

Orthopedic OSCE TEAM

Physical examination & Procedural skills

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Resources: Department handouts, Notes and 435 OSCE Team.

[[Important](#), [Notes](#), Extra] [editing file](#)

Contents:

Introduction.

Physical examination:

- 1- Shoulder examination.
- 2- Hip examination.
- 3- Knee examination.
- 4- Foot and ankle examination.
- 5- Back (thoraco-lumbar spine examination).
- 6- Peripheral neurovascular examination

Procedural skills:

- 1- Knee aspiration (arthrocentesis).
- 2- Open fractures.
- 3- Splinting and casting.
- 4- Closed reduction (joint dislocation/bone fracture)

Introduction:

This work is done by students and may contain some errors. Please notify us if you find any.

Also, this is not a replacement for the resources given by the department.

هذا العمل اجتهاد من الطلاب و يحتمل الخطأ. كما أنه ليس بديل عن المراجع المقررة من القسم.

- Don't Forget Your equipment (measuring tape + reflex hammer)

1st do **WIP₃E₂**: before you start the examination

- Wash your hands.
- Introduce yourself.
- Position patient. (standing, sitting, supine, prone)
- Insure Privacy.
- Explain examination. (what you will do)
- Take Permission
- Exposure

Important notes: during the examinations:

- before you touch the patient ask him if he has pain
- Always compare to other side

Mention at the end:

- I'll finish my examination by examining one joint above and one joint below.
- I'll also do neurovascular examination.
- I'll order imaging if it's indicated.
- Don't forget to thank and to cover the patient
- Ask the patient if he has any concerns or questions.

Physical Examination

1- Shoulder Examination

Before you start you have to check this [video](#) which done by Dr. Al Omar

★ **Look, Feel, Move, Special tests, Neurovascular status.** Joint above and below.

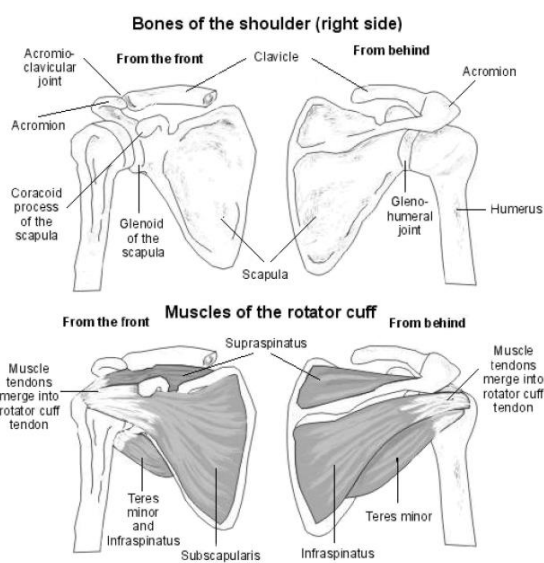
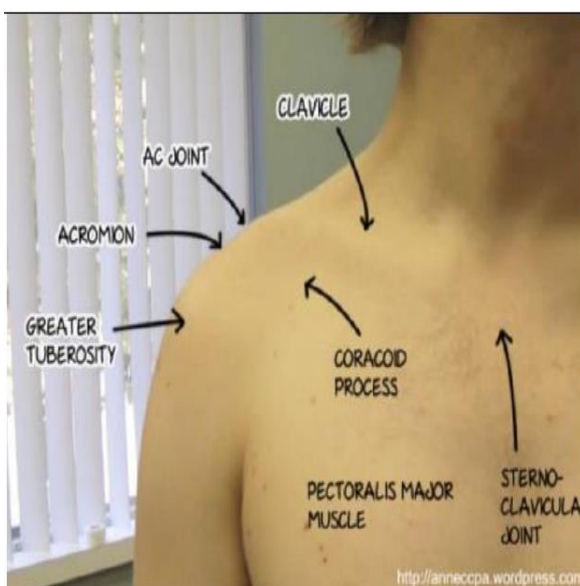
1. Look (Position: standing)

- **Exposure:** both Shoulders and upper limbs.
- From the **Front, Side and Back** for:
 - **Alignment (shoulder & scapula), Deformity (Winging of scapula), Muscle wasting (Deltoid, supra- infra-spinatus muscles atrophy), Skin changes, Swelling, Scars.**

2. Feel

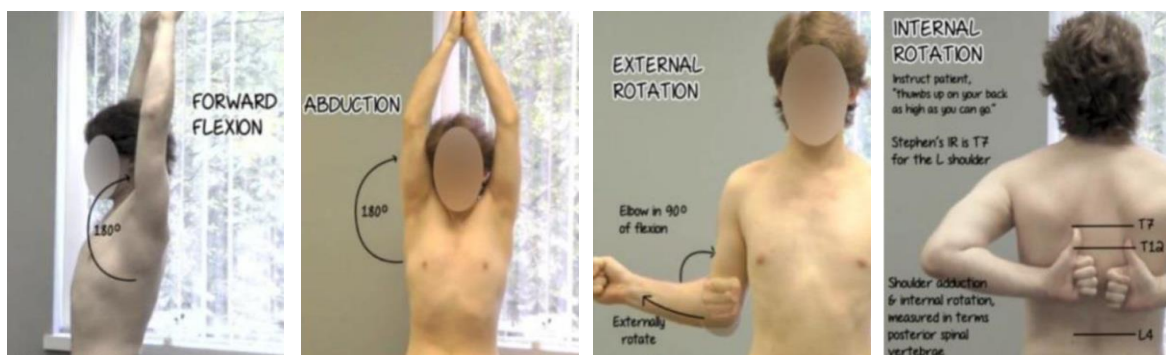
- **Temperature**
- **Tenderness of bones and soft tissues:**
 - **Bones - Sternoclavicular Joint, Clavicle, Acromioclavicular Joint , Acromion, coracoid process, Scapular Spine, Medial & inferior borders of scapula, Scapular apex, Humeral greater tuberosity & joint line.**
 - **Soft tissues: Deltoid, Supraspinatus and Infraspinatus grooves, teres minor, Trapezius, Bicipital Groove.**

(Don't forget to warm your hand and to look at the patient's face)



3. Move

- Test **ROM** both **actively**: [Video](#).
 - **Forward flexion:** The motion involved in reaching forward and up to a cupboard above the head. This is measured from zero (lowest) to 180 degrees.
 - Muscles: Anterior fibers of deltoid muscle, Pectoralis major, Coracobrachialis (muscle of arm), Short head of biceps.
 - **Extension** Muscles: Posterior fibers of deltoid, Latissimus dorsi, Teres major.
 - **Abduction:** from zero beside body to 180 degrees at maximum.
 - Muscles: 0- 15 deg. **Supraspinatus**, 15 -90 deg. middle fibers of deltoid.
 - **External rotation:** Ask the patient to keep the upper arms flat against his/her sides and rotate the forearms outward. The range is from zero (straight ahead) to 80-90 degrees.
 - Muscles: Post. Fibers of deltoid, **Infraspinatus**, **Teres minor**.
 - **Internal rotation:** ask patient to rotate his arm cross his back and walk the fingers(usually the thumb) as far up the back as possible, record this by vertebral level (inferior tip of scapula =T7, iliac crest = L5). (A Normal person should reach T7)
 - Muscles: Pectoralis major, Latissimus dorsi, Teres major, Ant. fibers of deltoid, **Subscapularis**.
- Note if painful or painless.
- Attempt passive ROM if active ROM is limited or painful.



Special tests

- **Rotator cuff integrity and strength:** [Video](#)
 - **Empty can test/ jobe test (for supra-spinatus).** [Video](#).
 - Resisted abduction with arm abducted 90° abduction. 30° of forward elevation in the plane of the scapula (glenohumeral joint horizontally abducted 30°- 45°) and maximally internally rotated.
 - A positive test when there is pain or weakness.
 - **Lift-off test for subscapularis.** [Video](#).
 - ask patient to rotate his arm cross his back and push against your hand away from his body.



Fig. 7.4 The supraspinatus empty can test.



Fig. 7.7 The subscapularis Gerber lift-off test.

(If you are applying resistance, make sure that the action is produced from the shoulder joint and not the fingers or wrist joint. Put your hand against the proximal aspect of the hand or distal forearm to make it easier for you to notice. Also make sure that the patient's hand/arm moves on a horizontal level and not downwards.)

- **Resisted external rotation for Infra-spinatus and teres minor:** [Video](#).
 - with arm against body sides

(Put your hand against the distal forearm of the patient)



Fig. 7.5 The infraspinatus external rotation test.

- **Rotator cuff muscles (SITS muscles):**
 - **Supraspinatus:** Initiates Abduction “Most common tear”. Abduction above 15°-30° is continued by Deltoid muscle.
 - **Infraspinatus:** Primary ER.
 - **Teres minor:** ER
 - **Subscapularis:** Primary IR “Strongest Muscle”
 - Their tests are similar to their actions but, at their maximum extension.
 - In the young athletic patient, the shoulder cuff may be torn as the result of a violent traumatic incident.
 - In the older patient tears may occur spontaneously (e.g. in a cuff weakened as a result of chronic impingement and attrition) or follow more minor trauma, such as sudden arm traction. It may occur in patients suffering from instability of the shoulder joint. Most commonly the supraspinatus region is involved, and the patient has difficulty in initiating abduction of the arm.

Table 9. Rotator Cuff Special Tests

Test	Examination	Positive Test
Jobe's Test	Supraspinatus: place the shoulder in 90° of abduction and 30° of forward flexion and internally rotate the arm so that the thumb is pointing toward the floor	Weakness with active resistance suggests a supraspinatus tear
Lift-off Test	Subscapularis: internally rotate arm so dorsal surface of hand rests on lower back; patient instructed to actively lift hand away from back against examiner resistance (use Belly Press Test if too painful)	Inability to actively lift hand away from back suggests a subscapularis tear
Posterior-Cuff Test	Infraspinatus and teres minor: arm positioned at patient's side in 90° of flexion; patient instructed to externally rotate arm against the resistance of the examiner	Weakness with active resistance suggests posterior cuff tear
Neer's Test	Rotator cuff impingement: passive shoulder flexion	Pain elicited between 130-170° suggests impingement



- **Impingement syndrome:**

- **Neer's impingement sign:** Pain with forward flexion with humerus in internal rotation position [Video](#). (when you internally rotate the arm you bring the tuberosity closer to the joint exacerbating impingement).

- **Hawkin's test:** With arm in the throwing position(90° of forward flexion) and elbow flexed forward about 30°, forcibly internally rotate humerus. [Video](#).
 - Pain suggest impingement of the supraspinatus tendon against the coraco-acromial ligament.



Fig. 7.12 Hawkins test for impingement.

- Compression during glenohumeral movement, giving rise to pain. The commonest site is Subacromial, painful bet. 70° and 120° abduction. Also, compression beneath the acromioclavicular joint itself, pain during the last 30° of abduction, or deep to the coracoacromial ligament.

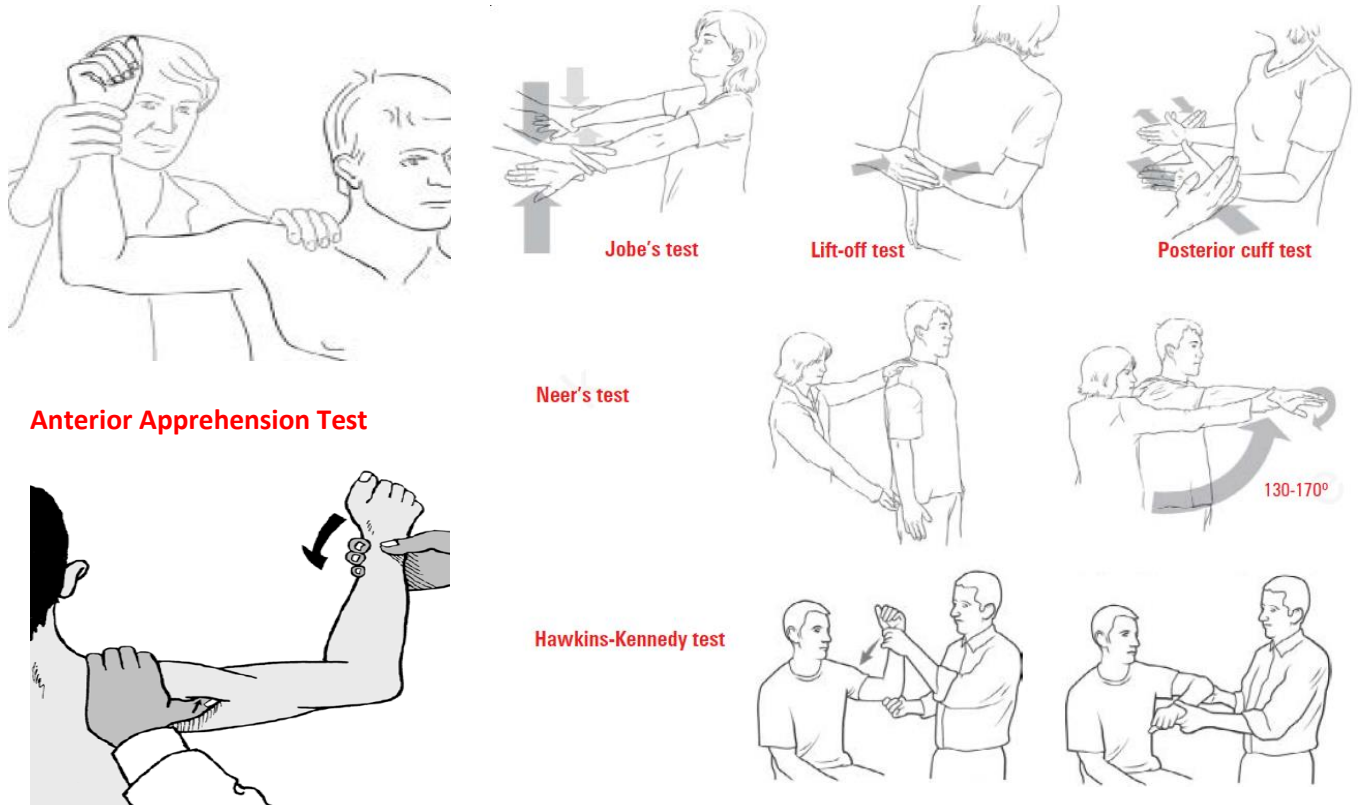
Symptoms may occur acutely (e.g. in young sportsmen, especially in activities involving throwing) or be chronic, particularly in the older patient, usually degenerative changes in the acromioclavicular joint which lead to a reduction in size of the supraspinatus tunnel; this may cause attrition and rupture of the shoulder cuff.

- **Instability**
 - **apprehension test.** [Video.](#)
 - Can be done at any position.
 - Arm in throwing position, 90° abduction and elbow 90° flexion, then push forearm posteriorly while looking at patient face.
 - A positive test if there is pain or fear (patient feels his shoulder is coming out of place).
- Tear in glenoid labrum which deepens the glenoid cavity leads to instability.



➤ Fig. 7.14 The apprehension test.

- **To complete the examination perform Neurovascular Examination.**



2- Hip examination

- Start **Standing** then lying **supine** and **prone**
- Start your examination with asking your patient to stand:

While Standing

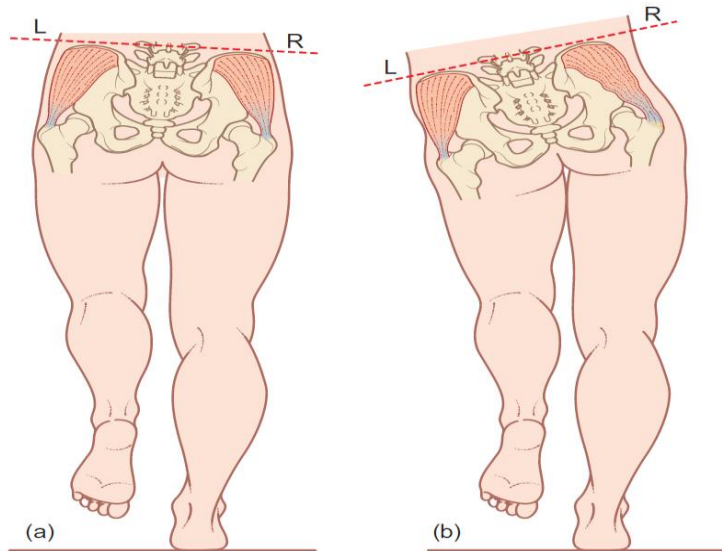
★ Look

- Expose from the **Umbilicus to mid-thigh**. Keeping the patient's dignity, cover the patient's genitalia.
- Mainly you check for Pelvic Obliquity by commenting on:
 - Shoulder level.
 - Pelvis level.
 - Lumbar lordosis.
 - Spinal deformities (Kyphosis, Scoliosis, Hyperlordosis...).
- Next you ask the patient to walk in a straight line, comment on the Gait if it's:
 - **Antalgic Gait:** Shortened stance phase on the affected side. Pain is a common cause of the limp. [Video](#).
 - **Trendelenburg Gait:** During the stance phase, the weakened abductor muscles allow the pelvis to tilt down on the opposite side. [Video](#).
 - **Waddling Gait:** Bilateral abductor lurch. [Video](#), [Video](#).
 - Comment if the patient is using any walking aids.

★ Special Test

- Look for **Trendelenburg's Sign**. [Video](#), [Video](#), [Video](#).
- There are many ways for doing the test. The preferred way to do the test by the doctors who taught us is the following:
 - You stand in front of the patient and ask him/her to stand on each leg in turn (They can hold your hands if they need to).
 - Ask the patient to rise the foot on the contralateral side from the floor by flexing the knee. "If we want to examine the right side, ask patient to flex his/her left leg"
 - Normally, the hip is held stable by Gluteus Medius acting as an abductor in the supporting leg.

- If the pelvis drops on the unsupported side/flexed knee (or the patient squeezes your hand on that side tightly) = positive Trendelenburg sign.



(a) Ask the patient to stand on one leg. There should be a raising of the pelvis on the opposite side, a negative Trendelenburg test.

(b) When the pelvis drops, the sign is positive.

While Lying

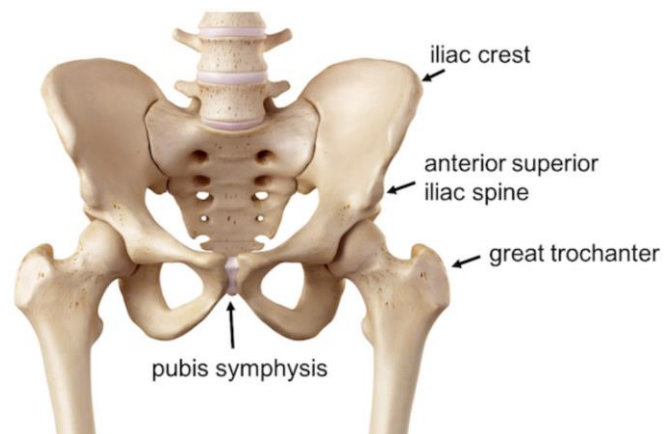
★ Look

- Exposure: Umbilicus to mid-thigh and cover the genitalia.
- Skin Changes.
- Scars.
- Discolorations/erythema.
- Swellings.
- Muscle Wasting: Glutei.

435 OSCE Tip: If you were asked to do a Focused exam on one side, this means that you have to do all the exam only to that side (not only the special tests). Mention that you'll examine the other side to compare at the end for the sake of time.

★ Feel

- Don't forget to Ask the patient before you start: Do you have any pain?
- Skin Temperature (by the dorsum of your hands).
- Tenderness over the Bony Landmarks:
 - **Anterior Superior Iliac Spine.**
 - **Iliac crest.**
 - **Greater Trochanter.**
 - **Pubic Tubercle.**



★ Move

- Flex the patient's hip passively. Comment on the degree. [Video](#).
- Extension of the hip is done while the patient is prone. Comment on the degree.

435 OSCE tip: While you're flexing the hip you can do the Thomas test at the same time. You can also do the hip extension (because it's done prone) at the end to gain time but don't forget to tell the examiner. The station is only 5 minutes try not to waste time.

- While flexing the hip you can examine the Internal Rotation and the External Rotation of hip at 90 degrees hip and knee flexion passively. Comment on the degree.
- Passive Abduction and Adduction and stabilize the pelvis. Comment on the degree.



Fig. 8.8 With the patient lying on their front, lift each thigh and assess hip extension.



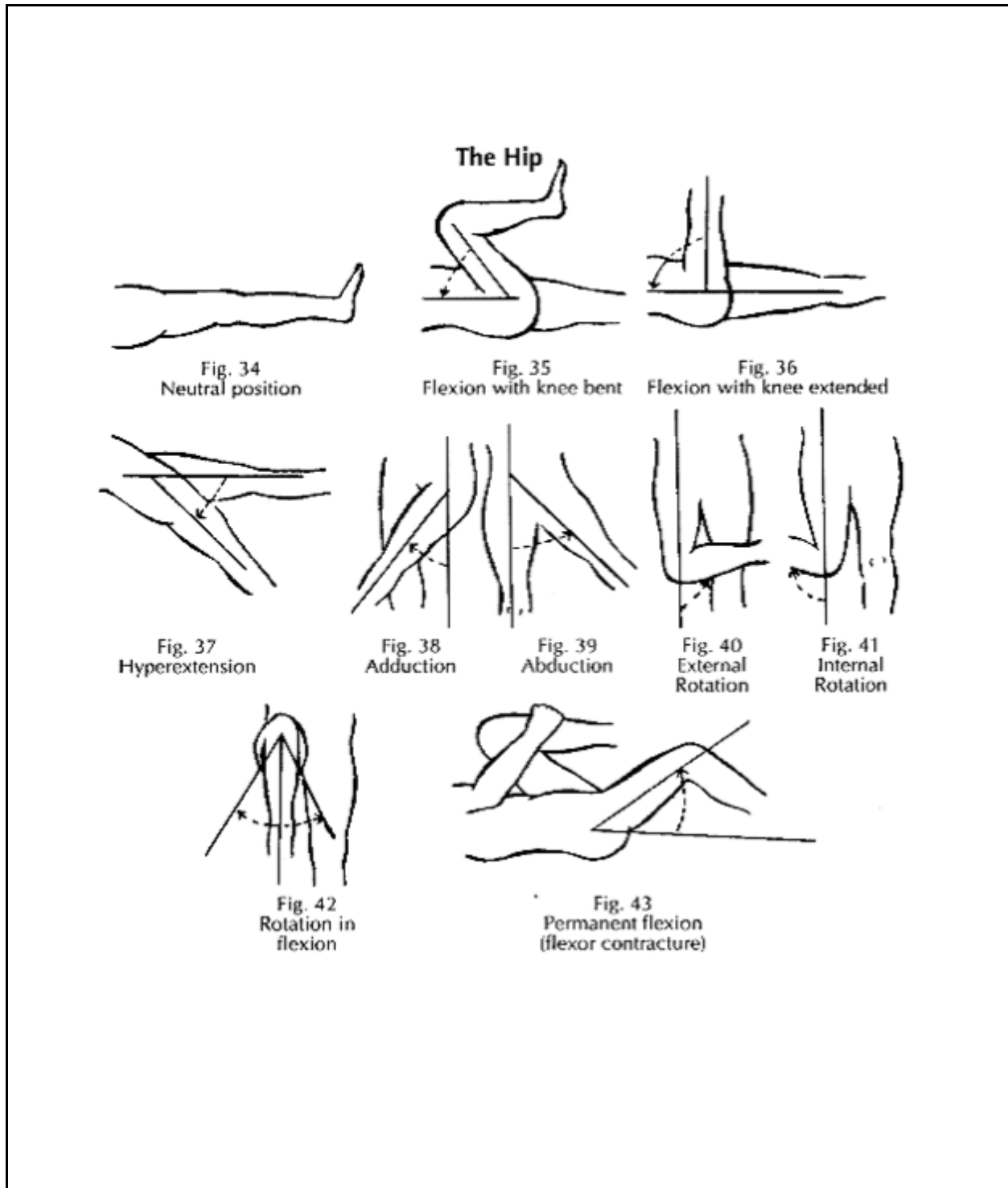
Fig. 8.6 Keep your fingers and thumb stretched across the iliac spines when testing abduction and adduction to detect any movement of the pelvis.



Fig. 8.5 When testing hip movements such as flexion, place your fingers on the greater trochanter and your thumb on the iliac spine so that you detect any tilting of the pelvis.



Fig. 8.7 Rotation is measured by flexing the hip and the knee to 90° and rotating the femur by moving the foot back and forth across the line of the limb.



★ Special Tests

● Thomas test: [Video](#)

- To look for the Fixed Flexion Deformity.
- Put your hand under the patient Lumbar spine before flexing the Hip and while flexing it comment on the disappearance of Lumbar lordosis.
- When the affected side" contralateral" shoots up when flexing the other side That a positive sign.
- If the Thomas Test is positive = assess the extension of the affected side with the patient lying on the same side of the flexed hip while stabilizing the pelvis.
- Restricted extension = True FFD.

● Leg Length Discrepancy:

- With the help of a measuring tape, measure both legs from the Anterior Superior Iliac spine to the medial malleolus of each side. ("True" leg length discrepancy measurement)
- Compare both legs' length to look for any discrepancy.
- If there is a difference, look for the Galeazzi sign to Identify level of leg length discrepancy. (The "apparent" leg length is measured from the umbilicus to the medial malleolus.)

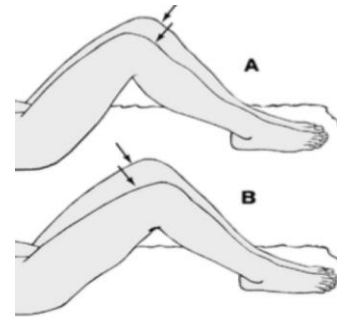


Fig. 6.10 A quick method of detecting difference in bone length is to put the patient's heels together, with the knees flexed, and look from the side and the end of the bed. This patient has shortening of the right tibia and femur.

● Galeazzi sign: [Video](#)

- knees flexed at 90° with hips and ankles at 45°.
- Put the malleoli at the same level. Any hind foot(foot posterior 1/3) asymmetry makes the test inaccurate.
- If you see the discrepancy when looking at the Femurs parallel (You're standing beside the patient's head):
 - Tibias at the same height. The discrepancy is above knee (Femur).
- If you see the discrepancy when looking at the Tibias parallel (You are standing beside the patient feet):
 - Femurs at the same height. The discrepancy is in the tibia (knees at different levels).

- The position of the two knees should be compared.
(A) This appearance suggests femoral shortening.
(B) This appearance is suggestive of tibial shortening.
- You can never judge from the physical exam which side is normal and which side is not. You can only tell that there is a discrepancy and you will need further imaging to decide.



- **Mention at the end:**
 - I'll finish my examination by examining one joint above (Lumbar spine) and one joint below (knees).
 - I'll also do a full neurovascular exam.
 - I'll order imaging if it's indicated.
 - Don't forget to thank and to cover the patient.

- **Full Examination** [Video](#).

3- Knee examination

Before you start you have to check this [video](#) which done by Dr. Al Omar

Look

❖ **Exposure: from mid-thigh down**

❖ **Standing:**

- Expose both lower limbs from mid-thigh down.
- Comment on knee alignment while standing (varus/valgus /or neutral) and whither physiological or pathological).
- Look for abnormal motion of the knees while walking.
- Look for ankle and foot alignment and position.
- **Gait.**

❖ **Supine**

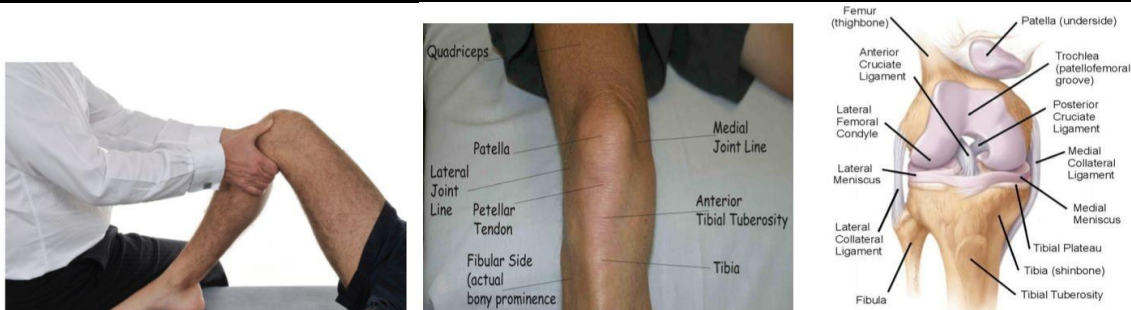
- Alignment (physiological valgus, abnormal valgus, varus)
- Skin changes
- Varicose veins
- Swelling
- Muscle wasting (quadriceps) (Should be measured by a measuring tape)
- **Inspect the back of the knee.** (Baker's cyst)

Feel

1. Before touching the patient ask if he has any pain

2. Always compare to the other side

- ❖ Check and compare temperature
- ❖ Feel for any lumps or bumps in the soft tissue or bone around the knee – comment if present.
 - **Baker's cyst (in popliteal fossa)**
- ❖ **Identify bony landmarks** (femoral condyles, tibial plateaus, tibial tuberosity, proximal fibula, patella and comment if tender) (Best done with the knees flexed. Keep looking at the patient's face.) (Tenderness over the tibial tuberosity may indicate Osgood–Schlatter disease) [Video](#)
- ❖ Feel for any soft tissue tenderness.
- ❖ Identify course of collateral ligaments and comment if tender
- ❖ Identify joint line in flexion of 90 degrees and comment if tender (Joint line tenderness = meniscus injury) (Identify the quadriceps tendon checking for a gap)



- ❖ You should know surface anatomy to localize the site of abnormality, in the exam the SP may points to an area that hurts, you should be able to identify it.

Move

- ❖ **Flexion and Extension:** Do active R.O.M and compare, normally from -5° to calf touching thigh (normal ROM from -5° to 140°)
 - **Passive ROM if active is abnormal.** [Video.](#)
 (There is variation in the degree of extension, usually it's zero)
- ❖ Comment on pain or crepitus with movement
- ❖ You should be able to approximately describe ROM in degrees (varies in normal individuals, Full extension is 0° , flexion of 135° and above consider normal)
- ❖ ROM is measured using **Goniometer**



Fig. 8.17 Testing knee flexion.



(a) Milking of fluid on the medial side of the knee. The fluid displacement test: compress one side of the knee and note the joint distending on the opposite side.



(b)

Special tests:

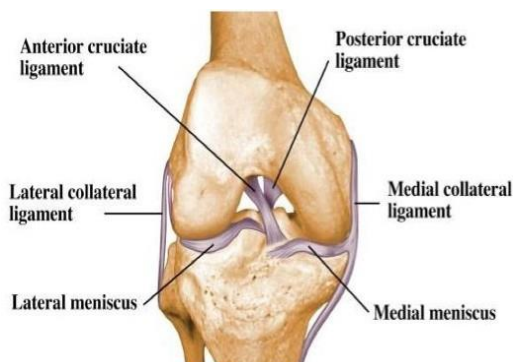
★ Tests for effusion:

- **Milking test:** in extension milk the knee medially upwards to fill the suprapatellar pouch and hold fluid in pouch with one hand then run other hand laterally downwards and look for filling medially (moderate effusion) [Video](#)
- **Patellar tap:** in extension tap the patella downward and feel the patella bounce on the femur (large effusion) [Video](#)
- A warm knee can be suggestive of mild effusion.



Fig. 8.15 The patellar tap test: squeeze any fluid out of the suprapatellar pouch using the right hand and then press down on the patella. A tap or click will indicate an effusion.

★ Examine the ligaments

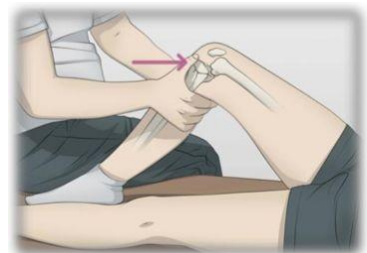


- **ACL**
 - **Lachman's test (Most sensitive).** [Video.](#)

Flex the knee to 30°, patient should be relaxed, place on hand medially distal to the knee and the thumb on tibial tuberosity. Place the other hand laterally proximal to the knee. Make sure the quadriceps are relaxed. then pull the tibia forward.



Fig. 8.22 Anterior draw test (blue arrow) for the anterior cruciate ligament and posterior draw test (red arrow) for the posterior cruciate ligament.



Ligament:	Function:
Anterior cruciate ligament (ACL)	Prevents the tibia sliding forward on the femur
Posterior cruciate ligament (PCL)	Prevents the tibia from sliding backward on the femur
Medial collateral ligament (MCL)	Resists forces from the outside of the leg
Lateral collateral ligament (LCL)	Resists forces from the inner side of the knee



Fig. 8.23 The Lachman test for cruciate insufficiency.

- **Anterior Drawer Test.** [Video.](#)

Flex the knee to 90°, make sure the hamstrings are relaxed, and stabilize the foot by sitting on it. Place your fingers in popliteal fossa and thumbs on the tibial tuberosity pull the leg forward. Normal forward movement should not exceed 3 mm

- **PCL**

- **Posterior Drawer Test.** [Video.](#)

Position is same as the anterior drawer, but you push the leg back.

- **MCL**

- **Valgus Stress Test.** [Video.](#)

At extension (0°) apply valgus force to the knee, if positive: **pain, +- opening.**

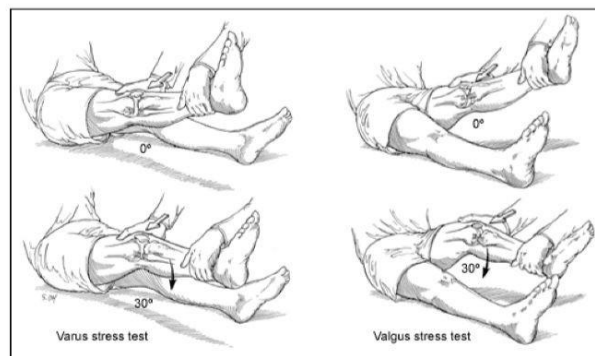
Then repeat with the knee flexed to 30° (we only did it in extension during the session).

- **LCL**

- **Varus Stress Test.** [Video.](#)

at extension (0°) apply varus force to the knee, if positive: **pain, +- opening.**

Then repeat with the knee flexed to 30°. (we only did it in extension during the session)



	Increased valgus laxity	Increased varus laxity
In full extension	Damage to MCL and posteromedial capsule	Damage to LCL and posterolateral capsule
In flexion	Isolated damage to MCL with intact posteromedial capsule	Isolated damage to LCL with intact posterolateral capsule

Patellar Instability

- **Apprehension Test** .[Video](#).
- Start in extension with relaxed quadriceps, push patella laterally with one hand , and ask the patient to flex the knee to 30 degrees (actively) , at any point if patient contracts his quadriceps aggressively or becomes apprehended stop and identify test as positive .
(suggest lateral patellar dislocation)

(To assess for meniscal tear/injury, palpate the joint line while the knee is flexed 90°, tenderness indicates meniscal injury)

To complete the knee examination Examine:

- **joint above (hip):** can be a source of referred pain , so a quick screening while supine is required as follows:
 - Move hip to flexion passively to 90 degrees and internally/externally rotate and check for pain.
- **joint below (ankle):** Move ankle passively in dorsal/plantar flexion and check for limitation and pain. Check subtalar motion and comment if abnormal.

Distal neurovascular examination:

- Palpate distal pulses
- Quick screening that ankle and toes are moving up and down
- Quick screening for sensation in the foot.

Comment if abnormal and compare to opposite side if abnormal

4- Ankle and foot examination

1- Look (weight bearing and non-weight bearing) while standing and supine

Proper bilateral exposure, at least mid-leg, compares Rt and Lt, front, side and back.

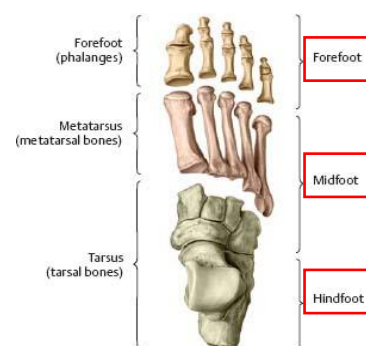
And look for:

1. **Alignment.**
2. **Deformity:**
 - **hindfoot:** varus or valgus.
 - **midfoot:** cavus (High arch) or flat foot.
 - **Forefoot:** hallux valgus.

(The normal for hindfoot is: straight or 5 degrees valgus/physiological valgus)

3. **Skin changes** (callosities, scars, bruises and color changes)
 (callosities: piece of skin that has become thickened as a result of repeated contact and friction)*

4. **Swelling or mass**
5. **Muscle wasting** (leg)
6. **Gait** (Antalgic gait, Trendelenburg's gait, waddling gait...)



Superior view

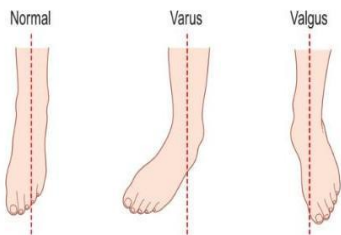


Fig. 8.39 Bilateral hallux valgus.



2- Feel (supine position)

1. **Before touching the patient ask if he has any pain** and warm your hands.

2. **Always compare to the other side**

(Look at the patients face to assess the pain)

You should know surface anatomy to localize the site of abnormality, in the exam the SP may points to an area that hurts you should be able to identify it.

a. Joint line anteriorly.

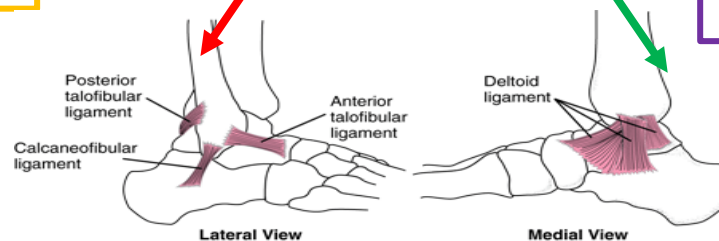
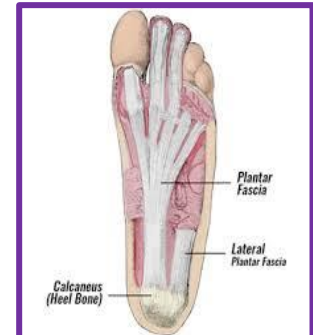
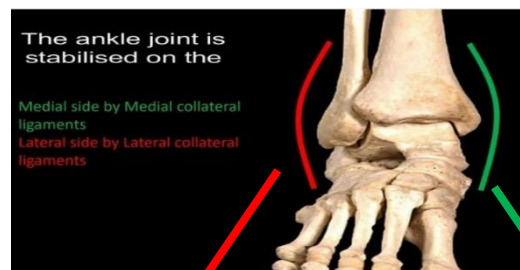
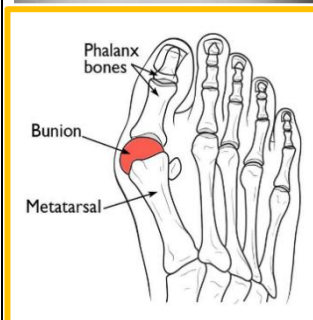
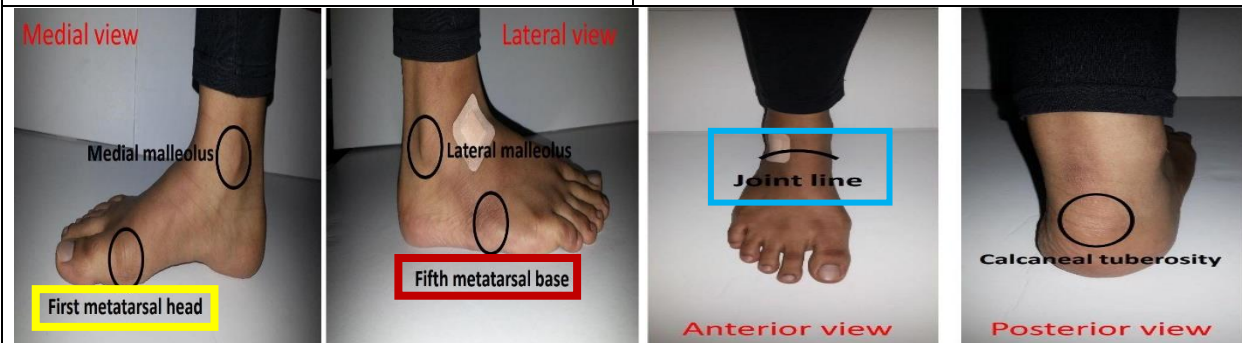
b. Soft tissue:

- skin temperature (use dorsum of the hand more sensitive).
- tenderness.
- Achilles tendon.
- plantar fascia (Fasciitis).
- medial collateral ligaments (Deltoid ligament).
- lateral collateral ligaments. (Anterior talofibular, Posterior talofibular and calcaneofibular ligaments).

c. Bony prominences:

- first metatarsal head (Osteoarthritis, Bunion*).
- fifth metatarsal base (tenderness-avulsion fracture).
- medial and lateral malleoli.
- navicular tuberosity.
- calcaneal tuberosity.

(*bunion is a painful bony bump that develops on the inside of the foot at the big toe joint.)



3- Move

Ankle joint is formed by the lower end of the tibia & fibula into which is fitted the upper part of the body of the talus.

Actions: dorsiflexion and plantarflexion.

Subtalar joint is formed between talus and calcaneum.

Actions: Inversion and Eversion

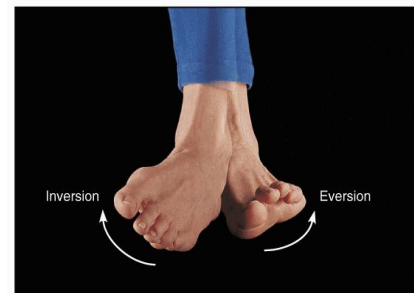
- Active Ankle ROM Range of Motion (**Ask the patient to do** dorsiflexion and plantarflexion)
If the patient can't do dorsiflexion or plantarflexion do dorsiflexion it passively.
- passive ankle ROM (dorsiflexion and plantarflexion). **Start at neutral (0 degrees).**
Hold the heel by left hand and midfoot by right hand then assess plantar flexion (0–40°) and dorsiflexion (0–20°).
- Passive subtalar ROM (ankle to neutral and stabilized then apply **inversion** and **eversion** to assess subtalar ROM).
- **N.B: note if painful or painless**
Active ROM ([video](#))
Passive ROM ([Video](#))



(a) Ankle dorsiflexion.



(b) Ankle plantar flexion.



(b) Inversion and eversion

4- Special tests:

1. **Anterior drawer test** with **ankle in plantar flexion (10-15 degrees)** to evaluate anterior talofibular ligament (8mm diff).

- **Technique:**

The patient is supine with the ankle at the edge of the bed. Hold the lower end of the leg above the ankle with one hand grab the heel with the other then pull the talus anteriorly > 8mm difference is positive.

Test Technique ([video](#)), Positive Test ([video](#))

2. **Rigid flat foot**

If the patient has flat foot: you will ask him to tip toe **to check if it is flexible or rigid flatfoot**, you have to observe if the heel will correct from valgus to varus or not as well as mid foot arch reconstitution. **If it didn't correct** ⇒ rigid flat foot ([video](#))



(a) The heel is in valgus when viewed from behind.

Fig. 8.29 ANKLE INSPECTION



(b) As the patient goes onto tip toes, the heel swings inwards into varus.

3. **Achilles tendon test: Thompson test.**

Technique: While the patient is prone ask him to flex his knee. squeeze his calf muscles and look at the Achilles tendon > **check for plantar flexion.**

Normal: there will be plantar flexion.

Ruptured Achilles tendon: no plantar flexion.

Test Technique ([video](#)), Positive Test ([video](#))

4. **How to differentiate between Achilles tightness or only gastrocnemius Tightness?**

by dorsiflexion of ankle while the knee extended then when flexed will help for spine session but not for ankle and foot itself)

([Video](#))([Video](#))

More explanation: Limitation of dorsiflexion due to Achilles tendon tightness or gastrocnemius tightness can be differentiated with this test:

Dorsiflexion of the ankle is limited with tightness of the gastrocnemius muscle **only with knee extension** but with knee flexion, gastrocnemius muscle will relax because its origin is above knee joint **and this will improve the ankle dorsiflexion.**

With Achilles tendon tightness, **ankle dorsiflexion is the same** with the knee in both extension and flexion.

When doing the test make sure the ankle is at neutral position at the subtalar

To complete the examination of ankle:

1) Perform neurovascular examination.

2) Examine joint above and below (Examination of hip and knee joints.)

5- Back Examination

Standing/Walking Position:

1. Look:

- Expose the trunk and lower limbs properly.
- Examine front and back.
- Alignment, Deformity (Kyphosis, Scoliosis, Hyperlordosis...), Muscle wasting, skin changes, swelling, scars, Hairy tuft, “cafe au lait” spots.
- Are shoulders and pelvis level?



Gait:

- Abnormal gait types: Antalgic, Trendelenburg, Waddling.
- Heel and toe walking: For nerve roots.
- Heel walk = Examining L4.
- Toe walk = Examining S1.

2. Feel:

- Palpate spinous processes for tenderness, steps or gaps. (Check for the spinous processes alignment if it is central).
- Soft tissues: Temperature, tenderness.

3. Move:

Test the spine ROM (Actively and passively):

Start with Active ROM in all 6-directions:

- Flexion: Record as such (able to touch toes/shins/knee/thighs...) (Make sure the leg is straight/ knee extended)
- Extension: Normal around 30°.
- Lateral bending: Normal around 30°.
- Rotation: Normal around 40°. (When assessing rotation, it's mandatory to put your hands on each side of the patient's pelvis !!)
- Note if Painful/Painless.

Attempt passive ROM if Active is limited and painless, record.

4. Special test:

Adams forward bending test:

- (The examiner stands behind the patient to assess)
- Full forward flexion until back is horizontal to the floor. (with complete knee extension and hands in the air not touching the knee).
- If thoracic Scoliosis is present, then rib hump will become visible

Supine Position:

1. Look

- Note any muscle wasting in the lower limbs

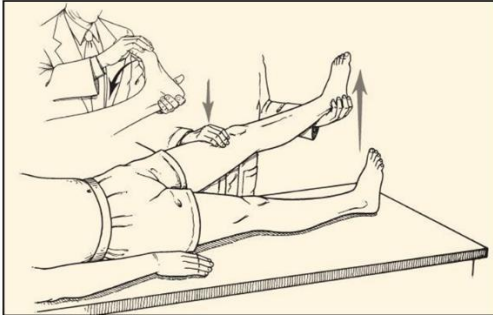
2. Feel

- Check for Leg Length Discrepancy (ASIS to medial malleolus).

3. Special test

Straight leg raising test (SLRT):

- With the patient supine, passively elevate the leg, the examiner's hand behind the heel-with knee extended while observing the patient's face for any signs of discomfort.
- A positive test is reproduction of sciatica (Sharp shooting pain radiating below knees-between 30° and 70° of hip flexion).
- The pain is aggravated with ankle dorsiflexion and relieved with knee flexion



Hamstring tightness and knee or hip pain should be distinguished from a true positive SLRT:

- Screening Hip and Knee examination (rotation of the hips, joint line tenderness at the knees) should be done to rule out hip or knee osteo arthritis which can be confused with sciatica.
- We differentiate between them by flexion of the knee, this relieves the pain in case of sciatica. If the pain didn't reduce with knee flexion the cause is most likely from the hip or the knee

4. Neurological examination (The patient is in supine position):

1.Motor:

- Hip flexion=L2
- Knee extension=L3
- Ankle dorsiflexion=L4
- EHL (great toe extension-Extensor Hallucis Longus)=L5
- Ankle plantar flexion=S1

2.Sensory: Dermatomes.

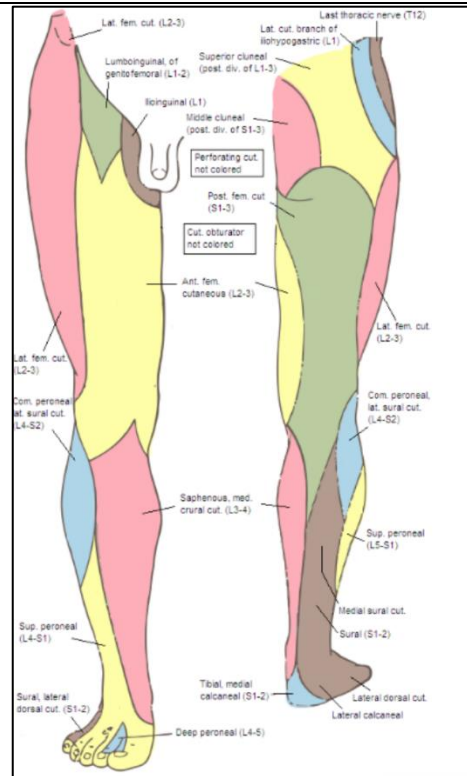
3.Tone: Normal, Flaccid or rigid.

4.Reflexes: Knee & ankle jerks.

(For the knee jerk, slide one arm below the knee while the patient is supine, then strike the hammer with the other hand. For the ankle jerk, put the foot that will be tested on the other leg and passively dorsiflex it slightly, then strike the hammer.)

5. Vascular examination:

- Pedal pulses: Dorsalis Pedis , posterior Tibial arteries
- Capillary refill time: Normal < 2 seconds

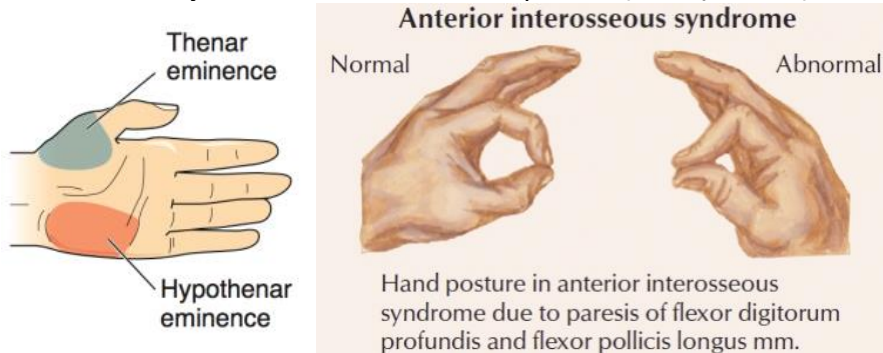


6- Peripheral neuro-vascular examination

Upper limb:

❖ Median nerve:

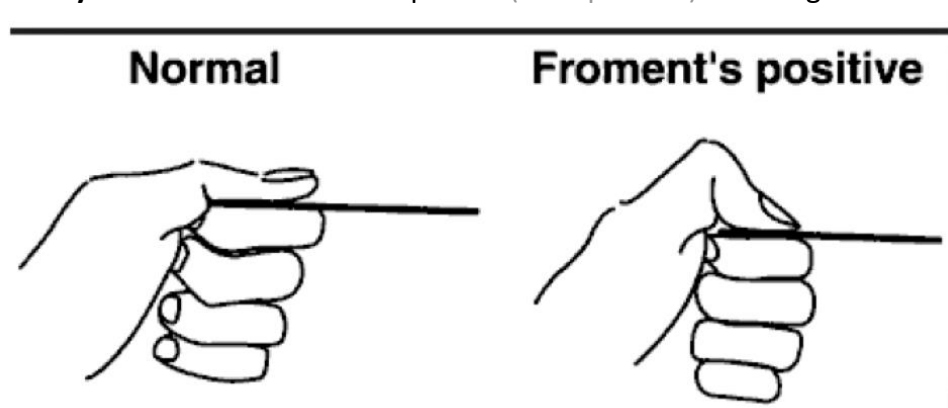
1. **Inspection:** Thenar muscle wasting.
2. **Motor:** Thumb abduction or opposition (opposition of thumb to little finger and NOT to index finger for OK sign). (Opposition gets affected first) (The doctor said avoid the thumb abduction) (When the patient does the OK sign, try to open it and ask the patient to prevent you doing so)
3. **Sensory:** fine touch over volar aspect of (the tip of the) index finger.



- Anterior interosseous nerve is a branch of the median nerve.
- Median nerve Examination: [video](#)

❖ Ulnar nerve:

1. **Inspection:** hypothenar muscle wasting, claw hand.
2. **Motor:** finger abduction, Froment's sign (adduction of the thumb can also be used).
3. **Sensory:** fine touch over volar aspect of (the tip of the) little finger.

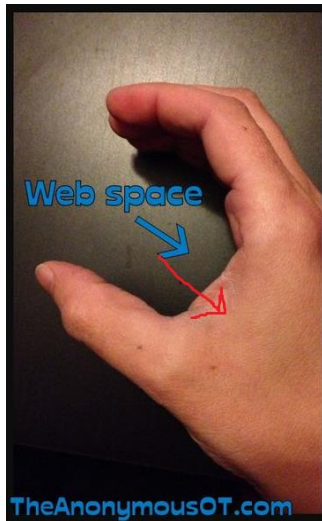


Froment's sign: [video](#)

Ulnar nerve Examination: [video](#)

❖ Radial nerve:

1. **Inspection:** drop wrist
2. **Motor:** wrist extension (assess the wrist and not forearm)
3. **Sensory:** fine touch over dorsal aspect of first web-space



ulnar

claw hand



radial

wrist drop



median

parson hand

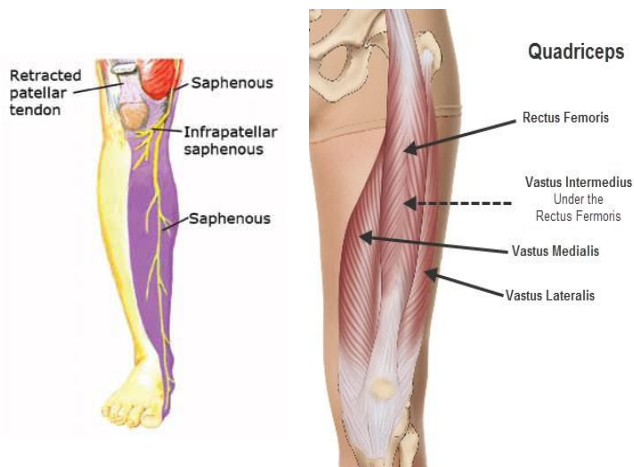
Radial nerve examination: [video](#)

Upper limb (Hand) peripheral nerves examination: [video](#)

Lower Limb:

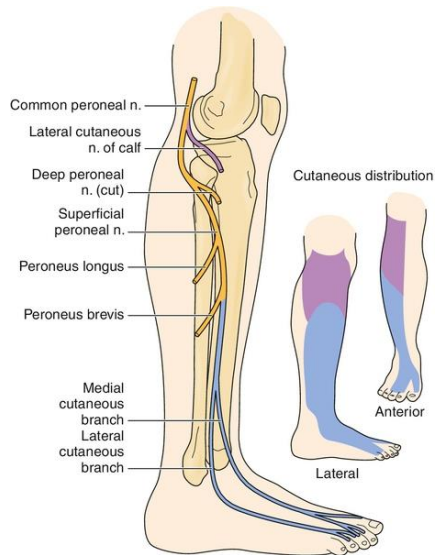
❖ Femoral nerve:

1. **Inspection:** Quadriceps wasting
2. **Motor:** knee extension
3. **Sensory:** medial aspect of leg and foot (saphenous nerve).



❖ **Common peroneal nerve:**

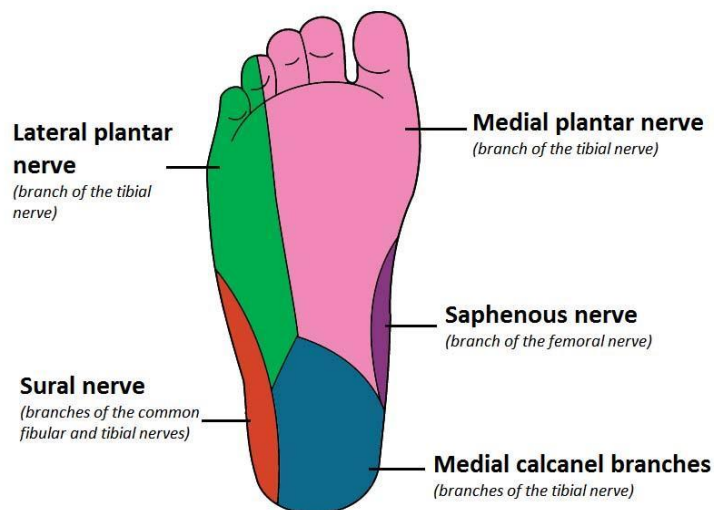
1. **Inspection:** drop foot, anterior leg muscle wasting. (For drop foot, raise the leg passively to detect it)
2. **Motor:** ankle dorsiflexion
3. **Sensory:** dorsal aspect of foot



Drop foot

❖ **Tibial nerve:**

4. **Inspection:** calf muscle wasting (Look at the back of the leg !)
5. **Motor:** ankle plantar flexion
6. **Sensory:** plantar aspect of foot



Vascular exam:

- A. **Look:** Thin, shiny, hairless skin. Ulcers. Pallor.
- B. **Feel:** temperature
- C. **Special tests:**
 1. Capillary refill (normal is <2 seconds).
 2. Pulses

Important Notes:

1- Always **compare**.

2- For the motor part, it's better to ask the patient to do the movement, then assess it against resistance for power. However, **The most important thing is testing the action against resistance.**

3- Mention the **power grade** after comparing resistance on both sides. (e.g.; 5/5 on both sides)

4- When assessing the sensory function, ask the patient:

A- Do you **feel** it? B- **Is it the same** in both sides?

5- For **fine touch**, use a cotton.

Grade	Description
0	No muscle contraction at all
1	Visible muscle contraction, but no movement
2	Movement without influence of gravity
3	Movement against gravity
4	Movement against resistance
5	Normal strength

Grade 5	Normal movement
Grade 4	Movement against resistance, but weaker than the other side
Grade 3	Movement against gravity, but not against resistance
Grade 2	Movement only with gravity eliminated
Grade 1	Palpable contraction but no visible movement
Grade 0	No movement

During inspection, the most important thing (in orthopaedics) is the muscle bulk (i.e.; wasting and deformities).

(Doctor H. Al. Sanaawi said that one test for each part is sufficient. For instance, when testing the motor function of the ulnar nerve, you can test either the finger abduction or the Froment's sign)

A wasted (Atrophied muscle) indicates prolonged nerve injury.

Procedural Skills

1. Knee aspiration

Check this [Video on knee aspiration](#).

Principles of Aspiration
Consent
Cleaning
Position: Supine, semi flexed knee 30
Entry point
Bony landmarks
Aspiration
Instruments
Aspirate analysis
Tubes
Dressing

Indications:

❖ Diagnostic:

1. Diagnosis of suspected septic arthritis. Rule out infection like septic arthritis, subacute or chronic arthritis.
2. Rule out inflammatory causes (Rheumatoid arthritis, Reactive synovitis).
3. Identification of crystal arthropathy.
4. Traumatic causes (intra-articular fracture bleed hemarthrosis)

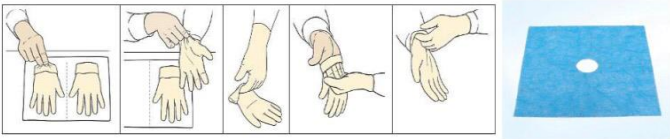






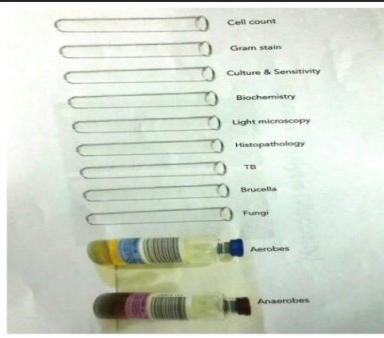

❖ Therapeutic (not common)

1. Relief of pain by aspirating effusion or blood.
2. Injection of medications

Contraindications:

Relative contraindications include the following:

1. Cellulitis overlying the joint.
2. Uncontrolled coagulopathy.

Equipment	
Sterile gloves and drapes	
Gauze pads, 4 × 4 in	
Skin preparatory solution (alcohol or chlorhexidine)	
Lidocaine 1%.	
Syringes: 60 mL.	
Needles, 18 gauge.	
Patients who are morbidly obese might require a 21-gauge spinal needle for arthrocentesis	
Specimen tubes, blood culture tubes: specimen will be sent for (cell count, Gram stain, culture and sensitivity, histopathology, biochemistry, light microscopy, AFB, aerobic and non aerobic cultures, fungal, TB cultures, brucella, and crystals). Dr. Hamza told us that we should mention them all.	
Bandage	

Position: supine in bed and a small cushion under the knee to flex it (30°).

Exposure: mid thigh to the foot, Adult patient should be relaxed.

For pediatric patient, it should be done in operating room or under conscious sedation.

- ❖ **A written consent should be taken from the patient or guardian.**
- ❖ **Check your equipment** (sterile gloves and cleaning set, antiseptic solution, syringe, local anesthesia).
- ❖ **Identify the bony landmarks of the knee joint** (also the tendons and joint lines):
(Quadriceps tendon, patella, patellar tendon, tibial tuberosity, medial and lateral joint lines)
- ❖ **entry points:** joint line or suprapatellar pouch.

During the Procedure: (under aseptic conditions), (how to perform):

1. Clean the area 3 times (in out) with alcohol and put drape on knee
2. Inject 3-5 cc local anesthesia in the subcutaneous tissue, inject it in three directions (in each direction you have to aspirate before if you do not see blood inject + while injecting withdraw the needle to anaesthetize the whole area)
3. Wait for 2-3 min **(in the exam just mention it).**
4. Approach: Lateral Suprapatellar approach.
5. Remember that in 10% of the population, the suprapatellar bursa does not communicate with the knee joint.
6. For large effusion, **Insert the needle 1 cm above and 1 cm lateral to the superior lateral aspect of the patella at a 45° angle.**
7. While inserting the needle aspirate at the same time until you see fluid, stop inserting the needle and keep aspirating.
8. Cover and bandage the aspiration site.
9. Send the fluid for culture and analysis.
10. Analyze the aspirate: **Remember to comment on:**
 - a. **Amount** (Large or small).
 - b. **Color** (clear, Straw color).
 - c. **Consistency.**
 - d. **Content** (Blood or Fat droplet).
 - e. **Viscosity.**

After the procedure:

1. Advise the patient to rest the joint for 1-2 days and to avoid strenuous use for five days (rest the joint).
2. Warn the patient that the joint may be painful for a while and advise on use of analgesics.
3. Following injection, patients should be warned that they might experience worsening symptoms during the first 24-48 hours (related to a possible steroid flare) which can be treated with ice and NSAIDs. If pain is severe or increasing after 48 hours, seek advice.
4. Warn about possible other side-effects. Advise to seek help if systemic side effects develop suggesting infection.
5. Arrange appropriate follow-up

Possible scenarios for knee aspirates:

- **Thick pus (septic arthritis):** patient must be admitted for emergency knee joint washout and Intravenous broad spectrum antibiotic therapy.
- **Blood (hemarthrosis):** if no fracture, same advices as for therapeutic arthrocentesis.
- **Blood and fat droplet (fracture is present):** should be managed as fracture principles.
- **Straw color fluids (crystal induced arthritis vs rheumatological cause):** fluid must be sent for same cultures as mentioned before with stress on crystal under light microscopy.

please note that this picture for the location of entry point. But handles (doctor) MUST have full field prepped and draped under full aseptic technique.



2. Open fracture management

Open fractures:

- Fractures that are exposed to the external environment.
- The amount of soft tissue destruction is related to the level of energy transmitted to the limb during the traumatic episode.
- Open fracture can be an isolated entity or part of high energy multiple trauma injuries.
- Approach should be always toward saving patient's life, safe patient's limb then save limb's function.
- **Most likely the trauma that cause open fracture is high energy (e.g. RTA) so you need first to stabilize the patient by ATLS and then look at his limb.**

Classification: Open fractures are commonly described using the Gustilo grading system		
Type 1	Type 2	Type 3
small (<1cm), clean wounds, minimal injury to the musculature and no significant stripping of periosteum from bone.	large (> 1 cm but < 10 cm) wounds, no significant soft tissue damage.	A: large wounds, associated with extensive injury of soft tissue but adequate viable soft tissue present to cover the bone.
Approach should be: always toward saving patient's life, safe patient's limb then save limb's function. To Know whether it is 3B Or 3C Check for pulse.		B: large wounds those are associated with extensive injury of soft tissue without adequate viable soft tissue present to cover the bone. C: Open fractures associated with Vascular injury that needs repair.

1. In ER:

- **Precautions** guideline (gowns, shoes cover, sterile gloves, face shield mask), dressing pads, normal saline)
- **ATLS principles** Stabilize the patient ABCs.
- Consent: explain what are going to do.
- Give him **analgesia**.
- Start **IV antibiotic** based on open fracture initial staging and patient allergy history.
- **Take AMPLE history** **A**: allergy **M**: medications **P**: past medical and surgical **L**: last meal **E**: event that caused the injury
- **Ask the patient for tetanus vaccine status.**
- **General examination of the patient mainly looking for other wounds in the body then you start the local wound care.**

Initial local wound care:

1. Expose the wound, look for: Size of the wound, swelling, deformity, color of skin, contamination.
 2. Take picture to avoid opening the wound again. Also, as medico legal documentation. (describe the wound; when multiple wounds, the largest is the most important)
 3. Remove any obvious foreign body from wound (avoid digging deep into wound) (e.g. glass, clothes or dust).
 4. Irrigate wound with Normal Saline (1-2 L).
 5. Push any prominent fracture fragment gently.
 6. Cover the wound with sterile saline-soaked gauzes.
 7. Wrap the limb with sterile cotton roll.
- **Check distal neurovascular status, and check for compartment syndrome.** (firm wooden feeling on palpation, compare to other leg, painful big toe traction)
 - **Reduction:**
Reduce fracture by applying traction and counter-traction followed by correcting the deformity. (Maintain alignment and rotation)
 - **Immobilization:**
Using backslab the aim is to reduce the pain, prevent further vascular damage and skin damage.
 - **Re-check distal neurovascular status.**
 - Send patient for appropriate **X-rays:**
Do X-ray 2 views and 2 joints (distal and proximal joint).

Antibiotics selection:

- According to doctor judgment (1st generation cephalosporin is used always then according to the wound he can add other antibiotics).

Grade 1	Give 1st generation cephalosporin (gram +ve) e.g. cefazolin
Grade 2	Cover both gram –ve and +ve by adding Gentamicin
Grade 3	Add penicillin to cover for anaerobes such as clostridium
Add penicillin for all farm and soaked wounds	

Tetanus prevention: (it depends on the wound type)

Clean wounds criteria	Other wounds
<6 hours from injury	Any wound does not apply to type A (?)
Not a farm injury	
No significant devitalized tissue	
Non immersed wound	
Non contaminated wound	

Clean wounds		Other wounds					
Completed vaccination		Not Completed or Unknown		Completed vaccination		Not Completed or Unknown	
Booster < 10 years	Booster > 10 years	Td 0.5 ml IM		Booster <5 years	Booster > 5 years	TIG 250U and Td 0.5ml IM	
nothing	Td 0.5ml IM			nothing	Td 0.5 ml IM		

Tetanus toxoid (Td) considered as active immunity. While immunoglobulins (TIG) are passive immunity. Called in Arabic الكزاز. Ask about vaccination status. In KSA, most patients will be not completed or unknown.

As soon as patient is stable and ready, alert the OR, and get consent from the patient for surgery.

Plan: Irrigation (usually we use 3,6, and 9 Liters of normal saline for grade 1,2 and 3 respectively), **debridement of necrotic tissue** (because it is a source of infection) and **fracture stabilization**.

The sooner the less risk of further morbidity.

move to the OR as soon as the patient is stable enough.

2. IN OR

- Extend wound if necessary. If it was a small wound, we need to extend until we can reach the bone.
- Thorough irrigation. 3, 6, 9L depending on grade.
- Debride all necrotic tissue.
- Remove bone fragments without soft tissue attachment i.e. floating **except articular fragments** (except the part of bone that have cartilage over it).
- In OR:
 - if there were no necrotic tissue, no contamination & the cut was simple & **Clean** (make sure) → stabilize the fracture & close the wound.
 - **Contaminated:** necrotic tissue → do debridement & leave the wound open (no suture yet only gauze & bandage) → recheck again in 48-72 hour for necrotic tissue.

- Usually requires second look or more every 48-72 hours.
- Generally, **do not close open wounds on first look.** (Don't close it surgically, only cover it, and then put external fixation).
- whenever the wound become clean close it the definitive Tx will be IM nail.

what will you tell the OR?

Diagnosis: e.g. Open fracture, grade 3C.

What you'll do? Debridement, irrigation and external fixation

If 3B, mention that you'll need a plastic surgeon

If 3C, mention that you'll need a vascular surgeon and a plastic surgeon

3. Splinting and casting

Introduction:

The initial approach to casting and splinting requires a thorough assessment of the injured extremity for proper diagnosis.

Examine: Skin, Neurovascular status (before and after: a. reduction, b. casting or splinting), Soft tissues, and Bony structures to accurately assess and diagnose the injury.

Indications for immobilization:

- Fractures.
- Sprains.
- Severe soft tissue injuries.
- Reduced joint dislocations.
- Inflammatory conditions: tendinopathy¹, tenosynovitis.
- Deep laceration repairs across joints.
- Tendon laceration.

Materials and equipment:

- Stockinet (2-3 inches for upper limb, 4 inches for lower limb) [Not required in our OSCE](#)
- Sheets, underpads (to minimize soiling of the patient's clothing)
- Plaster or fiberglass casting material
- Padding (soft rolls)
- Elastic bandage (for splints)
- Casting gloves (necessary for fiberglass)
- Basin of water at room temperature (dipping water)
- Bandage scissors
- Adhesive tape

¹ a type of tendon disorder that results in pain, swelling, and impaired function.

Control of setting time

The most important variable affecting the setting time is water temperature. The faster the material sets, the greater the heat produced, and the greater the risk of significant skin burns. A good rule is that heat is inversely proportional to the setting time and directly proportional to the number of layers used.

Gypsum (جبس) is the precursor of P.O.P, known as calcium sulphate dihydrate.

Gypsum + heat = P.O.P + water

Factors that speed setting time	Factors that slow setting time
Warm water	Cold water
Colloids	Crystalloids
Fiberglass cast use	Plaster of Paris (P.O.P) (gypsum)
Accelerator use: Potassium Sulfate	Retarder use: Sodium borate

General application procedures

The physician should carefully **inspect the involved extremity** and **document skin lesions, soft-tissue injuries**, and **neurovascular status** before splint or cast application.

Following immobilization, neurovascular status should be rechecked and documented.

Know how to examine neurovascular status for upper and lower limb.

Pay attention to the patient comfort status and pain level; never re-align a fracture without adequate analgesia.

The patient's clothing should also be covered with sheets to protect it and the surrounding area from being soiled by water and plaster or fiberglass.

Before you start: wash your hands, **wear gloves** (So you don't have the gypsum sticking to your hand), take permission and expose the fractured part.

Types and techniques

- 1- Complete cast
- 2- Plaster slab (Back slab)

1- Complete cast

- Measure the length.
- The physician holds the limb reduced and the assistant applies stockinet.
- Stockinet; 10 cm longer than the required length, therefore can be folded.
- Soft roll application; in the same position the limb will be immobilized, avoid folds at joint line, **apply extra padding at bony prominence** (each layer with 50% overlap **when**



you roll have your new layer cover 50% of the previous one as seen in the picture, how many rolls you use depends on the patient's arm or leg usually for below elbow we use 3 rolls and 4-5 for above).

- Assistant immerses P.O.P (or fiber glass) in warm water until all air bubble within the bandage disappears.
- Squeeze the bandage to expel excess water.
- P.O.P applied around the limb with gentle firmness, each circle should overlap about half the width.
- The plaster should be smoothed and molded.
- Limb should be elevated and iced in the first 48hrs to decrease the swelling.

Remember to use appropriately sized rolls (either cotton or P.O.P). For the arm use the smaller rolls.

Advantages of Complete Cast	Disadvantages of Complete Cast
Cheap and easily available	More time and skills needed to apply
Versatile	More complication compared to slab
Fairly strong	Stiffness of immobilized joints
More effective immobilization compared to slab	Pressure problems
-----	Not waterproof
-----	Heavy compared to fiberglass cast

2- Plaster slab

- Measure the length.
- The physician holds the limb reduced and the assistant apply stockinette.
- Stockinette; 10 cm longer than the required length, therefore can be folded.
- Soft roll application; in the same position the limb will be immobilized, avoid folds at joint line, **apply extra padding at bony prominence +4 layers.**
- A longitudinal piece of plaster prepared to the required length, folded in 10 layers.
- **For arms use a 3-4 inch wide roll while for lower limbs use a wider 6 inch roll.**
- Assistant immerses P.O.P in warm water until all air bubble within the bandage disappears.
- Squeeze the bandage to expel excess water.
- Apply dorsally and hold by gauze bandage (or crepe bandage).
- Limb should be elevated and iced in the first 48hrs to decrease the swelling.

Advantages of Plaster slab	Disadvantages of Plaster slab
Faster and easier to apply	Lack of patient compliance They might cut it themselves
Because a splint is non-circumferential, it allows for the natural swelling that occurs during the initial inflammatory phase of the injury	Excessive motion at the injury site
A splint may be removed more easily than a cast, allowing for regular inspection of the injury site	-----

General rules for cast fixation:

- Immobilize the joint above and below the fracture.
- Try not to immobilize any joint unnecessarily.
- Immobilize the joint in functional position whenever possible; e.g. knee 10 to 15 degree flexion, elbow 90-degree flexion, ankle and wrist are neutral.
- Do two layers when you start rolling with soft rolls (cotton) or POP.

Where to stop the cast?

- ❖ At the wrist stop just proximal to the distal palmer crease, to keep metacarpophalangeal joint free. 1st picture
- ❖ Below elbow: two finger width distal to the elbow crease. 2nd picture
- ❖ Above elbow: just below deltoid insertion. 3rd picture
- ❖ For the foot keep all toes exposed.
- ❖ Below knee: Just below the tibial tuberosity. 4th picture
- ❖ Above knee: upper third of the thigh. 5th picture

So for example let's say that you will apply a cast below the elbow, where will you stop the cast?

Proximally two fingers distal to the elbow crease, and distally at the distal palmer crease.



Complications of cast application:

- Compartment syndrome.
- Ischemia.
- Heat injury.
- Pressure sores and skin breakdown.
- Infection.
- Dermatitis.
- Joint stiffness.
- Neurologic injury.

Cast instructions to the patient:

- Keep limb elevated esp. first 48hrs.
- Move fingers/toes.
- Exercise all joints not included in the cast.
- If fingers/toes become swollen, painful or stiff raise the limb, apply ice and move the fingers/toes.
- If no improvement in half hr., return to the hospital immediately.
- If the cast becomes loose or cracked report to hospital.

Indications for splitting or removal of cast:

- Swelling of toes/fingers without ischemia → **split the cast.**
- Swelling of toes/fingers with sign of ischemia/compartament syndrome → **remove the cast and all compressive dressing down to skin.**

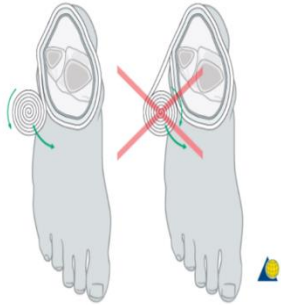
Cast removal:

- A cast saw is a specialized saw made just for taking off casts. It has a flat and rounded metal blade that has teeth and vibrates back and forth at a high rate of speed.
- The cast saw is made to vibrate and cut through the cast but not to cut the skin underneath. (don't drag the saw, do an up-down motion)
- After several cuts are made in the cast (usually along either side, in and out technique), it is then spread and opened with a special tool to lift the cast off.

The underlying layers of cast padding and stockinet are then cut off with scissors.



Helpful photos and videos:



Proper rolling of soft rolls or POP cast



Note folding of the stockinet to make smooth upper end in 1st picture

Lower limb Complete Cast (below knee) : [Video](#)

Upper limb Complete Cast (above elbow) : [Video](#)

Lower Leg Cast Removal: [Video](#)

Below elbow Cast Removal: [Video](#)

4. Closed reduction (dislocation/fracture)

Principles of Reduction:

- Activate ATLS if it is a high energy trauma or associated with other injuries.
- Give analgesia.
- Confirm the clinical diagnose of a joint dislocation or a displaced fracture by an orthogonal X-rays, joint above and below as needed (AP + Lateral or axillary view).
- Quick clinical & neurovascular assessment (assess distal neurovascular status **before and after reduction**).
- A dislocated joint is an acute emergency that needs immediate reduction or realignment.
- Check stability and safety zone (for dislocated joint) ?.

- A displaced long bone closed fracture:
 - If intra-articular: it needs anatomical reduction, which might necessitate surgery, but displaced intra-articular fracture need realignment and splinting prior to surgery.
 - If extra-articular: can be treated by closed reduction in the emergency department.
 - Reduction needs a calm and comfortable patient, that is done by one of or both:
 - “Conscious sedation”: I.V sedation with a narcotic.
 - “Hematoma block”: with local anesthesia injection.
 - Reduction done by:
 - A two-person job, each on a side of the dislocation/displacement.
 - The person at the distal segment does a gentle gradually increasing sustained traction, and the people at proximal segment remains stationary, to counteract each other.
 - Each type of dislocation/displacement has its own method of reduction; will be discussed next.
- Recheck again the distal neurovascular status.
 - Examine the compartment to rule out compartment syndrome
 - Obtain a post reduction 2 view X-ray.
 - Immobilize to maintain reduction.
 - Consult an orthopaedics doctor.
 - Once satisfactory: instruction and follow up given to patient.

Reduction technique for anterior Shoulder Dislocation:

there are two type of shoulder dislocation:

1. **TUBS** (Traumatic Unilateral lesion with Bankart lesion and usually requiring surgery)
 2. **Habitual dislocation: AMBRI** (Atraumatic, Multidirectional, Bilateral, responds to Rehabilitation and rarely requires an Inferior capsular shift) they can reduce themselves and don't need surgery
- Distal neurovascular status as well as axillary nerve sensation.
 - Evaluate X-ray prior to reduction (**AP, Lateral and axillary view**):
(one contra-indication of shoulder reduction at ER is fracture at humeral neck).
 - Analgesia and muscle relaxant.
 - Expose both shoulder and perform physical exam

- Look: **findings**: (asymmetry, loss of contour, anterior bulging, attitude e.g. pt holding his arm)
- Feel: empty shoulder
- Move: restricted movement
- Special test: positive apprehension test

With the patient supine in bed and the affected limb towards its edge **perform traction-counter traction maneuver.**

- **A pop of reduction is felt and heard.**
- **Check the reduction's stability, and distal neurovascular status.**
- Check X-rays post reduction.
- Apply an upper limb immobilizer (as shown in the figure below) for three weeks.
- To outline the patient care after the immobilization ends.

Helpful Video: [video](#)



Reduction technique for Colles Distal Radial Closed Fracture:

- Analgesia and **distal neurovascular check**.
- Patient supine in bed with the affected limb towards its edge.
- Identifying bony landmarks of the wrist joint and distal forearm.
- **Perform traction then reversal of deformity.** (traction then >downward> upward)
- **A pop of reduction can felt and heard**, if not maneuver the fracture by milking the distal fragment during the traction.

Helpful Video: [video](#).

- Apply a below elbow full P.O.P cast with three points of pressure (to mold the cast).
- **Check distal neurovascular** and do a post reduction X-ray.
- If reduction achieved and satisfactory, then extend the cast to above elbow in pediatric and below elbow for adults.
- Post casting distal neurovascular status and post reduction orthogonal X-rays.
- To outline the patient care during the cast and after the immobilization ends.

