.

Points to be addressed:

- Rhythmic / arrhythmic
- Present at rest / increased with effort
- Fast / slow
- Distal/ proximal
- Focal/ multifocal
- Suppressible
- Present or absent during sleep
- Postural
- Relation to emotion, stress and attention
- Relation to heat and cold

Methods:

- Ask the patient to hold his hands out in front of him and to maintain the posture with his eyes closed.
- Ask him to hold hands above his head, palms facing forward.
- Ask him to make small voluntary movements like picking up an object
- Peripheral fine tremor can be better appreciated with a piece of paper placed on his outstretched fingers.

Tremor:

Tremor is defined as a rhythmic, repetitive oscillatory movement of a body part around a fixed point, produced by alternating contraction of agonists and antagonists.

Tremors may be

- Rest tremor - mainly at rest and often suppressed by movement.(4-7 Hz) Eg. Parkinson's disease (pillrolling tremor)
- Intention tremor - mainly on movement especially towards the end of precise movements. May be associated with titubation. Seen in cerebellar diseases.
- Postural tremor - mainly on sustained posture (Eg: outstretched hands) and also throughout active movements

Eg: Essential tremor, thyrotoxicosis, Drugs like Salbutamol.

Tremors may also be classified as

Fine eg: thyrotoxicosis

Coarse eg: Parkinson's disease.

Myoclonus:

Myoclonus is defined as sudden, shock like arrhythmic contraction of a single muscle, a group of muscles or the whole body, capable of producing a focal twitch, jerk or violent movements of the entire body.

Convulsions:

Convulsions are paroxysmal and spasmodic violent movements due to alternating contractions of agonists and antagonists produced by abnormal excessive hypersynchronous discharge from an aggregate of CNS neurons. They are motor manifestation of seizures.

Chorea:

Chorea is defined as a sudden, fast, irregular, non repetitive, quasi purposive movements, predominantly distal more than proximal, present during waking hours, absent during sleep. The movements are slower than that of myoclonus. It is usually accompanied by respiratory irregularities and rapid protrusion and retraction of tongue (jack-in-the-box tongue). Limbs are hypotonic with retained reflexes. Hung up knee jerk may also be present. Movements are minimal at rest and exaggerated when patient is frightened or embarrassed. If asked to hold his hand above his head with palms facing forward, a patient with chorea will be unable to do so. It can involve all the limbs or it could be in a hemi distribution.

Hemiballismus:

Hemiballismus is defined as violent, flinging movement in a wide radius, affecting the proximal joints. It is usually unilateral and spares face and trunk muscles. Rarely it may result in injury to the patient or even to the caretaker. It may be present during sleep. It is disabling and exhausting.

Dystonia:

Dystonia is defined as slow bizarre involuntary movements, due to contraction of antagonist & agonist muscle, the peak of which remains sustained for more than 30 seconds. If the peak of the movement remains sustained more than a one minute it is called a dystonic posture.

Athetosis:

Athetosis is defined as a slow, sinuous writhing movement, predominantly distal, flowing from joint to joint. Most marked in a limb not being examined. It is usually absent during sleep, increased by voluntary movement. Some consider it as dystonia affecting the distal limb.

Tics:

Tics are repetitive, compulsive, stereotypical movements, which is partially suppressible.

Dyskinesia:

Dyskinesia is an involuntary movement which cannot be fitted into a recognised group by description. It also is used to describe involuntary movements associated with drugs.

Cramps:

Cramps are painful involuntary shortening of muscles.

Fasciculations:

Fasciculations are defined as fine flickering inconsistent irregular single rapid twitching movements due to involuntary contraction of a single muscle fascicle when the muscle is at rest.

Myokymia:

Myokymia are worm like contractions of a group of muscles, indicative of denervation.

Asterixis (Flapping tremor) :

Asterixis is defined as a brief, asymmetric lapse in the voluntary sustained posture of head, trunk or extremities. Ask the patient to hold his arm outwards with wrist dorsiflexed for 15 sec, there is sudden loss of posture often followed by a compensatory jerk. It is often seen in metabolic encephalopathy. (Eg: hepatic precoma)

Examination of Gait**Prerequisites**

1. Patient should be emotionally calm; not anxious
2. There shouldn't be any local painful condition
3. The legs should be adequately exposed.

Gait is observed

- As the patient enters the room
- At the end of examination
- In addition patient is instructed. The patient is asked to walk away from the examiner. To turn around a given point, then to come back again.

Parameters to be evaluated

1. Stance
2. Stride
3. Pace
4. Stepping
5. Turns
6. Tandem Walking
7. Walking on Heels
8. Walking on Toes
9. Climbing Up
10. Climbing Down

Also look for

1. Stamping
2. Swaying
3. Reeling
4. Dragging and tripping
5. Waddling
6. Stooping
7. Limping

Stance: It is the distance between both feet for stable standing.

Stance becomes wider in cerebellar ataxia.

Stride length: Is distance from initial contact of one foot to initial contact of the same foot at next contact

Pace: is the distance covered within a unit of time.

Stepping: Smooth forward swing, with slight dorsiflexion at ankle.

Turns : Patient who is stable during routine walking might manifest subtle abnormalities during turning.

Tandem walking : Patient comfortably walks keeping one foot in front of other. With subtle cerebellar disease, it is not possible.

Walking on Heels : not possible in conditions producing weakness of dorsiflexion (foot drop).

Walking on Toes: defective in mild weakness of plantar flexion.

Climbing up: Difficult in patients with proximal muscle weakness.

Climbing Down : It is particularly difficult in patients with spasticity.

Abnormal Gait

- Dragging gait - due to spasticity of lowerlimb.
- Scissory gait - seen in pyramidal lesions
- Waddling gait - Alternate depression of hip while walking. Indicate weakness of hip abductors.

- Cerebellar gait - broad based gait with swaying to either or both sides with reeling (whole trunk moves through a wide arc)
- Stamping gait - Foot is elevated and comes down abruptly to land forward. seen in proprioceptive dysfunction.
- High stepping gait - Patient elevates the foot abnormally to clear the toes off the ground and the toes touch the floor first. seen in foot drop.
- Festinant gait - patient stoops forward, walks in short shuffling steps as if to catch the center of gravity - seen in parkinsonism.
- Antalgic gait - seen in painful conditions of lower limb.

EXAMINATION OF SENSORY SYSTEM

Modalities tested

1. Superficial Sensations (exteroceptive sensations)

- Pain
- Light touch
- Temperature

2. Deep sensations

- Sense of Position
- Sense of passive movement (joint sense)
- Vibration
- Deep Pain or Pressure

3. Cortical sensations

- Tactile localization
- Two Point discrimination
- Stereognosis
- Graphaesthesia
- Double simultaneous stimulation

Purposes :

- To demonstrate clearly and consistently the areas of abnormal sensation.
- To determine which modalities are involved in these limits.
- To compare the findings with known patterns of abnormal sensations.

Prerequisites

- Patient should be alert and attentive
- The procedure should be properly explained.

- Patient should keep his eyes closed.
- Compare response on both sides.
- While mapping out area of sensory abnormality proceed from abnormal area to normal. We are looking for areas of reduced, absent or altered sensations. Sensory system examination is problem oriented and tailor made, depending on the clinical diagnosis after history taking.

Rapid Mini Sensory Examination

This is done when we are not suspecting any sensory deficit after the history taking. Examine touch and pinprick over face, chest, abdomen, proximal and distal limbs on both sides and sense of position and passive movement over thumb and big toe.

Superficial sensation:

Pain:

Use sharp pin with head. (Hollow hypodermic needle should be avoided)

Patient should be tutored well before the formal test. See that he/she understands the difference in sensation using the pin tip and the rounded blunt end of the pin. Apply sharp and blunt ends randomly and elicit responses to each. Do not apply too close or in quick succession. Instruct the patient to say yes - sharp or yes - blunt. Also say whether increased/decreased or altered. Compare with adjacent normal area on the opposite side. Then the abnormal area with reduced sensation is mapped out.

Results : analgesia / hypoalgesia / hyperalgesia / hyperpathia

Touch

Instrument - small piece of cotton wool

Procedure : Randomly touch using the cotton wool. Ask the patient to say yes each time he feels the sensation.

Results : anesthesia / hypoesthesia / hyperesthesia / dysesthesia

Temperature

Instruments - Test tubes containing hot water (44°C) and cold water (30° C) (37°C +/- 7°C). The tubes should not be damp on the outside.

Procedure : Apply the test tubes to your skin for less than 2 seconds. Warm and cold tubes are applied randomly. Patient has to correctly identify the tubes. The abnormal area should be mapped out.

Deep sensations (proprioceptive sensations)

Position Sense :

Place the patient's arm in a particular position and then replace the arm in the resting position. Ask him now to close his eyes and keep the limb by himself in the demonstrated position and to place the opposite limb also in the same position.

Joint position sense : Sense of Passive movement:

Procedure: Instructions given with eyes open first. The digit (thumb, finger or big toe), is held firmly by the examiner. The proximal joint is fixed using the left thumb and index finger and hold the distal phalanx between right thumb and index finger. Move the phalanx up and down. Randomly and ask the patient whether he can appreciate any movement. Subject should identify whether the phalanx is moved up or down. Perform the test with the patient's eyes closed.

The examiner should not hold above and below the distal phalanx as uneven pressure while moving the phalanx will indicate the direction of movement. Only the sides of the phalanx should be held. Start

with greater amplitudes till the patient understands the test. Then reduce to the smallest range (normally 1-2 degree at thumb and big toe and 10 degree at other joints). Six consecutive correct answers are needed to report the sense of passive movement as normal.

If digital movement cannot be detected, test should be carried out at wrist, elbow and knee.

Vibration (pallesthesia)

Instrument used is a tuning fork of 128 Hz.

It is better to strike the tuning fork on a percussion hammer to make it vibrate.

First demonstrate to the patient the sense of vibration by placing the base of fork over clavicle or forehead.

Fork should be stopped vibrating and look whether the patient can appreciate that the vibration has stopped. Patient should recognize the 'on' and 'off' state of the tuning fork.

Instruct him to concentrate on vibration and not on touch.

Bony points are chosen as they act as better resonators of vibration.

Sites to be tested :

Lower limb: Dorsum of distal phalanx of big toe, medial and lateral malleoli, tibial tuberosity, anterior superior iliac spine.

Upper limb: Acromion, olecranon process, styloid process knuckles etc.

Ask the patient to say when he can feel it no longer. Compare both sides. After the patient says that vibration has stopped hold the tuning fork over examiner's bony prominence. Note whether the examiner can feel the vibration.

Timed vibration: We can note the duration for which the subject can appreciate the vibration sense at each site. This can be compared with opposite side and with the examiner.

Results - normal / decreased / absent.

Difficulties and fallacies

Procedure is difficult in obese.

In edematous patients the fluid can be pressed away when the test performed.

Deep Pain

Any of the following can be done:

- Squeeze the muscles of the forearm and calves.
- Squeezing of tendo achilles between finger and thumb.
- Pressure on the testicles.
- Results - normal / decreased / absent/ increased

Cortical Sensations

Prerequisite - primary modalities of sensations should be intact

Tactile Localization:

Instruct the patient regarding the procedure. Ask the patient to close his eyes, He is touched on some point of his body with examiner's finger or a pin. He is asked to locate the site with his own forefinger.

Two Point Discrimination:

It is the ability to detect that a stimulus consists of two blunt points when they are simultaneously applied.

Instrument - a compass divider with ends blunted / round end of two pins.

Procedure : Apply the stimuli simultaneously on two

points with equal pressure. The sites tested are - lips, finger tips, dorsum of hands and foot. Progressively decrease the distance between the two points. Find the minimum distance to perceive the two stimuli and compare with the opposite side.

Normal distance appreciated -

3 mm on lips, 3-5mm on finger tips, 2-3cm on dorsum of hands, 3-4cm on dorsum of foot, 4-5cm on interscapular area.

Avoid callosities

Stereognosis:

It is the ability to recognise an object from feel of its size and shape.

Prerequisite : test object should be familiar; easily identifiable, large enough for a weak hand to feel (coins of different sizes, pens, watch, key). The test is done without prior demonstration. After the patient's eyes are closed, object is first placed to the hand suspected to be abnormal and patient is asked to identify the object. If he fails to identify or takes a long time the object is transferred to the other hand.

Difficulties and fallacies:

- A very weak hand may be unable to make movements properly. So the patient's finger should be held closed over the object by the examiner.
- A hand that is edematous or deformed may be unable to close over, so use a large object.

Graphaesthesia:

It is the ability to recognize letters or numbers written on skin with a blunt point (pencil, key or pointed end of a percussion hammer). Letters and

numbers traced out on palm, anterior aspect of forearm, thigh, or lower leg. Clear letters like 8, 4, 5 should be used. Figures like triangles, rectangles, and letters can also be used. The letters should be written in the patient's reading direction. Compare both sides.

Double Simultaneous stimulation:

It is the ability to perceive two identical stimuli applied on both side of body in mirror image points. Use tips of index fingers or equally sharp pins. Explain that a stimulus will be applied either on one side or both sides simultaneously. The patient is instructed to respond by saying one or two. In sensory inattention, there will be inability to perceive the stimuli as two on the opposite side of lesion even though each can be separately identified.

EXAMINATION OF AUTONOMIC NERVOUS SYSTEM

1. Test for Orthostatic Hypotension

Check the supine Blood Pressure. 3 minutes after standing BP is again checked. Drop in systolic BP > 20mm Hg or Diastolic BP > 10mm Hg is taken as positive test.

Heart rate should not increase by > 30 beats/min above baseline on standing.

2. Deep Breath Test

Testing the heart rate variability for 6 deep breaths per minute. In normal subjects pulse rate should fall by >15 beats/min. With autonomic disturbance, the pulse rate falls <10 beats/min.

3. Hand Grip Test

With patient lying flat, measure maximal hand grip force by having the patient grip a sphygmomanometer cuff as hard as possible. Then measure the rise in diastolic BP after 5 minutes. The diastolic pressure should rise > 16mm Hg in normal person. In patient with autonomic dysfunction the diastolic pressure will rise by < 10mm Hg.

4. Valsalva Test

The patient blows in to a sphygmomanometer, maintaining a pressure of 40mm Hg for 15 seconds and record ECG continuously. The Valsalva ratio = longest R-R after the manoeuvre ÷ shortest R-R while blowing, is > 1.5 in normal subjects and <1.1 in patients with autonomic disturbances.

5. The 30th 15th Pulse Ratio

The patient lies quietly on a couch for 15 minutes, with ECG leads attached. Note the pulse rate from R-R interval at the 15th and 30th beats after standing. Normal ratio is >1.03. In patient with autonomic dysfunction, it is ≤ 1.

SIGNS OF MENINGEAL IRRITATION

Neck stiffness:

Passively flex neck of supine person, if chin does not touch the chest, there is neck stiffness. Side to side movement will be normal in meningeal irritation.

Kerning's sign:

Patient in supine position, flex the knee and hip. Then extend the flexed knees. If pain occurs on hamstrings, it is a sign of meningeal irritation.

Brudzinski's sign:

- Neck sign: Flexing the neck produces hip and knee flexion in meningeal irritation.
- Leg sign: On flexing one leg, other also flexes.

Straight leg raising test:

Passively flex the hip with knee kept extended. In sciatica and meningitis, the movement is restricted.

EXAMINATION OF PERIPHERAL NERVE

Palpate simultaneously on both sides, look for thickening and tenderness.

- Supra orbital, Supratrochlear nerve - thumb sliding over supraorbital margin.
- Great auricular - Over neck crossing sternomastoid.
- Ulnar nerve - Palpate behind the medial epicondyle.
- Radial nerve - Over anatomical snuff box
- Common Peroneal nerve - Palpate the fibular neck from behind and laterally with 60 degree knee flexion in supine position.

EXAMINATION OF SKULL AND SPINE**Skull**

Following things are looked.

- Size of skull
- Shape
- Tender vessels
- Percussion
- Auscultation – bruit

Size : Circumferentially measured from supra orbital ridge to occipital protuberance.

Shape : Look for abnormalities of shape of skull.

Temporal artery tenderness: palpate the temporal arteries of both sides for any nodularity or tenderness.

Percussion: Cracked pot resonance hydrocephalus in children.

Auscultation:

- Temporal artery
- Over closed eyelids with bell - orbit is an acoustic window, transmits bruit of AV fistula.
- Suboccipital - vertebral artery bruit.
- Carotid artery bruit (Below the angle of the jaw with the bell)

Spine

- Deformity - kyphoscoliosis, lordosis, gibbus. Gibbus is defined as acute angulation of spine with paraspinal spasm. Seen in extradural lesions like caries spine and vertebral secondaries.
- Tenderness - occurs in epidural abscess, TB spine, metastasis etc.
- Height : Neck length ratio >13.6 is short neck. Neck length is measured as the vertical/height from occipital protruberance to C7 Spine, with a scale/metallic tape.
- Lhermitte's sign - electric shock like sensation on spine on neck flexion - Occurs in multiple sclerosis, Cord compression.
- Auscultation - bruit of spinal AV malformation.

EXAMINATION OF THE UNCONSCIOUS PATIENT

Consciousness is the state of normal cerebral activity in which the patient is aware of both self and environment and is able to respond to internal changes and external environment.

Coma:

Unnatural situation of reduced alertness where the patient is unarousable and unexcitable to all external stimuli (even to deep painful stimuli) and internal ones.

Mental Functions:

Assessed by Glasgow coma scale.

Cranial nerves:

Examine all cranial nerves which can be assessed:

- II fundus: Papilloedema, hypertensive retinopathy, diabetic retinopathy, fundal hemorrhage.
- III, IV, VI: Look for size shape and direct and consensual light reflex.
- V: Corneal and conjunctival response.
- VII: Voluntary movement cannot be tested. Look for flattening or smoothening of wrinkles on one side, uncovering of sclera, paralyzed side blowing out during expiration and sucking in during inspiration. Apply firm supraorbital pressure, which will make the patient grimace - look for facial movement while grimacing.
- VIII: look for oculovestibular reflex and Oculocephalic reflex. (Doll's Eye movement).

Motor system

Observe the posture

- *Decerebrate posture* : adduction and internal rotation of shoulders, pronation of forearm, plantar flexion of feet.
- *Decorticate* : bilateral flexion at the elbow and wrist, shoulder adducted, lower limbs are extended.

Bulk and tone can be tested in normal way.

- *Power* : Raise the upper limb, allow it to fall.

Flex the knee so that soles of feet rest on ground. Unparalysed limb slowly extends. Paralyzed limbs fall back to original position.

Reflexes: Should be checked in normal way. Interpretation of results may be different in deep coma. Plantar reflex when absent or bilaterally extensor has no localizing value. Unilateral extensor plantar is a localizing sign.

Sensory System and Incoordination: cannot be tested.

Signs of Meningeal irritation

Examination of Peripheral Nerves

Examination of Skull and Spine

References

Bickerstaffs neurological examination in clinical practice - John Spillani

Dejongs The Neurological examination - Armin Haerer

Neurology in clinical Practice - W.G. Bradley

CARDIOVASCULAR SYSTEM

Stigmata of rheumatic fever

- Swollen painful joints
- Subcutaneous nodules
- Erythema marginatum
- Chorea
- Fever.

Features of carditis:

- Carey Coomb's murmur
- Third heart sound
- Cardiomegaly

Stigmata of infective endocarditis

- Eyes- Pallor, icterus, subconjunctival hemorrhage
- Skin - Petechiae
- Fundus- Roth spots
- Hands-Clubbing, janeway lesion, Osler's node, splinter hemorrhage
- Arthritis
- Abdomen-Splenomegaly

Peripheral signs of AR

- Face-Light house sign, De Musset's sign, Muller's sign
- Eye- Landolfi's Sign, Becker's sign
- Neck-Corrigan's sign, Pulsus bisferians
- Hand- Pulsus bisferians, Quincke's sign, palmar click, collapsing pulse, digital throbbing.
- Abdomen-Rosenbach's sign, Gerhard sign
- Legs-Traube's sign (Pistol shot), Durozie's murmur, Hill sign

Marfan's Syndrome

- Tall slender built
- Long narrow face (Dolicocephalus)
- High arched palate with crowded teeth
- Eye-Ectopia lentis, cataract, Glaucoma, myopia, micro cornea, strabismus, iridodonesis, retinal detachment.
- Arm span-Height >5 cm, US : LS ratio<0.8
- Chest - Pectus excavatum /carinatum, suprasternal pulsation (aortic aneurysm)
- Scoliosis/kyphosis/lordosis/straight back syndrome
- Long thin limbs and long thin fingers (arachnodactyly)
- Joint hyper mobility-Wrist sign (Walker), thumb sign (Steinberg)
- Pes planus, pes cavus, hallux valgus.
- Inguinal hernia/Incisional hernia/Striae atrophicae

Atrial Myxoma

- Fever
- Clubbing
- Pallor
- Rash
- Change in murmur with change of position
- Tumor Plop
- Embolic phenomena

Congenital heart disease

VSD:

- Down Syndrome
- Edwards Syndrome
- Patau Syndrome
- Fetal alcohol Syndrome

ASD:

- Downs Syndrome
- Holt Oram syndrome (Hypoplastic/absent thumb, triphalangism, radial hypoplasia)
- Edward Syndrome
- Patau Syndrome

PDA:

- Congenital Rubella Syndrome(cataract, deafness mental retardation)
- Edward's Syndrome

TOF:

- Poland's syndrome (absent pectoralis major, syndactyly, brachydactyly, hypoplasia of the involved hand hypothyroidism)
- Goldenhar syndrome (Oculo-auriculo – vertebral dysplasia.)
- Conotruncal facies –associated with other conditions like DORV,TGA,Truncus arteriosus (hypertelorism, narrow eye fissures, bloated eyelid, fish like mouth, deformed ear lobes, micrognathia)

Bicuspid Aortic valve and coarctation of Aorta:

- Turner syndrome

Pulmonary stenosis:

- Moon facies, high coloured cheeks, redness of digits
- Noonan syndrome (webbed, low posterior hair line, low set ears, micrognathism ,hypertelorism)
- Watsons' syndrome (café-au-lait spots, dull intelligence & short stature).

Supravalvular aortic stenosis:

- Elfin facies (Prominent forehead, hypertelorism, blunt upturned nose, dental hypoplasia and malocclusion, patulous lips)

Congestive cardiac failure

- Tachypnoea
- Pulse - tachycardia, low volume pulse, pulsus alternans
- Hypotension, low pulse pressure
- Elevated JVP
- Bilateral pitting pedal oedema / sacral edema in supine patients.
- In shock- sweating, cold clammy extremities, cyanosis.

External markers of atherosclerosis & hyperlipidemia

- Arcus senilis, prominent ear lobe crease
- Xanthoma striae palmaris
- Thickening of tendoachilles.
- Vascular bruit, atherosclerotic stenosis
- Fundus: lipemia retinalis.
- Nicotine stains

External markers of insulin resistance

- Obesity
- Increased waist hip ratio > 0.8
- Acanthosis nigricans
- Skin tag
- Scleredema
- Hirsutism

RESPIRATORY SYSTEM

- Dental caries
- Halitosis
- Nasal polyp
- Sinus tenderness

Evidence of superior sulcal syndrome (Pancoast's syndrome)

- Supraclavicular fullness
- Horner's syndrome
- Small muscle wasting
- Rib erosion

Evidence of Respiratory failure

- Altered sensorium
- Cyanosis
- Flapping tremor
- Bounding pulse
- Palmar erythema
- Warm extremities
- Conjunctival chemosis
- Papilloedema
- Muscle twitching.

Evidence of SVC obstruction

- Dilated veins over chest.
- Raised non pulsatile JVP.
- Conjunctival chemosis, exophthalmos.
- Oedema of face, neck and upper limb.
- Fundus –papilloedema.

Bronchogenic carcinoma

- a. General Examination:

- Pallor
 - Clubbing
 - Hoarseness of voice
 - Supra clavicular lymphnode
 - Horner's syndrome
 - Rib tenderness
 - Diaphragmatic palsy
 - SVC obstruction
 - Small muscle wasting.
- b. Paraneoplastic skin manifestation
- ❖ Pemphigus, cutaneous metastasis
 - ❖ Tylosis, Gynaecomastia, HPOA
 - ❖ Ectopic cushing's syndrome
 - ❖ Tripe palms
 - ❖ Ptyriasis rubra pilaris
 - ❖ Erythema gyratum ripens
 - ❖ Erythema annulare centrifugum
 - ❖ Systemic sclerosis
 - ❖ Hypertrichosis lanuginosa acquisita
 - ❖ Dermatomyositis

External markers of Tuberculosis

- Tuberculous chancre
- Lupus Vulgaris
- Scrofuloderma
- Tuberculous gumma
- Tuberculous verrucosa cutis
- Papulonecrotic tuberculid
- Erythema nodosum
- Erythema induratum (Bazin disease)

- Tuberculous cutis orificialis
- Miliary tuberculosis of the skin
- Lichen scrofulosorum
- Eye:
 - ❖ Phlycten
 - ❖ Interstitial keratitis
 - ❖ Scleritis
 - ❖ TB dacryocystitis
 - ❖ Conjunctival , eyelid & orbital TB
 - ❖ Choroidal tubercle
 - ❖ Eale's disease(Periphelebitis retinae)
 - ❖ Optic neuritis

Cutaneous markers of internal malignancy

- Acanthosis nigricans-Gastric carcinoma
- Sign of Lesser Trelat- Multiple seborrheic `keratosis –GI Malignancy
- Acquired ichthyosis-Lymphoma
- Exfoliative dermatitis- Lymphoma
- Superficial migratory thrombophlebitis- Pancreatic malignancy.
- Pemphigus-Lung malignancy
- HPOA-Lung malignancy.
- Leukemia cutis.
- Lymphoma cutis.
- Tylosis-Ca Oesophagus, Ca Lung.
- Sweet syndrome-Acute leukemia.
- Dermatomyositis/polymyositis-GIT malignancy, Ca Ovary
- Tripe palms-Lung malignancy

- Hypertrichosis lanuginosa acquisita – Lung, colon breast.
- Erythema gyratum ripens – Ca Breast.
- Acrokeratitis paraneoplastica - oral cavity malignancy
- Necrolytic migratory erythema – Glucagonoma.
- Ectopic Cushing's syndrome – Ca Lung, Carcinoid
- Panniculitis- Ca pancreas
- Dermatitis herpetiformis – Lymphoma
- Sezary syndrome –Cutaneous T cell lymphoma
- Porphyria cutanea tarda – HCC, Hepatitis C
- Sister Mary Joseph's nodule – Ca Stomach
- Chloroma-Acute myeloid leukemia

CUTANEOUS ASPECTS OF RENAL DISEASE

Chronic renal disease (Uremia)

- Hyperpigmentation: (MSH, retention of carotene.)
- Anemia
- Pruritis
- Xerosis: excessive dryness
- Kyrle's disease
- Uremic frost - Tan granules, most prominent on the nose, beard area and neck (represent crystallization of urea in sweat)
- Erythema papulatum uremicum
- Subepidermal bullous dermatosis.
- Cutaneous calcification: (Hyperparathyroidism – may appear as papules/ nodules-may ulcerate and discharge a chalky material)
- Nails- Half and half nails.
- Xerostomia and stomatitis, coated tongue.

GASTRO INTESTINAL SYSTEM

Stigmata of Chronic Liver Disease

Eyes:

- Icterus
- Bitot's spot
- Xanthelasma, KF ring

Hands:

- Palmar erythema
- Clubbing
- Asterixis (Flap)
- Dupuytren's contracture
- Nails-leuconychia, koilonychia, white bands

Face:

- Glossitis
- Alopecia
- Parotid gland enlargement
- Hepatic flush
- Feter hepaticus

Trunk:

- Loss of hair
- Muscle wasting
- Scratch marks
- Spider naevi
- Gynaecomastia

Abdomen:

- Ascites
- Testis atrophy
- Umbilical hernia
- Caput medusae
- Pedal edema
- Abdominal striae

Skin:

- Darkening
- Bruises, Skin bleeding

Features of Hepatic Encephalopathy

- Flap
- Constructional apraxia
- B/L extensor Plantar

Wilson's disease

- Wing beating tremor
- KF ring
- Dystonia
- Ascites
- Features of CLD

Haemochromatosis

- Hyperpigmentation of skin
- Arthritis of MCP joints (2nd & 3rd)

Stigmata of Inflammatory Bowel Disease

- Erythema nodosum
- Peripheral arthritis
- Pyoderma gangrenosum
- Pyoderma Vegetans
- Pyostomatitis vegetans
- Sweets syndrome
- Psoriasis
- Perianal skin tag
- Oral lesion
 - ❖ Aphthous ulcers
 - ❖ Stomatitis
- Musculoskeletal
 - ❖ Osteomyelitis
 - ❖ Ankylosing spondylitis
 - ❖ Hypertrophic Osteoarthropathy

- Ocular
 - ❖ Conjunctivitis
 - ❖ Uveitis
 - ❖ Episcleritis
- Late
 - ❖ Amyloidosis
 - ❖ Malabsorption
 - ❖ Vitamin deficiencies
 - ❖ DVT

Colonic Malignancy

- Gardner's syndrome
 - ❖ Osteoma
 - ❖ Fibroma
 - ❖ Desmoid tumors
- Peutz jegher's syndrome
 - ❖ Perioral hyperpigmentation

Miscellaneous

- Subconjunctival haemorrhage
 - ❖ Weils disease
- Grey turners and cullen sign
 - ❖ Pancreatitis
- Prophyria
 - ❖ Photosensitivity
 - ❖ Hypertrichosis
 - ❖ Hyperpigmentation
 - ❖ Scarring of skin
 - ❖ Milia
 - ❖ Fluid filled vesicles and bullae.
- Mesenteric lymphadenopathy
 - ❖ GI tuberculosis

HEMATOLOGIC DISORDERS

General

- Pallor, Koilonychia, clubbing, Icterus
- Mouth and oral cavity
 - ❖ Macroglossia
 - ❖ Atrophic glossitis
 - ❖ Enlarged tonsils
- Vitiligo
 - ❖ Pernicious anemia
- Hyperpigmentation of palms and knuckles
 - ❖ Megaloblastic anemia
- Bleeding disorders
 - ❖ Superficial spontaneous ecchymosis
 - ❖ Petechiae
 - ❖ Purpura
 - ❖ Neck rigidity (SAH)
- Fundus
 - ❖ Retinal bleeds
- Coagulation disorder
 - ❖ gum bleed
 - ❖ subcutaneous and Muscle hematomas
 - ❖ Joint bleeds
 - ❖ Joint deformity
 - ❖ Flexed leg (psoas bleed)

Haematologic Malignancy

- Sternal tenderness
- Pallor
- Lymphadenopathy
- Gum hypertrophy
- Soft tissue mass(chloroma)

Hemolytic disorders

- Leg ulcer
- Dactylitis
- Osteomyelitis

Hemolytic facies:

- Bossing of skull
- Prominent parietal and frontal eminence
- Straight forehead
- Hypertrophy of maxilla
- Depressed nasal bridge (Chipmunk facies)

Skin and Malabsorption

- Ichthyosis, brittle hair and nails
- Generalized hyperpigmentation
- Stomatitis /dermatitis
- Psoriasiform lesion-acrodermatitis
- Anemia, bitots spots

NERVOUS SYSTEM

Cranio vertebral junction anomalies

- Short neck
- Low posterior hair line
- Restricted neck movements due to vertebral fusion (Klippel feil anomaly)
- Sprengel shoulder
- Polydactyly
- Cleft lip
- Cleft palate

Neurocutaneous Syndromes

Tuberous Sclerosis

- Hypomelanotic macules (ashleaf macules)
- Shagreen patch

- Ungual fibromas, facial angiofibromas (adenoma sebaceum)

Neurofibromatosis

- Café au lait spot
- Subcutaneous neurofibromas
- Axillary freckling
- Lisch nodules in iris
- Pseudoarthrosis of tibia.
- Plexiform neurofibroma-NF1
- Juvenile posterior subcapsular lenticular cataract –NF2

Ehler-Danlos Syndrome

- Hyper elastic skin and joints
- Vascular lesions, easy bruising
- Excessive scarring after injuries.

Rendu Osler Weber Syndrome

- Telangiectasia of skin and mucosa (Eg: conjunctiva)

Pseudoxanthoma Elasticum

- Yellow papules and plaques of skin and mucous membrane
- Angioid streaks

Fabry's Disease

- Red or purple Rashes around umbilicus
Buttocks and hips
- Swirling corneal opacity

Sturge Weber Syndrome

- Port wine naevus in face
- Buphthalmos

Progressive facial hemiatrophy (Parry Romberg Syndrome)

- Unilateral atrophy of skin, sub cutaneous tissue and adjacent bone.

Ataxia Telangiectasia

- Telangiectasia in sclera, ear lobe
- Hypertrichosis
- Grey hair
- Poikiloderma
- Loss of subcutaneous fat
- Sclerosis
- Basal cell carcinoma

Xeroderma Pigmentosum

- Sunlight sensitivity
 - ❖ Bullae
 - ❖ Erythema
 - ❖ Freckling
 - ❖ Telangiectasia
 - ❖ Xerosis
 - ❖ Squamous/basal cell carcinoma.

Von Hippel Lindau

- Hemangioblastoma
- Scoliosis, kyphosis, pseudo arthrosis tibia
- Tuft of hair at sacral area
- Frontal baldness, testicular atrophy
- Parkinsonism (mask like) facies

Optic Atrophy

- Mitochondrial disease (Lebers's optic atrophy)
- Leukodystrophies

- Lysosomal storage diseases
- Spinocerebellar ataxias
- Pelizaeus Merzbacker's disease

Seizure Disorder

- Dysmorphic facies (Mucopolysaccharidosis)
- Skin hyperpigmentation/ hypopigmentation
- Adenoma Sebaceum

Peripheral Neuropathy

- Pes cavus, hammer toes-Hereditary neuropathies
- Charcot joint, Non healing ulcers, Acral mutilations - Acrodystrophic neuropathies
- Blisters, hyperpigmentation, Hypertrichosis, increased skin fragility –Porphyria
- Hyperpigmentation –Adrenal leukodystrophy
- Hypopigmented patches –Hansens disease
- Dermatitis-Niacin deficiency
- Anemia,atrophic glossitis –Vit B12 deficiency
- Melanosis, Kerotosis-Arsenic poisoning
- Mee's line-Thallium and arsenic poisoning
- Alopecia-Thallium and arsenic poisoning
- Blue line at gingival margin (Burton's line), anemia –lead poisoning
- Curly hair-Giant axonal neuropathy

RHEUMATOLOGICAL DISEASES

SLE

- Photosensitivity
- Malar rash
- Discoid rash
- Oral ulcers
- Vasculitic ulcers
- Alopecia
- Urticaria
- Cutaneous lupus
- Arthritis
- Hand deformities
- Conjunctivitis
- Episcleritis
- Sicca syndrome

Rheumatoid Arthritis

- Rheumatoid nodules
- Rheumatoid vasculitis –Cutaneous ulcers, Dermal necrosis.
- Digital gangrene
- Deformities- Z deformity, swan neck deformity, boutonniere's deformity
- Contractures
- Baker's cyst
- Scleritis, episcleritis, scleromalacia perforans, conjunctivitis sicca

Systemic Sclerosis

- Scleroderma
- Erythema
- Firm thick skin
- Contractures, ulcers, scars

- Hypo/hyperpigmentation
- Salt and pepper appearance of skin
- Alopecia
- Intra/ Subcutaneous calcifications
- Thinning of lips, loss of skin wrinkles and facial expression, microstomia, beaked nose, furrows around mouth perpendicular to lips
- Arthritis
- Raynaud's phenomenon

MCTD

- Raynaud's Phenomenon
- Puffy hands
- Scleroderma
- Telangiectasia
- Calcinosis
- Skin Changes of SLE and dermatomyositis
- Arthritis
- Deformities

Sjogren's Syndrome

- Dry erythematous sticky oral mucosa
- Parotid enlargement
- Red eye with increased photosensitivity
- Keratoconjunctivitis sicca
- Dry nose, throat
- Vasculitis – Purpura, urticaria, skin ulcerations
- Arthritis
- Raynaud's phenomenon
- Lymphadenopathy

Behcet's Syndrome

- Aphthous ulcers
- Genital ulcers
- Folliculitis

- Erythema nodosum
- Uveitis
- DVT
- Vasculitis

Sarcoidosis

- Erythema nodosum
- Maculopapular eruption
- Subcutaneous Nodules
- Lupus pernio
- Skin plaques
- Uveitis
- Conjunctival nodules
- Keratoconjunctivitis sicca
- Lymphadenopathy

Amyloidosis

- Waxy papules/plaques in axillary fold, face, neck, mucosa, anal and inguinal region
- Periorbital ecchymosis (Black eye/raccoon syndrome)
- Shoulder pad sign
- Arthritis
- Macroglossia

Gout

- Arthritis
- Bursitis
- Tophaceous deposits

Dermatomyositis

- Heliotrope rash
- Gottron's rash, V sign, Shawl sign
- Mechanic's hand (dirty horizontal lines)

Markers of Vasculitis

- Hypertension
- Asymmetrical pulse and BP – Takayasu's arteritis
- Weight loss
- Thickened temporal artery – Temporal arteritis
- Episcleritis / scleritis – Wegeners granulomatosis / PAN
- Uveitis – Wegeners granulomatosis / Behcet / reactive arthritis
- Interstitial keratitis – Cogans
- Dacryocystitis, conjunctivitis, Proptosis, PNS tenderness, Saddle nose, Hoarseness of voice / stridor (tracheal stenosis) – Wegeners granulomatosis
- Painful aphthous ulceration – Behcets
- Strawberry tongue, Cervical lymph nodes, conjunctival congestion, erythema of oral cavity, lips and palm, desquamation of skin and finger tips, edema – Kawazaki
- Skin and subcutaneous nodules - Wegener's granulomatosis, idiopathic cutaneous vasculitis, PAN
- Macules, papules, vesicles – Wegener's granulomatosis, idiopathic cutaneous vasculitis
- Rash / purpura – Wegener's granulomatosis, SLE, PAN/HSP
- Testicular tenderness – PAN
- Palpable purpura – HSP, idiopathic cutaneous vasculitis
- Skin ulcer and necrosis – Wegener's granulomatosis, SLE, PAN, idiopathic cutaneous vasculitis
- Urticaria – Atopy, anaphylaxis, systemic mastocytosis, idiopathic cutaneous vasculitis
- Ischemic optic neuritis – Giant Cell Arteritis

ENDOCRINE DISEASE

Diabetes mellitus

- Cutaneous infections (carbuncle, furuncle)
- Diabetic dermopathy – brown atrophic macules over shins
- Diabetic thick skin
- Diabetic bullae
- Granuloma annulare
- Necrobiosis lipoidica diabetorum
- Acanthosis nigricans
- Eruptive xanthoma
- Skin atrophy / hair loss
- Diabetic foot
- Kyrle's disease (papules or nodules with keratin plugs)
- Dupuytren's contracture
- Limited joint mobility syndrome
- Flexor tenosynovitis
- Neuropathic joints
- Reflex sympathetic dystrophy
- Scleredema diabetorum

Thyroid disorders

Thyrotoxicosis:

- Tachycardia, Atrial fibrillation
- Fine tremor
- Thyroid swelling
- Thyroid bruit
- Pemberton's sign, dilated veins
- Kocher's sign
- Warm moist skin

- Proximal muscle weakness
- Gynecomastia
- Palmar erythema, onycholysis
- Pruritus, urticaria, Diffuse hyperpigmentation
- Alopecia

Graves Disease

Pre-tibial myxoedema, Thyroid acropachy

Eye signs : NOSPECS Scoring

N : No signs or symptoms

O : Only signs

S : Soft tissue involvement

P : Proptosis

E : Extra ocular involvement

C : Corneal involvement

S : Sight loss

Von Graefe's sign - Lidlag

Joffroy's sign - Absent forehead wrinkling on upgaze

Stellwag's sign - Stare

Moebius' sign - Absent convergence

Dalrymple's sign - Visible upper sclera

Hypothyroidism

- Dry coarse skin
- Cool peripheral extremities
- Puffy face, hands and feet (myxoedema)
- Diffuse alopecia
- Bradycardia
- Peripheral edema
- Delayed tendon reflex relaxation
- Carpal tunnel syndrome
- Serous cavity effusion

Adrenal Cortex

Cushings syndrome

- Truncal Obesity, weight gain.
- Moon face, hirsutism, acne, purple striae, bruising, thin skin,
- Fungal infections, plethora, hyperpigmentation.
- Mental changes, proximal muscle weakness.
- Amenorrhoea, impotence

Adrenal insufficiency

- Generalised weakness, lethargy, weight loss, hypotension.
- Vitiligo / hyperpigmentation.

Adrenal Medulla

Pheochromocytoma

- VHL syndrome, MEN syndrome
- Neurofibromatosis type 1
- Hypotension
- Paroxysms of head ache, profuse sweating, palpitations
- Pallor / flushing

Pituitary

Pituitary adenoma

- Features of raised ICT
- Optic tract compression – producing loss of red perception and bitemporal hemianopia, field defects, scotoma.
- Cavernous sinus compression
- Hypothalamic compression
- Hormone deficiencies producing hypogonadism, hypothyroidism, hypoadrenalism, growth failure / adult hyposomatotrophism
- Hormone excess causing galactorrhoea, acromegaly, cushings disease, thyrotoxicosis

Hypopituitarism

GH Deficiency

- Growth failure in child
- Abnormal body composition in adult (waxy pallor, increased body fat mass, increased waist / hip ratio)

GnRH Deficiency:

Loss of secondary sexual characters

Females : Breast atrophy

Males : Decreased muscle mass with weakness, decreased beard and body hair growth, small testes, fine facial wrinkles.

Prolactin Deficiency

Failure of lactation.

Acromegaly

- Frontal bossing
- Coarse facies
- Fleshy large nose
- Prognathism
- Widened lower incisor teeth
- Deep voice
- Oily skin
- Hyperhidrosis
- Skin tags
- Acanthosis nigricans.
- Increased hand and foot size
- Ring tightening
- Increased heel pad thickness
- Arthropathy
- Kyphosis
- Carpal tunnel syndrome
- Visceromegaly
- Macroglossia
- Thyromegaly
- Cardiomegaly.

GENETIC DISORDERS

Down's syndrome (Trisomy 21)

- **Face:**
 - ❖ Hypertelorism
 - ❖ Low set ears
 - ❖ Upward slant (mongoloid) of eyes
 - ❖ Epicanthal fold
 - ❖ Flat nose
 - ❖ Brushfield spots in iris.
- **Limbs**
 - ❖ Short and thick hand
 - ❖ Short thumb arising at a level lower than normal from palm
 - ❖ Clinodactyly
 - ❖ Single palmar crease (simian crease)
 - ❖ Sandal gap.

Turner syndrome (XO) :

- Female of short stature
- Micrognathia
- Webbed neck
- Scoliosis
- Shield chest with widely spaced nipples
- Absent axillary and pubic hairs
- Low posterior hair line
- Large ears
- Cubitus valgus
- Short 4th metacarpals
- Hypoplastic nails
- Multiple naevi
- Keloid.

Klinefelter's syndrome (XXY) :

- Tall stature, increased leg length
- Eunuchoid proportion (Arm span – height > 5cm)

- Gynaecomastia, decreased facial and axillary hair.
- Small firm testes, decreased penile length
- Obesity, varicose veins

Patau syndrome (Trisomy 13)

- Polydactyly
- Flexion deformity of fingers
- Simian crease
- Microcephaly
- Cleft lip and palate
- Low set ears.

Edward syndrome (Trisomy 18)

- Prominent occiput
- Low set malformed ears
- Micrognathia
- Clenched fist
- Rocker bottom feet.

Laurence Moon Bardet Biedl syndrome

- Mental retardation
- Obesity
- Hexadactyly
- Brachydactyly
- Syndactyly
- Retinal degeneration.

Prader willi syndrome

- Mental retardation
- Obesity
- Hypogonadotrophic hypogonadism
- Hypotonia

- DM
- Limb – deformity.

Frohlich's Syndrome (Adipose Genital syndrome)

- Hyperphagia, Obesity
- Central hypogonadism

McCune Albright syndrome

- Polyostotic Fibrous dysplasia
- Skin patch
- Adrenal adenoma
- GH hypersecretion
- Autonomous ovarian function.
- Cafe - au - lait spots

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