JHARKHAND RAI UNIVERSITY
RANCHI

LAB MANUAL

ORTHOPAEDICS

(23A501P)

BPT V

	LIST OF PRACTICAL
S.NO	**Orthopaedics Practical**
1.	Assessment of the Shoulder joint involves eliciting a proper history and examination of the joint.
2.	Assessment of the Elbow joint involves eliciting a proper history and examination of the joint.
3.	Assessment of the Wrist and hand joint involves eliciting a proper history and examination of the joint.
4.	Assessment of the Hip joint involves eliciting a proper history and examination of the joint.
5.	Assessment of the Knee joint involves eliciting a proper history and examination of the joint.
6.	Assessment of the Ankle and Foot joint involves eliciting a proper history and examination of the joint.
7	Assessment of the Peripheral nerve involves eliciting a proper history and examination of the nerve.

Practical 1

Aim: Assessment of the shoulder joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the shoulder joint.

Pain: It is the most common complaint presented by the patient. It should not be confused with tenderness. Pain is a symptom presented by patient and tenderness is a sign elicited by the examiner. Pain site, onset, duration, radiation to any nearby joints, progression, severity, associated and relieving factors and any precipitating factors if associated.

Restriction of movements: Very common complaint presented by patients with shoulder injuries. It should be carefully noted that which movements were restricted first and how has this progressed further. Patients should also be asked about active as well as passive movements.

The patients with fractures will be unable to move their limb and have severe pain with movements and will be unable to take weight on their affected limb.

Patients with rotator cuff tears will have restricted abduction and external rotation initially and will have passive movements present, while those with frozen shoulder will have global restriction of movements and will have absent active as well as passive movements.

Deformity: Any history of deformity should be noted carefully. In cases with shoulder dislocation, there is visible loss of contour of shoulder joint. A fracture can also present with swelling due to hematoma. Any contractures and tendon injuries can also lead to certain deformities.

Acute events leading to chief complain: The nature of precipitating factors to chief complains can lead to a probable diagnosis and should be enquired carefully. Direct violence can cause fractures and dislocations. If the violence was not severe enough to cause fracture, one should suspect any other chronic diseases as it might be a pathological fracture. It should be remembered that in old patients, even trivial trauma can lead to fractures due to osteoporosis.

Relevant Past history: Any history of similar events in the past should be carefully noted. Recurrent dislocations are usually due to Bankart's lesion (anterior labral tear or bony avulsion of anterior glenoid rim) or laxity of ligaments and may result into a postero lateral defect on the humeral head (Hill Sach's lesion). Multiple fractures in old age might be due to any systemic and metabolic bone disorders. The chronicity of restriction of movements can go in favour of rotator cuff tears.

Personal history: Any chronic illness that can affect metabolism of bone is important and should be enquired. Diabetic patients commonly present with frozen shoulder. Old age osteoporotic females may present with fractures even with trivial trauma.

Age and Sex: Greenstick fractures are common in children. Adults mostly have dislocations associated with trauma to shoulder. Fractures can occur at any age but elderly osteoporotic patients can have fractures even with minor trauma.

Physical Examination: The physical examination has the components of inspection, palpation and restriction of movements

Inspection: The patient must be stripped up to the waist and then examined from back, side and front. Inspection should be started with attitude of the patient. Following points must be evaluated in inspection:

a. Position of head
b. Sterno- clavicular joint
c. Position of bilateral clavicles
d. Position of bilateral Acromio-clavicular Joints
e. Contour of shoulder joint
f. Bulk of biceps/ Deltoid
g. Wasting of any muscles
h. Bilateral spine of scapula and inferior angle
i. Distance from midline
j. Any sinus/ scarring/ Bruising
k. Cervical and Dorsal spine

Palpation: It should be started with temperature and tenderness evaluation at the site of complains. Routinely, it should be started from sterno-clavicular joints, followed by Coracoid process, Acromion process, and all the points of inspection must be covered.

In supraspinatus tendinitis pressure just below the acromion process will elicit tenderness. In painful arc syndrome pressure just below the acromion will elicit tenderness if the arm is adducted, but not if the arm is abducted as the tender spot will disappear under the acromion process. The corresponding axilla should be always palpated while examining the affected shoulder. This palpation should be deep high in the axilla to detect any fullness there to indicate joint effusion.

a. Palpation of spine of scapula
b. Palpation of medical border of scapula
c. Palpation of base of spine and angle of scapula
d. Palpation of lateral border of scapula

Movements: Evaluation of shoulder range of movements (ROM) is relatively complicated; motion is possible in so many directions. Active ROM is normally assessed first; passive ROM is then assessed in certain directions if active motion is abnormally limited. To evaluate abduction, the clinician asks the patient to bring both arms up to the side as far as possible and the clinician should evaluate from the back so that the relative contributions of glenohumeral and scapulothoracic motion to shoulder abduction can be noted. If abduction is restricted, the examiner should evaluate passive abduction by grasping the patient's limb at the elbow and slowly and gently abducting it past the limit of maximal active abduction.

Abduction can usually be obtained to at least 160°, if not a full 180°. Adduction. the patient is asked to start with the arm at the side and swing the upper extremity across the trunk while

keeping the elbow straight. Normal adduction in this position is about 30°. For forward Flexion, the patient is asked to lift his or her arms forward in the sagittal plane as far as possible. In a normal individual, 160° to 180° of forward flexion is possible. If forward flexion is reduced, passive forward flexion is then evaluated. Again, passive forward flexion that is significantly greater than active forward flexion is usually related to muscular weakness or tendon injury.

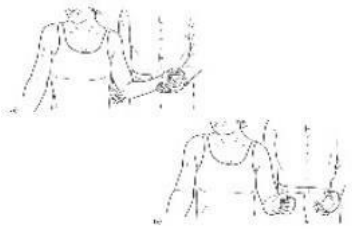
For the Extension, the patient is asked to swing the upper limb as far posteriorly as possible in the sagittal plane and is asked to keep the elbow straight. It is about 40° to 60° in the normal individual. For Rotation, External rotation is examined with the examiner standing directly in front of the patient. The patient is asked to place both arms firmly against the sides and flex both elbows to 90°. The patient is then instructed to externally rotate both forearms as far as possible while keeping the elbows firmly against the sides of the trunk. Normal external rotation in this position may vary from 45° to 90°. To assess internal rotation, the patient is instructed to start with the elbow at the side of the trunk and is asked to turn the arms inside. It is about 80° when the forearm touches the abdomen. Alternatively, to evaluate complete internal rotation, the patient is asked to reach behind his or her back.

Differential diagnosis and special tests of the various conditions

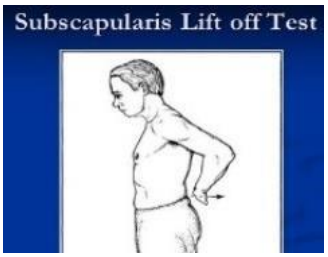
Rotator Cuff Tear: Patient presents with pain and restriction of active movements usually associated with a mild history of trauma. Pain is more in night and patient cannot sleep on affected side. Passive movements of shoulder joint are normal. MRI is the investigation of choice for the diagnosis. However, X-ray and USG can also guide in favour of cuff tears.

The drop arm test: The examiner gently abducts the patient's shoulder to the maximal degree possible. The examiner then gently releases the patient's arm and asks him or her to slowly lower the arm back to the side. When a drop arm sign is present, the patient loses control of the arm after about 100° of shoulder abduction, after which it drops suddenly to the side.

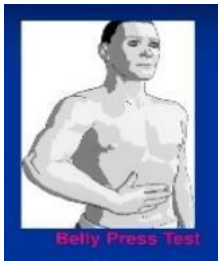
Drop Arm Test



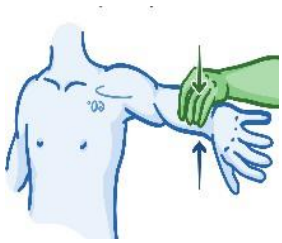
External Rotation Lag Sign



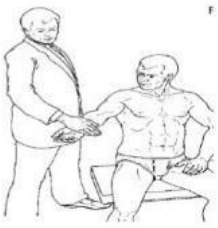
Subscapularis Lift off test



Belly Press test



Empty Can Test



Speed Test

External rotation lag sign: It is performed by asking the patient to flex his elbow to 90° with his arm by his side. The examiner then externally rotates the arm out to maximal external rotation and is asked to maintain this arm position as the examiner releases the arm. Normally, this can be maintained but in infraspinatous weakness, it comes back to neutral position.

Subscapularis lift off test: The patient is asked to internally rotate the arm behind the back to the mid lumbar region. The dorsum of the patient's hand rests on the back and is asked to maintain this position. The patient is then asked to lift the hand off the back. This test checks internal rotation done by subscapularis.

Belly press test: It is done by placing the patient's palm against the abdomen, and the elbow flexed to 90 degrees. The patient is then instructed to press the hand firmly against the abdomen. This also tests internal rotation and can check subscapularis.

Jobe's test/Empty Can Test: The patient can be seated or standing for this test. The patient's arm should be elevated to 90 degrees in the scapular plane, with the elbow extended, full internal rotation, and pronation of the forearm. This results in a thumbs-down position, as if the patient were pouring liquid out of a can. The therapist should stabilize the shoulder while applying a downwardly directed force to the arm, the patient tries to resist this motion. This test is considered positive if the patient experiences pain or weakness with resistance.

Fracture: Patient has a history of severe trauma on the affected shoulder. Severe pain and inability to move the shoulder is the chief complain here. Xray is the first investigation done to evaluate fracture pattern followed by CT scan as required. Transmitted movements: The examiner keeps his hand on the head of humerus and then rotates the limb with his other hand. The continuity if broken by a fracture with lead to loss of movements of head with this

Frozen shoulder: Patient presents with severe pain in shoulder with inability to functionally use the affected shoulder. The patient is usually an elderly one usually having a history of Diabetes or thyroid disorders. On examination there is Global restriction of movements.
Active as well as passive restriction of movements associated with pain.

Speed test: To perform the Speed's Test, the examiner places the patient's arm in shoulder flexion, external rotation, full elbow extension, and forearm supination; manual resistance is then applied by the examiner in a downward direction. The test is considered to be positive if pain in the bicipital tendon or bicipital groove is reproduced.

Practical 2

Aim: Assessment of the Elbow joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the elbow joint.

Pain: Common complaint by patient and detailed history about its site, onset, duration, severity, radiation of pain, aggravating and relieving factors.

Movement Restriction: Encountered complain of patient with elbow injuries and we should look for restricted movement and progression. Patient with fracture will be unable to move limb due to severe pain and swelling, whereas patients with arthritis and myositis ossificans have movement restriction.

Deformity: Patient with deformity around elbow gives history of injury in past and which were mismanaged leading to deformity. Example- Gun-stock deformity in malunited supracondylar humerus fractures, cubitus valgus deformity in non-union lateral condyle humerus fractures or neglected lateral condyle humerus fractures.

Acute events leading to chief complaints: The precipitating factors to chief complaints can help in making diagnosis and should be asked by clinicians carefully. Direct trauma can cause fractures and dislocations whereas trivial trauma can lead to osteoporotic fractures and pathological fractures in patients with underlying metabolic disease.

Relevant Past History: Any history of similar events in the past should be carefully noted. Multiple fractures in old age might be due to metabolic disorders or systemic disease whereas recurrence of tennis elbow can be due to repeated microtrauma at that site. The chronicity of movement restriction due to arthritis which occurs as sequelae of infection or as part of arthritis.

Relevant Personal History: Personal history such as chronic illness that can affect bone metabolism is important and should be enquired. Rheumatoid patients commonly present with elbow stiffness. Old age patients may present with fractures on trivial trauma.

Physical Examination

Inspection: The patient should be stripped up to waist and then examined from front, back and side. The inspection should be started with attitude of the patient.

a. Attitude- Patients with injury around elbow joint presents with flexed position and swelling around joint. Front position - look for the joint position whether it is flexed or extended, supinated or pronated. Look for the carrying angle which is normally 10-15° and which is slightly more in females and measured in anatomic position with forearm in supination and extension and when it is decreased condition called cubitus varus and when it is increased condition called cubitus valgus. Side position- look for

elbow broadening in antero-posterior plane commonly seen in supracondylar humerus fractures and elbow dislocation(posterior).

b. Swelling- Patients with injury around elbow presents with massive swelling and which makes difficulty in making diagnosis and we have to take help of radiograph in making diagnosis and seen commonly in supracondylar humerus fractures, olecranon fractures, radial head fractures and can be seen in olecranon bursitis and bicipito-radial bursitis(rare).
c. Muscle Wasting- Seen in condition like arthritis and myositis which affectthe elbow function.

Palpation:

a. Local temperature- Raised temperature seen commonly in patients with infections, arthritis, fresh fractures, olecranon bursitis and bicipito-radial bursitis(rare) whereas cold limb can be seen in vascular injuries associated with supracondylar humerus fractures.
b. Local tenderness- Seen in patients with fractures and arthritis around elbow and in case of tennis elbow tenderness seen in area of lateral epicondyle whereas in golfer's elbow tenderness seen in area of medial epicondyle, over olecranon process in student's elbow.
c. Position of bony points – Normally 3 bony points (2 epicondyle and 1 olecranon process) whether in flexion and extension are congruous as in flexion they make isosceles triangle and they are in straight line in extension and base disrupted in supracondylar and intercondylar humerus fractures, whereas apex disrupted in olecranon fractures
d. Palpation of axillary and supratrochlear lymph nodes- Unilateral involvement seen in infective lesions of forearm, wrist and hand whereas bilateral involvement seen in syphilis and supratrochlear nodes are best felt in 90°degree flexion.

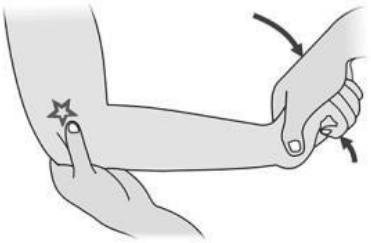
Movements: Active range of motion (ROM) is assessed first and passive ROM is then assessed in certain condition if active movement is limited. Flexion- normal range (0-140°) and occurs due to biceps, brachialis, brachioradialis. Extension- normal range (0°) and occurs due to triceps and anconeus. Supination- is45°- 85° and occurs due to biceps and supinator whereas pronation is 45°-80° occurs due to pronator quadratus, pronator teres and flexor carpiradialis. Movement restrictions are seen in patients with fractures, infections, arthritis, myositis ossificans and synovial chondromatosis elbow(rare).

Measurements: Arm length- measured from acromion angle to lateral epicondyle humerus. The arm is short in displaced shaft humerus fractures and supracondylar humerus fractures. Forearm length- measured from lateral epicondyle humerus to radial styloid. The forearm shortened in forearm fractures, posterior elbow dislocation.

Special Test:

Cozen's test: Elbow to be tested is pronated and flexed and patient told to dorsiflex wrist actively against resistance, if pain produced around lateral epicondyle suggestive of tennis elbow.

Reverse Cozen's test: Side to be tested hand and wrist placed in supination and elbow is extended by putting pressure on hand and patient tries to flex elbow, if pain felt around medial epicondyle suggestive of medial epicondylitis/ golfer's elbow.



Reverse Cozen Test

B- The patient will perform Flexion in the wrist against the resistance (downward force) applied by the examiner.

Cozen's Test

Reverse Cozen's Test

Practical 3

Aim: Assessment of the Wrist and hand joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the wrist and hand joint.

Pain: Full pain analysis as in other joints should be carried out. These include site & radiation (Radial/ulnar-sided & dorsal or palmar), radiation up or down. Time- night pain, pain at rest and if it is aggravated with movements. Severity- it's duration, relieving and aggravating factors.

Stiffness: morning/all day Swelling

Loss of function Deformity ADL (Activity of Daily Living): Difficulty opening jars or doorknob in thumb carpo-metacarpal joint (CMCJ) arthritis; weak pinch and grip, dropping objects. Pain, clicking and giving way in instability,pins and needles, hypoesthesia, Buttoning and knitting.

Personal History: regarding Age, hand dominance, occupation, hobbies and smoking.

Medical History: Diabetes Mellitus, Rheumatoid Arthiritis, previous Operations

Physical Examination

Inspection:

a. Skin discoloration- Any skin discolouration. There are various conditions in which the discolouration of the skin occurs like erythema (cellulitis), white (arterial insufficiency), blue/purple (venous congestion), black spots (melanoma).
b. Skin trophic changes like increased hair growth or altered sweat production due to derangement of sympathetic system.
c. Sign Nerve Involvement- thenar atrophy median nerve involvement (Carpel tunnel syndrome) interossei atrophy ulnar nerve involvement (Cubital tunnel syndrome) subcutaneous atrophy locally post-steroid injection
d. Deformity- Absence of normal anatomy (as compared to normal hand) indicates some deformity may be there, so check for asymmetry, any angulation in the fingers or hand, any rotation of nail or fingers, previous amputation, Look for the cascade sign - ask to flex fingers at the metacarpo-phalynjeal joints (MCPJ) and proximal interphalyngeal joints (PIPJ). The fingers will point towards the scaphoid tubercle, if one or more fingers do not converge, then trauma to the digits has likely altered normal alignment.

Palpation:

a. Temperature- warm: infection, inflammation; cool: vascular pathology
b. Tenderness
c. Crepitus (fracture)
d. Clicking or snapping (tendonitis)
e. Joint effusion (infection, inflammation, trauma)
f. Swelling: On the dorsum of hand, tender, cystic and rounded(ganglion)

Movement: Range of motion- Active and passive of wrist and fingers (Wrist- 60° flexion, 60° extension, 50° radioulnar deviation arc, Pronation / Supination; Finger- MCP: 0° extension to 85° of flexion, PIP: 0° extension to 110° of flexion, DIP: 0° extension to 65° of flexion, opposition)

Neurovascular Examination

a. Sensory: Superficial sensation like touch, pain, temperature; Deep sensation like proprioception, vibration, two-point discrimination etc.
b. Motor: required to check for the individual nerves. The test for the three nerves of the hand and wrist. Different types of injury at different sites involve different nerves, so examine thoroughly the site involved. Example - radial nerve: test thumb IP joint extension against resistance, median nerve: recurrent motor branch: palmar abduction of thumb, anterior interosseous branch: flexion of thumb IP and index DIP ("OK sign"), ulnar nerve: cross-fingers or abduct fingers against resistance
c. Vascular: radial pulse, ulnar pulse and check for capillary refill

Special tests

Grind test: used to test for pathology at the thumb carpometacarpal joint (CMC), examiners apply axial load to first metacarpal and rotates or "grinds" it. Positive findings: pain, crepitus, instability.

Finkelstein's test: used to test for DeQuervain's tenosynovitis (inflammation of tendon sheath through which abductor pollicis longus and extensor pollicis brevis pass) patient makes fist with fingers overlying thumb examiner gently deviates the wrist medially (ulnar wards) positive findings: pain along the abductor pollicis longus and extensor pollicis brevis tendon (1st extensor compartment).

Flexor Digitorum Profundus test: used to test continuity of FDP tendons, MCP + PIP joints of the finger to be tested are held in extension while patient is asked to flex the DIP joint, thereby isolating FDP (from FDS) as the only tendon capable of flexing the finger

Flexor Digitorum Sublimus test: Used to test for continuity of FDS tendon. The finger to be tested is allowed to flex at PIP joint while the rest of all the other finger movements are blocked at the MCP, PIP and DIP with the hand held in extension, flat on a table top with the palm facing upwards

Tinel's Sign: tests for carpal tunnel syndrome- examiner percusses with two fingers over distal palmar crease in the midline positive if patient reports paresthesias in median nerve distribution.

Phalen's test: tests for carpal tunnel syndrome with the hands pointed up, the patient's wrist is allowed to flex by gravity in palmar flexion for 2 minutes maximum positive if patient reports paraesthesia in median nerve distribution

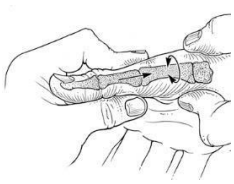
Froment's sign: tests for ulnar nerve motor weakness patient asked to hold a piece of paper between thumb and radial side of index positive if as the paper is pulled away by the examiner the patient flexes the thumb IP joint in an attempt to hold on to paper

Wartenberg's sign: tests ulnar nerve motor weakness patient is asked to hold fingers fully adducted with MCP, PIP, and DIP joints fully extended the test is positive if small finger

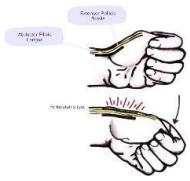
drifts away from others into abduction

Jeanne's sign: tests for ulnar nerve motor weakness- ask patient to demosntrate key pinch positive finding if patients first MCP joint is hyperextended

Allen's Test: Both radial artery and ulnar artery are occluded fist with the first clenched, now open the fist and release radial artery, check for flushing of hand. repeat the procedure with releasing ulnar artery now and check for flushing. this test is done to check the patency of both the arteries.

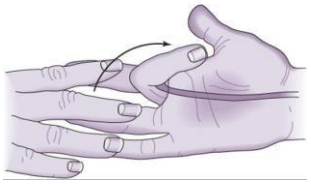


Grind test

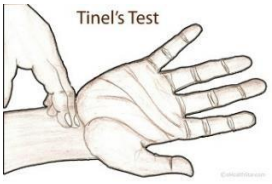


Finkelstein's test

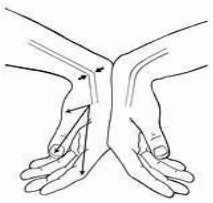
Flexor Digitorum Profundus test



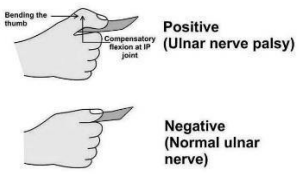
Flexor Digitorum Sublimus test



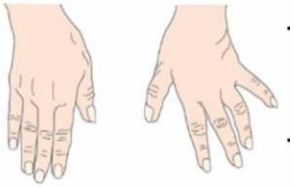
Tinel's Sign



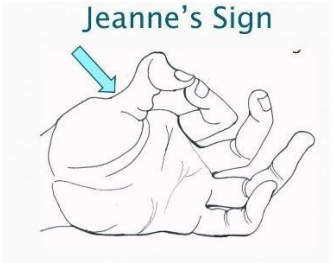
Phalen's test



Froment's sign



Wartenberg's sign



Jeanne's sign

Allen's Test

Common conditions of the hand and wrist

a. Degenerative Arthritis of the Fingers: Heberden's nodes (most common), Bouchard's nodes (common), Mucous cysts (occasional), Decreased motion at involved interphalangeal joints (common) Instability of involved joints (occasional)

b. Rheumatoid Arthritis: The characteristic features of the is disease includes Boggy swelling of multiple joints (metacarpophalangeal joints and wrist joint most commonly involved) tenosynovium of the extensor tendons over the dorsum, flexor tendons on the volar surface of the wrist and the hand (common). Secondary deformities in more severe cases, such as ulnar deviation of the metacarpophalangeal joints and swan neck and boutonniere deformities, Secondary rupture of extensor or flexor tendons (variable).

Practical 4

Aim: Assessment of the Hip joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the Hip joint. Majority of patients of hip pathology would have the presenting complaints of pain with or without limp.

Pain: Site- Hip pain usually occurs around the groin and front of the proximal thigh (area around the Scarpa's triangle) and may radiate till the knee due to the common nerve supply. This is in contrast to pain in the gluteal area and back of the thigh which is due to spine or sacroiliac joint involvement.

Severity- Severity depends of the degree of involvement of the hip joint and loss of articular cartilage in various diseases.

Aggravating factors- Mechanical pain is caused or aggravated by weight bearing or loading of the joint. Pain at the terminal range of movement is likely to be due to synovitis while pain in arthritis is aggravated due to any attempted movement of the joint.

Night cries versus Rest Pain: Tuberculosis of the hip typically causes night pain as the patient wakes up from sleep when the diseased articular surfaces of the hip joint come in contact due to muscle relaxation during sleep. During day time the muscle spasm around the hip helps to keep the articulating surfaces of the diseased portions of the head of femur and acetabulum apart. Rest pain or pain at rest may occur in day time or a period of inactivity and is associated with avascular necrosis of the head of femur.

Morning stiffness and pain - This is typical of inflammatory diseases like rheumatoid arthritis and ankylosing spondylitis especially if the morning stiffness lasts more than half an hour. It is important in such cases of morning stiffness to find out about the duration of morning stiffness and history of remissions and exacerbations and involvement of other joint involvement, particularly small joints of hands in rheumatoid arthritis and low back pain due to sacroiliitis in ankylosing spondylitis.

Relieving factors- Usually painkillers are taken by the patients for pain relief and the frequency and amount of such medications may be an indirectindicator of the extent of the hip disease or arthritis.

Limp: Limp is any abnormal gait and in hip pathology, limp could be due to various causes which may be better observed during gait examination. Sometimes the following history may be elicited to find out the characteristics of the limp:

Painful or painless: Painful limp would be present in arthritis. The classical painless limp is seen in Perthes disease in children and not in elderly.

Due to the limp, does the patient need any ambulatory aid like a walking cane or crutch or walker.

Short limb: the patient noticed or has been informed by someone, of any limb length discrepancy contributing to the limp and whether he uses or has been advised any shoe raise to compensate the shortening. Has the patient noticed or has been informed that his trunk lurches while walking?

Negative History and Past History (For differential diagnosis): Relevant negative history needs to be mentioned to eliminate the differential diagnosis. Thus, leading questions may need to be asked to identify the various causes of hip disorders, which include trauma, causes of avascular necrosis (AVN) of femoral head and other causes of secondary arthritis like infection, tubercular or pyogenic in the past.

A few common questions need to ask to rule out

Trauma: Many patients tend to attribute any orthopaedic ailment to a traumatic incident. Hence history of significant trauma is important. If the patient is unable to stand up, bear weight on the affected limb and walk, then it is considered to be a significant trauma. However sometimes in the elderly even without an history of trauma fragility fracture of the neck of femur may occur. Along with trauma it is important to ask the patient for any history of massage. Massage may predispose to heterotrophic ossification.

Avascular necrosis of femoral head (AVN): History of steroid intake, High doses steroid for immunosuppression for example in renal transplant, Chronic steroid intake for various respiratory or skin diseases, Steroid may be given by quacks and taken by patients since it provides an initial false sense of well-being.

History of chronic alcohol intake, Past history of fracture neck of femur, History of any radiotherapy given around the hip, rarer causes of AVN include Gaucher's disease, gout, post-partum, excessive use of NSAID.

Infections: Past history of hip pain associated with fever which could by high grade with a history of pus drainage may be elicited in pyogenic infections compared to low grade fever in the evening, loss of appetite and loss of weight or chronic cough and night cries due to hip pain may be elicited in tuberculosis.

Inflammatory disorders: Inflammatory disease of rheumatoid arthritis and ankylosing spondylitis with hip involvement may have a chronic course of remission and exacerbation with morning stiffness. Rheumatoid arthritis patients are likely to develop polyarticular disease with joints of hand and feet. Ankylosis spondylitis patients may have low back ache or sacroiliac pain with stiffness, with redness of eyes. Seronegative spondyloarthropathy may be associated with symptoms of inflammatory bowel disease with bloating, tenesmus, passage of loose stools off and on. Similarly mouth sores, eye inflammation, skin rashes and genital sores may be present in Behcet's syndrome; conjunctivitis, urethritis in Reiter's syndrome and typical skin lesion in psoriatic arthropathy.

Physical Examination

Inspection: On lying down on the bed, comment on whether the patient is able to lie down comfortably and check the following

Supine- Lumbar lordosis, Level of anterior superior iliac spines, Attitude of lower limbs- Hips: Flexion / Abduction or adduction / Internal or external rotation, Indicator of attitude of

internal or external rotation, Position of patella (normally faces 5-10° upwards and outwards) If it faces directly upwards – limb is in internal rotation, Lateral border of foot, if it touches the bed – limb is in external rotation, Front of thigh- Scarpa's triangle, Any swelling / scars /sinus, Level of patella and medial malleolus, Indicator of apparent shortening / lengthening, From the side, Any swelling/ bruise / scars /sinus, Greater trochanter – Any bruising / colour changes of old hematoma, Any prominence, Proximal migration.

Prone- Any wasting in gluteal muscles, Any swelling in gluteal area

Palpation (Head to toe sequence)

a. Lumbar lordosis
b. Level of anterior superior iliac spines (ASIS)
c. Local temperature
d. Tenderness over hip joint
e. Femoral pulse (vascular sign of Narath)
f. Femoral or Scarpa's triangle
g. Any swelling / fluctuation
h. Greater trochanter
i. Tenderness
j. Thickening or broadening or irregularity
k. Proximal migration (3digit palpation)
l. Gluteal region-Tenderness
m. Swelling
n. A rounded or globular swelling which moves with rotation of limb could be a dislocated head of femur
o. Hard swelling which does not move may be heterotopic ossification

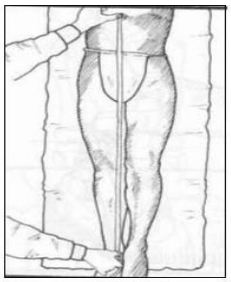
Movements

Assess the following movements- Flexion, Extension, Abduction, Adduction, Internal and External Rotation. Active as well as passive movements, Painful / painless / terminal movement painful, any crepitus, any muscle spasm.

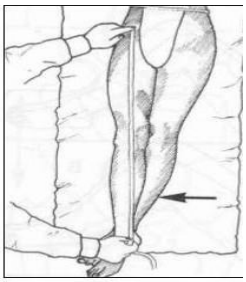
Measurements

a. Circumference of thigh
b. Apparent Limb length
c. True Limb Length (Pelvis squared and limbs kept in identical position)
d. Bryant's triangle - Supratrochanteric shortening, Pelvis squared and limbs kept in identical position
e. Schoemaker's line - Line from ischial tuberosity through tip of greater trochanter to ASIS if prolonged reaches umbilicus. If greater trochanter is proximally migrated, line crosses below the umbilicus.
f. Nelaton's line - Line drawn from the most prominent part of ischial tuberosity (lateral position with hip flexed to 90 degrees) to ASIS touches the tip of trochanter.
g. Morris' bitrochanteric test - Distance between outer border of trochanter to pubic symphysis on both sides are measured by a caliper. Decreased distance – central hip dislocation / internal rotation of hip Increased distance-external rotation of hip.
h. Chiene test - Line joining tips of both trochanter is normally parallel to another line joining both the ASIS

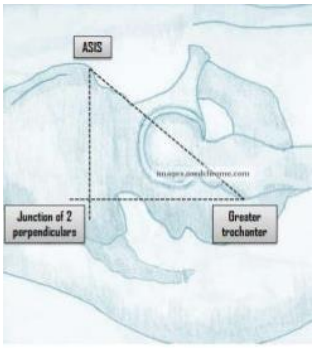
i. Kothari's method - Angle of abduction or adduction deformity, Line joining both ASIS and perpendicular drawn from each ASIS to the midline (xiphisternum to pubic symphysis)

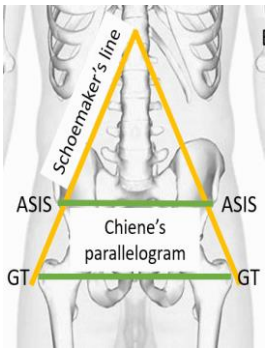


Apparent Length
Midpoint to Medial Malleolus

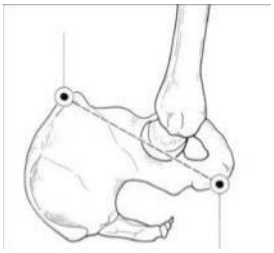


True Length
ASIS to Medial Malleolus



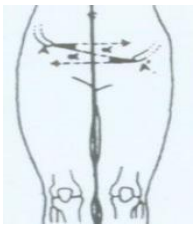


Measurement of Apparent and True Limb Lrngth Bryant's Triangle Schoemaker's Line & Chiene's Test



Nelaton's Line

Morris' Bitrochanteric Test



Kothari's Method

Special Tests

Active SLR - Patient with a hip fracture is unable to actively lift up the lower limb with knee extended. Sometimes in old non-union of hip fractures patient may be able to do active SLR due to fibrosis across the fracture site.

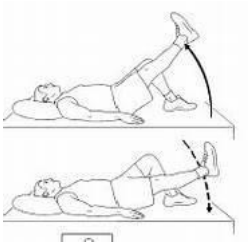
Passive SLR is a test for nerve root stretch due to disc prolapse.

Telescopy test - The pelvis is fixed with thumb on ASIS and other fingers placed on greater trochanter. Knee is grasped with other hand and pushed the thigh downwards along the axis of thigh, while the other hand notes whether the trochanter is moving downwards

Trendelenburg test - Patient stands on unaffected normal limb first, the buttocks on affected side rises up. Next, patient stands on affected side, pelvis on opposite side sinks as shown by gluteal folds and iliac crest

Galleazzi test or Allis sign - The level of knee is examined with the patient lying supine and knee flexed and sole of the foot on the bed. The test can be used to differentiate femoral shortening where the affected knee is proximal versus a tibial shortening where the length of thigh is same and knee is at a lower level.

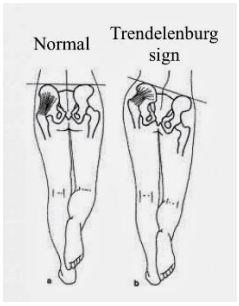
FABER - Flexion Abduction External Rotation test



Active SLR

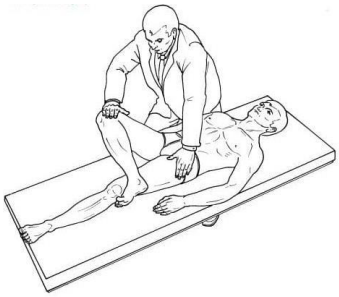
Passive SLR

Telescopy test



Trendelenburg Test

Galaezzi Test or Allis Test



Faber or Patrick Test

Common Conditions of Hip Joint

Hip fracture, TB hip (untreated natural course of disease), Early arthritis, Pyogenic bacterial infections usually affect the hip in infancy or elderly when immunity is poor, Acute septic arthritis – features of pseudoparalysis, Painful restriction of all movements- Healed sequelae, Untreated will lead to bony ankylosis Usually when patient presents with fever antibiotics are given, so complete destruction of cartilage by the rapidly multiplying bacteria is arrested and patient may present as healed arthritis which will have different finding depending on the amount of destruction of hip. Ankylosis spondylitis

Practical 5

Aim: Assessment of the Knee joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the Knee joint. Majority of patients of Knee pathology would have the presenting complaints of pain with or without limp.
Comprehensive history about Pain, Swelling, stiffness, limp, deformity.

Physical Examination

Inspection - Complete exposure before the examination is necessary. Start examination in standing position, both from front and behind, seated position, supine position, and lastly in the prone position.

a. Gait – with a stiff knee, the affected leg will swing outward while walking. In other conditions, the patient will lurch on the normal side to avoid weight bearing on the affected side.
b. Attitude – Moderate flexion [optimum position] mostly seen in arthritic joints, be it early stage of tuberculosis of knee or acute arthritis, with the progression, triple displacement [flexion, external rotation and valgus at knee associated with posterior subluxation of tibia, genu varum in case of osteoarthritis, always look for the position of patella and its anterior surface.
c. Swelling – effusion of the knee joint could be present in acute arthritis, osteoarthritis, tuberculosis, and trauma. Extra-articular swellings are common around the knee joint due to the enlargement of different bursae around the knee. Prepatellar bursa situated in front of the lower part of patella and ligamentum patellae, inflamed in prepatellar bursitis [housemaid's knee]; other bursae around knee joint are semimembranosus, infrapatellar, suprapatellar, bicipital bursa also get inflamed and enlarged.
d. Morrant Baker's cyst – herniation of synovial membrane posteriorly slightly below joint line, prominent on extension and disappears on flexion is often associated with tuberculosis and osteoarthritis of the joint.
e. Muscle wasting – should be looked at both above and below the joint.

Palpation

a. Local temperature
b. Local tenderness
c. Swelling – fluctuation or cross fluctuation test, patellar tap (positive only if a moderate amount of fluid is present in the joint), Bulge Test – for a small amount of fluid – apply pressure over one of the obliterated hollows on either side of ligamentum patellae and then release the pressure, look for slowly filling hollow patellar tap in standing thickened synovial membrane – spongy & boggy feel and absent patellar tap Transillumination – positive only when the swelling is enlarged bursa or cyst, e.g., Morrant-Baker cyst.
d. Popliteal fossa palpation – palpation in prone position.

e. Bony components - femoral condyles, tibial condyles, and patella for any swelling, tenderness, irregularity, or crepitus.
f. Look for muscle wasting or any adhesions to the bone. Extraarticular - the slip of semitendinosus over medial condyle, biceps tendon over fibular head, iliotibial band over lateral condyle, etc. Intraarticular – the most typical cause is osteoarthritis.

Movements – mainly flexion and extension. To assess small amounts of loss of flexion, one should check for heel to buttock distance. Loss of flexion is expected because of effusion and arthritic change of patellofemoral pain. The medio-lateral instability can be assessed by varus and valgus stress at 15-20 degrees of knee flexion. Some degree of internal and external rotation can be elicited in 90 degrees of flexion. While doing flexion and extension of the knee, one should place the palm of one hand over the patella; if crepitus is present, then it is suggestive that osteoarthritis has involved the patella-femoral joint. One should also check for movements of proximal and distal joints. (Hip & ankle joint)

Measurements

Check for muscle wasting at equidistance from ASIS.

Genu varum – a line is drawn from ASIS passing from center of the patella and should strike the medial malleoli.

Lymph nodes – in arthritis of knee joint, popliteal group of lymph nodes will be palpable, later inguinal group of lymph nodes may be involved.

Special Test

Mcmurray's Test is a knee examination test that elicits pain or painful click as the knee is brought from flexion to extension with either internal or external rotation. This test uses the tibia to trap the meniscus between the femoral condyle and the tibia. When performing the McMurray's test, the patient should be lying supine with the knee flexed. The examiner then grasps the patient's heel with one hand and places the other hand over the knee joint. To test the medial meniscus, the knee is fully flexed and the examiner then passively externally rotates the tibia and places a valgus force. The knee is then extended in order to test the medial meniscus. To test the lateral meniscus, the examiner passively internally rotates the tibia and places a varus force. The knee is then extended in order to test the lateral meniscus. A positive test is indicated by pain, clicking or popping within the joint and may signal the tear of either the medial or lateral meniscus when the knee is brought from flexion to extension.

Lachman's Test is the most sensitive examination test for ACL injury. The anterior cruciate ligament is located in front of the knee. The ACL keeps the tibia from sliding out in front of the femur and provide rotational stability to the knee. ACL tear causes anterolateral rotational instability of the knee. The patient should be lying supine and completely relaxed. Bend the knee to about 20°-30°. Stabilize the femur with one hand and with the other hand pull the tibia anteriorly and posteriorly against the femur. With an intact ACL, as the tibia is pulled forward, the examiner should feel an endpoint. If the ACL is ruptured, the ACL will be lax and the examiner will feel softer with no end point. The tibia can be pulled forward more than normal (anterior translation).

Pivot Shift Test is a specific test for ACL deficient knee (ACL injury- acute and chronic).. The pivot shift test goes from extension (tibia subluxed) to flexion, with the tibia reduced by the iliotibial band. The patient should be lying supine and completely relaxed. With pivot shift, the knee is in the subluxed position when the knee is in full extension. The pivot shift starts with the extension of the knee and you can feel a "clunk" at 20°-30° of flexion. Hold the knee in full extension then add valgus force plus internal rotation of the tibia to increase the rotational instability of the knee. Then take the knee into flexion. You feel a palpable clunk on outside of knee as the tibia reduces. The iliotibial band will reduce the tibia and create the clunk on the outside of the knee.

Reverse Pivot Shift Test helps to diagnose acute or chronic posterolateral instability of the knee. A significantly positive reverse pivot shift test suggests that the PCL, the LCL, the arcuate complex and the popliteofibular ligament are all torn. The test begins with patient supine with the knee in 30° of flexion. Valgus stress is then applied to the knee with an external rotation force. Bring the knee from 90° of flexion to full extension. The tibia reduces from the posterior subluxed position at about 20° of flexion. A shift and reduction of the lateral tibial plateau can be felt as it moves anteriorly from a posterior subluxed position. A "clunk" occurs as the knee is extended. This is called reverse pivot shift because the shift of the lateral tibial plateau occurs in the opposite direction of true pivot shift. If the tibia is posterolaterally subluxed, the iliotibial band will reduce the knee as the IT band transitions from a flexor to extensor of the knee.

Posterior Drawer Test is the most accurate test for PCL injury. The posterior cruciate ligament is located in the back of the knee. PCL is the primary restraint to posterior tibial translation. PCL tear is not as common as ACL tear. The test is done with the patient in supine position and the knee is flexed to 90°. The examiner stabilised the foot. Then the examiner pushes backwards on the tibia, looking for the tibia to sag posteriorly. Observe the sag that develops due to the PCL tear. The amount of translation in relationship to the femur is observed. The test is considered positive if excessive posterior translation of the tibia is demonstrated.

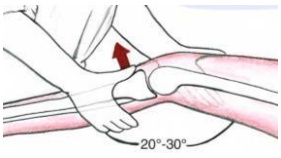
Dial Test is to diagnose the posterolateral instability due to posterolateral corner injury with or without PCL injury. Isolated injuries of the posterolateral corners are rare and often cause instability and varus thrust. By performing the dial test, you can detect if there is an isolated or combined injury of the posterolateral corner of the knee. The test is performed with the patient in the supine or prone position with both knees in 30° and 90° of flexion. It is preferable to perform the test in the prone position. Support the thigh in position if the test is performed in supine position. An external rotation force is then applied to both feet. The amount of external rotation to both lower extremity is measured at both ankles. The testing of the injured extremity in 30° of flexion is done to determine injury to the posterolateral corner. Flexion at 90° angle will test the PCL for injury. More than 10° of external rotation compared to the other side indicates a significant injury. More than 10° of external rotation asymmetry at 30°and 90° is consistent with PLC and PCL injury (combined injury).

Valgus Stress Test (0-30°) is the test for medial collateral ligament injury. Palpate around the knee in order to check for injury to the MCL. Usually, the site of tenderness and pain is above the level of knee joint and rarely below the knee joint. The best way to test the superficial part of the MCL is to place the knee in about 30° of flexion. With the MCL

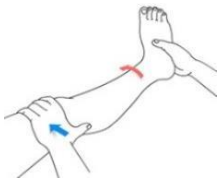
isolated and the knee flexed to 30°, move the knee from side to side to assess the stability of the knee. Check the opening on the medial side when valgus force is applied. Then place the knee back into 0° of full extension and test the stability of the MCL in the same way. If the MCL appears to be loose in full extension, this will signal a complete injury to the posterior capsule or cruciate ligaments in addition to injury of the MCL. Valgus force at 30° of knee flexion will test the superficial part of the MCL, which is the strongest part of MCL.

Varus Stress Test (0-30°) checks for joint laxity on the outside of the knee, which usually represents an injury to the LCL. Palpate around the knee in order to check for injury to the LCL. Apply a varus force to the knee. Isolated tear of the LCL is tested at 30°of flexion. With the LCL isolated and the knee flexed to 30°, move the knee from side to side to assess for stability of the knee. Next place the knee back into 0° of full extension and test the stability of the LCL in the same way. A positive test demonstrates increased lateral joint laxity compared to the unaffected side when the varus force is applied to the knee. Varus instability at 0° and 30° of flexion indicates a combined injury of LCL and the cruciate ligaments. An isolated injury to the LCL will give you varus instability at 30° of flexion.

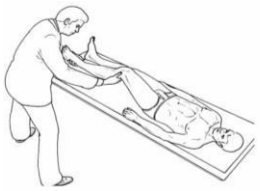
Mcmurray's Test



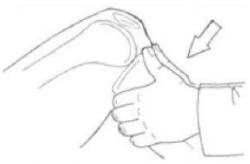
Lachman's Test



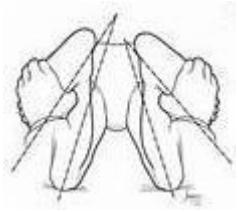
Pivot Shift Test



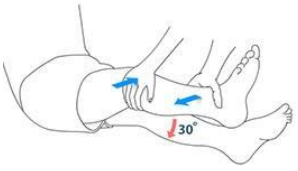
Reverse Pivot Shift Test



Posterior Drawer Test



Dial Test



Valgus Stress Test

Varus Stress Test

Knee Common Conditions

Osteoarthritis knee - The patient may present with a history of slowly progressive knee pain, with stiffness worse in the morning or when the limb stayed in one position for too long, difficulty walking, and pain may exacerbate on kneeling, squatting, or descending stairs. Pain may be relieved by sitting, resting, or reclining. Symptoms may become worse on humid or cold days

Tuberculosis of knee - The patient generally presents with swelling and pain of the knee, insidious in onset and progressing gradually. The patient may have a history of fever, weight loss, decreased appetite, night sweats, and night cries. Site of involvement, the swelling may be of parapatellar fossa, suprapatellar pouch, and even popliteal fossa. Advanced cases may present with swelling and knee deformities.

Phemister's triad - peri-articular osteoporosis, peripherally located osseous erosion, joint space narrowing

Synovitis - Inflammation of the synovial membrane, the inner lining of articular capsule which secretes the synovial fluid, is called synovitis.

Gout - Patients present with pain and swelling with complaints of fever, general malaise, and fatigue, Severe pain acute in onset more common at night and in the early morning period. The patient may have had a similar history in the past with other joints. Typically, first metatarsophalangeal joint involvement. In these patients, history is essential about risk factors like Hypertension, type2 diabetes mellitus, alcohol, history of taking urate metabolism altering drugs, hyperlipidemia, family history.

Rheumatoid arthritis - Patients present with pain and morning stiffness. Symptoms are slow and insidious. Usually involve small peripheral joints like the hand and wrist.

Practical 6

Aim: Assessment of the Ankle and Foot joint involves eliciting a proper history and examination of the joint.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Chief Complains: The common chief complaints encountered in a patient with pathologies of the ankle and foot joint. Majority of patients of ankle pathology would have the presenting complaints of pain with or without swelling and instability.
Comprehensive history about Pain, Swelling, Deformity, Instability, Numbness and paraesthesia, Ulcers.

Physical Examination

Inspection: Examiner should have complete exposure to patient foot and ankle region. Start the examination in Gait phase, standing position and non-weight bearing position.

a. Gait- There are various gait related to foot and ankle problems; Antalgic gait- acute injury cases; High stepping gait- common peroneal nerve palsy**;** Short leg gait- limb length discrepancies
b. Swelling- In cases of trauma, acute arthritis, gout, tuberculosis, malignancy and infections patient can present with swelling of foot and ankle joint.
c. Deformity- The patient is asked to stand evenly on both feet and observed for the deformities. Hallux valgus is most common deformity of great toe; Pes planus/ flat foot: longitudinal arch is flattened; Haglund deformity: occurs due to bone and soft tissue abnormality of foot posterior to the calcaneus.
d. Skin changes- Thickened cornified skin over dorsum of toes known as helema durum/ hard corns; Ulcerations over the foot can be due to pressure, tuberculosis or neuropathy; Skin should also be inspected for rashes and warts; Atrophic changes: can be due to neurological, vascular or fungal; infection of toe nails.

Palpation: On palpation following things need to be assessed:

a. Pain
b. Local temperature – can be raised in inflammatory swellings
c. Localised tenderness – look for osteoporotic fractures or pathological fracture
d. Swelling- Ankle arthritis and traumatic injury can lead to swelling of ankle joint; in cases of gouty arthritis, osteoarthritis of foot, rheumatoid arthritis.
e. Pulsations - feeble or absent in peripheral vascular disease

Movements

At Ankle joint – Dorsiflexion and Plantarflexion (Passive movements at Ankle joint can be assessed by holding the lower leg with one hand and gripping the talus with the other hand) At Hindfoot – Inversion and Eversion (this can be tested by holding proximal part of foot (i.e. Talus) in one hand and heel in other hand after locking the tibio-talar joint in full dorsi flexion). At Midtarsal joint – Adduction and Abduction (passive movements can be assessed by holding the heel in one hand and forefoot in other hand)

Neurological Examination: Following things are to be assessed during neurological examination: -

Muscle power
Sensation
Reflexes

Common Conditions

Hallux Valgus - This is the most common deformity of great toe mainly caused due to wearing tapered shoes for long period of time. It can be hereditary or acquired. More than half of the patients have positive family history.

Plantar Fasciitis - It is a painful condition caused by inflammation at insertion of plantar fascia on the medial process of calcaneal tuberosity. Characterised by pain and tenderness, usually, self-limiting condition.

Diabetic foot - Diabetic foot is a known complication of long-standing Diabetes mellitus. It can lead to peripheral vascular diseases, damage to peripheral nerves (Neuropathic), Immunocompromised host, infections.

Gout - It is an acute inflammatory arthritis caused by deposition of monosodium urate crystals around the joint. Patients present with pain and swelling associated with fever, malaise and fatigue. Pain is acute in onset, severe, more during night, localised to great toe most commonly but can affect other joints also, followed by dull aching pain associated with swelling. Affected joint become warm, red, swollen, tender and associated with restriction of movements. Chronic gout may be associated with pain, stiffness and deformity.

Osteoarthritis Foot and Ankle - This is degenerative disease of joints caused by rubbing of two articular surfaces with each other. Risk factors include age, obesity, alcohol and tobacco consumption, genetic predisposition, mechanical insult. Complaints like pain, swelling Stiffness and restricted movements.

Hallux Valgus Plantar Fasciitis Diabetic Foot Gout

Practical 7

Aim: Assessment of the Peripheral nerve involves eliciting a proper history and examination of the nerve.

History: To undertake a comprehensive history, it is required to enquire about the chief complaints in the patient.

Pain: It is the most common complaint following any event of injury. It should be studied under the headings of site, onset, character, duration, radiation to any nearby joints, progression, severity, associated and relieving factors and any precipitating factors if associated.

Onset of symptoms: sudden onset (compression neuropathy, Saturday night palsy), gradual onset (carpal tunnel syndrome, Hansen's disease)

Site: Unilateral (usually injuries) and bilateral (Guillian Barre Syndrome) involvement of nerves may occur. The site and part affected of upper or lower extremity needs to be ascertained.

Loss of function: The patient presents with complains such as inability to do certain actions and can also affect the activities of daily living. All the functions that have any problems should be enquired about and the conclusion carried out accordingly. eg holding a glass of water (claw hand), unable to lift his wrist and fingers (wrist drop, finger drop). Thus, the loss of function may be due to Weakness like motor weakness (may lead to clumsy actions, dropping objects while holding by upper extremity, clumsy gait or unable to walk or slippage of footwear), Sensory loss (loss of sensation in the prehensile grasp area due to median nerve injury and trophic ulcers in sciatic nerve injury may be disabling along with the motor weakness.

Deformity: Claw hand deformity due to ulnar or combined median and ulnar nerve palsy.

Negative History: To rule out the various causes of nerve palsy relevant negative history need to be elicited, which include: Peripheral Nerve Injuries - Anaesthetic patches over the back (Hanson's disease), trauma(fibular neck fracture, tibial condyle fracture, compartment syndrome), injections (injection palsy may not be due to direct trauma from needle rather due to the toxic drugs injected in the vicinity of the nerve), tumour(example exostoses around proximal fibula), iatrogenic following surgery (acetabular fracture, discectomy), low back pain(disc prolapse), exposure to paints, working in ship yard(lead poisoning- motor neuropathy), diabetes mellitus (mononeuropathy), alcoholism, use of axillary crutches(Saturday night palsy),sitting cross legged, vitamin deficiency– beriberi, heavy metal poisoning(arsenic, antimonymixed neuropathy with more involvement of the lower extremity), drugs (isoniazide, streptomycin, ethambutol, vincristine, cisplatin), poisoning, motor neuron disease (fasciculation's with muscle weakness), Guillian Barre Syndrome (ascending weakness usually bilateral).

Occupation History: Agriculture (Leprosy), shipyard (lead poisoning)

Inspection: On inspection, the attitude of the limb, the wasting of muscles, skin changes due to sensory loss should be looked for along with gait abnormalities in case of lower limb involvement. Attitude of the limb Nerve involvement in the upper limb may result in typical

attitude of the limb. Hence the attitude of the limb at different joints starting with the level of both shoulders, position of the elbow, wrist and fingers should be assessed. For example: Radial Nerve Palsy – there would be a wrist drop with the wrist in 90° palmar flexion, fingers in 45° flexion. Whereas a low radial or posterior interosseous nerve palsy would result only in finger drop not wrist drop.

Median nerve palsy - the thumb would be lying in the same plane as rest of the fingers (ape thumb), instead of the thumb being at right angle to the plane of other fingers when kept in anatomical position.

Ulnar nerve palsy - clawing of little and ring fingers (intrinsic minus position) may be visible with the attitude of hyperextension of the metacarpo-phalangeal (MCP) joints and flexion of the inter-phalangeal (IP) joint.

Common peroneal nerve palsy - foot drop may be seen with an attitude of equinus.

Wasting of muscles: Radial nerve - wasting of forearm extensor muscles, Median nerve – wasting of thenar and hypothenar eminence, Ulnar nerve - wasting of intrinsic muscles of hand, Axillary Nerve – wasting of the deltoid with loss of rounded shoulder contour, Sciatic nerve palsy - wasting of thigh (hamstring) and calf muscles

Skin: Look for trophic ulcers, dryness of skin, brittle nails, loss of hairs in the sensory distribution of the nerve. Any scars of injury

Gait: stepping (classically described for tabes dorsalis) or circumduction gait may be seen in common peroneal nerve palsy.

Palpation: The usual sequence of palpation is done to check for:

1. Any Local rise in temperature (usually cold compared to opposite limb)
2. Tenderness- superficial and deep
3. Muscle Bulk (compared to normal side)
4. Tone (suppleness of the muscle compared to normal site)
5. Nerve - Some of the peripheral nerves which are superficial at certain sites should be palpated to assess for any tenderness, thickening or beading or rarely nerve abscess. In cases of Hansen's disease, the ulnar nerve, behind the medial epicondyle in elbow and the common peroneal nerve around the neck of fibula may be involved.
6. Tinel sign- The peripheral nerve should be gently tapped by a finger along its course from distal to proximal level. In a positive Tinel sign, there is tingling and parasthesia along the course of the nerve, distal to the point at which it is tapped by the finger. This is a sign of nerve regeneration and recovery. A progressive Tinel sign over a course of few weeks is significant to clinically assess nerve recovery before motor or sensory recovery occurs.

A: Ulnar nerve behind medial epicondyle of humerus and
B: Common Peroneal Nerve behind the Neck of Fibula

Note: On History taking: Irritability of ulnar nerve may occur in neuritis, with twitches and shooting pain. This may occur in tardy ulnar nerve palsy in cubitus valgus deformity.

Muscle Involvement

The muscles supplied by the peripheral nerve should be assessed. While checking the muscle power the belly of the muscle or the tendon should be palpated to confirm that the particular muscle being tested is contracting. This is necessary to assess Grade 1 muscle power. It is advisable to know the MRC grading of muscle power testing. Sometimes during paresis or paralysis of a muscle, patient may use other muscles and perform a trick movement hence it is important to ensure that the muscle being tested is palpated.

Muscle Power {Grading is 0 – no contraction, 1 – flicker of contraction,2- contraction with gravity eliminated, 3- against gravity,4- with slight resistance,5- full resistance}

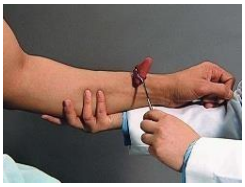
The innervation of the muscles supplied by the peripheral nerves is useful to diagnose the level of the nerve injury. For example, the Radial Nerve supplies triceps, anconeus, brachialis, brachioradialis, supinator, extensor group of forearm muscles (ECRL and ECRB) and finger extensors (Abductor pollicis longus, Extensor pollicis brevis, extensor digitorum) and radial nerve palsy at the level of the mid-arm would lead to a wrist drop and a lesion more proximal (very high radial nerve palsy) would lead to triceps weakness as well. A low radial nerve injury to its branch the posterior interosseous nerve (PIN) would permit wrist dorsiflexion but not finger extension. In case of Median Nerve, the muscles supplied in the forearm are pronator teres, Flexor carpi radialis, Palmaris longus, Flexor digitorum superficialis, Flexor digitorum profundus, Flexor pollicis longus, Pronator quadratus and lateral half of Flexor digitorum profundus. In the hand, the muscles supplied are Abductor pollicis brevis, Flexor pollicis brevis, Middle and index lumbricals. (Note: The sensation to radial 3 and a half fingers should be checked). The Ulnar Nerve does not supply any muscle in the arm, at the elbow it sends a sensory branch to the joint. It supplies the Flexor carpi ulnaris, medial half of Flexor digitorum profundus, hypothenar muscles, dorsal and palmar interossei, medial 2 lumbricals, and Adductor pollicis. (Note: The sensation to volar aspect of little finger, medial half of ring finger, should be checked).

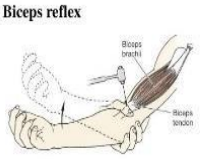
Sensory Examination

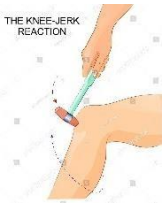
The following modalities of sensation should be checked.

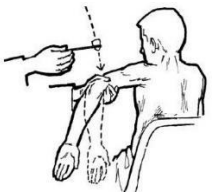
1. Tactile sensation - Pain sensations (by a blunt pin), light touch (by a wisp of cotton or wool), pressure by finger,2 point discrimination (by a compass)
2. Deep pain
3. Temperature- Test tubes with hot and cold water may be used. The cold metallic part of a knee hammer may be used in winters.
4. Vibration- A tuning fork 256 Hertz should be kept on a bony prominence of the limb to detect the vibration sensation after striking the tuning fork.
5. Proprioception- The joint position should be checked after obstructing the vision of the patient or keeping his eyes closed. eyes while the patient responds whether joint is flexed or extended (as shown in the video of spine examination)
6. Stereognosis- Patient should be asked to identify an object by its shape and size (eg: key chain, pen) with the eyes closed.

Deep Tendon Reflexes: Ankle reflex, Supination reflex, Bicep's reflex, Knee reflex, Triceps reflex









Ankle Jerk Supinator Jerk Biceps Jerk Knee Jerk Triceps Jerk

Movements

Active and Passive Movements- Complete range of motion of all joints, active and passive, of the involved extremity should be done in nerve palsy. The passive movements of the joints may be done by the examiner to check for joint suppleness and ensure there are no soft tissue contractures or joint deformities before the patient is asked to perform active movements.

Measurements

Linear: Length of particular limb, total and segmental measurement

Limb Circumference: - To know the wasting of muscles

Special Tests and Sequence of Assessment

Radial Nerve: - To assess the level of the radial nerve palsy, check for the following muscles: extensor digitorum communis (EDC) by extension of metacarpophalyngeal (MCP) joint of fingers, extensor carpi radialis longus and brevis (ECRL & ECRB) by extension of the wrist, brachioradialis by extension of flexed elbow kept in mid prone position and palpating the contraction of muscle belly of brachioradialis, triceps by extension of the elbow. In a low radial nerve or posterior interosseous nerve (PIN) palsy only the finger and thumb extensors are paralyzed, the wrist can dorsiflex. In a high radial nerve palsy the wrist dorsiflexors along with brachioradialis muscle is paralyzed. In a very high radial nerve palsy, the triceps muscle is also paralyzed. Significance of thumb and finger paralysis. To differentiate between radial nerve or PIN palsy, a simple screening test of extension of thumb can be performed. Normally with intact radial nerve and intact PIN, patient can extend the thumb, hitch hiker sign. A patient of PIN palsy will be unable to do hitch hike sign or even extend the other fingers but will be able to dorsiflex the wrist. In a radial nerve palsy patient will be unable to even do the wrist extension. Significance of Brachioradialis - The brachioradialis muscle is supplied by the radial nerve proximal to the elbow joint at the distal fourth of the humerus. While testing the muscle power of the brachioradialis with elbow flexion in mid prone position, contraction of muscle belly of brachioradialis should be confirmed by palpating it. The level of the radial nerve injury can be determined by the brachioradialis, which is intact in a low radial nerve palsy and lost it is a high radial nerve palsy. In a recovering radial nerve palsy, brachioradialis is the first muscle to recover in case of axonotmesis. The recovery occurs at the rate of 1 mm. per day after 3 weeks delay due to Wallerian degeneration.

To differentiate between a high ulnar and a low ulnar nerve palsy the Flexor digitorum profundus of ring and little fingers and Flexor carpi ulnaris muscles are tested. These muscles are supplied by the ulnar nerve at the proximal forearm, hence if they are paralyzed it is a high ulnar palsy while they would be intact in a low ulnar palsy. The Ulnar paradox is thus explained by increased clawing of ring and little fingers in a low ulnar nerve palsy since the flexor digitorum profundus (FDP) of ring and little finger are intact. On the other hand, a high

ulnar nerve lesion causes a paralysis of the FDP resulting in less degree of ulnar claw hand deformity.

Froments sign (Book Test): - The first palmar interossei and adductor pollicis are required to hold a book between the thumb and the hand. In ulnar nerve paralysis, these muscles are paralyzed and the patient relies on Flexor pollicis longus to hold the book by flexing the thumb.

Card test: - loss of adduction due to paralysis of palmar interossei supplied by ulnar nerve causes the card to pulled out.

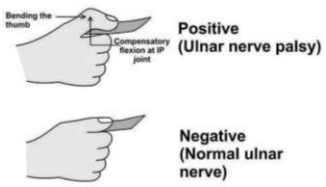
EgawaTest: - Keeping the palm on a table the middle finger is moved on either side. It is not possible in ulnar nerve paralysis due to weakness of dorsal interossei.

Median Nerve: - Pen Test: - Unable to touch the pen due to weakness of abductor pollicis brevis Pointing Index (Oschner Clasp Test) Long flexors of middle and index supplied by median nerve fail to flex when both hands clasped to gather.

Axillary Nerve: - Deltoid paralysis causes loss of shoulder abduction with wasting of contour of deltoid and sensory loss at regimental patch area

Common Peroneal Nerve: - There is a loss of sensation on lateral border of foot along and first web space. Motor paralysis is foot drop due to loss of dorsiflexion of foot. Plantar flexion is possible,

Sciatic Nerve: - There is a complete loss of sensation around foot except medial border till ball of great toe (supplied by saphenous nerve). The motor paralysis includes a complete foot drop with loss of both planter and dorsiflexors of foot.



Froment Sign Card Test Egawa Test

Oschner Clasp Test Deltoid muscle paralysis Foot Drop

The diagnosis of a nerve palsy should include the anatomical, etio-pathological and type and extent of nerve involvement or damage.

Anatomical –Identify the peripheral nerve and the level of injury (high or low)
Etio-pathological – Trauma, tumor, tuberculosis, diabetic neuropathy, Hansens's disease or any other cause.
Type of nerve involvement- In cases of nerve injury is it neurapraxia, axonotmesis or neurotmesis, or is it compressive neuropathy.

INVESTIGATIONS

Electro Diagnostic Studies
Nerve Conduction Study including the nerve conduction velocities (NCV), the chronaxie and rheobase of the strength duration curve.
Electromyography of the muscles supplied by the nerves and identify denervation and re-innervation patterns.
Diagnostic tests: for leprosy- nasal scrapings, ear lobe biopsy, blood levels for lead, Vit B12 levels.
Routine investigations - Hemogram

SPLINTS: Various orthotic devices (splints) are used to prevent contractures resulting from peripheral nerve paralysis. In radial nerve paralysis, for wrist drop, a cock-up splint is used, which may be static or dynamic. In ulnar nerve paralysis, a knuckle bender splint is used to change the position of an intrinsic minus hand to an intrinsic plus hand (Keeping the MCP joints at 90-degree flexion and IP joints in full extension. In median nerve palsy, an opponens splint is used to maintain the thumb in abduction. In common peroneal nerve palsy, a foot drop splint is used to prevent equinus.