

2019

Session 4 - Musculoskeletal Anatomy

SKMC Surface Anatomy

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Surface Anatomy Program
Session 4 — Musculoskeletal Anatomy
Wednesday, November 24th or Wednesday, November 31st

Learning Objectives

1. Be able to appropriately identify the location to assess upper and lower extremity pulses
 2. Be able to identify the contents of the femoral canal
 3. Be able to identify the safe location for an inter gluteal injection
 4. Be able to identify the contents of the tarsal tunnel
-

Disclaimer — *This is not intended to serve as a primary study guide for Anatomy or Clinical Skills exams. Surface Anatomy is a peer-taught mentoring program overseen by Dr. Spudich; however, the review sessions are primarily designed by Program Coordinators. The goal of review sessions is to highlight clinically relevant anatomical landmarks in order to reinforce lecture material. All review topics have been discussed in lecture; no new testable material will be introduced in these sessions.*

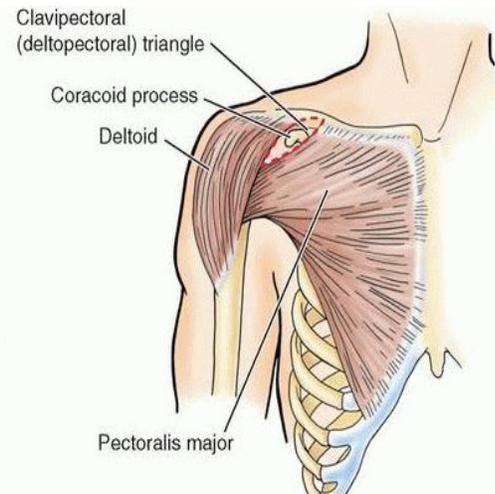
Program Coordinators

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Upper Extremity Surface Anatomy

Clavicular Anatomy

- A. Can be divided into three regions...
 - a. Lateral = attachment of **trapezius** and **deltoid**
 - b. Middle = attachment of **SCM**
 - c. Sternal/Medial = associates with **jugular notch**
- B. The **infraclavicular fossa** contains the **cephalic vein** which ascends from the upper limb, enters the **deltopectoral/clavipectoral triangle**, and pierces the clavipectoral fascia *en route* to the axillary vein.
- C. Deep to the infraclavicular fossa is the **deltopectoral/clavipectoral triangle** with boundaries...
 - a. Superior = **clavicle**
 - b. Medial = **pectoralis major**
 - c. Lateral = **deltoid**



DISCUSSION QUESTION 1 — *What region of the clavicle is most vulnerable to fractures?*

Scapular Anatomy

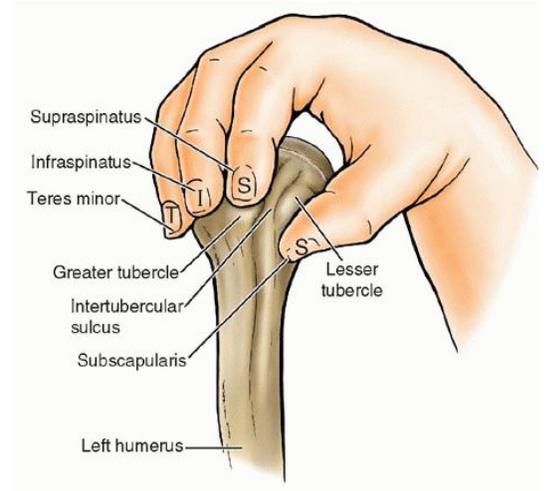
- A. The superior angle is at **T2**, the medial root of the scapular spine is at **T3**, and the inferior angle is at **T7**
- B. **Coracoid Process**: palpable in the deltopectoral groove.
 - a. Attachment point of **pectoralis minor**, **biceps brachii**, and **coracobrachialis** muscles.
- C. **Acromial Angle**: formed by the lateral and posterior borders of the **acromion**

Humerus Anatomy

- A. **Greater Tubercle**: attachment point of **supraspinatus**, **infraspinatus**, and **teres minor** muscles
- B. **Intertubercular Groove**: located between the lesser and greater tubercles; site of **long head of biceps brachii**

DISCUSSION QUESTION 2 — Name the rotator cuff muscles and describe their joint function.

- C. **Medial and Lateral Bicipital Grooves:** separate the prominences of the triceps and biceps brachii muscles
- Cephalic vein ascends the humerus in the **lateral bicipital groove**
 - Basilic vein ascends the humerus in the **medial bicipital groove**



Surface Anatomy Projections of the Arm and Cubital Fossa

- A. **Bicipital Aponeurosis:** passes obliquely over the brachial artery and median nerve
- Medial cubital vein** crosses subcutaneously superficial to the aponeurosis, connecting the cephalic and basilic veins
 - Clinical correlation:* common site for **venipuncture!**
- B. **Cubital Fossa**
- Superior Border = imaginary line connecting the medial and lateral **epicondyles**
 - Medial Border = **pronator teres** and **flexor muscles** arising from the medial epicondyle
 - Lateral Border = **brachioradialis** and **extensor muscles** arising from the lateral epicondyle
 - Running from lateral to medial: **biceps tendon, brachial artery, medial nerve (TAN)**
- C. **Medial and lateral epicondyles** of the humerus
- Medial** epicondyle serves as a common flexor origin for many of the superficial wrist **flexors**
 - Lateral** epicondyle serves as a common extensor origin for many of the superficial wrist **extensors**
 - The **ulnar nerve** passes posterior to the medial epicondyle; tweaking the nerve results in “funny bone” sensation
 - Clinical correlations**
 - Lateral epicondylitis** (tennis elbow) occurs from repetitive use of superficial wrist extensors. The pain radiates from the lateral epicondyle down the posterior forearm.
 - Medial epicondylitis** (golfer’s elbow) occurs from repetitive use of the digit flexors, and wrist flexors and pronators. Pain is present when performing gripping tasks or resisted finger/wrist flexion.
- D. Posterior border of the ulna: demarcates the boundary separating the **flexor-pronator** and **extensor-supinator** compartments
- E. Tendinous landmarks
- Tendon of the **flexor carpi radialis:** landmark for the **radial artery** (lateral to the tendon)
 - Tendon of the **palmaris longus:** landmark for the **median nerve** (lateral to the tendon)
 - Absent in 14% of individuals
 - Tendon of **flexor carpi ulnaris:** landmark for the **ulnar nerve and artery** (lateral to the tendon)

DISCUSSION QUESTION 3 — What sub-population of patients is most at risk for Nursemaid’s Elbow?

Bones of the Hand:

- Proximal Row (lateral to medial)— **scaphoid, lunate, triquetrum, pisiform**
- Distal Row (lateral to medial): **hamate, capitate, trapezoid, trapezium**
- Mnemonic: **So Long To Pinky, Here Comes The Thumb** (makes a backwards C-shape on the palmar aspect of the hand)



Arterial Pulses

- Ulnar:** Palpated lateral to the **flexor carpi ulnaris**, where it lies superficial to the **ulnar head**
- Radial:** Palpated on the lateral wrist or within the **anatomical snuff box**.

DISCUSSION QUESTION 4 — What structures form the anatomical snuff box?

- C. **Brachial:** Palpated within the medial bicipital groove, the groove between the biceps and triceps muscles; it can also be palpated just medial to the biceps tendon at the **antecubital crease** when the muscle is flexed.
 - a. **Clinical Relevance:** Hemostasis and control of bleeding can be obtained with compression brachial artery against the midshaft of the humerus.

Upper Extremity Clinical Correlates

Allen Test: Assesses the patency of the radial and ulnar arteries and of the deep palmar arch. It can determine the risk of radial artery puncture and/or cannulation.

- A. Compress the patient's **radial artery** until blood flow is stopped.
- B. Have the patient clench and unclench his hand until there is **visible blanching**.
- C. When the patient finally relaxes his hand, there will be visible refilling of the capillary bed from the ulnar side, with return of the normal pink color **within 5 seconds**.
- D. Absence of refilling or delayed refilling = **positive test**

Carpal Tunnel Syndrome: Entrapment of the **median nerve** between the **transverse carpal ligament** (flexor retinaculum) and carpal bones.

- A. Most commonly associated with states of **edema** and **excess proteinaceous material** causing compression of the space
 - a. Pregnancy
 - b. Hypothyroidism
 - c. Diabetes
 - d. Rheumatoid arthritis
 - e. Dialysis-related amyloidosis.
- B. May also secondary to overuse in poor ergonomic positions, such as laptop usage.
- C. **Symptoms:** paresthesia, numbness, pain, in the distribution of the median nerve (lateral 3.5 fingers). In severe cases, can have **thenar eminence atrophy**.

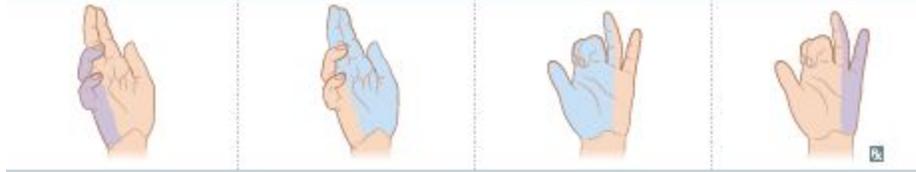
DISCUSSION QUESTION 5 — Why does sensation to the thenar eminence remain intact with carpal tunnel syndrome?

DISCUSSION QUESTION 6 — What are the physical exam tests for carpal tunnel?

Hand Neurologic Exam

- A. **Radial nerve (C5-T1)**
 - a. Main function: elbow, wrist, finger **extension**, grip strength
 - b. Injury: **Screwdriver** - repetitive pronation/supination of forearm
 - c. Deficit: Wrist drop, decreased grip strength, loss of sensation over posterior arm, dorsal hand (snuff box)
- B. **Median nerve (C5-T1)**
 - a. Main function: wrist, lateral finger **flexion**, thumb opposition, lumbricals of 2nd and 3rd digits (**flex** at MCP, **extend** at PIP and DIP), sensation of thenar eminence
 - b. **Proximal lesions:** Deficits presents when trying to flex digits. Less severe than distal lesions
 - c. **Pope's blessing:** Trying to make a fist, cannot flex first 3 digits.
 - d. **Distal lesions:** Loss of lumbricals results in clawing (**extension** at MCP, **flexion** at PIP and DIP)
 - e. **Median claw:** Extension at MCP and flexion of finger tips (PIP and DIP) of first 3 digits
- C. **Ulnar nerve (C8-T1)**
 - a. Main function: Wrist, 4th, 5th digit **flexion**, abduction and adduction of fingers (interossei), lumbricals of 4th and 5th digits (**flex** at MCP, **extend** at PIP and DIP), sensation of hypothenar eminence
 - b. Proximal lesions: Deficits presents when trying to flex digits. Less severe than distal lesions
 - OK sign:** Trying to make a fist, cannot flex 4th and 5th digit
 - c. Distal lesions: Loss of lumbricals results in clawing (**extension** at MCP, **flexion** at PIP and DIP)
 - Ulnar claw:** Extension at MCP and flexion of finger tips (PIP and DIP) of 4th and 5th digit

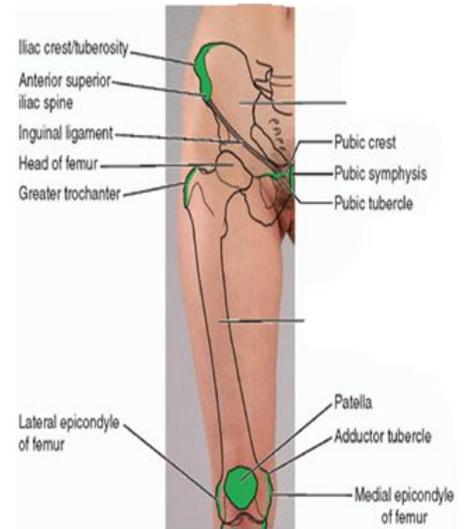
DISCUSSION QUESTION 7 — Name the nerve injury from left to right, where the shaded area shows the deficit.



Lower Extremity Surface Anatomy

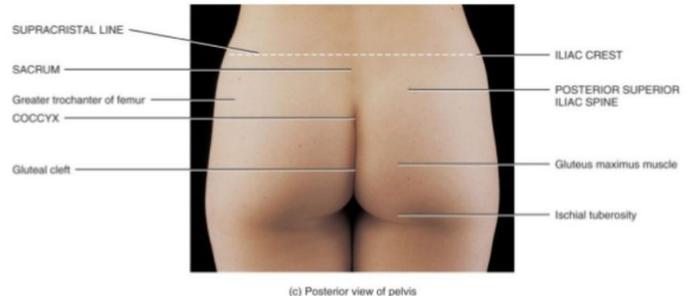
Bony Landmarks

- A. Anterior Superior Iliac Spine (ASIS)
- B. Iliac tubercle (widest part of the hips)
- C. Iliac crest
- D. Posterior Superior Iliac Spine (PSIS) — may be difficult to palpate but seen as permanent skin dimples in most people
- E. Pubic tubercle of the pubic bone
- F. Pubic crest
- G. Pubic symphysis
- H. Ischial tuberosity — best palpated when the thigh is flexed
- I. Greater trochanter of femur
- J. Tibial tuberosity of tibia
 - a. Head of fibula – Insertion site for tendon of bicep femoris
 - b. Medial malleolus of tibia
 - c. Lateral malleolus of fibula
 - d. Anterior border of tibia



Femoral Triangle — visualized as a depression when the thigh is flexed...

- a. Superior Border: **inguinal Ligament**
- b. Lateral Border: **Sartorius**
- c. Medial Border: **Adductor Longus**
- d. Floor: **Iliopsoas** (laterally) and **pectineus** (medially)



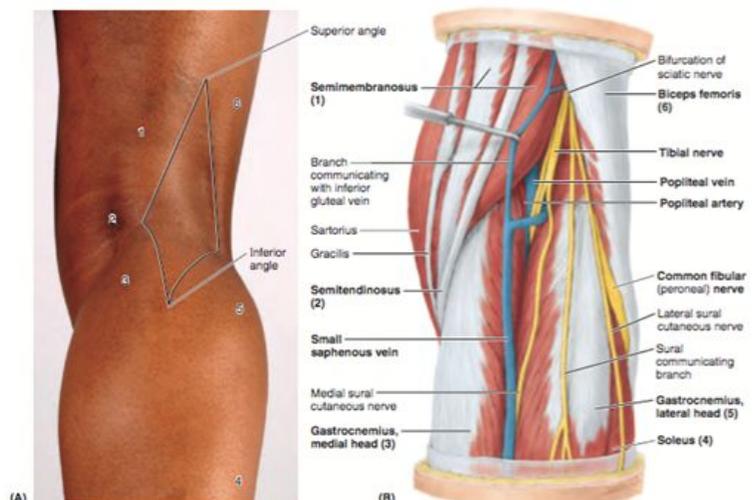
DISCUSSION QUESTION 8 — What are the contents of the femoral triangle from lateral to medial?

Projections of the Upper Leg

- A. **Iliotibial (IT) Band:** Fibrous band formed by the tensor fascia lata and gluteus maximus muscles
 - a. Insertion into the anterolateral (**Gerdy's**) tubercle of tibia
- A. **Quadriceps Tendon**
- B. **Patellar Ligament:** Extension of quadriceps tendon; inserts on tibial tuberosity

Projections of the Popliteal Fossa

1. Boundaries of the popliteal fossa
 - a. Superior-lateral = The tendon of the **bicep femoris**



- b. Superior-medial = The lateral tendon of the **semitendinosus**, and medial is the semimembranosus
 - c. Inferolateral/medial = Lateral and medial heads of **gastrocnemius**
2. Contents of the popliteal fossa
- a. Neurovascular structures in from *superficial to deep* = **Tibial nerve, Popliteal vein and Popliteal artery**
 - b. Termination of the **small saphenous vein** into the **popliteal vein**
 - c. **Sciatic nerve** usually divides into **tibial nerve** and **common fibular nerve** at the superior angle of the popliteal fossa
 - d. **Tibial nerve** crosses through the center of the fossa
 - e. **Common fibular nerve** follows deep to the bicep femoris

Projections of the Lower Leg

- A. **Common fibular Nerve:** Follows along medial border of bicep femoris tendon and then travels subcutaneously around lateral aspect of fibular neck.
 - a. **Clinical Correlation:** Due to its superficial route at the fibular neck the common fibular nerve is the most common nerve injured in the lower limb. Severe trauma can result in paralysis of the anterior and lateral compartment muscles.

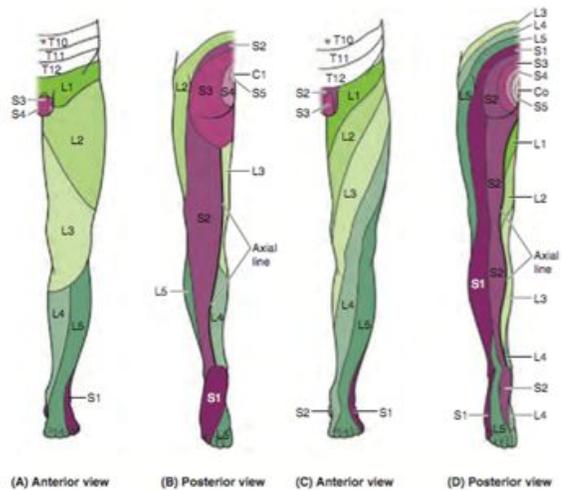
DISCUSSION QUESTION 9 — What is the presentation of injury to the common fibular nerve?

Projections of the Foot

- A. **Tarsal Tunnel** — Found posterior to the medial malleolus.

DISCUSSION QUESTION 10 — What three ankle tendons run through the tarsal tunnel and under what retinaculum do they run?

- B. **Tibialis Posterior** — Runs posterior to the medial malleolus when foot is inverted, the tendon can be seen as it crosses the ankle to insert on the navicular bone.
- C. **Tibialis Anterior** — Runs anterior to the medial malleolus, when foot is inverted and dorsiflexed the tendon can be seen crossing the ankle to insert on the medial cuneiform and base of 1st metatarsal.
- D. **Extensor Hallucis Longus** — Lateral to the tibialis anterior tendon, when the foot is dorsiflexed and 1st digit flexed the tendon can be visualized.
- E. Additional tendons of the **extensor digitorum longus** can be seen on the dorsum of the foot.
- F. Posterior to the lateral malleolus when foot is everted the tendons of the **fibularis longus** and **fibularis brevis** are visible, note that the fibularis longus disappears as it passes under the sole of the foot while the fibularis brevis can be seen attaching to the base of the 5th metatarsal



Dermatomes

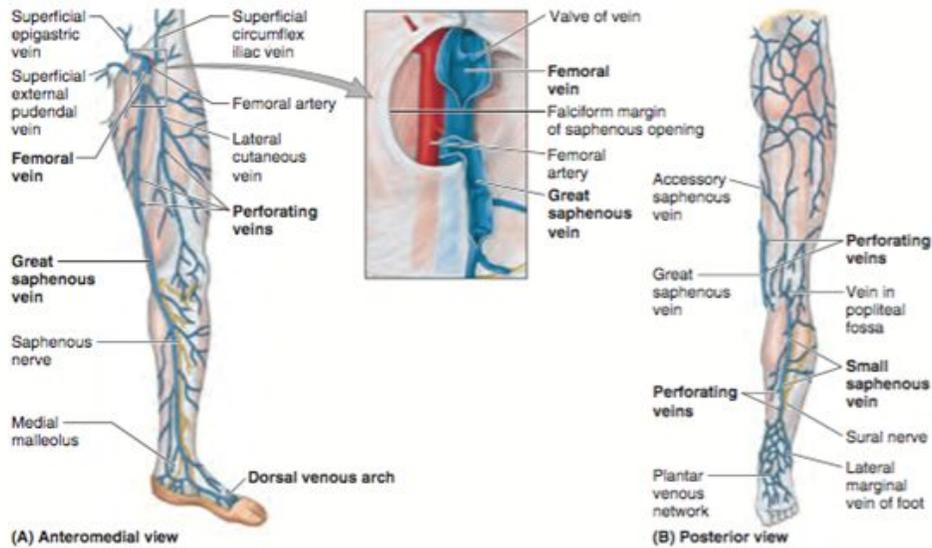
- 1. L5 = 1st toe
- 2. S1 = 5th toe and plantar surface of foot

Arterial Pulses

- A. **Femoral:** Located midway between ASIS and pubic symphysis, just inferior to the inguinal ligament.
- B. **Popliteal:** In the posterior fossa of the knee, palpation is performed with person is prone with knee flexed (p604).
- C. **Posterior Tibial:** Palpated posterior to the **Medial Malleolus** and **Tibialis Posterior**; palpated best if foot is inverted, relaxing the flexor retinaculum (p608).
- D. **Dorsalis Pedis:** Palpation lateral to **Extensor Hallucis Longus** when foot is slightly dorsiflexed (p625); recall the anterior tibial artery is renamed dorsalis pedis artery as it crosses the ankle.

Superficial Venous Drainage of Leg

- A. **Great Saphenous Vein** — the continuation of the venous arch that crosses **anterior to the medial malleolus**. It ascends along medial leg passing a hands breath posterior to the medial condyle of the femur, traversing the saphenous opening in the *fascia lata* and empties into the femoral vein at the inferior part of the femoral triangle.
- B. **Small Saphenous Vein** — the continuation of the venous arch that crosses the ankle **posterior to the lateral malleolus**. It ascends between the heads of the gastrocnemius (accompanied by the sural nerve) and empties into the popliteal vein at the inferior aspect of the popliteal fossa.

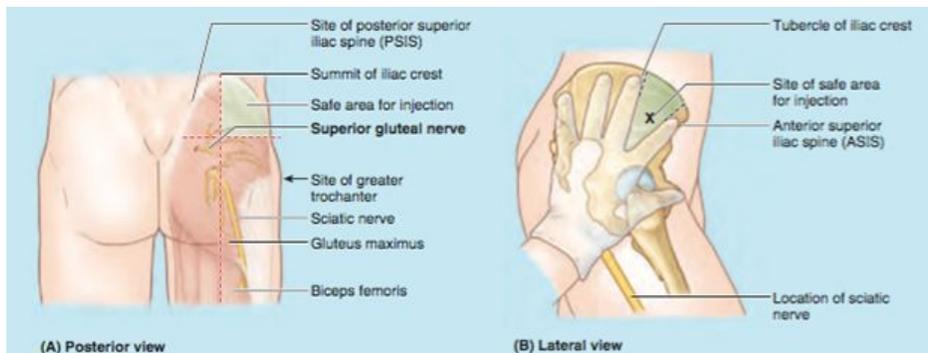


Lower Extremity Clinical Correlates

Clinical Correlates of the Anterior Thigh

- A. **Left Cardiac Angiography:** The femoral *artery* can be cannulated with a catheter in order to access the *left ventricle* of the heart or the right atrium.
- B. **Right Cardiac Angiography:** The femoral *vein* can be cannulated in order to access the *right atrium* of the heart. Note that the femoral vein is not palpable so it is located by finding the pulsating femoral artery and inserting the catheter *medial* to the artery.
- C. **Femoral Hernia:** The opening to the femoral canal (the femoral ring) is a weak area of the abdominal wall; abdominal viscera can protrude through it into the femoral canal, creating a femoral hernia which appears as a tender mass inferolateral to the pubic tubercle.

DISCUSSION QUESTION 11 — Where is it safe to perform an intragluteal injection? What structure are at risk for in the intragluteal injection?



Clinical Correlates of the Knee

1. **MCL Strains** and **LCL** — identified using the Varus and Valgus stress tests.
 - a. **Valgus Stress Test** — an assessment for medial instability caused by gaping of the tibia away from the femur on the medial side. Valgus stress is applied at the knee while the ankle is stabilized in slight lateral rotation. To position, the knee should start in extension and then be flexed approximately 20-30 degrees to “unlock” the joint.
 - i. Medial Pain = MCL issue
 - ii. Lateral Pain = meniscus issue
 - b. **Varus Stress Test** — an assessment for lateral instability caused by gaping of the tibia away from the femur on the lateral side. Varus stress is applied at the knee while the ankle is stabilized. Again, the joint must be “unlocked”.
 - i. Lateral Pain = LCL issue
 - ii. Medial Pain = meniscus issue
2. **ACL Tears** can be identified using the Lachman and Anterior/Posterior Drawer signs
 - a. **Anterior Drawer Sign** — patient lies supine with hips flexed to 45° and knees flexed to 90°, the tibia is displaced forward with a positive sign indicating ACL damage
 - b. **Lachman Sign** — with the knee flexed 20-30°, the tibia is displaced anteriorly relative to the femur, > 4mm of displacement is positive and indicates deficiency of the ACL

DISCUSSION QUESTION 12 — Why bother with the Lachman’s Test when you can just use the anterior drawer test?

Clinical Correlate: Peripheral Vascular Disease

1. A disorder of blood circulation (in either the arteries or veins) caused by narrowing, blockage or spasm. Often occurs in the legs with symptoms of **claudication** (pain and fatigue) especially during exercise.

DISCUSSION QUESTION 13 — What are the physical signs of PVD?

2. The main test for PVD is the **Buerger Test**
 - a. **Stage 1** — patient supine, elevate both legs to 90° and hold them up for 2 minutes. Observe the color of the feet, with pallor indicating ischemia resulting from the inability of peripheral arterial pressure to overcome the effects of gravity.
 - b. **Stage 2** — patient sits up and lowers leg over the edge of the exam table. Gravity aids in blood flow and color returns to ischemic leg. Examine both legs simultaneously.
 - c. **Positive Test** — pallor elicited with elevation and intense rubor with gravity dependency
-

USMLE Case

Adapted from Musculoskeletal Case 7 from *First Aid Cases for the USMLE Step 1*

A 19-year-old woman athlete comes to the emergency department with her coach after injuring her left knee during sports practice. She says she heard a “pop” when she made a quick turn and then developed a sharp pain on the lateral side of her knee and her leg “collapsed.”

1. What are the two main intracapsular ligaments of the knee?
 2. What is the blood supply to the knee?
 3. What is the role of the meniscus?
 4. How do the collateral and cruciate ligaments differ in function?
 5. Which ligaments of the knee is most often injured?
 6. What is the terrible or unhappy triad?
-

Multiple Choice Questions

1. Which is not a border of the femoral triangle?

- a. Sartorius
- b. Inguinal ligament
- c. Gracilis
- d. Adductor longus

2. What is the order of neurovascular structures in the popliteal fossa from superficial to deep?

- a. Tibial nerve, Popliteal vein, Popliteal artery
- b. Popliteal artery, tibial nerve, popliteal vein
- c. Tibial nerve, popliteal artery, popliteal vein
- d. Popliteal vein, popliteal artery, tibial nerve

3. Fractures of the clavicle occur most frequently at...

- a. The junction of the medial and middle third
- b. The middle third
- c. The lateral third
- d. The junction of the middle and lateral third

4. The _____ is NOT a boundary of the infraclavicular fossa.

- a. The clavicle
- b. Pectoralis major
- c. Coracoid process
- d. Deltoid

5. The _____ lies in the anatomical snuff box.

- a. Ulnar artery
- b. Median nerve
- c. Median artery
- d. Radial artery

6. The thumb's cutaneous innervation comes from vertebral level.

- a. C4
- b. C5
- c. C6
- d. C7

7. A patient is unable to prevent anterior displacement of the femur on the tibia when the knee is flexed. Which of the following ligaments is most likely damaged?

- a. Anterior cruciate
- b. Fibular collateral
- c. Patellar
- d. Posterior cruciate
- e. Tibial collateral

8. A 67-year old patient has been given a course of antibiotics by gluteal intramuscular injections after a major abdominal surgery. To avoid damaging the sciatic nerve during an injection, the needle should be inserted into which of the following areas?

- a. Over the sacrospinous ligament
- b. Midway between the ischial tuberosity and the lesser trochanter
- c. Midpoint of the gemelli muscles
- d. Upper lateral quadrant of the gluteal region
- e. Lower medial quadrant of the gluteal region

9. If the lateral (fibular) collateral ligament is torn by a fracture, which of the following conditions may occur?

- a. Abnormal passive abduction of the extended leg
- b. Abnormal passive adduction of the extended leg
- c. Anterior displacement of the femur on the tibia
- d. Posterior displacement of the femur on the tibia
- e. Maximal flexion of the leg

Practice Questions (USMLE style)

from Moore's online USMLE-style review questions and case studies

1. A 78 year old man with chronic bronchitis complained of an oval swelling and pain in his right groin. He told his physician that the swelling enlarged when he coughed and/or strained. On examination, the physician noted that muscles in the man's abdominal wall were weak. He placed his fingers over the inguinal (Hesselbach) triangle, and asked the man to hold his nose and blow it. The physician felt a mass protruding from the inferior part of the inguinal triangle. A diagnosis of direct inguinal hernia was made. Which of the following statements about the man's hernia is correct?

- a. a direct inguinal hernia traverses the entire inguinal canal and exits through the superficial inguinal ring.
- b. a direct inguinal hernia leaves the abdominal cavity medial to the inferior epigastric artery.
- c. a direct inguinal hernia, although common in well-conditioned 30-40 year old men, is more common in women.
- d. a direct inguinal hernia lies within the processus vaginalis, which is largely obliterated.

2. Following an appendectomy for surgical removal of a perforated appendix, a 21 year old man was given a series of intragluteal injections of antibiotics. After several injections he complained of numbness and tingling (paresthesia) on the anterior and lateral sides of his left leg and dorsum of his foot. On examination, paresthesia was detected in the areas mentioned by the patient. The physician also observed that dorsiflexion of his left ankle was weaker than that of his right ankle. Which of the following statements best describes the most likely cause of the patient's signs and symptoms?

- a. injury to the tibial division of the sciatic nerve.
- b. injury to the superior gluteal nerve.

- c. injury to the inferior gluteal nerve.
- d. injury to the left common fibular division of the sciatic nerve.

3. A 58 year old man comes to you because of a 6 month history of “tingling” in the wrists and hands at night, predominantly in the right. Physical exam shows wasting of the thenar eminence of the right hand, weakness of thumb opposition, and reduced sensation to light touch on the palmar surface of his right hand on the lateral three digits and the lateral half of the fourth digit. The symptoms are reproduced by tapping immediately distal to the wrist joint of his right hand for about 30 seconds.

Which of the following nerves is involved in this man’s presentation?

- a. Long thoracic nerve
- b. Median nerve
- c. Musculocutaneous nerve
- d. Radial nerve
- e. Ulnar nerve

4. A 47 year old man comes to the physician due to several weeks of knee pain. He originally tried to manage the pain with over the counter medication because he thought it was associated with work, but he wants to be evaluated because the pain has not resolved. Further history taking reveals that the patient still plays basketball with some friends from college. He reports that he has felt slightly more discomfort when playing, but doesn’t note any instance where he felt a pop in his knee. He reports that he works in a warehouse where he spends most of his time on his knees stocking shelves. On physical examination, the physician notes a soft, non-tender globular fluid-filled lump around the patella. On passive examination while supine, the patient had normal passive flexion, extension, adduction, and abduction of the knee. The patient’s anterior and posterior drawer signs were within normal limits. Additionally, the patient had a normal McMurray test.

Which of the following is the most likely underlying injury?

- a. ACL injury
- b. MCL injury
- c. Medial meniscus injury
- d. Prepatellar bursitis
- e. “Unhappy triad injury”

ANSWER KEY

Discussion Question Answers

1. What region of the clavicle is most vulnerable to fractures?

The junction of the middle and lateral thirds. Injury here results in the SCM elevating the medial bone; the trapezius will be unable to elevate the lateral bone due to the weight of the limb, causing the shoulder to drop.

2. Name the rotator cuff muscles and describe their joint function.

The rotator cuff muscles can be remembered by the acronym SITS — supraspinatus, infraspinatus, teres minor, and subscapularis. Jointly, they draw the head of the humerus into the glenoid during abduction. Tendonitis will cause pain with abduction. Tears will cause inability to abduct.

3. What sub-population of patients is most at risk for Nursemaid’s Elbow?

Nursemaid’s Elbow (radial head subluxation) is a partial dislocation for which children are most at risk. It is caused by longitudinal traction on a pronated forearm.

4. What structures form the anatomical snuff box?

The medial border is formed by the extensor pollicis longus. The lateral border is formed by the tendons of the abductor pollicis longus and the extensor pollicis brevis. The proximal border is formed by the styloid process of the radius.

5. Why does sensation to the thenar eminence sensation remain intact with carpal tunnel syndrome?

The palmar cutaneous branch of the median nerve enters the hand external to the carpal tunnel.

6. What are the physical exam tests for carpal tunnel?

- a. Tinel Test: percussion of wrist causes tingling
- b. Phalen sign: 90 degree flexion of wrist causes tingling

7. Name the nerve injury from left to right, where the shaded area shows the deficit.

L to R: Distal ulnar nerve, proximal median nerve (Pope's), distal median nerve, proximal ulnar nerve (OK sign)

8. What are the contents of the femoral triangle from lateral to medial?

- N femoral Nerve (not contained within the femoral sheath)
- A femoral artery
- V femoral vein
- E empty space formed by the femoral canal
- L lymphatics

9. What is the presentation of injury to the common fibular nerve?

The common fibular nerve innervates the short head of the biceps femoris muscle, it's terminal branch of the superficial fibular nerve innervates the lateral compartment muscles (eversion) and the deep fibular branch innervates the anterior compartment (dorsiflexion).

- a. Waddling gait (leans to the side to hike hip)
- b. Swing out gait (swing foot out to clear ground)
- c. Steppage gait (do extra flexion at the hip to clear the ground)

10. What three ankle tendons run through the tarsal tunnel and under what retinaculum do they run?

Tibialis posterior, flexor digitorum longus, posterior tibial Artery, posterior tibial Vein, tibial Nerve, flexor Hallucis longus.
Mnemonic: Tom Dick And Very Nervous Harry

11. Where is it safe to perform an intragluteal injection? What structure are at risk for in the intragluteal injection?

Injections are safe in the *superior lateral quadrant* of the buttock.

Injections are safe in the *anterolateral thigh* – place index finger on ASIS, spread fingers out until middle finger is on tubercle of iliac crest; the shot may be given in the region between the index and middle finger.

Another method is to give an injection above the imaginary line drawn from greater trochanter to PSIS.

Injections are NOT safe in the most prominent part of buttock because there is risk for hitting the sciatic nerve.

12. Why bother with the Lachman's Test when you can just use the anterior drawer test?

Lachman's test is more sensitive than is the anterior drawer sign (one reason may be that it is difficult for the patient to contract his hamstrings and thus prevent forward sliding of the tibia when the knee is in only 20 degrees - 30 degrees of flexion).

The other situation where Lachman's test is used is during the examination of the acutely injured knee. Often there is a hemarthrosis and a great deal of pain. One simply cannot flex the knee more than 20 degrees or 30 degrees.

13. What are the physical signs of PVD?

- a. Decrease or absent pulses
- b. Atrophic changes in the foot (hair loss, discoloration of the skin, decreased warmth, impaired nail growth)
- c. Vascular bruits
- d. Increased venous filling time

USMLE Case Answers

1. The anterior cruciate ligament extends from the anterior intercondylar area of the tibial plateau and traverses superior and lateral to the medial surface of the lateral femoral condyle. The posterior cruciate ligament extends from the posterior intercondylar area of the tibial plateau and traverses superior and medial to the lateral surface of the medial condyle of the femur.
2. Blood supply to the knee consists of genicular branches of the following blood vessels: anterior recurrent tibial artery, anterior tibial artery, descending branch of the lateral circumflex artery, femoral artery, patellar plexus, popliteal artery, and posterior tibial artery.

3. The half-moon-shaped meniscus is cartilage that is found between the femur and tibia. The meniscus absorbs the impact load of the joint and is involved in stability. The meniscus is mostly avascular and is divided into the anterior horn, body, and posterior horn. A medial and lateral meniscus is connected by the transverse ligament.
4. The cruciate ligaments remain tight in flexion and extension and relax at 30 degrees of flexion. The collateral ligaments are tight in extension and relaxed in flexion. Also, the cruciate ligaments prevent anterior and posterior displacement of the tibia. The collateral ligaments prevent abduction/adduction of the knee.
5. The medial collateral ligament is weaker than the anterior or the posterior cruciate ligaments, so medial collateral ligament injuries are more common. Anterior cruciate ligament tears are much more common than posterior cruciate ligament tear.
6. This is a common contact-sport injury to the knee that occurs when lateral trauma is applied to the knee joint while the foot is fixed to the ground. Subsequently, the medial collateral ligament, lateral meniscus, and anterior cruciate ligament are damaged.

Practice Question Answers

1. C
2. A
3. D
4. C
5. D
6. C
7. D
8. D
9. B

USMLE Style Questions Answers

1. B
2. D
3. B
4. D