Professional Skills Notes Unit 7
Musculoskeletal System
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- When asked to examine a joint or body part in the musculoskeletal system, you must always use the following sequence (unless the Dr. states otherwise or is more specific to which component of this sequence):
    1. **Look** (equivalent to inspection)
    2. **Feel** (equivalent to palpation)
    3. **Move**
    4. **Special tests**

- Generally:
    - **Look**
        - Ask for permission, ask the patient to undress themselves, stand, etc.
        - Relaxed, comfortable vs. irritated, in pain, etc. (general appearance)
        - **Always compare both sides** (i.e. both arms, both legs, etc.)
        - Always look from **ALL directions** (anterior, posterior, lateral)
        - Look for the typical contour of muscles in that part of the body
        - Look for rash, color change, bruises, deformities
        - DON'T say, "Looks normal;" instead say, "No blah blah."
    - **Feel**
        - **Ask if they feel pain** somewhere first
        - **Palpate for bony (anatomical) landmarks**
        - Look for **tenderness** (it is a SIGN, so look at the patient's face)
        - Make sure you cover the whole region (anterior, posterior, lateral)
        - Notice any masses and comment
    - **Move**
        - Three types of movements (you must say this):
            - **Active movement** (patient moves on their own)
            - **Passive movement** (you assist the patient)
            - **Against resistance**
        - **Always start with active movement**
            - It is to get an idea about which part of the body (e.g. upper limb) is affected
            - Inability to perform it usually indicates a muscular one if the patient is capable to perform it when passively moved
        - Types of movements (be very careful, always think about it logically):
            - Abduction
            - Adduction
            - Flexion
            - Extension
            - Circumduction
            - External (lateral) rotation
            - Internal (medial) rotation

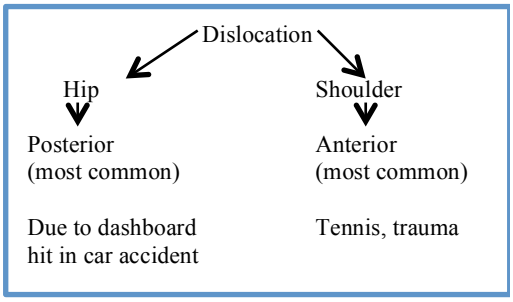
Range of Movement (ROM): The doctor may ask you the normal range of movement. It need not to be memorized, BUT you must be skilled in observing movement and saying how many degrees it can go. For example, knee flexion is commonly confused to be 90°, while it is around 140°!

- **Special tests**
  - Depends on what you're trying to assess (doctor told us only a few)

SHOULDER JOINT (& REGION)

- **Look:**
  - Relaxed, comfortable or not
  - Symmetrical (both shoulders look symmetrical)
  - Contour of muscle normal (e.g. deltoid muscle contour)
  - No scars, no deformities (protrusion of abnormal bony prominence)
  - No rashes or color changes noted
  - Ask patient to stand, look again from the side and from behind
  - Compare both sides
- **Feel:**
  - Ask the patient if they feel any pain in their shoulder (or elsewhere)
  - Palpate for the anatomical landmarks
    - Find the suprasternal notch and sternoclavicular joint
    - Follow the clavicle to the acromioclavicular (AC) joint and acromion
    - Coracoid process (2.5 cm below anterior edge of clavicle laterally)
      - Might be uncomfortable as it is mostly felt in thin individuals
    - Greater tubercle/tuberosity of the humerus (most lateral point)
  - Notice any tenderness (look at the patient's face)
  - Again, palpate all around (anterior, posterior, lateral)
  - Feel for temperature difference (vs. other side)
- **Move:**
  - There are two main types of movements, active and passive (+ against resist.)
  - Starting with active movement (and repeated with passive), at the shoulder joint, they are:
    - Abduction (from neutral position above ~ 160 – 170 degrees)
    - Adduction (from up all the way BEYOND neutral position [20 degrees], TOWARDS midline)
    - Flexion (forwards, about 180)
    - Extension (backwards, about 50 – 60)
    - Circumduction
    - External (lateral) rotation
      - Two ways: elbow extended or elbow flexed
      - 80 – 90 degrees (less than internal rotation)
    - Internal (medial) rotation
      - Two ways: elbow extended or elbow flexed
      - About 100 degrees (more than external rotation)
      - Doctor illustrated this by doing a "full internal rotation" by dorsum of hands meeting behind his back

- **Special Tests:**
  - For the shoulder, they are to test two conditions:
    - Dislocation of shoulder (e.g. Stability test, such as Apprehension test)
    - Rotator cuff abnormalities (e.g. Drop arm test)



- **Apprehension Test**
  - It is a type of joint stability test for anterior dislocation
  - Patient will come to you with a PAST history of shoulder dislocation (and fear of recurrent and future dislocations)
  - Basically, in this test, you try to push the shoulder out of place (dislocate it)
  - The patient will lie supine, and shoulder abducted to 90 degrees and his elbow flexed to 90 degrees
  - Applying an anterior force from behind while externally rotating the arm may cause the humeral head to dislocate anteriorly
  - The patient knows and fears that this will cause a dislocation and pain, so they resist this movement and will look "apprehensive"
  - Essentially, the reversal of this test is Jobe's relocation test, in which you direct a posterior force over the shoulder in the same position and if the apprehension ceases or if relocation occurs, it is positive
  - This test is NOT done with patients coming in with an already dislocated shoulder, but instead to test patients for easy dislocation!

- **Drop Arm Test**
  - Mostly used to test for the supraspinatus muscle (which initiates abduction of arm at shoulder from 0 – 15 degrees)
  - It assesses the rotator cuff (mainly supraspinatus) and is a muscular/tendinous test
  - Fully abduct the patient's arm at the shoulder
  - Tell the patient to slowly adduct to 90 degrees and then onwards
  - It is positive if there is a rapid/sudden drop when adducting below 90 degrees (cannot resist gravity)
  - It indicates a chronic problem with this muscle (?)

ELBOW JOINT/REGION

- **Look:**
  - Same steps as for shoulder, always compare both sides and look from all directions
- **Feel:**
  - Ask for pain
  - Palpate the anatomical landmarks:
    - Medial epicondyle
    - Lateral epicondyle (and lateral supracondylar ridge?)
    - Olecranon
    - Ulna (posterior border felt?)
  - Palpate for masses, feel for temperature, check for tenderness

- **Move:**
  - Flexion (About 170 degrees)
  - Extension (about 170 degrees)
    - Some people can extend beyond normal (hypermobility) and are normal. If significant - should be assessed (hyperextension beyond 0°)
  - Pronation
    - Place a pencil across patient palm and ask them to grip it
    - From supination, ask them to pronate their forearm (make sure the arm doesn't move)
    - Again, it's about 170 degrees
  - Supination
    - From pronated position, ask them to supinate their forearm
- **Special Tests:**
  - Tests for "Golfer's Elbow"
    - Medial epicondylitis (remember by golFers and common Flexor origin on medial epicondyle)
    - Expect to see tenderness over the medial epicondyle and pain when the flexors are stretched (the flexors are stretched when the extensors are shortened); therefore, pain will be felt during EXTENSION OF THE WRIST
  - Tests for "**Tennis Elbow**"
    - Lateral epicondylitis
    - Expect to see tenderness over the lateral epicondyle and pain when the extensors are stretched (the extensors are stretched when the flexors are shortened); therefore, pain will be felt during FLEXION OF THE WRIST
  - **Stress Test**
    - This is done to assess the collateral ligaments at the elbow
    - Collateral ligaments of elbow:
      - Lateral ligament (radial)
      - Medial ligament (ulnar)
    - To assess for damage of these ligament, you must first know that:
      - Varus = going TOWARDS midline
      - Valgus = going AWAY from midline
    - For lateral ligament damage:
      - Applying a varus force (towards midline) will not be resisted at the elbow (it will bend!)
    - For medial ligament damage:
      - Applying a valgus force (away from midline) will not be resisted at the elbow joint (it will bend!)
    - NOTE: DO NOT put your hand on the ligament that is being test on; instead you put it on the other side

Valgus testing

WRIST/WRIST JOINT

- **Look:**
  - Same idea
- **Feel**:
  - Same idea
  - Bony landmarks:
    - Styloid process of radius and ulna
- **Move**:
  - Again, active and passive movements; start with active
  - Don't forget to put the patient in anatomical position (supinated forearm)
  - Flexion (80 – 90)
  - Extension (70 – 80)
  - **Radial deviation** (which is abduction) ~ 10
    - Called radial deviation because the term abduction can be misleading when forearm is prone (so, radial deviation is true whether supine or prone; you are deviating towards the side of the radius)
  - **Ulnar deviation** (Adduction) ~ 40
    - You can adduct your hand at the wrist joint more than you can abduct it because of the larger radial styloid process limits abduction (the styloid process of the ulna is smaller)
  - Circumduction

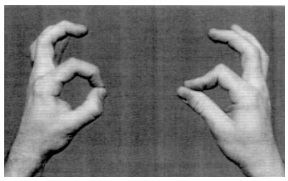
Anatomy Background

- Nerves of the forearm and hand carry motor and sensory innervation
- To test for motor function, we carry out specific movements OR look for signs of muscle atrophy
- To test for sensory function, we ask the patient to close their eyes and tell us when they feel something touch their hand (don't ask if they feel what you're doing; ask them to tell you when they do feel it before you start)
  - **Median nerve**
    - **Motor function:**
      - Most flexors of forearm ***except*** flexor carpi ulnaris and medial half of flexor digitorum profundus
      - In carpal tunnel syndrome, the median nerve is compressed and will result eventually (in prolonged cases) in atrophy of the thenar muscles, which visibly is described as "**ape hand**"
    - **Sensory function:**
      - Lateral 3 and half digits and palm (includes thenar muscles)
      - Gives off palmar branch proximal to carpal tunnel, which has sensory distribution over the thenar (so, loss of sensation is not seen in carpal tunnel syndrome)
    - **"OK sign"** – testing for median nerve function
      - To make an OK sign with your thumb and index finger, you need to use your flexor pollicis brevis (flex thumb), flexor

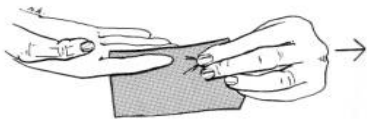
Recall that the f. digitorum superficialis divides like the eye of a sewing needle and inserts into the middle phalanx. The deeper f. digitorum profundus tendon inserts in the distal phalanx by passing through this eye like a thread. Therefore, the profundus flexes BOTH DIP and PIP, while superficialis only flexes PIP.

digitorum profundus of index finger (flex distal interphalangeal joint "DIP" and proximal interphalangeal joint "PIP")

- All these muscles are innervated by the median nerve
- If the patient fails to do this, you will see that the DIP, PIP joints are extended (and the thumb is adducted?)



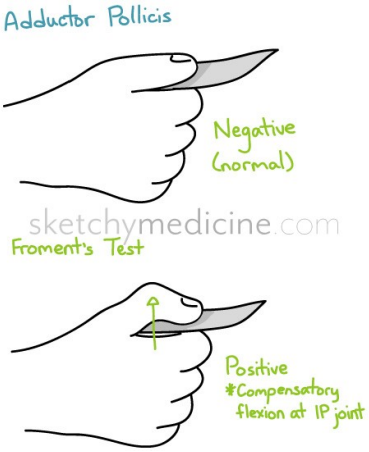
- **Ulnar Nerve**
  - **Motor function**:
    - Supplies flexor carpi ulnaris and medial half of flexor digitorum profundus muscles in forearm
    - All intrinsic muscles of hand, ***except*** thenar muscles and lateral 2 lumbricals
    - If ulnar nerve is chronically compressed or damaged, expect to see the hypothenar atrophy
  - **Sensory function:**
    - Medial 1 and half digit and related palm and dorsum
    - Also has palmar branch arising from ulnar nerve before crossing the wrist (above the flexor retinaculum/not in carpal tunnel) which supplies skin
  - **Froment's test/sign**
    - The patient is asked to hold a piece of paper between his thumb and index finger
    - Normally, you'd adduct your thumb against your index finger to hold the paper; this would need you to use your adductor pollicis (innervated by ulnar nerve)
    - If the patient suffers from ulnar nerve palsy, he will be unable to hold it using his adductor and instead hold it in place while FLEXING his thumb (uses flexor pollicis longus, median innervation [anterior interosseous branch]) as to FOOL YOU!
    - Make sure you keep the patient's thumb EXTENDED so look for a positive sign
  - **Paper between fingers**
    - Similar to froment's test, you ask the patient to hold the paper between any two of his fingers
    - Adduction of fingers (done by palmar introssei) is needed to hold it in place, which is innervated by the ulna
    - If the patient has ulnar palsy or weakness, the p pulled easily from their fingers

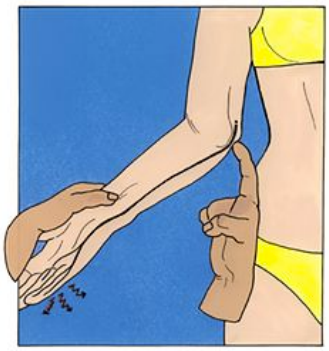


  - **Tinel's test/sign at elbow**
    - ***Tapping*** behind the medial epicondyle leads to numbness and tingling in the area supplied by the ulnar nerve

Intrinsic muscle of hand:
- Palmaris brevis
- 3 palmar interossei (PAD)
- 4 dorsal interossei (DAB)
- 4 lumbricals
- Thenar muscles (3)
- Hypothenar (3)

You have 5 digits, but 4 fingers and 1 thumb. The thumb is called pollex, index finger = indicis/secondus, middle finger = medicus, ring finger = annularis, little finger = minimis

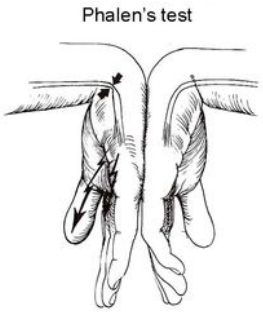




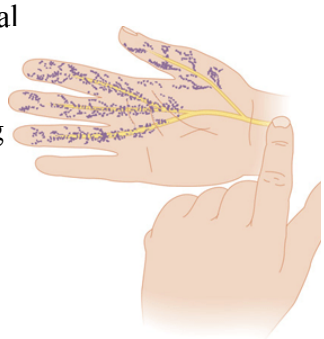
- **Radial Nerve**
  - **Motor function**:
    - Supplies posterior compartment of arm and forearm
    - Supplies extensors of forearm
  - **Sensory function**:
    - Supplies dorsum of the hand (not the whole thing though)
    - The **purely radial spot** in the dorsum of the hand (no overlap) is the **triangular (web) space** between thumb and index finger
- **Axillary nerve**
  - Abduction of arm at shoulder joint beyond 15 degrees (deltoid muscle innervated by axillary nerve)
  - Sensory = skin over the deltoid muscle
- ALL NERVES QUICKLY ☺
  - **Abduct and adduct fingers → ulnar nerve**
  - **Flex hand → median nerve**
  - **Extend hand → radial nerve**

- **Testing for flexor tendons:**
  - **Flexor digitorum superficialis**
    - **Flexes PIP joint**
    - **Testing** for it:
      - Hold the 3 medial fingers of the patient while they are extended
      - Ask the patient to flex his index finger at his PIP joint
  - **Flexor digitorum profundus**
    - **Flexes PIP and DIP** (but because of PIP overlap with superficialis, to test for it, we only test DIP flexion as it is purely profundus function)
    - **Testing** for it:
      - Patient makes a fist and keeps index finger extended
      - Stabilize the PIP by holding it from above and below
      - Ask the patient to flex his DIP

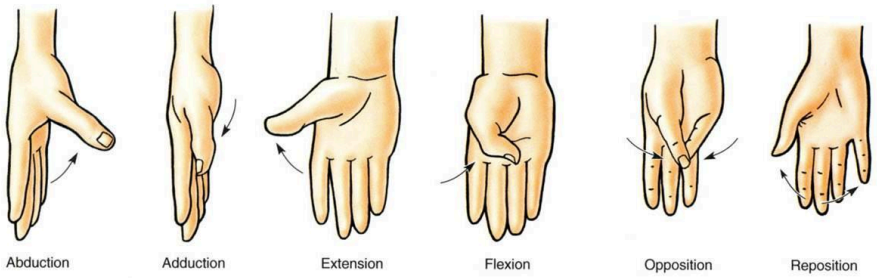
- **Carpal Tunnel Syndrome**
  - Median nerve is entrapped (and compromised) within the carpal tunnel due to compression of whatever reason (inflammation, arthritic changes, etc.)
  - Late sign would be **thenar muscle wasting** (ape hand)
  - **Special tests:**
    - **Direct Pressure/Compression Test**
      - Press over the flexor retinaculum of the patient's hand
      - Within 30 seconds, the patient will feel tingling and numbness of the lateral 3 and half digits



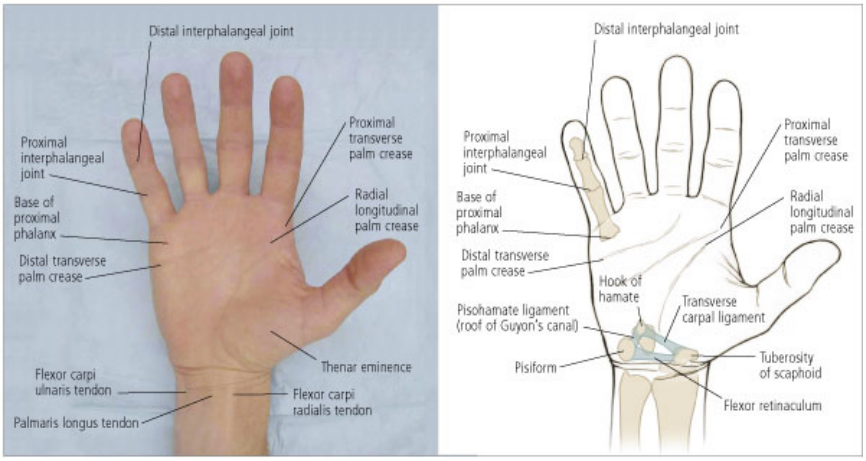
- **Phalen's test/maneuver**
  - Flex wrist and hold for 30 seconds (often back to back with other hand)
  - Again, numbness and tingling will be felt over the lateral fingers
- **Tinel's sign/test at wrist**
  - Tapping on the wrist will lead to numbness and tingling

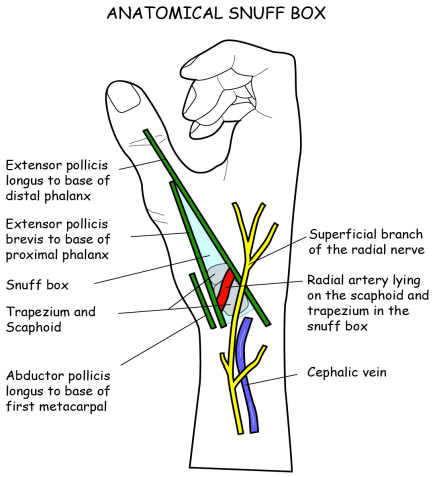


- **Movements at the fingers**:
  - The important thing to remember is that abduction of the thumb is perpendicular to that of the fingers, moving upwards instead of laterally ("**ABC**" **AB**duction of thumb is towards → **C**eiling)



  - Another thing is the **position of the flexor retinaculum**, which is right above the wrist (the most distal crease); you can palpate for the tubercle of the scaphoid (laterally) and hook of hamate and pisiform bone (medially)





  - Another stressed point is the **anatomical snuffbox** and its borders
    - Medial border → extensor pollicis longus (because it hooks around the dorsal tubercle of the distal radius)
    - Lateral border → extensor pollicis brevis, abductor pollicis longus
    - Radial artery (and cephalic vein) runs in it
    - Fracture of scaphoid bone produces deep tenderness there

Lower Limb

- The same rules of examination applied to the upper limb are applied for the lower limb
- Look, feel, move, special tests
- Look:
    - Includes gait
        - The gait of the patient should be observed from all directions
    - Includes limb length measurement (test for limb leg inequality)
        - Measure from ASIS to medial malleolus (compare both sides)

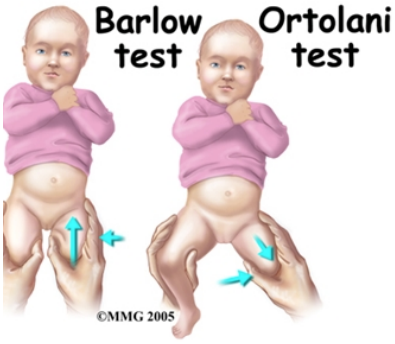
- Hip Joint
    - Look
        - Scars, swelling, deformities, color changes, rashes, muscle contour (any visible wasting)
        - Gait (look for trendelenburg lurch/gait, shuffling gait, etc.) 
    - Feel
        - Temperature, masses, tenderness, anatomical landmarks
        - Anatomical landmarks include:
            - ASIS (anterior superior iliac spine)
            - Iliac crest 
            - Pubic symphysis
            - Greater trochanter
            - PSIS (visible as dimple)
            - Ischial tuberosity
        - Feel for femoral pulse
    - Move
        - Active, passive, against resistance
        - Hip is a ball and socket multi-axial synovial joint
        - Movements include:
            - Flexion (for full flexion at hip, flex leg at knee first) 
            - Extension (patient lying on side, 30 degrees)
            - Abduction
            - Adduction
            - Circumduction
            - Medial rotation
            - Lateral rotation
        - Abduction:
            - You must stabilize the pelvis before abduction
            - This is done by holding down the pelvis on the other side
            - Or by putting the patient's other limb off the side of the bed
            - It's about 50 degrees
        - Adduction:
            - The adducted limb should pass over the other limb
            - Goes 20 – 30 degrees beyond zero (resting position)

- Internal and external rotation
  - It's very tricky; it depends if leg is flexed at knee or not
  - If limbs are extended, internal rotation can be done just as the way you think it would be done (turn the whole limb medially) – this is accompanied by medial rotation of leg and foot too!
  - The same can be said for external rotation when limb extended
  - Another way of performing internal and external rotation is by flexing the leg at the knee joint
  - In this case, the leg is used as handle; when the leg brought medially (medially rotated), this is EXTERNAL (lateral) rotation of THIGH ~ > 90 degrees
  - When leg is brought laterally (laterally rotated), this is INTERNAL (medial) rotation of THIGH ~ 90 degrees
  - External rotation of thigh > internal rotation of thigh

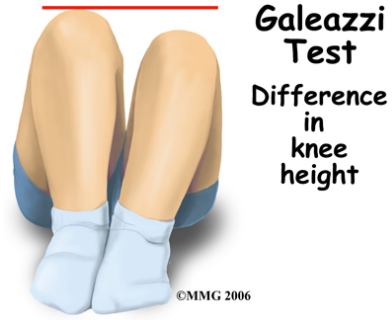
- Special test at hip joint
  - Thomas Test
    - Used to detect fixed flexion deformity
    - In the case of fixed flexion deformity, the patient is seemingly normal because there is a compensatory lordosis (inward curving) of spine, directing it forward
    - During this test, we diminish this lordosis and thus the deformity becomes apparent
    - Your hand is kept under the patient's back (there will be some space for where the lordosis occurs in lumbar area)
    - The limb with the deformity is kept laid on the bed extended
    - The normal limb is fully flexed at right hip and knee by the examiner, pushing it towards his body
    - When this occurs, the examiner should feel the arched back come in contact with his hand (diminishing lordosis)
      - You can also diminish it by letting the patient lie down near the edge of the bed
    - Positive Thomas test is seen if the opposite (untouched) limb raises as the test is being done (flexes at hip)
    - Be careful to note that when you are asked to test for right sided fixed flexion deformity, you will be moving the left limb and vice versa
  - Trendelenburg sign
    - Used to test weakness of gluteus medius and minimus at hip abduction
    - Normally, when limb is raised off the ground (as in swing phase of gait cycle or walking), the hip abductors of the opposite leg (stance phased limb) contracts to prevent dropping of the pelvis of the raised limb.

- If the left hip abductors are weak, there will be a drop in the hip on the right side when the right limb is raised above the ground → positive trendelenburg sign
- So, to examine left hip, we ask the patient to flex the right hip and knee
- If there is dropping of pelvis on right side (visible) or if the patient bends towards the supported left limb → positive trendelenburg sign

- Special test for Developmental Dysplasia of Hip (DDH)
  - **Barlow Test/Maneuver**
    - "**BD**" = Bahraini Dinar as is **Barlow = Dislocation test**
    - Used to test for DDH in infants
    - It is basically done to dislocate the hip
    - You will enter from below, putting your fingers over the infant's buttocks, and thumb over inner thigh
    - Bring both thighs towards each other medially
    - A clicking sound indicates +ve test (dislocated)



  - **Ortolani Test/Maneuver**
    - "**OR**" = Omani Riyals as is **Ortolani = Relocation test**
    - Used for DDH; reversal of dislocation after Barlow test done
    - It is basically to relocate the hip
    - You will enter from above, putting hands on outer thigh
    - Pull both thighs away from each other (laterally)
    - A clicking sound indicates +ve test (relocation of femoral head into acetabulum)
  - **Galeazzi Test**
    - Done for **older children**
    - Dislocated hip will lead to shortened limb
    - Place both limbs parallel to each other with the knee flexed above the bed
    - Make sure the feet are next to each other and at the same level
    - Now look at the level of the knees – they should be the same height
    - A positive test shows the affected limb lower than the unaffected limb at the knee

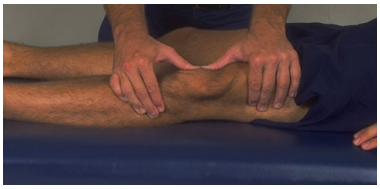


- **Knee Joint** (3 joints; medial tibiofemoral, lateral tibiofemoral, patellofemoral)
  - Look
    - At all directions
    - Look at popliteal fossa (important)
    - Look for genu valgum
      - Refers to tibia bent laterally (away from midline)
      - Knees are almost in contact while medial malleolus are wide apart ("Knock-knees")

- Look for genu varum
  - Refers to tibia bent medially (towards midline)
  - Knees are wide apart; medial malleolus are almost in contact

- Feel
  - Same as for hip + anatomical landmarks:
    - Medial and lateral femoral epicondyle
    - Medial and lateral tibial condyles
    - Patella
    - Head of fibula
  - Popliteal artery pulse (difficult)
  - Later, we'll learn tendon reflex at patellar ligament (for L3, L4)
- Move
  - Flexion at knee (0 – 140 degrees, NOT 90 ~ don't be mislead)
  - Extension at knee (140 – 0 degrees) ~ hyperextension rare (< 0)
- Special tests at the knee joint
  - **Patellar tap**
    - Done to test for **significant** synovial effusion
    - First, push fluid from suprapatellar bursa into synovium by messaging the bursa downwards towards knee joint (milking)
    - Pushing on the patella (tapping) will show visible bouncing
    - Only seen if there is significant effusion

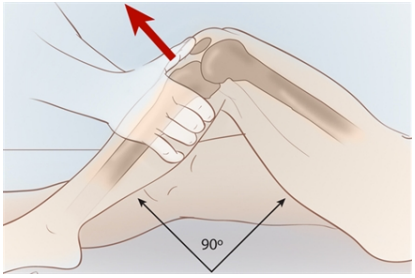
  - **Fluid Displacement Test**
    - Done to test for **minimal** synovial effusion
    - Push fluid from suprapatellar bursa into synovium (milking)
    - Push medially by sliding hand down medial border of knee
    - Finally, pushing knee laterally to medially will show bulging medially (= positive test)
  - **Collateral ligament testing**
    - Valgus and varus stress test (as in elbow)
    - But you have to do it 30 degrees off the bed (Raise the leg above the bed and do it)
    - Valgus testing for medial (Tibial) collateral ligament testing
    - Varus testing for lateral (fibular) collateral ligament testing
  - **Apprehension test for patella**
    - Patella commonly dislocates laterally; painful
    - The examiner pushes the patient's patella laterally and observes for tenderness (look at patient's face) or apprehension (wants this motion to be stopped)



  - **Anterior drawer sign**
    - ***Anterior*** cruciate ligament (ACL) prevents ***anterior*** displacement of **tibia** on (under) fixed femur
    - **ACL is weaker** and thinner than PCL; attaches **to lateral condyle** of femur in intercondylar fossa

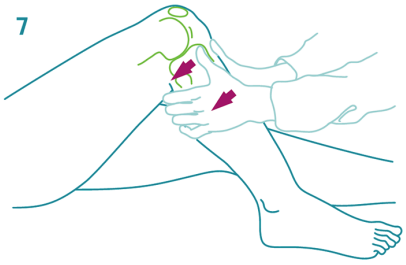
Note: this description (for the function of ACL) is better than saying the alternative, which is that it prevents backwards displacement of femur on tibia, because it easier to recall (*A*CL tear = *anterior* displacement = positive *anterior* drawer sign.

The ACL and PCL cross each other in the **sagittal plane**, not the coronal (frontal) plane. The ACL commonly torn in **"Unhappy" or O'Donoghue Triad**, in which a **laterally applied force** tears ACL, medial meniscus and tibial (medial) collateral ligaments of knee



- The patient is in **supine position**, with the **knee** to be tested **flexed to 90°** and the examiner seated on the patient's foot
- The examiner then tries to **pull the tibia forwards**
- Normally, there should be little to no grossly visible anterior displacement
- A **positive anterior drawer sign** indicates visible forward displacement of tibia; this indicates **tear of the ACL**

▪ **Posterior drawer sign**



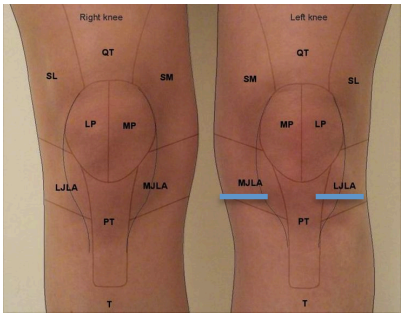
- ***Posterior*** cruciate ligament (PCL) prevents ***posterior*** displacement of **tibia** on (under) fixed femur
- PCL is larger than ACL; attaches to **medial condyle** of femur in intercondylar fossa
- The patient is in supine position, with the knee to be tested flexed to 90° and the examiner seated on the patient's foot
- The examiner then tries to **push the tibia backwards**
- Normally, there should be little to no grossly visible posterior displacement
- A **positive posterior drawer sign** indicates visible posterior displacement of tibia; this indicates **tear of PCL**

▪ **Lachman Test**

- Additional test for **ACL tears**
- Patient is supine, but the **knee is flexed to 15 - 20° only**
- The examiner can easily do this by placing his flexed knee under the patient's knee (which is being tested on)
- Another approach is to lift the knee to that angle manually, but it will be less practical for the examiner
- The examiner must stabilize the femur with one hand
- The other hand should **pull the tibia forward**
- A **positive Lachman test** indicates visible forward displacement of tibia on fixed femur, indicating ACL tear

▪ **McMurray's Test**

McMurray's test is the most complicated test to perform, according to our doctor. Recall that the **medial meniscus is more prone to injury** because it is firmly **attached to the tibial (medial) collateral ligament**.



- This tests for the **medial and lateral menisci** separately by producing tension of the meniscus (by **trapping it**)
- There are two fibrocartilaginous menisci:
  - Medial meniscus is larger and C shaped + attached to tibial (medial) collateral ligament
  - Lateral meniscus is smaller and incomplete O shaped and is *not* attached to the fibular collateral ligament
- The examiner **must always check for meniscal tenderness along the joint line** first before performing this test:
  - Feel for the medial joint line and lateral joint line
  - Joint line is represented by a line across **the two pitted areas, medial and lateral to patella when knee is flexed**

- The **joint line is palpated** by descending from above it along the borders of the knee
- Medial joint line tenderness ~ medial meniscal injury
- Lateral joint line tenderness ~ lateral meniscal injury
- Once you detected the meniscus most likely to be injured, move to perform McMurray's Test on that side
- Online, it says that you must be holding on the joint line during the test

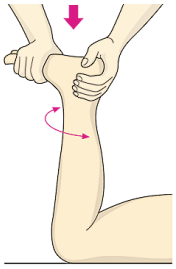
- **McMurray's Test for Medial Meniscus**
  - Patient is **supine**
  - ***Flex the knee*** (as much as possible)
  - ***Externally rotate the foot***
  - ***Abduct the leg***
  - ***Extend the leg***
  - Any **clicking** or pain would indicate possibility of **medial meniscal injury, tear**
  - Link to video closest to the doctor's description: https://www.youtube.com/watch?v=cXfenAediHM

You must *hold* the ***lateral*** *side of knee* steady in order to prevent **abduction of thigh at hip** instead of **abduction of leg *alone***. Yes, there's a difference.

McMurray's tests for medial and lateral meniscus are the **exact OPPOSITE** of each other.
Medial = flex, externally rotate, abduct, extend.
Lateral = extend, internally rotate, adduct, flex.

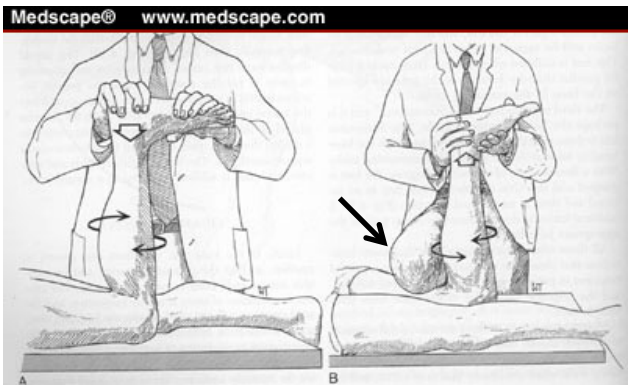
- **McMurray's Test for Lateral Meniscus**
  - Patient is **supine**
  - ***Extended leg***
  - ***Internally rotate the foot***
  - ***Adduct the leg***
  - ***Flex the leg***
  - Any **clicking** or pain would indicate possibility of **lateral meniscal injury, tear**

You must *hold the* ***medial*** *side of knee* steady in order to **prevent adduction of thigh at hip** instead of **adduction of leg *alone***. Yes, there's a difference.



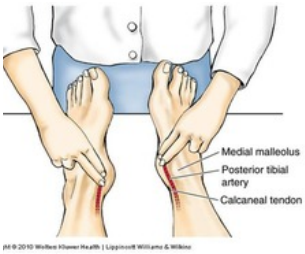
- **Apley (Grind) Test**
  - Patient is ***prone***
  - The knee is flexed to 90°
  - **Grind the knee by moving the feet & leg while pressing down and pulling up**
  - It's like you're trying to make orange or lemon juice
  - Online, it is said that you can press down the patient's thigh with your knee as seen below

Note that **Apley Test** is the only test at the knee where the **patient is prone**; the others are all in supine position.

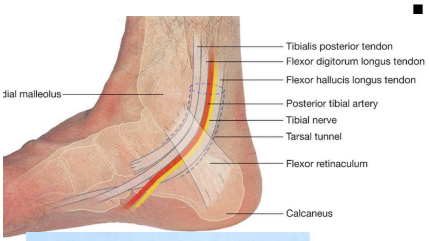


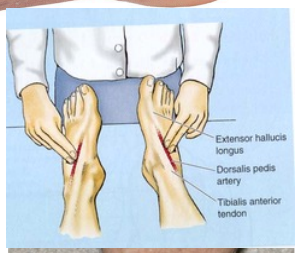
- **Ankle and Foot**
  - Background
    - **Ankle joint**
      - Synovial hinge joint
      - Formed by **distal end of fibula and tibia + talus**
      - Allows dorsiflexion (20 – 30°) & plantarflexion (40 – 50°)
      - **Plantarflexion > dorsiflexion**
      - It is *not* where eversion and inversion occur
      - Surrounded by many ligaments, the doctors will not ask you about them in the exam!
    - **Subtalar joint**
      - **Allows *eversion* (20°) and *inversion* (30°)**
      - **Inversion > eversion**
    - **Calcaneus**
      - Calcaneal (Achilles) tendon inserts into its posterior aspect
      - Calcaneal tendon formed by gastrocnemius, soleus +/- plantaris
      - Achilles tendon allows for plantarflexion (these are strong muscles and so it is understandable that plantarflexion > dorsiflexion)

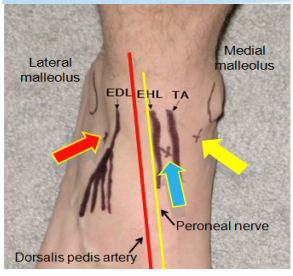
In case you want to be a smart ass, plantarflexion is technically flexion, and dorsiflexion is technically extension. But these terms can be misleading, so you're better off not using them!



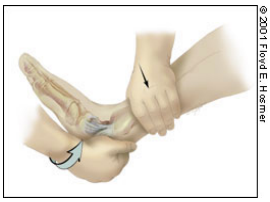
  - **Examination (of Ankle and Foot)**
    - **Look**
      - Same idea as all above examination
      - Bony landmarks visible: medial and lateral malleoli
      - Any deformities, signs of swelling
      - Hallux valgus, gout tophi (first metatarsal), flatfoot, etc.
      - Gait → shuffling gait, high-stepping gait
    - **Feel**
      - Same idea as all above examination
      - Anatomical landmarks:
        - Medial and lateral malleoli
        - Calcaneus, whatever else you want to feel -.-
      - Pulses:
        - **Posterior tibial artery pulse** (behind medial malleolus)
        - **Dorsalis pedis artery pulse** (dorsum of foot between great toe and second toe ~ between extensor digitorum longus laterally and extensor hallucis longus medially)
    - **Move**
      - 3 types of movements: active, passive, against resistance
      - Movements at ankle joint: dorsi and plantarflexion
      - Movements at subtalar joint: inversion and eversion
      - Other movements: supination and pronation, movements of toes (not important)







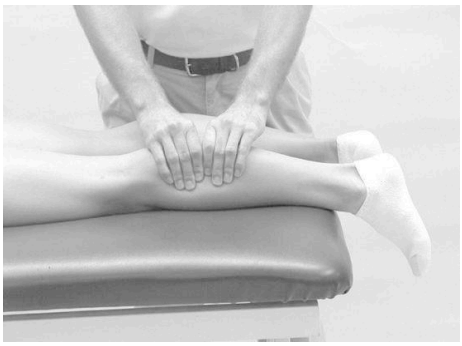
The **great saphenous vein** runs in **front of medial malleolus**. It runs all the way up to upper thigh to **drain into the femoral vein** through the **saphenous ring**. The **small saphenous vein** runs **behind lateral malleolus**, to enter deep in posterior leg to **drain into the popliteal vein**. Both these veins are **superficial veins** that interconnect with the deep veins **through perforator veins**. Insufficiency of the valves of perforators can lead to **varicose veins.**



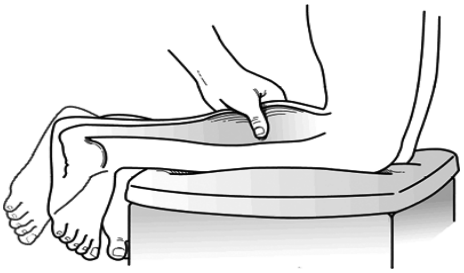
- Special Tests:
  - **Ankle Joint Stability Test**
    - Hold the heel of patient and pull foot forwards and backwards, with your other hand holding leg
    - Hold the heel and perform inversion and eversion (varus and valgus technically) with your other hand holding leg
    - Just check for any signs of pain

  - **Thompson's Test**
    - Checks for **integrity of Achilles tendon**
    - The patient is put in **prone**
    - **Feet are hanging** off the end of the bed
    - **The flexor muscles (posterior compartment) are squeezed** (to imitate contraction)
    - Normally, the response would be seen as plantarflexion
    - This is because the function of the tendon is to pull the heel (calcaneus) and allowing plantarflexion
    - A **positive Thompson's test** means ***no*** plantarflexion

Do not confuse Thompson's test (of ankle) with Thomas test (for fixed flexion deformity at the hip)!



A positive thompson's test means there is NO plantarflexion upon squeezing the calf muscles.



Spine

- You could follow the same principle of look, feel and move
- The doctor didn't really use that standard examination technique, but he followed the order basically
- **Look:**
  - Anatomical landmarks visible
    - **C7 vertebra prominens**
    - Dimples in skin below indicating PSIS
    - Posterior median furrow (the visible depression on the center of the back)
- **Feel:**
  - Median posterior furrow → check for **curvatures** (cervical, thoracic, lumbar)
    - Recall that there are cervical and lumbar lordosis and thoracic and sacral kyphosis
    - Primary curvatures = thoracic and sacral curvatures

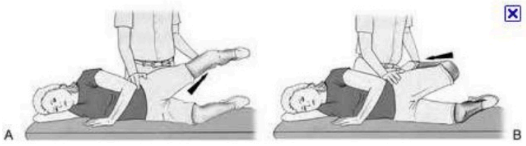
Up to C7 vertebra, but there are up to C8 spinal nerves. In IV disc prolapse, the nerve root below is the one compressed; L4/L5 IV disc will compress L5 nerve root (not L4)

- Anatomical landmarks to feel at or around the back
  - Occiput
  - C7 (vertebra prominens) spinous process
  - Most cervical, thoracic and lumbar spinous processes in posterior median furrow
  - PSIS
  - Iliac crest (at the same level as L3)
  - Iliac tubercle (at the same level as L4)
- Also palpate for:
  - Hyoid bone (difficult to feel, deep in anterior neck)
  - Thyroid cartilage and laryngeal prominence
- **Signs of scoliosis**
  - Follow the median furrow with your hand and see if it guides you sideways
  - If positive, ask patient to flex his back to continue examination

- **Move:**
  - **Flexion** (forward bending)
    - Most flexion occurs at lumbar vertebrae
    - You can see for signs of scoliosis
      - If you notice any lateral deviation of spine on palpation or are told so by the patient, you can ask the patient to flex his back
      - If scoliosis not present while flexing = **NON-STRUCTURAL scoliosis** (muscle related problem)
      - If scoliosis still present while flexing = **STRUCTURAL scoliosis** (could be congenital ~ related to vertebrae itself)
  - **Extension** (backward bending)
    - Most extension also occurs at lumbar vertebra
  - **Lateral flexion** (bending towards left and right sides)
  - **Rotation to right and left side**
- Joints to beware of:
  - Atlanto-axial joint (pivot join ~ allows restricted rotation, nodding)

- **Special Tests**
  - **Straight Leg Raise Test**
    - Patient is **supine**
    - The lower limb is flexed at the hip (**hip flexion**)
    - The flexion is done all the way to its maximum
    - Flexion at hip will cause **sciatic nerve root (L4 – S3)** to stretch
    - Note any signs of pain (look at patient's face) at specific angle of hip flexion (positive test)
    - It is said that if sciatica is felt between 30 – 70 degrees, it is most likely due to a herniated disc (usually at L5)

  - **Femoral Nerve Stretch Test**
    - Same basic principle as the above test
    - Patient is **on his side**, leg is flexed at knee (and/or **extended at hip**)



- Stretching **femoral nerve root (L2 – L4)**
- If pain in anterior thigh is felt → positive test
- Positive test may indicate protrusion of L2/L3, L3/L4 IV discs

Nerve Roots and Their Examination

Brachial plexus (C5 – T1)
Femoral nerve (L2- L4)
Obturator nerve (L2 – L4)
Sciatic nerve (L4 – S3)
Lumbosacral plexus (L2 – S3)

- Examine the nerve root X. You must always comment on:
  - **Sensory component (dermatome)**
  - **Motor component (myotome)**

- **Peripheral nerve field**
  - Refers to the peripheral nerves, the areas of skin they supply
  - Nerve roots (such as C5) supply multiple peripheral nerves, so dermatome is NOT the same as peripheral nerve field

- **Dermatome**
  - The **area of skin** supplied by a **SINGLE nerve root**
- **Myotome**
  - A group of muscle supplied by a SINGLE nerve root
  - Hence, the specific movements that are supplied by specific nerve root(s)

- Things to keep in mind when examining myotomes:
  - The movement will be done **AGAINST RESISTANCE**
  - So for example, flexion at elbow, you must ask the patient to flex while you try to resist the flexion by pushing his hand
  - **Grading of muscle (1 – 5)**
    - 5 = good against resistance
    - 4 = ok against resistance
    - 3 = can't against resistance, ok against gravity
    - 2 = can't against gravity (sideways ok)
    - 1 = some evidence of ANY muscle movement
    - 0 = NO muscle movement at all!

Table 3. Grading of muscle strength

Grade	Ability to move
5	The muscle can move the joint it crosses through a full range of motion, against gravity, and against full resistance applied by the examiner.
4	The muscle can move the joint it crosses through a full range of motion against moderate resistance.
3	The muscle can move the joint it crosses through a full range of motion against gravity but without any resistance.
2	The muscle can move the joint it crosses through a full range of motion only if the part is properly positioned so that the force of gravity is eliminated.
1	Muscle contraction is seen or identified with palpation, but it is insufficient to produce joint motion even with elimination of gravity.
0	No muscle contraction is seen or identified with palpation; paralysis.

  - Shoulder – C4
  - Lateral arm (deltoid region) – C5
  - Distal lateral forearm up to thumb– C6
  - Middle finger – C7
  - Little finger, distal medial forearm – C8
  - From medial elbow, medial arm → T1
  - Upper thigh → L2
  - Lower thigh → L3
  - Lateral leg → L5
  - Medial leg → L4
  - Where you stand (sole of foot) → S1 (online = lateral foot and back of leg)
  - Where you sit (gluteal region) → S3
  - Between where you sit (S3) and stand (S1) = posterior leg & thigh → S2

- Myotomes
  - He said to make it easy, follow the sequence below and examine only flexion and extension (other movements might confuse you)

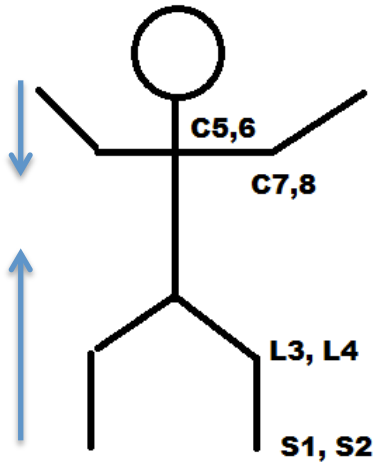
Joint	Flexion (or dorsiflexion*)	Extension (or plantarflexion*)
Shoulder	**C4**, ***C5***	C6, C7
Elbow	**C5**, C6	C7, C8
Wrist	**C6, C7**	**C6, C7**
Hip	**L2**, L3	L4, L5
Knee	**L3**, L4 (extension)	L5, S1 (flexion)
Ankle	**L4**, L5	S1, S2

*In this case of ankle movements only

  - As you see above:
    - For upper arm you start C4
    - For flexion of should say C4, C5
    - For extension at shoulder continue C6, C7
    - For the next joint below, just start at a lower nerve root
    - Therefore, if you started in shoulder at C4, start in elbow at C5
    - Following the same sequence: elbow flexion C5, C6/ extension C7, C8
    - The only exception is wrist flexion and extension (same values for both flexion and extension C6, C7)
    - The same idea is applied for the lower limb
    - Basically, you follow a sequence

Abduction at shoulder – C5
Other mishaps:
- Elbow extension: C6, C7

- **Reflexes**
  - Reflexes are involuntary (in this case, muscular) responses to stimuli
  - The most important reflexes to be aware of are that of the biceps brachi tendon, triceps, patellar ligament (quadriceps tendon; knee jerk), calcaneal tendon (ankle jerk)
  - Again, he said follow a sequence starting at the ankle:
    - Ankle 1, 2
    - Knee 3, 4
    - Biceps 5, 6
    - Triceps 7, 8
  - Then he said, add the appropriate level:
    - **Ankle S1, S2**
    - **Knee L3, L4**
    - **Biceps C5, C6**
    - **Triceps C7, C8**
  - Information to note:
    - Patient is sitting on side of bed with legs dangling
    - Hold hammer like a pen for patellar ligament reflex
    - For knee jerk → you will see extension of leg
    - For ankle jerk:
      - You need to slightly dorsiflex foot first
      - Response = plantarflexion



He drew this stickman and started from below. Makes things easier, doesn't it?

- For biceps brachi reflex:
  - Patient hand is resting on your arm
  - Your thumb (of your limb on which the patient is resting his limb on) is placed over the biceps tendon
  - Hit on your thumb over the tendon
  - You should see the biceps muscle contract
- For triceps reflex:
  - Patient must be supine with his limb to be tested on resting on his chest (relaxed!)
  - Tapping on the triceps tendon will result in barely visible contraction of triceps muscle

- **ALWAYS COMPARE BOTH SIDES**
  - Some people have brisk reflexes but on both sides (NORMAL)
  - Some people have sluggish reflexes but on both sides (NORMAL)
  - What should raise attention is differences in reflexes (whether exaggerated OR depressed).

I heard from someone in year 5 that we also need to know ways of making the tendons/ligament to be tested on relaxed so that the reflexes are viewed better.