

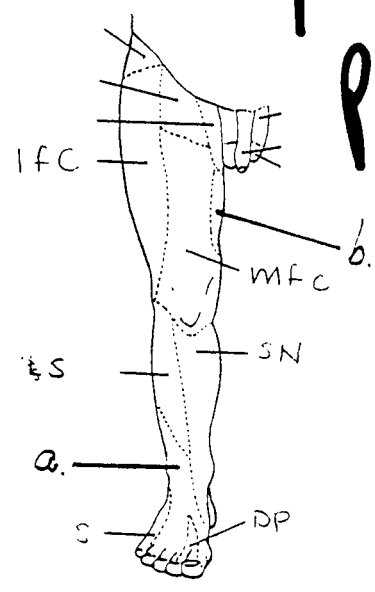
GROSS ANATOMY EXAMINATION I

September 4, 1998

PART I. Answer in the space provided. (17 pts)

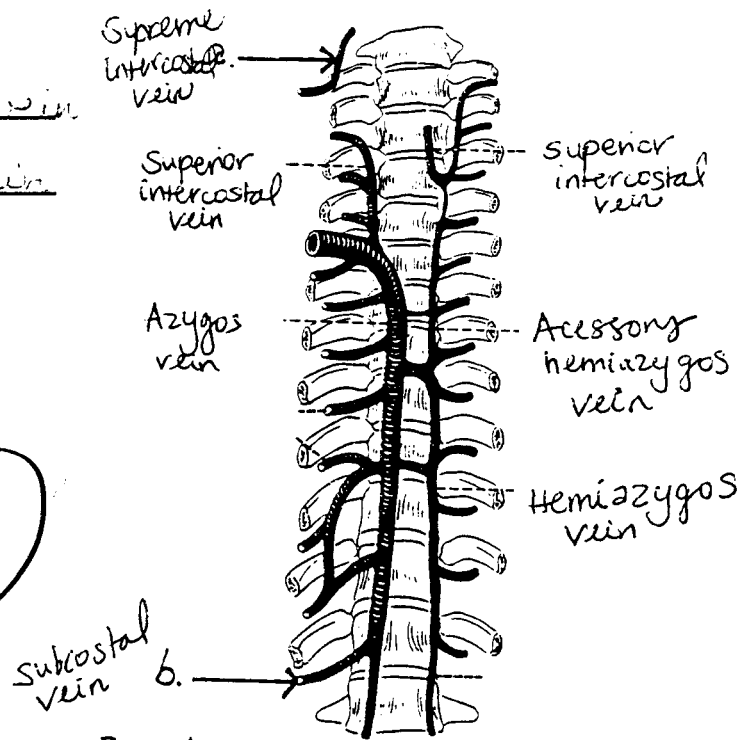
1. Identify the cutaneous innervation to the areas indicated. (1 pt)

- a. obturator nerve
- b. Superficial peroneal



2. Identify the veins. (1 pt)

- a. Superior intercostal vein
- b. posterior subcostal vein



44
-12

32

3. Identify the structures. (2 pts)

- ~~a. superior spine~~
- ~~b. axis~~
- ~~c. axis~~
- ~~d. vertebral notch~~

- A. Transverse process
- B. Superior articular process
- C. pedicle
- d. inferior vertebral notch

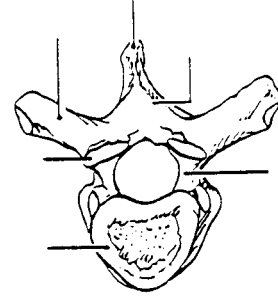
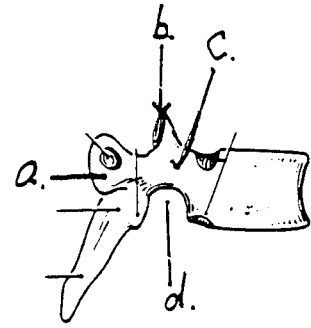
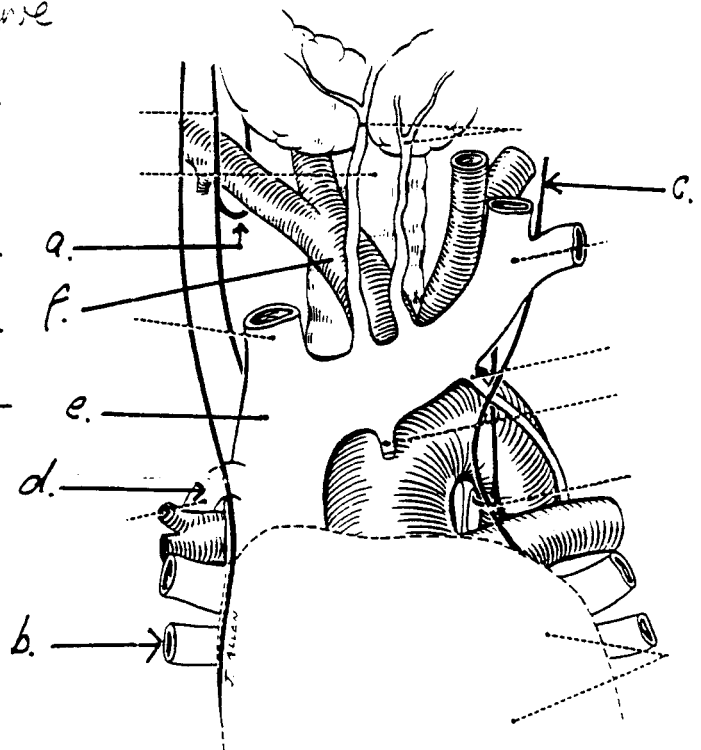


Figure 1.1. Typical thoracic vertebra in lateral and superior view.

4. Identify the structures. (3 pts)

- a. right recurrent laryngeal nerve
- b. right pulmonary vein
- c. left phrenic nerve
- d. arch of azygos vein
- e. Superior vena cava
- f. Brachiocephalic artery

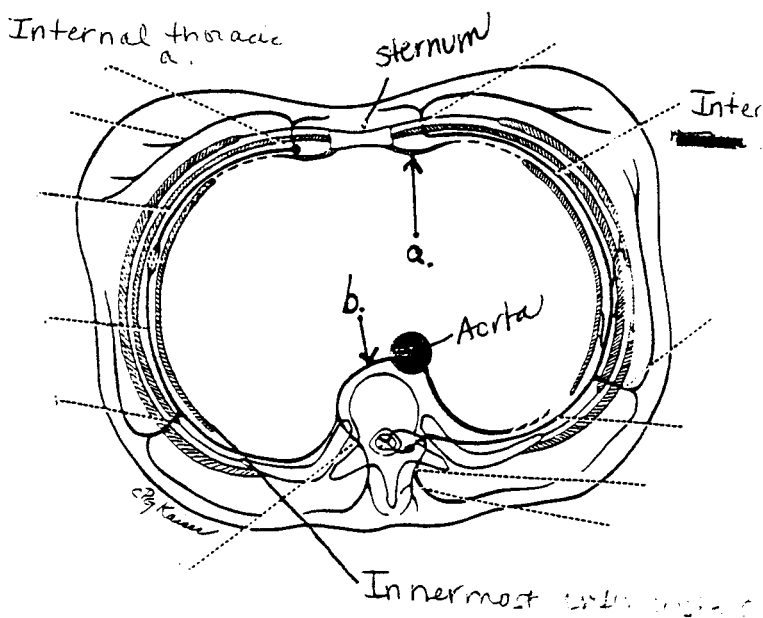


5. Identify the structures. (1 pt)

a. transversus thoracis

~~b. intercostal vein~~

Left posterior
b Intercostal a.



6. Identify the structures. (1 pt)

a. adductor longus

b. biceps

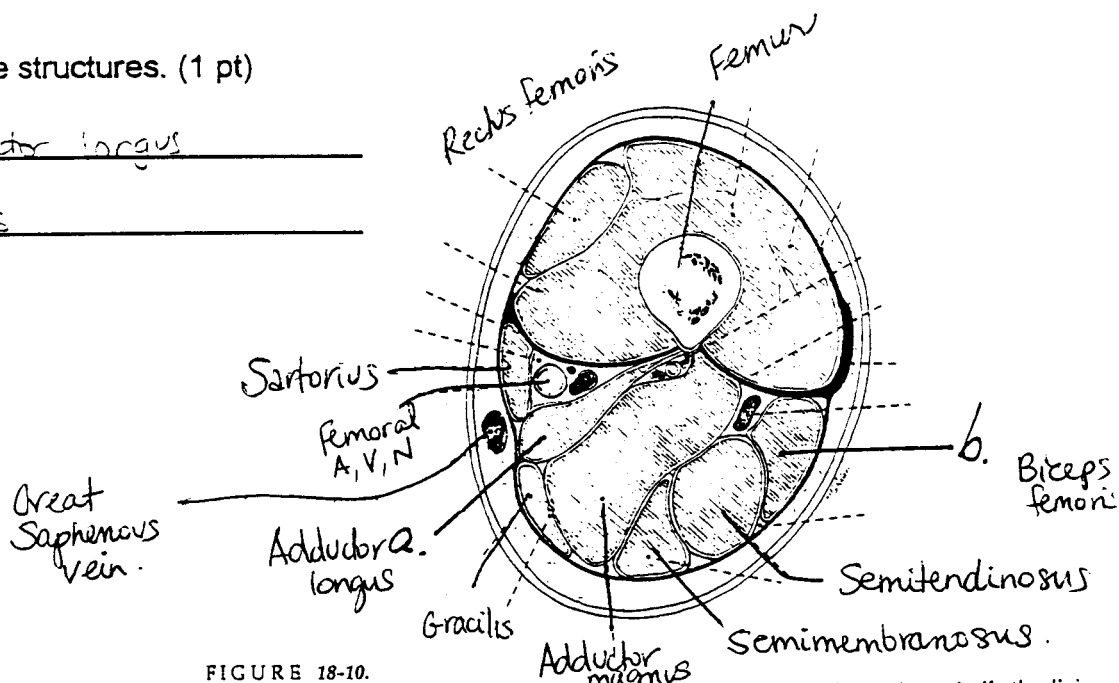


FIGURE 18-10. A transverse section through the middle third of the thigh, drawn to show schematically the division of the musculature into compartments and to illustrate the position of the main nerves and vessels. The thickness of the fascia lata, intermuscular septa, and iliotibial tract is exaggerated.

7. Identify the arteries. (2 pts)

- a. inferior medial genicular artery
- b. peroneal artery
- ~~c. lateral tibial artery~~
- d. Fibular circumflex artery

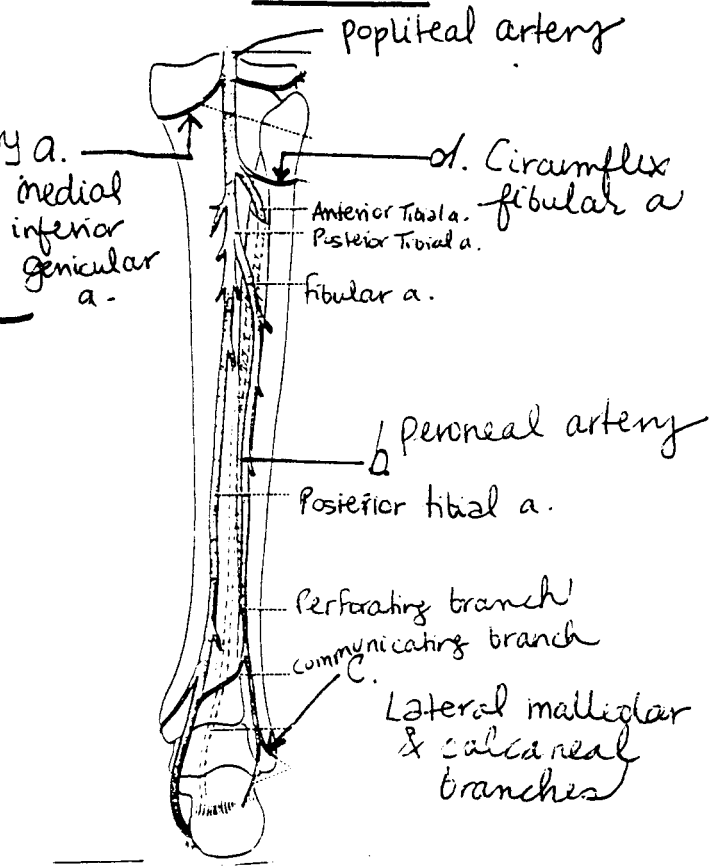


FIGURE 18-29. Diagram of the arteries of the leg; posterior view.

8. Identify the structures. (2 pts)

- a. tendon of Flexor hallucis longus
- b. 1st dorsal interosseous muscle
- c. Adductor hallucis

~~d. Flexor digiti minimi brevis~~

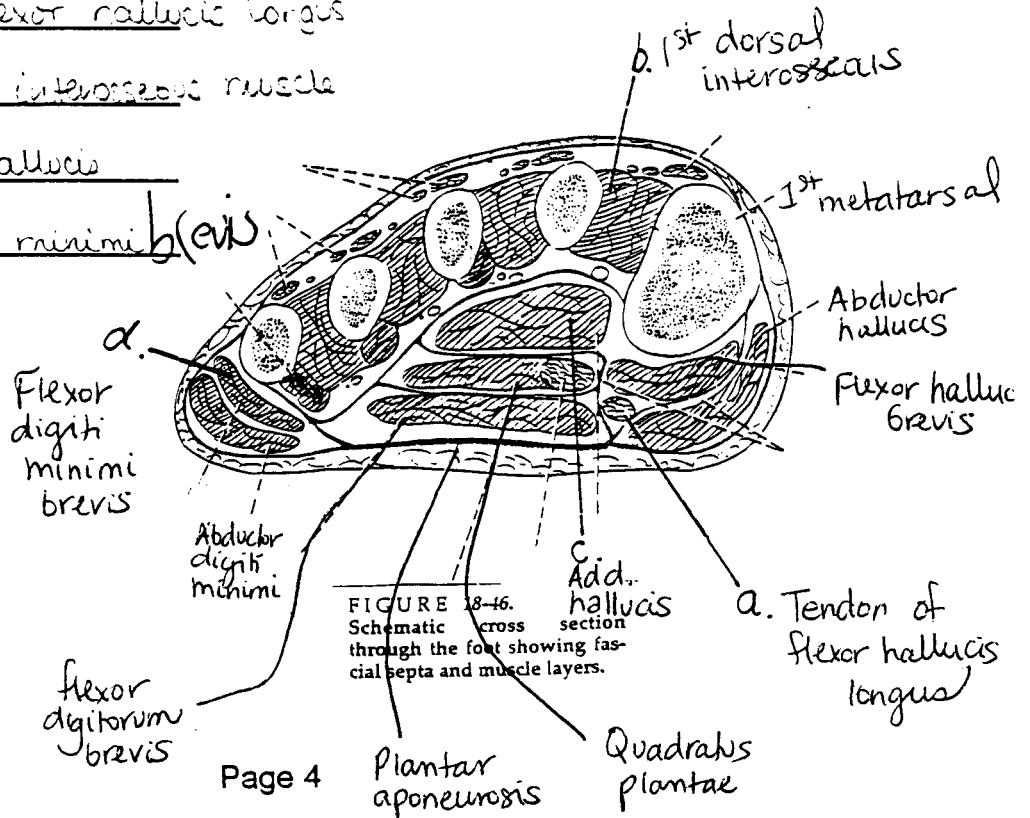


FIGURE 18-46. Schematic cross section through the foot showing fascial septa and muscle layers.

9. Identify the structures. (1 pt)

- a. Fibular collateral ligament
- ~~b. Semitendinosus tendon~~

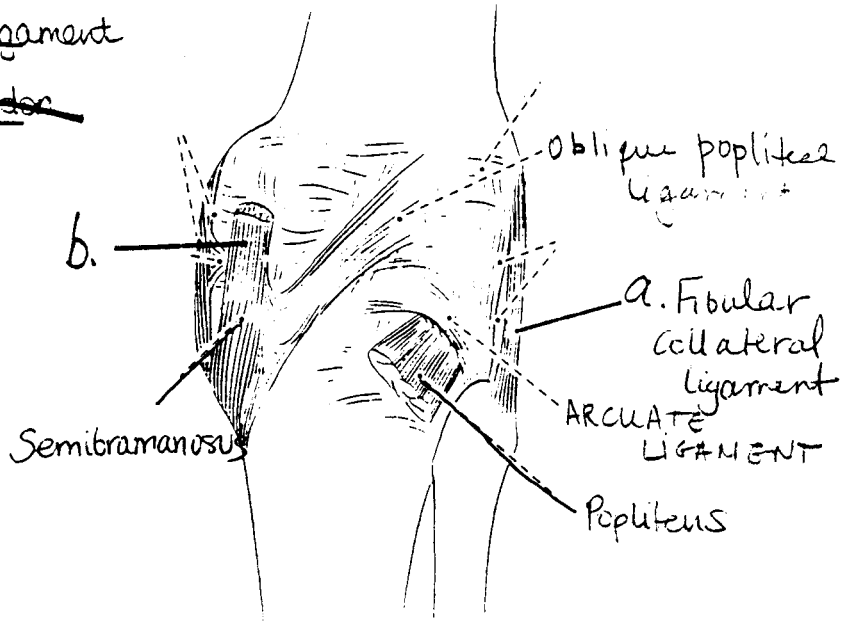
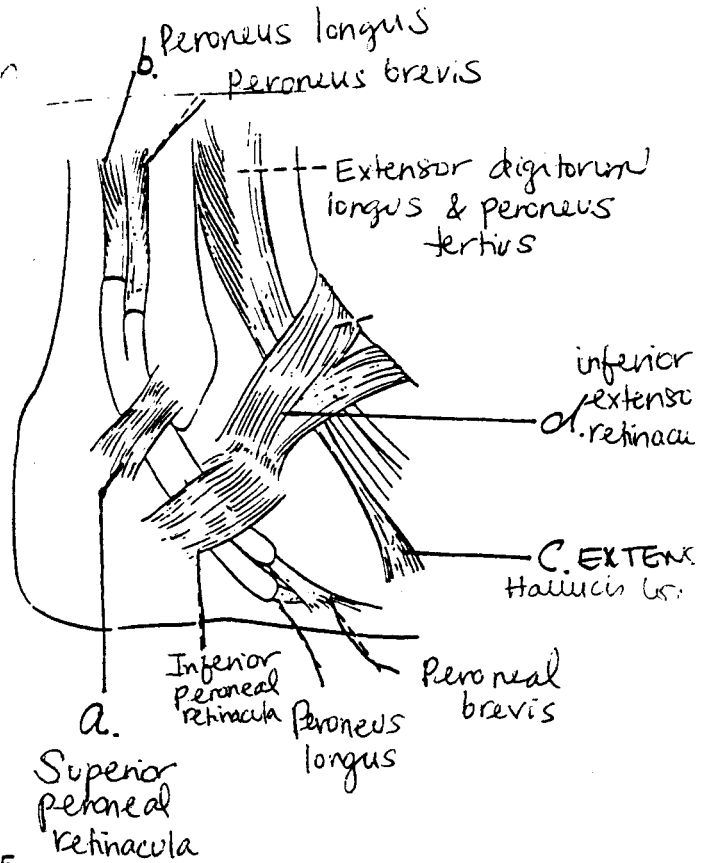


FIGURE 18-36.
Posterior view of the capsule of the knee joint.

10. Identify the structures. (2 pts)

- a. superior peroneal retinaculum
- b. peroneus longus
- ~~c. anterior tibialis~~
- d. inferior extensor retinaculum



11. Identify the structures. (1 pts)

a. coronary sinus

b. middle cardiac vein

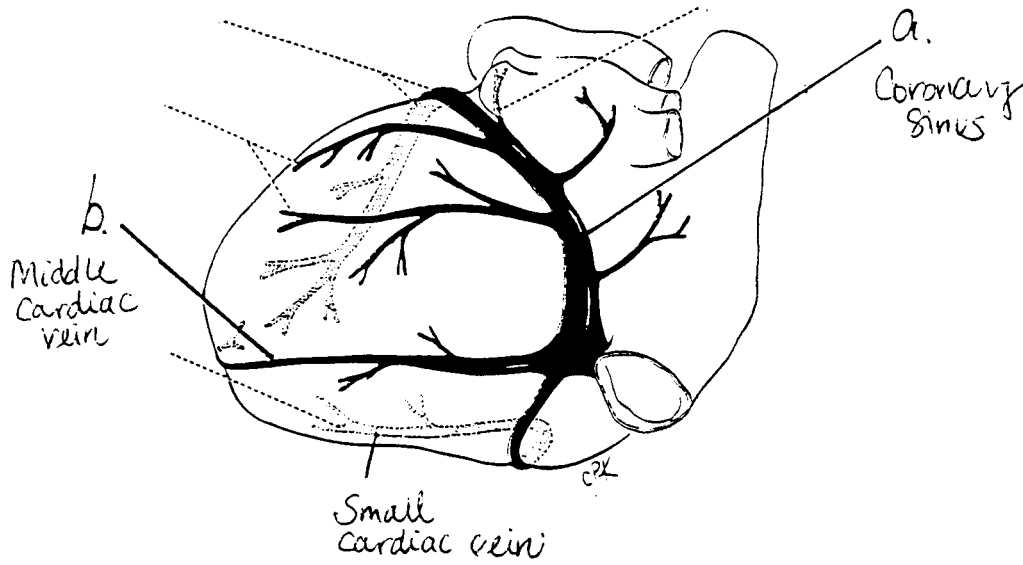


FIGURE 21-16.
The cardiac veins shown from a posterior view of the heart.

Part II. Circle the correct answer. All, none, or some may apply. (27 pts)

1. Muscles of respiration are innervated by:

- a. Intercostal nerves
- b. Anterior pulmonary plexus
- c. Greater splanchnic nerves
- d. Phrenic nerves
- e. Gray rami communicans

2. With respect to the pleura:

- a. The mediastinal parietal pleura is innervated by somatic nerves
- b. The parietal pleura extends caudally to the level of the 10th rib at the mid-axillary line
- c. The visceral pleura extends caudally to the level of the 6th rib at the mid-clavicular line
- d. The sensory innervation to the peripheral aspect of the diaphragm is by way of the intercostal nerves
- e. The cupula parietal pleura has its superior limit at the 2nd rib

3. With respect to the lungs and respiration:

- a. The surface projection of the horizontal fissure of the right lung is at the level of the fourth costal cartilage
- b. The trachea bifurcates at the level of T4
- c. The right principal bronchus is slightly smaller in diameter than the left and almost twice as long
- d. The right pulmonary artery is longer than the left

4. In the leg:
- a. The popliteus muscle attaches to the medial meniscus
 - b. The popliteus muscle is responsible for medial rotation of the femur
 - c. The peroneus brevis courses behind the lateral malleolus
 - d. Paralysis of the triceps surae results in a foot in plantar flexion
 - e. The subcutaneous prepatellar bursa lies between the skin and the patella and inflammation of this bursa has been termed "clergyman's knee"
5. In regard to the muscles (gastrocnemius, soleus, plantaris) of superficial posterior compartment of the leg:
- a. All plantar flex the foot
 - b. All take origin from the tibia or fibula
 - c. All insert onto the calcaneus
 - d. All are innervated by the tibial nerve
 - e. The posterior tibial artery courses down the leg between the gastrocnemius and soleus muscles
6. With respect to the nervous system:
- a. The somatic efferents of the femoral nerve consist of pre- and post-ganglionic neurons
 - b. The fibrous layer of the pericardium is innervated by the phrenic nerve
 - c. The visceral afferent fibers have cell bodies in the dorsal root ganglion
 - d. Post-ganglionic neurons of the parasympathetic nervous system are generally quite short compared to pre-ganglionic neurons
 - e. Parasympathetic pre-ganglionic neurons exit the central nervous system through white rami communicans

7. With regard to the saphenous veins:

- a. The greater saphenous vein begins in the dorsal venous arch of the foot
- b. The lesser saphenous vein begins in the plantar venous arch of the foot
- c. Valves in the communicating veins prevent blood from flowing from the deep to superficial veins
- d. The lesser saphenous vein passes up the leg anterior to the lateral malleolus
- e. The lesser saphenous vein pierces the popliteal fascia and terminates in the posterior tibial vein

8. The femoral nerve or branch/branches pass through:

- a. Femoral canal
- b. Adductor canal
- c. Adductor hiatus
- d. Femoral triangle
- e. Femoral ring

9. With regard to the heart:

- a. The middle cardiac vein is found in the coronary sulcus
- b. Trabeculae carneae are found in the left atrium
- c. The oblique pericardial sinus is created by reflection of the pulmonary veins and the aorta
- d. The sinoatrial node (S.A. node) is located in the endocardium at the cephalic end of the crista terminalis
- e. The greater splanchnic nerve contributes fibers to the superficial cardiac plexus

a counterbalance.

The gluteus minimus, medius and tensor fascia ~~lata~~ abduct the thigh. The adductor longus, adductor brevis and adductor magnus adduct the thigh. These antagonist muscles serve to stabilize the hip joint. The rectus femoris flexes the thigh along with the iliopsoas and pectineus. The semimembranosus, semitendinosus and biceps extend the thigh along with gluteus maximus and adductor magnus. These muscles prevent overextension and over flexion by their antagonistic action. The hip joint also has a transverse acetabular ligament within the acetabular fossa which provides a passageway for vessels. The ligamentum capitis helps to stabilize hip.

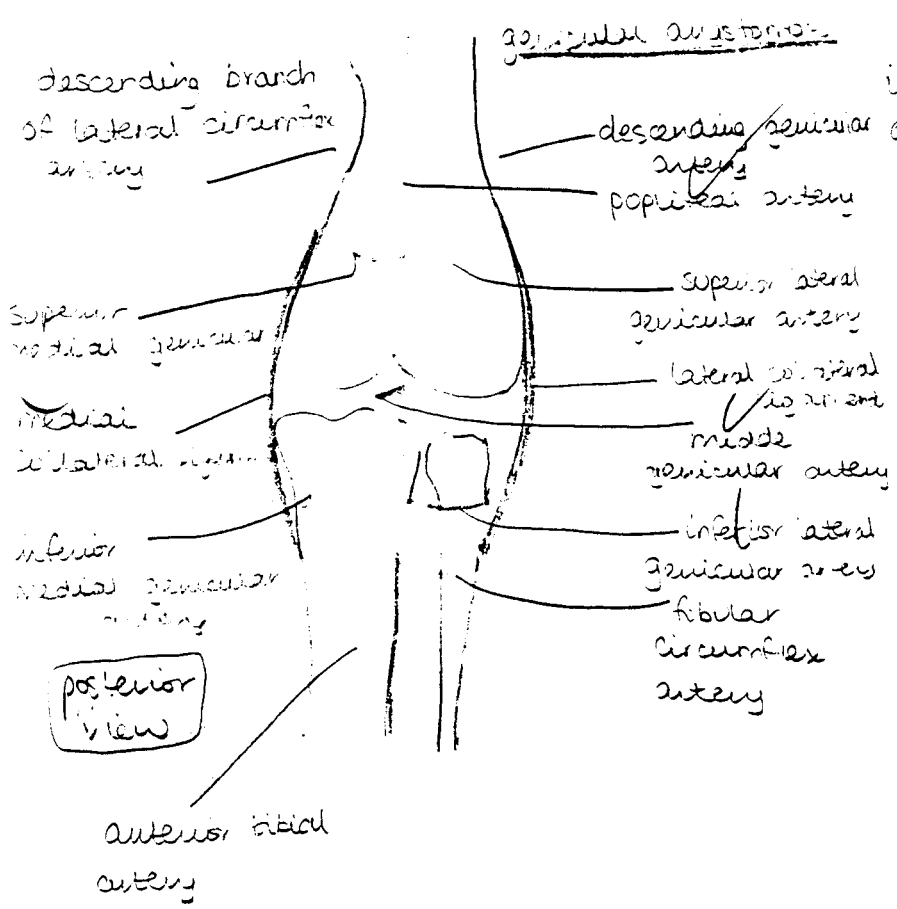
The hip is maximally stabilized when the joint is in a locked position. This is known as a screw home mechanism. The hip is maximally stabilized so that the line of gravity is constant (in back of hip joint). Therefore, weight is distributed in the correct proportions. The hip joint must be stable as it supports most of the weight in the acetabulum when standing and ischial tuberosity when sitting.

10. With respect to the thoracic wall and mediastinum:
- a. The endothoracic fascia lies between the fibrous layer of mediastinal pleura and the fibrous portion of the pericardium
 - b. The pericardiophrenic artery and vein is located between the fibrous and serous pericardium
 - c. Intercostal spaces 10 and 11 do not have external intercostal muscles
 - d. Blood supply to the 5th intercostal space arises from the aorta and the internal thoracic artery
 - e. The posterior intercostal artery in the first thoracic space is a branch of the costocervical trunk
11. In the thorax:
- ~~a.~~ The thoracic duct is joined by the right lymphatic duct to drain into the junction of the left subclavian and left internal jugular veins
 - b. The eparterial bronchus supplies blood to the left superior lobe
 - c. The esophagus is narrowed in the region of association with the arch of the aorta
 - d. The esophagus is narrowed in the region where it is crossed by the left bronchus
 - ~~e.~~ Behind the 6th rib the internal thoracic artery divides into two terminal branches: the musculophrenic and the superficial epigastric arteries

Part III. Answer in the space provided (including the back of the page for each question. (56 pts)

1. While serving as a resident in emergency medicine, a 53-yr old female is admitted to the clinic with the ability to walk for only short periods of time. You suspect intermittent claudication as the result of a dysfunction in the popliteal fossa. Specifically you detect a pulsating popliteal mass with a palpable thrill (vibration) and an audible bruit (abnormal sound). Review the boundaries (6 in number), structures entering and leaving, and the lymphatic drainage of the popliteal fossa, and state the relationships of these structures within the fossa. (12 pts)

10



Boundaries: The popliteal fossa is diamond shaped and located on the posterior side of the knee joint. The popliteal fossa has an anterior border which is the popliteus of femur and biceps and the popliteus muscle. The posterior border popliteal fascia. It is covered over by the ~~soleus~~ muscle. It is bounded medially and superiorly by the ~~semimembranosus~~ and ~~semitendinosus~~. It is bounded laterally and superiorly by the biceps. The popliteal fossa is bounded medially and inferiorly by the gastrocnemius medial head. It is bounded laterally and inferiorly by the gastrocnemius lateral head. The lateral border is the lateral collateral ligament and the medial border is the medial collateral ligament.

The popliteal artery gives off the superior medial and lateral genicular arteries. The superior lateral genicular artery anastomosis with the descending genicular. The superior medial genicular artery anastomosis with the descending branch of the lateral circumflex artery. The middle genicular is a branch of popliteal artery which enters the joint capsule. The popliteal artery gives off the inferior medial and lateral genicular arteries. Page 11 inferiorly the popliteal gives off the fibular circumflex artery.

2. In the course of a clerkship in orthopedics, an 83-yr old male comes to the clinic with problems in standing erect and walking after slipping in the grocery store. You suspect that the hip joint may be injured. Review the bones, articulations, ligaments, muscles, and fascial specializations that contribute to the stability of the hip joint. State when and why the hip joint is maximally stabilized. (10 pts)

Bones and Ligaments

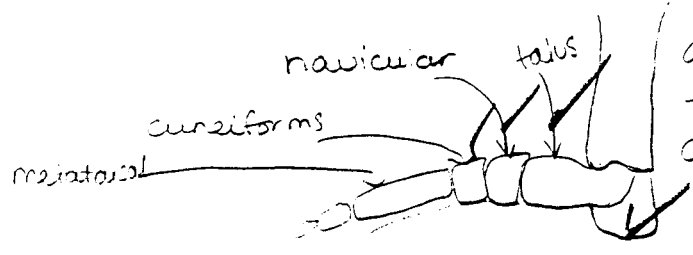
The hip consists of ~~three~~ bones which are fixed at the acetabulum. The ilium, ischium and pubis. The hip joint is a synovial, ball and socket joint. The head of the femur articulates with the acetabulum. The acetabulum has a labrum (cartilage) which deepens the socket for the femur head. This contributes to the stability of the hip joint. The hip joint is covered by a fibrous capsule. This is reinforced anteriorly by the iliofemoral ligament which covers the acetabulum and the neck of the femur anteriorly. This ligament prevents hyperextension of the hip. The pubofemoral ligament attaches to the joint anteriorly and medial to the iliofemoral ligament. The ischiofemoral ligament covers the joint posteriorly. The pubofemoral and ischiofemoral ligaments prevent overabduction. The sacrospinous ligament runs from the sacrum to the iliac spine and the sacrotuberous runs from the sacrum to the ischial tuberosity. These ligaments contribute to stabilizing the hip.

The gluteus maximus, superior gemellus and inferior gemellus, obturator internus, piriformis and quadratus femoris laterally rotate the hip. The gluteus minimus and gluteus medius medially rotate the hip. These muscles are antagonistic in that they prevent over rotation in the opposite direction. The gluteus muscles also can switch their

3. A 40-yr old male, working as a security guard in a local department store, comes to your office complaining that he can no longer stand for long periods of time. You note that the patient is overweight, and states that in the last year he has gained 40 lbs. Following a series of tests, including an imprint of his feet that showed no medial arch, your diagnosis is pes planus (flat feet). Discuss the medial longitudinal arch and indicate your understanding of the bones, ligaments, muscles, and fascial specializations. Relate your anatomical explanation to the clinical problems encountered in the patient, particularly a loss of sensation in the plantar aspect of the foot, and complaints of cold feet foot. (10 pts)



Medial Longitudinal arch

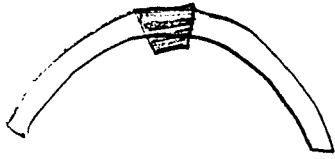


The medial longitudinal arch consists of the talus, navicular, 3 cuneiform and the first 5 metatarsal bones. It begins at the talus and ends at the metatarsal.

The medial longitudinal arch is supported medially by the ~~deltoid~~ ligaments. There are anterior and posterior tibiotalus ligaments, tibionavicular and tibiocalcaneal ligament. These ligaments are stronger than the lateral ligaments. The arch is supported by the spring ligament which supports the medial arch bones. It is also known as the ~~transverse~~ navicular ligament. The anterior and posterior tibialis muscles support the arch by providing suspension. The intrinsic muscles of the foot provide stabilization. These muscles include extensor hallucis ~~brevis~~, extensor digitorum ~~brevis~~, flexor digitorum ~~brevis~~ and flexor hallucis ~~brevis~~. Fascial specializations of the ~~plantar~~ fascia are the retinaculum. On the medial side, there is a flexor retinaculum which provides a passageway for the Tibialis posterior, Flexor digitorum ~~longus~~, posterior tibial artery and vein, tibial nerve and flexor hallucis longus. Anteriorly, there is a superior and inferior extensor

tendons and vessels,

Medial Arch Summary



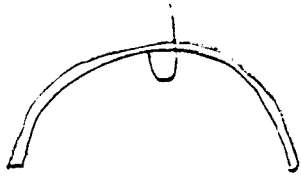
keystone of the arch = ~~navicular~~



Staples are the ligaments.
i.e. ~~deltoid ligaments~~



Tie beam is the plantar
~~aponeurosis~~, spring ligament



~~Suspension~~ is provided by ~~peroneus~~
longus, posterior and anterior tibialis.

The patient has flat feet so that there is no medial arch. The posterior ~~tibial~~ artery and ~~vein~~ run medially through the arch to the plantar aspect of the foot. The vessels are ~~squashed~~ so that the blood supply to the plantar foot is ~~impaired~~. This causes cold feet. The ~~tibial~~ nerve runs through the medial arch. The nerve is ~~also being~~ pressed upon. The tibial nerve splits into the lateral and medial plantar nerves. There is a loss of sensation due to the nerve being impaired by the flat foot.

4. While serving a clerkship in the orthopedic clinic, a 65-yr old male presents with a peculiar gait. Each time he lifts his left leg while going through the swing phase he leans to the right, appearing almost to balance his weight. During your history and physical he relates that a day earlier he went to a clinic complaining of a persistent cough and received an intragluteal injection of an antibiotic into the right gluteal region; you note a raised mark from the injection in the upper medial quadrant. Using your knowledge of the nerves, muscles, relationships, and function of the gluteal region, provide an explanation for these clinical findings. (8 pts) 6

The gluteal injections should be performed in the upper lateral quadrant to avoid damaging the nerves. The nerves which can be damaged are the sciatic and gluteal nerves.

The gluteus ~~minimus~~ and gluteus ~~medius~~ ~~muscles~~ function to counterbalance the lifting of a leg by switching their origins and insertions. The patient cannot counterbalance when lifting the leg so he leans to the affected side. The gluteus muscles are not switching origins and insertions indicating that they are impaired. The gluteus minimus and gluteus medius are innervated by the superior gluteal nerve. They perform medial rotation and abduction.

If the inferior gluteal nerve was damaged the patient would have impaired extension of the thigh and impaired lateral rotation. If the sciatic nerve was damaged, the posterior thigh muscles which are innervated by the tibial nerve and the anterior, posterior and lateral muscles of the leg would be impaired.

Due to the findings, the superior gluteal nerve would have been damaged.

5. Serving as a 1st year resident in cardiology you are asked to provide a comprehensive review of the right ventricle. What are the structural entities that support the function of the right ventricle? (8 pts) 6

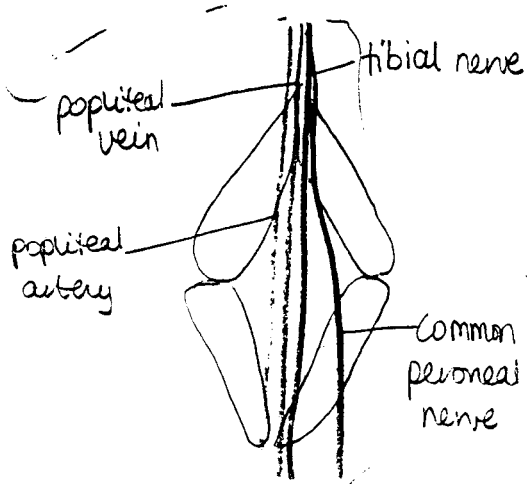
The right ventricle is composed of ~~trabeculae~~ carneae muscle. There is a moderator band also known as the septomarginal ~~trabeculae~~ which connects to the ~~anterior papillary~~ muscle. There are three anterior papillary muscles attached to inferior wall of the right ventricle. The papillary muscles are connected to chordae ~~tendinae~~ which attach to the three cusps of the right atrioventricular valve. This valve is known as a tricuspid valve. It prevents the backflow of blood to the right atrium. The papillary muscle contracts and the chordae ~~tendinae~~ pull on the cusps to keep them in position. There is a pulmonary valve connecting the right ventricle to the pulmonary artery. This valve prevents backflow of ~~blood~~ into the ventricle. It is known as a semilunar valve. It is a pulmonary valve. It also has 3 cusps. The semilunar valve has nodes which joint and keep the lunules together as the pressure of the blood shuts them.

6. A 37-yr old female complains of problems with swallowing. You suspect an abnormality in the posterior mediastinum and order an examination by mediastinoscope. Define the posterior mediastinum and discuss the contents (nerves, vasculature, viscera, lymphatics) in the posterior mediastinum? Provide an understanding of the relationship of the structures within the posterior mediastinum. (8 pts) ⑥

The posterior mediastinum has a posterior border of the thoracic vertebra. The anterior border is the pericardium. The lateral border is the thoracic pleura.

The posterior mediastinum contains the trachea which bifurcate into primary bronchi. The trachea is anterior to the esophagus which is anterior to the thoracic duct. The vagus nerves are on either side of the esophagus which give branches to the esophageal plexus. The phrenic nerves are also in the posterior mediastinum. The left phrenic nerve begins at the lower border of aortic arch and gives off the left recurrent laryngeal nerve which wraps around the aorta. The phrenic nerve continues downward and connects to the diaphragm.

The azygos vein is on the right, anterior to the vertebra. The accessory hemiazygos and hemiazygos the left posterior thorax. The superior and inferior venacava, the right and left brachiocephalic vein and brachiocephalic artery.



The popliteus muscle exits the popliteal fossa. It is anterior to the popliteal artery, vein and the tibial nerve.

The femoral artery and vein enter the adductor canal and leave through the adductor hiatus as popliteal artery and vein which enter popliteal fossa. The tibial nerve enters and gives off the common peroneal nerve.

lateral
sciatic

Both nerves leave the popliteal fossa. The popliteal artery and vein leave the popliteal fossa inferior and then the popliteal artery branches into the anterior and posterior tibial arteries. The posterior tibial artery gives off the peroneal artery. The nerve within the popliteal fossa is superficial to the popliteal vein and superficial to the popliteal artery.

Lymphatic drainage

Lymph nodes are within the popliteal fossa which drain into axillary lymphatic ducts which will drain into the veins of the leg.

- The tibial nerve is superficial to the popliteal artery and vein. The common peroneal nerve is lateral to the tibial nerve and the popliteal artery and vein.