JHARKHAND RAI UNIVERSITY

RANCHI

LAB MANUAL

PHYSIOTHERAPY IN ORTHOPAEDICS CONDITIONS

(23A602P)

LIST OF PRACTICALS

S.NO	PRACTICAL
1.	To learn about the orthopedic assessment pro forma.
2.	To demonstrate the measurement of limb length discrepancies (LLD).
3.	To learn about the special test for clinical diagnosis of spinal joint conditions.
4.	To learn about the special test for clinical diagnosis of thoracic outlet syndrome.
5.	To demonstrate special test for clinical diagnosis of shoulder joint pathology.
6.	To learn about the special test for clinical diagnosis of knee ligaments and meniscus injury.
7.	To perform stump bandaging of trans-femoral (above knee) and trans-tibial (below knee) stump.

Practical-1

Aim: To learn about the orthopedic assessment pro forma.

1. **Demographics Details:**
    - Name, age/sex, address, dominant side, occupation, marital status.
    - Date of visit, referral and date of admission.
2. **Chief complain/problem:** should be in patients own language, avoid medical terms, includes durations of problem.
3. **History of Present illness:** should be focused, concise and on recent and main problem, includes onset, previous treatments and ends with present problem.
    - Pain history: site, side, duration, type, nature, intensity (as per scale), aggravating factors, relieving factors.
4. **History of Past Illness:** includes important information directly/indirectly related to present problem.
5. **Medical History**: related to any systemic condition & its treatments.
6. **Surgical history:** any operation or surgical intervention, includes dates and description of surgery.
7. **Socio-economic History:** family members, income, social status.
8. **Environmental History:** related to house and job profile.
9. **Observation of Patient:**

- Mode of Ambulation: assistive aids, wheelchair, dependent, stretcher.
- Body built: Ectomorph, endomorphic, mesomorph.
- External Appliance/devices: ICU related, catheter, orthosis.
- Attitude of Limb and Face: anatomical position of limb w.r.t. environment, facial asymmetry.
- Posture analysis: anterior, posterior and lateral, mention deviation.
- Involuntary movement: limb, finger, trunk, or face.
- Muscle wasting: note any observable muscle wasting.
- Skin condition: texture, color, continuity.
- Wound/Ulcer: pressure sore, scar etc.
- Swelling/edema: mentioned affected area.

• Deformity: subluxation, LLD, mention deformity name.

• Gait: type of gait pattern, if patient is independent walking.

10. Palpation of local area:

• Warmth/Temperature: compare with the sound side.

• Tenderness: Mention grade

• Oedema: mention type and grade

• Peripheral pulsation: ankle brachial index, mainly in vascular disorders.

• Scar Assessment: site, nature, length, width, type.

Tenderness Grading:

I. Patient complains of pain
II. Patient complains and winces
III. Patient winces and withdraws the joint
IV. Patient will not allow palpation of the joint

Types of Oedema:

- Pitting/Non-Pitting
- Brawny Oedema
- Weeping Oedema

Grading of Pitting Oedema:

Allow pressure for 15 sec by tip of thumb

I. Requires 0-15 sec of recovery of indentation/ 2 mm depth
II. Requires 16-30 sec of recovery of indentation/ 4 mm depth
III. Requires 31-45 sec of recovery of indentation/ 6 mm depth
IV. Requires more than 45 sec of recovery of indentation/ 8 mm or greater

11. Examination of Patient:

1. Higher Mental Function:

• Level of consciousness: Glasgow Coma Scale

• Orientation: Person, Place, Time

• Vision:

• Hearing:

• Memory: Short term, Long term

• Cognition: Modified Rancho Los Amigos Scale, Mini- Mental State Examination

• Cranial Nerve Ex.

2. Sensory Examination: (mention grade dermatome wise)

• Superficial: pain, light touch, temperature.

• Deep: deep touch, proprioception, kinesthesis, & vibration.

• Combined cortical: Tactile Localisation, 2-point discrimination, graphesthesia, barognosis, stereognosis.

GRADE	RESPONSE
0	Absent,no response
1	Decreased,delayed response
2	Increased/egg response
3	Inconsistent response
4	Intact ,normal response

Figure 1.1: Sensory examination grades

3. Motor examination:

- **Muscle Tone Grading (**mention tone grading for individual muscle groups)

Grade	Finding
0	Flaccid
1+	Hypotonia
2+	Normal response
3+	Mild to moderate hypertonia
4+	Severe hypertonia

Figure 1.2: Muscle tone grades

- **Range of motion examination:** (examination should be done of individual joints by using goniometer)
    - Active range of motion
    - Passive range of motion (end-feel should be mentioned)

- **Muscle girth measurement:** (taken from a reference point/ bony prominence using measuring tape).

  Both limb girth need to be compared to find out the muscle wasting or any swelling.

- **Muscle strength:** Examined by Manual Muscle Testing of individual muscles.

TABLE 4: MANUAL MUSCLE TESTING CHART		
Number Grade	**Word Grade**	**Definition**
0	Zero	No muscle contraction seen or felt
1	Trace	Contraction seen and/or felt, but no motion
2-	Poor minus	Part moves through incomplete range of motion in gravity minimized position
2	Poor	Part moves through complete range of motion in gravity minimized position
2+	Poor plus	Part moves through less than 50% of available range of motion against gravity OR through complete range of motion in gravity minimized position with slight resistance
3-	Fair minus	Part moves through more than 50% of available range of motion against gravity
3	Fair	Part moves through complete range of motion against gravity
3+	Fair plus	Part moves through complete range of motion against gravity and slight resistance
4	Good	Part moves through complete range of motion against gravity and moderate resistance
5	Normal	Part moves through complete range of motion against gravity and maximal resistance

Figure 1.3: Manual muscle testing grades

- **Joint play testing:**

  Joint play need to be checked by providing glide to the individual joints and grades should be mentioned as below grading system.

Grade	Joint Status
0	Ankylosed
1	Considerable hypomobile
2	Slight hypomobile
3	Normal
4	Slight hypermobile
5	Considerable hypermobile
6	Unstable

Figure 1.4: Joint play grading

- **Resisted isometric contraction:** RIC should be checked for individual muscle groups. Joint need to be kept in mid-range and isometrics contraction made to perform for the muscle group need to be checked. It is done to differentiate that the involvement is of the contractile tissue or non-contractile tissue.

Resisted movement	Findings
Strong and painless	Nothing is wrong with contractile structures
Strong and painful	Minor lesion of some part of muscle
Weak and painless	Major lesion of the muscle, nervous system involvement
Weak and painful	Severe trouble present; fracture or secondary deposits

Figure 1.5: RIC interpretations

4. **Reflex examination:**

   Superficial reflex- Abdominal reflex, plantar response.

   Deep tendon reflex- Biceps jerk, triceps jerk, supinator jerk, knee jerk, ankle jerk.

5. **Balance and coordination examination:**
    - **Balance examination:** sitting balance static and dynamic, standing balance static and dynamic.
    - **Coordination examination:** upper limb (finger to finger or finger to nose); lower limb (heel to shin).
6. **Functional evaluation:** Bed mobility, mat activities, hand evaluation.
7. **Gait assessment:** analyze different components of both stance and swing phase of gait cycle.
8. **Tightness/contracture/deformity:** examine and find out the abnormality and mention it.

12. Investigation reports: X-rays, MRI, CT-Scan.

13. Special Test: (related to the condition suspected to rule out the provisional diagnosis).

14. Diagnosis: differential diagnosis, provisional diagnosis and diagnosis.

15. Problem lists:

16. Management: short term goals and long term goals.

Practical-2

Aim: To demonstrate the measurement of limb length discrepancies (LLD).

Theory: LLD is the difference in the length of the lower limbs i.e. both the lower limb are not of equal length. The difference in the length of both the lower limbs are measured using the measuring tape for the compensatory changes in the foot wears. Difference of 2 centimeter is acceptable. If difference is more than 2 centimeter then it is considered as LLD.

LLD are of two types: True LLD and functional/apparent LLD.

Procedure:

Patient position: Patient supine and pelvis is balanced aligned with lower limbs and trunk.

Measurement: Measure distance from ASlS to medial malleolus on each limb several times for consistency and compare results.

Positive sign: A difference in lengths between two limbs is noted identifying a true leg length discrepancy. This test will determine if the limb discrepancy is true or functional. True discrepancy is caused by an anatomical difference in bone lengths (either tibia or femur). Functional discrepancies are not anatomical in origin and are the result of compensation due to abnormal position or posture such as pronation of a foot or pelvic obliquity.

Figure 2.1 True LLD measurement

Figure 2.2 Functional/apparent LLD measurement

Practical-3

Aim: To learn about the special test for clinical diagnosis of spinal joint conditions.

1. **Straight Leg Raising (SLR)/Lasegue Test:**

   Aim of the test: Identifies dysfunction of neurologic structures that supply lower limb. Commonly done to clinically diagnose disc bulge.

   Patient position: Patient is supine with legs resting on table. Passively flex hip of one leg with knee extended until patient complains of shooting pain into lower limb. Slowly lower limb until pain subsides then passively dorsiflex foot.

   Positive sign: Positive finding is reproduction of pathologic neurologic symptoms when foot is dorsiflexed.

   More illustration of SLR test: ROM can demonstrate problems in different areas;

   - 0 – 30° equals hip pathology or severely inflamed nerve root.
   - 30 – 50° indicates sciatic nerve involvement
   - 50 – 70° is probable hamstring involvement
   - 70 – 90° when sacroiliac joint is stressed

   Neural tension & mobilization for lower quadrant by SLR;

   - While patient is supine several variations may be done; ankle dorsiflexion, ankle plantar flexion with inversion, hip adduction, hip medial rotation, and passive neck flexion.
   - These various positions of the lower extremity and neck are used to differentiate tight or strained hamstrings from possible sites of restriction or nerve mobility in the lumbosacral plexus and sciatic nerve.
   - Once the position that places tension on the involved neurological tissue is found, maintain the stretch position and then move one of the joints a few degrees in and out of the stretch position, such as ankle plantar flexion and dorsiflexion or knee flexion and extension.
     - Ankle dorsiflexion with eversion places more tension on the tibial tract.
     - Ankle dorsiflexion with inversion places tension on the sural nerve.
     - Ankle plantar flexion with inversion places tension on the common peroneal tract. • Adduction of the hip while doing SLR places further tension on the

nervous system because the sciatic nerve is lateral to the ischial tuberosity; medial rotation of the hip while doing SLR also increases tension on the sciatic nerve.

- Passive neck flexion while doing SLR pulls the spinal cord cranially and places the entire nervous system on a stretch; this technique is called **SLR modification test.**

Figure 3.1 SLR test

2. Slump Test:

Aim of the test: Detect sciatica or dural irritation

Patient position & procedure: Begin with the patient sitting upright. Have the patient slump by flexing the neck, thorax, and low back. Apply overpressure to cervical spine. Dorsiflex the ankle and then extend the knee as much as possible to the point of tissue resistance and symptom reproduction. Release the overpressure on the spine and have the patient actively extend the neck to see if symptoms decrease. Increase and release the stretch force by moving one joint in the chain a few degrees, such as knee flexion and extension or ankle dorsiflexion and plantar flexion.

Positive sign: Positive finding is sciatic pain or reproduction of other neurological symptoms.

Figure 3.2 Slump test

3. Patrick/FABER (flex, abd, external rot) test:

Aim of the test: Identify dysfunction of hip and sacroiliac joints such as mobility restriction.

Patient position: Patient lies supine. Passively flex, abduct, and externally rotate tested leg so that foot is resting above the opposite knee. Slowly testing leg down towards the table surface.

Positive sign: Positive test when involved knee is unable to assume relaxed position and/ or reproduction of painful symptoms.

Figure 3.3 FABER test

4. **Gaenslen's test:**

Aim of the test- Gaenslen's test is a provocation test, meaning it's designed to reproduce pain or symptoms that are characteristic of a particular condition. It helps to determine if the SI joint is a potential source of pain i.e. SI joint dysfunction.

Procedure:

Patient position- The patient lies supine (on their back) with the painful leg hanging off the edge of the examination table.The non-painful leg is flexed at the hip and knee, bringing the foot to the patient's opposite buttock. The examiner stabilizes the pelvis and applies pressure to the extended leg, attempting to hyperextend it at the hip. Simultaneously, a counter-pressure is applied to the flexed knee.

Positive test: A positive test is indicated if the patient experiences their familiar pain in the SI joint.

Figure 3.4 Gaenslen's test

5. **Modified schober test:**

Aim of the test- it is commonly performed to measure lumbar spine mobility, particularly in ankylosing spondylitis patients.

Procedure:

The test begins with the patient standing upright. The examiner locates the posterior superior iliac spines (PSIS) on both sides of the lower back. A horizontal line is drawn between the PSIS, and a point is marked in the center. A second line is marked 5 cm below the center point, and a third line is marked 10 cm above the center point. The examiner measures the distance between the top and bottom lines. The patient is

instructed to flex forward as much as possible, keeping their knees straight. The examiner then re-measures the distance between the top and bottom lines. The difference between the two measurements indicates the amount of lumbar flexion. In patients with ankylosing spondylitis, a reduction in lumbar flexion i.e. after flexion measurement will not be 20 cm.

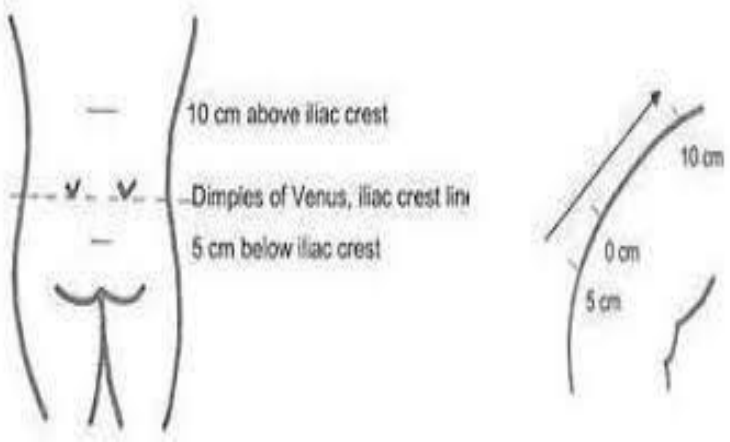

Figure 3.5 Modified Schober test

6. **Stork standing test:**

Aim of the test: Identifies spondylolisthesis.

Patient position: Patient standing on one leg. Cue patient into trunk extension. Repeat with opposite leg on ground.

Positive finding: pain in low back with ipsilateral leg on ground.

Figure 3.6 stork standing test

Practical-4

Aim: To learn about the special test for clinical diagnosis of thoracic outlet syndrome.

Theory: Thoracic outlet syndrome (TOS) is a group of disorders caused by compression of lower trunk of brachial plexus or blood vessels (subclavian veins and artery) in the area between the collar bone and the first rib, known as the thoracic outlet. This compression can lead to symptoms like pain, numbness, tingling, and weakness in the neck, shoulder, arm, and hand.

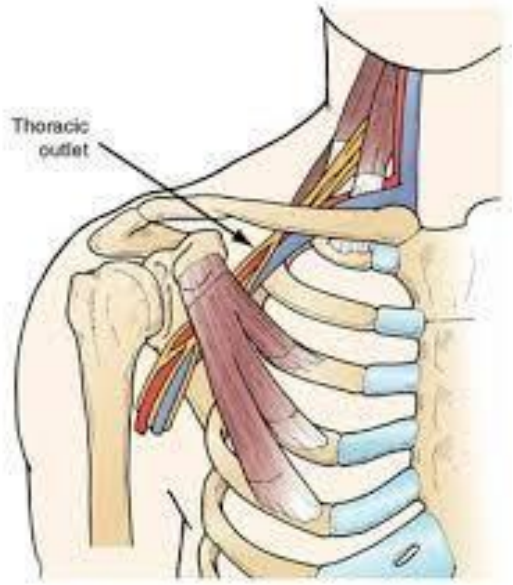

Figure 4.1 Thoracic outlet

Special tests for TOS:

1. Adson's test:

Aim of the test: Identifies pathology of structures that pass through thoracic inlet.

Patient position: Patient sitting & find radial pulse of extremity being tested.

Procedure: Rotate head towards extremity being tested then extend & externally rotate the shoulder while extending head.

Positive sign: Neurologic and/or vascular symptoms (disappearance of pulse) will be reproduced in upper limb (UL).

Figure 4.2 Adson's test

2. Wright (hyperabduction) test:

Aim of the test: Identifies pathology of structures that pass through thoracic inlet.

Patient position: Patient sitting and find radial pulse of extremity being tested.

Procedure: Move shoulder into maximal abduction and external rotation. Taking deep breath and rotating head opposite to side being tested may accentuate symptoms.

Positive sign: Neurological and/or vascular symptoms (disappearance of pulse) will be reproduced in UL.

Figure 4.4 Wright test

3. Roos elevated arm / EAST (elevated arm stress test) test:

Aim of the test: Identifies pathology of structures that pass through thoracic inlet.

Patient position: Patient standing with shoulders fully externally rotated, 90° abducted, & slightly horizontally abducted. Elbows flexed to 90° and patient opens/closes hands for three minutes slowly.

Positive sign: Neurologic and/or vascular symptoms (disappearance of pulse) will be reproduced in UL.

Figure 4.5 Roos elevated arm test

Practical-5

Aim: To demonstrate special test for clinical diagnosis of shoulder joint pathology.

Tests for impingement:

1. Neer test:

Aim of the test: Identify impingement of supraspinatus tendon or long head of bicep.

Patient position: Patient in sitting position & shoulder is passively internally rotated & fully abducted.

Positive sign: Reproduce symptoms of pain within shoulder region.

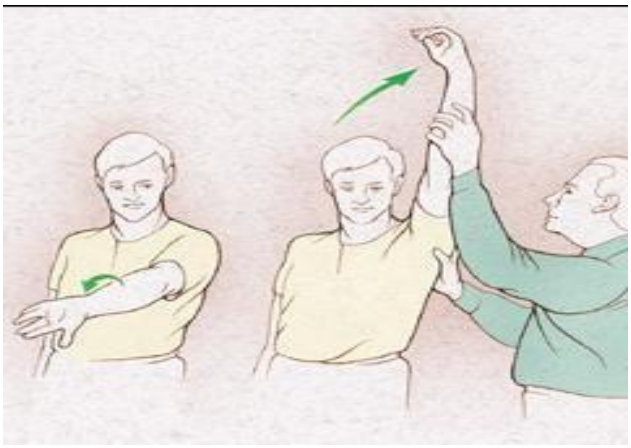

Figure 5.1 Neer impingement test

2. Hawkins-Kennedy test:

Aim of the test: Identify impingement of rotator cuff.

Patient position: Patient is sitting with arm flexed at 90° & elbow flexed to 90°, the examiner then stabilizes proximal to the elbow with their outside hand and with the other holds just proximal to the patient's wrist. Then passively move the arm into internal rotation.

Positive sign: Pain in the sub-acromial space.

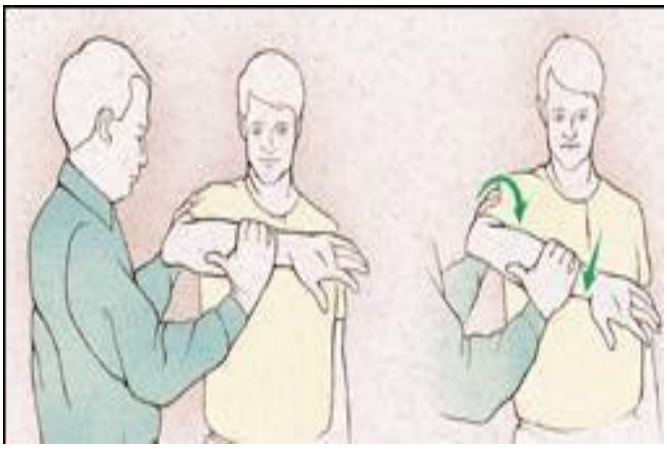

Figure 5.1 Hawkins-kennedy test

Tests for shoulder instability:

1. Anterior apprehension (Crank) test:

Aim of the test: Identifies past history of anterior shoulder dislocation

Patient position: Patient supine with shoulder in 90° abduction. Slowly take shoulder into external rotation.

Positive sign: Patient does not allow and/or does not like shoulder to move in direction to simulate anterior dislocation.

Figure 5.2 Anterior apprehension test

2. Posterior apprehension test:

Aim of the test: Identifies past history of posterior shoulder dislocation.

Patient position: Patient supine with shoulder elevated 90° (in plane of scapula) with scapula stabilized by table. Place a posterior force through shoulder via force on patient's elbow while simultaneously moving shoulder into medial rotation and horizontal adduction.

Positive sign: Patient does not allow and/or does not like shoulder to move in direction to simulate posterior dislocation.

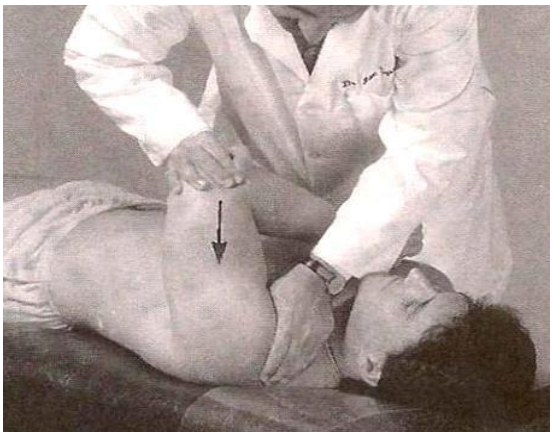

Figure 5.3 Posterior apprenhension test

Tests for muscles & tendons pathology:

1. Yergason's test:

Aim of the test: Identifies the integrity of transverse ligament & bicipital tendonitis.

Patient position: Patient is sitting with shoulder in neutral stabilized against trunk, elbow at 90°, & forearm pronated. The therapist resists supination of forearm & external rotation of shoulder.

Positive sign: Tendon of biceps long head will "pop out" of groove & pain on long head of biceps tendon.

Figure 5.4 Yergason's test

2. Speed's test (Biceps straight arm)

Aim of test: Identifies bicipital tendonitis

Patient position: Patient sitting or standing with upper limb in full extension & forearm supinated. The therapist resists shoulder flexion. May also place shoulder in 90° flexion & push upper limb into extension causing eccentric contraction of biceps

Positive sign: Pain in long head of biceps tendon.

Figure 5.5 Speed's test

3. Drop arm test:

Aim of test: Identifies tear &/or full rupture of rotator cuff.

Patient position: Patient sitting with shoulder passively abducted to 120°. Patient is instructed to slowly bring arm down to side .Guard patient's arm from falling in case it gives way.

Positive sign: Patient unable to lower arm back down to side.

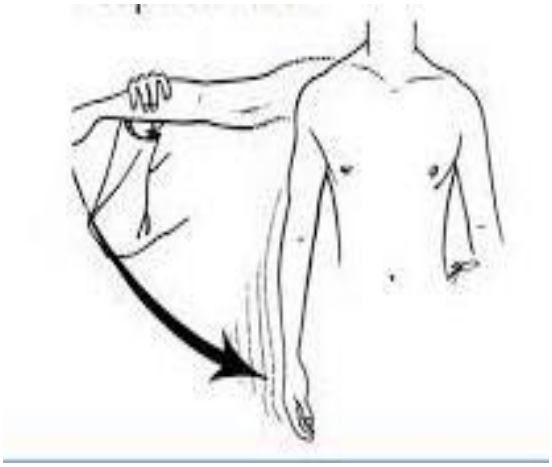

Figure 5.5 Drop arm test

4. Empty can test:

Aim of test: Identifies tear &/or impingement of supraspinatus tendon or possible suprascapular nerve neuropathy.

Patient position: Patient sitting with shoulder at 90° & no rotation. Resist shoulder abduction. Then place shoulder in "empty can" position, which is internal rotation and 30° forward (horizontal adduction), the patient's thumb point down to the floor, and resist abduction. Differentiate if pain present between two positions. Another test with thumb up "full can" is best for maximum contraction of supraspinatus & resist abduction.

Positive sign: Reproduces pain &/or weakness in supraspinatus tendon.

Figure 5.6 Empty can test

5. Lift-off test:

Aim of the test: identify tear/weakness of subscapularis muscle & scapula instability.

Patient position: Patient stands & places the dorsum of the hand against the mid lumbar spine.Then the patient lifts his hand away from the back. If the patient is able to take the hand away from the back, the examiner should apply a load pushing the hand toward back to test the strength of the subscapularis and test how the scapula acts under dynamic loading.

Positive sign: Inability to move the dorsum off the back indicates subscapularis rupture or dysfunction.

Figure 5.7 Lift off test

Practical-6

Aim: To learn about the special test for clinical diagnosis of knee ligaments and meniscus injury.

Theory: The knee joint contains both ligaments and menisci, which are crucial for stability, shock absorption, and movement. Ligaments are strong, fibrous bands that connect bones, providing stability, while the menisci are C-shaped cartilaginous structures that act as shock absorbers and enhance joint fit.

Ligaments are: Anterior cruciate ligament (ACL), Posterior cruciate ligament (PCL), Medial collateral ligament (MCL) and Lateral collateral ligament (LCL).

Meniscus are: Medial and lateral meniscus.

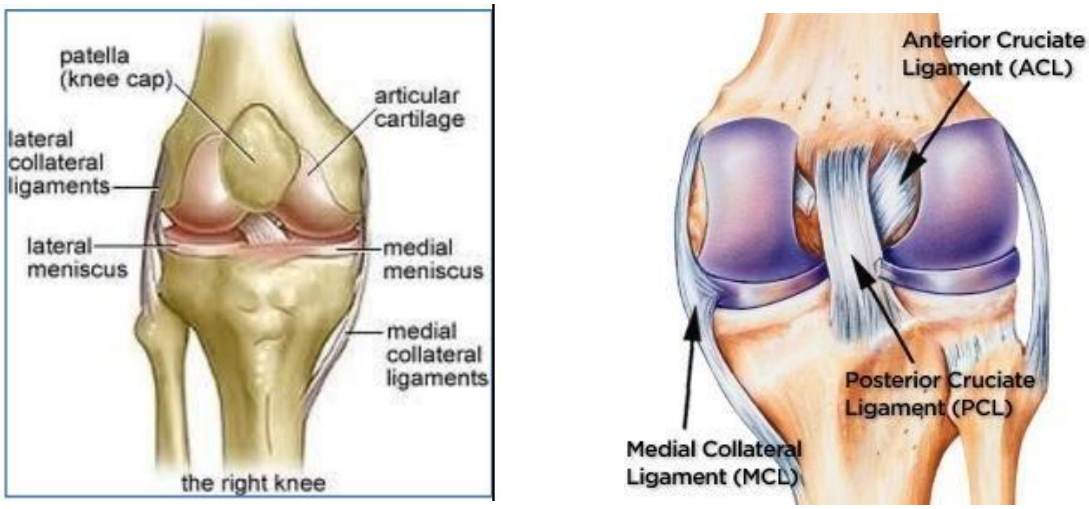

Figure 6.1 Ligaments and meniscus related to knee joint

1. Apley test:

Aim of the test: Helps to differentiate between meniscal tears and ligamentous lesions.

Patient position: Patient prone with testing knee flexed to 90 degrees. Stabilize patient's thigh to table with your knee. Passively distract the knee joint then slowly rotate tibia internally and externally. Next step is to apply a compressive load to knee joint and once again slowly rotate tibia internally and externally.

Positive sign: Pain or decreased motion during compression indicates a meniscal dysfunction. If pain or decreased motion occurs during the distraction then it is most likely a Ligamentous dysfunction.

Figure 6.2 Apley test

2. Collateral ligament instability tests (valgus & varus stress tests):

Aim of the test: Identifies collateral ligaments laxity.

Patient position: Patient is supine, the entire lower extremity is supported & knee placed in 20-30° of flexion. Valgus force placed through knee to test medial collateral ligament. Varus force placed through knee to test lateral collateral ligament.

Positive sign: Primary finding is laxity, but pain may be noted.

Figure 6.3 Valgus and varus stress test

3. Lachman stress test:

Aim of the test: Indicates integrity of anterior/posterior cruciate ligament (ACL/ PCL).

Patient position: Patient supine with testing knee flexed 20-30°. Stabilize femur and passively try to glide tibia anterior (posterior).

Positive sign: finding is excessive anterior (posterior) glide of tibia.

Figure 6.4 Lachman stress test

4. Anterior (posterior) drawer test:

Aim of the test: Indicates integrity of anterior (posterior) cruciate ligament.

Patient position: Patient supine and testing hip flexed to 45 degree and knee flexed to 90 degree. Passively glide tibia anteriorly (posteriorly) following the joint plane.

Positive sign: Positive finding is excessive anterior (posterior) glide.

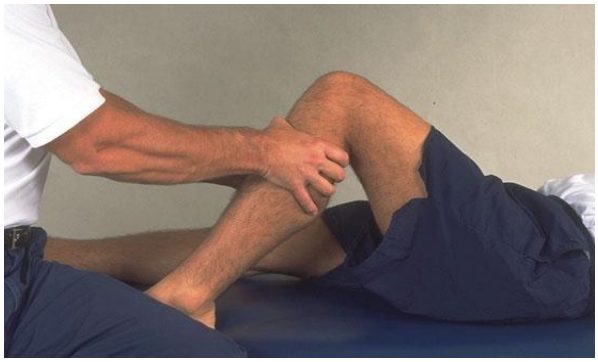

Figure 6.5 Anterior drawer test

5. McMurray test:

Aim of the test: Identifies meniscal tears.

Patient position: Patient supine with testing knee is in maximal flexion. Passively internally rotate and extend the knee. This tests lateral meniscus. Test the medial meniscus with the same procedure except rotate the tibia into lateral rotation.

Positive sign: Positive finding is reproduction of click and/ or pain in the knee joint.

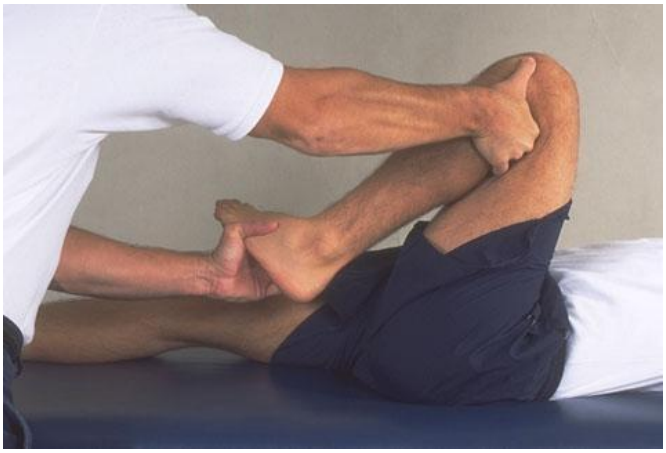

Figure 6.6 McMurry test

Practical-7

Aim: To perform stump bandaging of trans-femoral (above knee) and trans-tibial (below knee) stump.

Trans-femoral Bandaging:

Patient position: The side-lying position is preferred for better control of the residual limb with the hip neutral or slightly extended. The patient with good balance on the remaining limb can bandage the residual limb in the standing position.

Bandage required: For most residual limbs, two 6-in bandages and one 4-in bandage will adequately cover the limb.

Bandaging process:

Step 1: Applying the First 6-in Bandage

1. Start in the groin: Begin the bandage in the groin area, diagonally over the anterior surface.

2. Wrap around the distal lateral corner: Bring the bandage around the distal lateral corner and diagonally up the posterior side to the iliac crest.

3. Hip spica: Wrap the bandage around the hips in a spica pattern, starting medially to encourage extension.

4. Proximal circular turn: Continue wrapping around the proximal portion of the residual limb, high in the groin, and back around the hips.

Step 2: Anchoring the First Bandage

1. Anchor in the second hip spica: Secure the first bandage in the second hip spica with tape or pin.

Step 3: Applying the Second 6-in Bandage

1. Start laterally: Begin the second bandage laterally, covering areas not covered by the first bandage.

2. Continue figure-of-eight turns: Wrap the bandage in figure-of-eight turns, ensuring coverage of the entire residual limb.

Step 4: Applying the 4-in Bandage

1. Apply greatest pressure: Use the 4-in bandage to exert the greatest pressure over the middle and distal areas of the residual limb.

2. Figure-of-eight turns: Wrap the bandage in figure-of-eight turns, varied patterns to cover the entire residual limb.

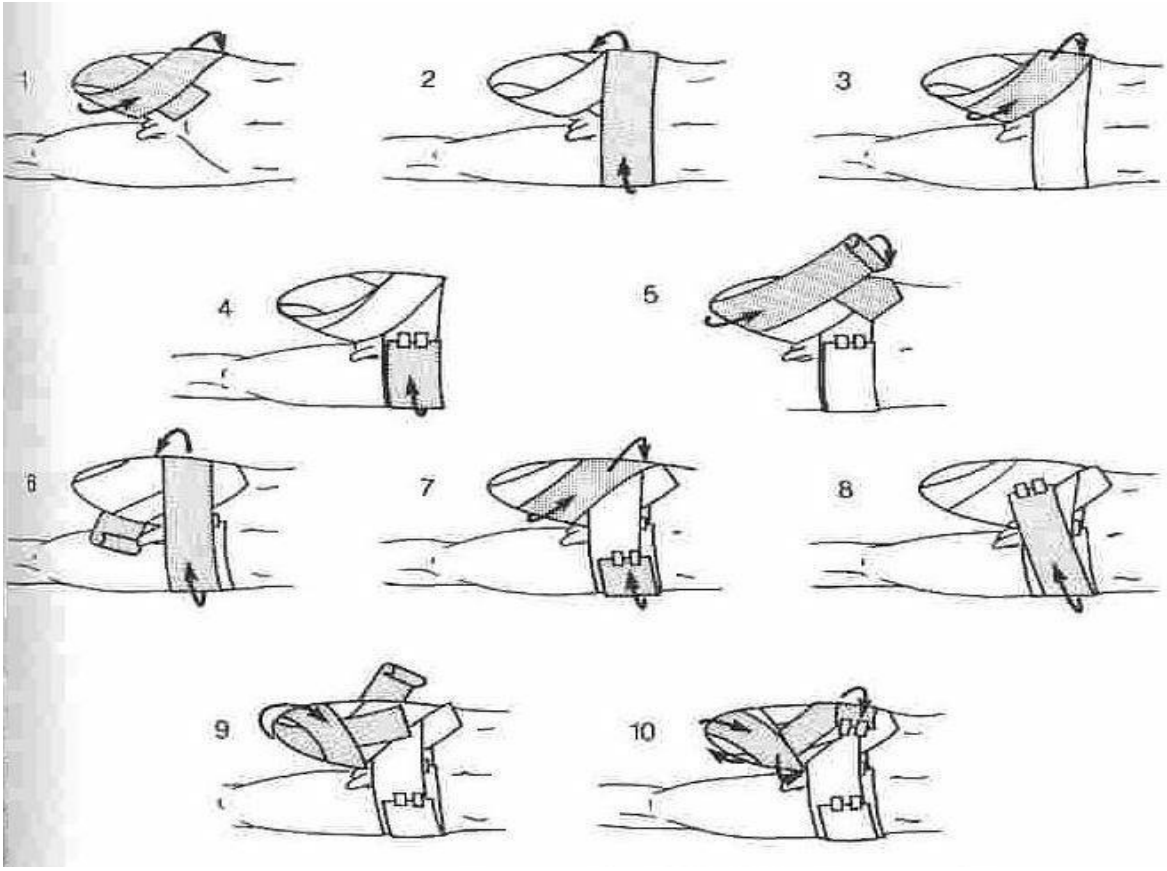

Figure 7.1 Trans-femoral bandaging

Trans-tibial bandaging:

Patient position: patient should be in supine lying or long sitting position with knee extension.

Bandage required: Two 4-in elastic bandages are usually enough to wrap most transtibial residual limbs. Very large residual limbs may require three bandages.

Bandaging process:

Step 1: Starting the Bandage

1. Start at the tibial condyle: Begin the bandage at either the medial or lateral tibial condyle.
2. Diagonal wrap: Bring the bandage diagonally over the anterior surface to the distal end.
3. Cover the incision: Ensure one edge of the bandage covers the midline of the incision.

Step 2: Continuing the Bandage

1. Diagonal wrap: Continue the bandage diagonally over the posterior surface.
2. Anchoring turn: Make an anchoring turn over the beginning turn.
3. Choose the pattern: Bring the bandage directly over the beginning point or use an "X" design.

Step 3: Anchoring and Wrapping

1. Anchoring turn: Make an anchoring turn over the distal thigh, clear of the patella.
2. Wrap around the limb: Bring the bandage around the opposite tibial condyle and down to the distal end.
3. Overlap the incision: Ensure one edge of the bandage overlaps the midline of the incision and the other wrap by at least 1/2 in (1.25 cm).

Step 4: Figure-of-Eight Pattern

1. Continue the figure-of-eight pattern: Wrap the bandage in a figure-of-eight pattern, covering the entire residual limb.
2. Semicircular turns: Make semicircular turns posteriorly to position the bandage.
3. Angular lines: Bring the bandage across the anterior surface in an angular line.

Step 5: Completing the Bandage

1. Cover the residual limb: Ensure complete coverage of the residual limb with firm and even pressure.
2. Partial overlap: Each turn should partially overlap other turns.
3. Leave the patella free: Usually, leave the patella free to aid in knee motion.

Step 6: Applying the Second Bandage

1. Start at the opposite tibial condyle: Begin the second bandage at the opposite tibial condyle from the first bandage.
2. Contraposition: Bring the weave of each bandage in contraposition for even pressure.

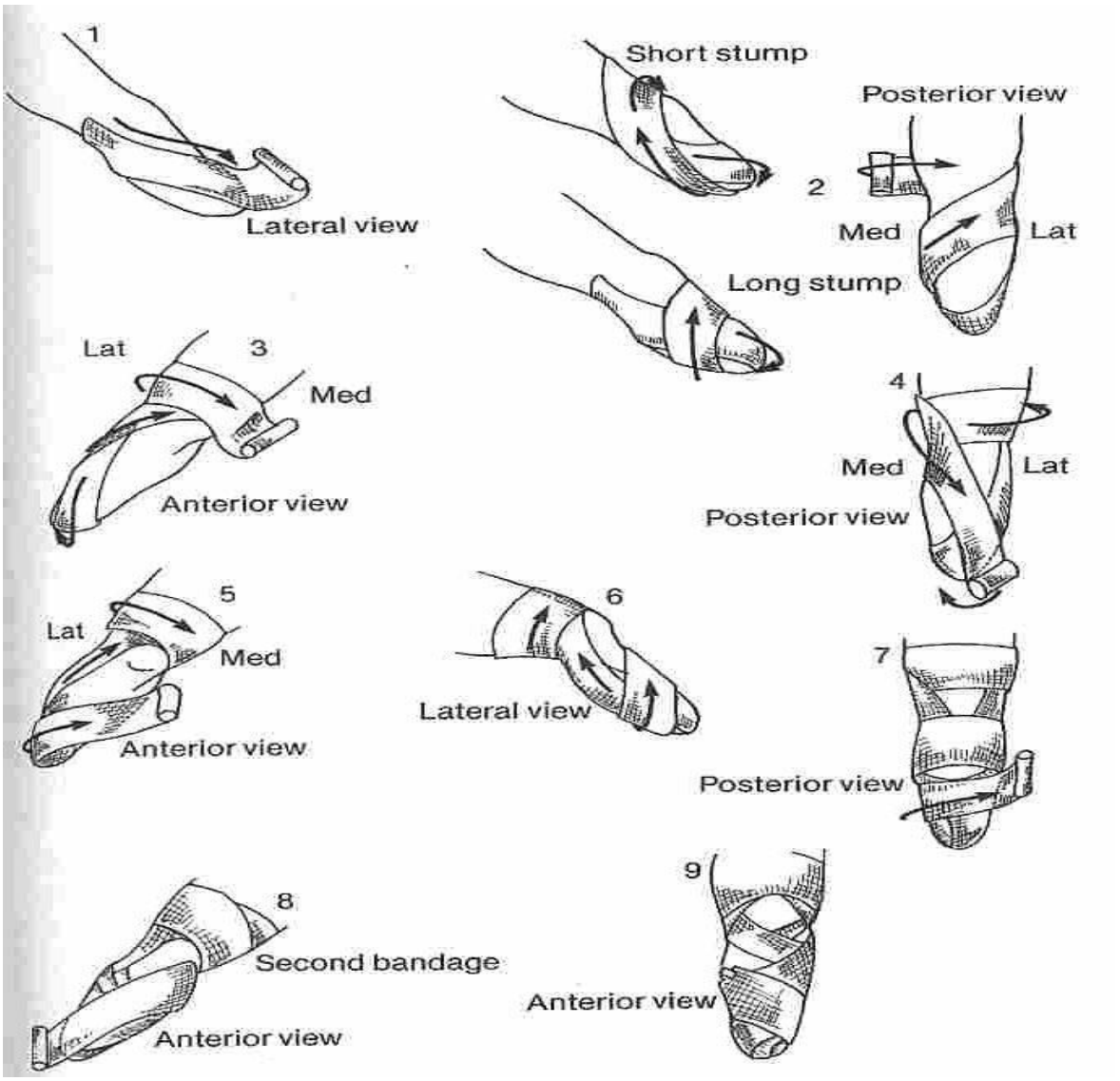

Figure 7.2 Trans-tibial bandaging