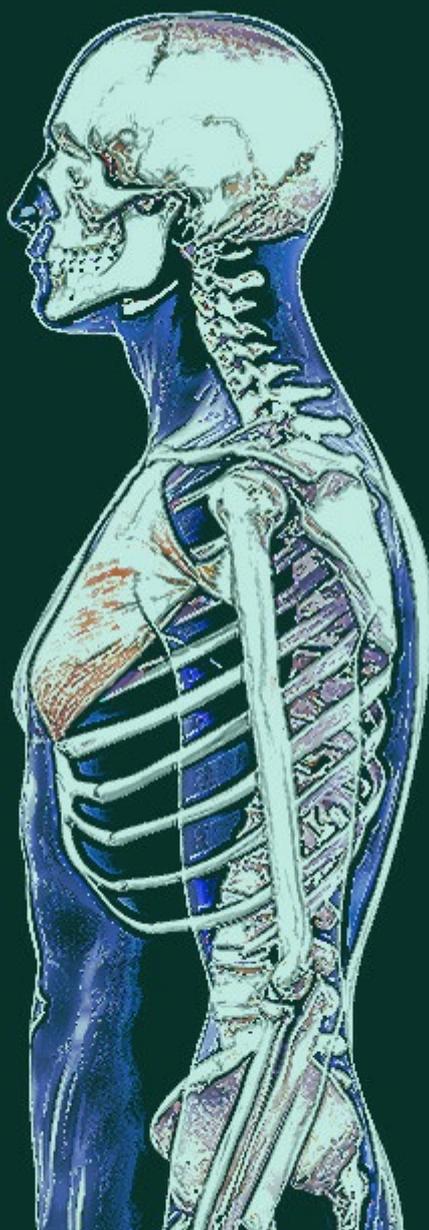


Human Anatomy Synopsis: Pelvic Girdle & Lower Limb

Gerard Gorniak; William Conrad



GERARD GORNIAK &
WILLIAM CONRAD

HUMAN ANATOMY SYNOPSIS: PELVIC GIRDLE & LOWER LIMB

Human Anatomy Synopsis: Pelvic Girdle & Lower Limb

1st edition

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ISBN 978-87-403-2039-8

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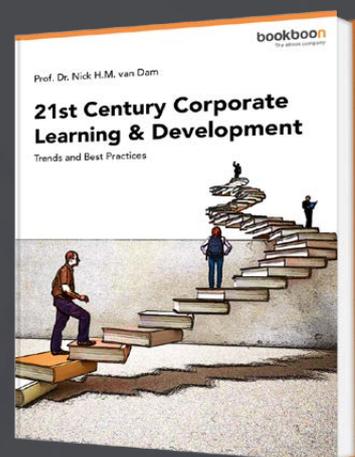
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PREFACE

This is one of a series of 4 Human Anatomy Synopses that are based on over 40 years of Anatomy course notes used in the graduate education of health care professions. This series started as a detailed content outline for a course developed for medical students back in 1983. Since that time, it has undergone many revisions and additions. In 2008 and 2014, text and illustrations were reviewed and revised, and study sections were added throughout the text. In 2017, the 4 Synopses were developed, and the text and illustrations formatted to be used by students as a supplement to anatomy courses.

The 4 Human Anatomy Synopses in this series are: Spine and Neck, Axilla and Upper Limb, Pelvic Girdle and Lower Limb, and Thorax, Abdomen, and Pelvis. There are numerous illustrations and Tables. Many of the Tables have clinical relevance. This PELVIC GIRDLE AND LOWER LIMB SYNOPSIS contains the osteology, joints and ligaments, nerves and muscles of the pelvic girdle and lower limb, and tables of lesion of the nerves of the lower limb. In this Synopsis, major structures are CAPTILIZED. This feature allows students to make a study outline by linking together these words under each title or subtitle. After each content area, there are short answer Study Questions to help students relate and apply the anatomy. The answers to these questions are included at the end of the Synopsis.

These Synopses are only possible because of the works of the many anatomists and other basic scientists as well as numerous clinicians who have contributed to our knowledge and understanding of the human body. I am most grateful to them for sharing what they learned. I am also grateful to the many students who over the years, have made comments and suggestions about the content of this work. I am also grateful to Drs. Hilmir Augustsson, Jeff Rot, Ed Kane, Sue Curfman, Jim Viti, and Mrs. Jackie Nelson and to the University of St Augustine for Health Sciences for help with this publication.

This book is dedicated to all those people who have so generously donated their body to science so that we may learn. Thank you for the unselfish gift of yourself to others. May God bless you for your contribution to mankind.

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1 PELVIC GIRDLE AND HIP JOINT

1.1 OSTEOLOGY

BONY PELVIS (Figs.1-1, 1-2, 1-3)

- **SACRUM** and **COCCYX** posterior part of bony pelvis
- **ILIUM** superior lateral part of pelvis and innominate bone
 - **ILIAC FOSSA** where the iliacus muscle
 - **TUBEROSITY** of the **ILLIUM**
 - **AURICULAR SURFACE** for sacroiliac joint
 - **ANTERIOR SUPERIOR ILIAC SPINE**
 - **ANTERIOR INFERIOR ILIAC SPINE**
 - **ILIAC CREST** and **TUBERCLE**
 - **POSTERIOR SUPERIOR ILIAC SPINE**
 - Superior part of **ACETABULUM**
- **ISCHIUM** inferior lateral part of pelvis and innominate bone
 - **ISCHIAL TUBEROSITY**
 - **ISCHIAL SPINE**
 - **GREATER SCIATIC NOTCH**
 - **LESSER SCIATIC NOTCH**
 - **SUPERIOR ISCHIAL RAMUS**
 - **INFERIOR ISCHIAL RAMUS**
 - **OBTURATOR FORAMEN** formed by ischial rami
 - Posterior part of **ACETABULUM**
- **PUBIC BONE** anterior part of pelvis and innominate bone
 - **INFERIOR PUBIC RAMUS**
 - **SUPERIOR PUBIC RAMUS**
 - **OBTURATOR FORAMEN** for by pubic rami
 - **PUBIC CREST**
 - **PUBIC TUBERCLE**
 - anterior part of **ACETABULUM**
- **SACROILIAC JOINT** is the articulation of innominate bone with the sacrum
- **PUBIC SYMPHYSIS**
 - Fibrocartilage plate between anterior ends of pubic bone
 - **PUBIC ARCH** is angle formed below pubic symphysis by both inferior pubic rami
- **INNOMINATE BONE** formed by fusion of the ilium, ischium, and pubic bones on one side

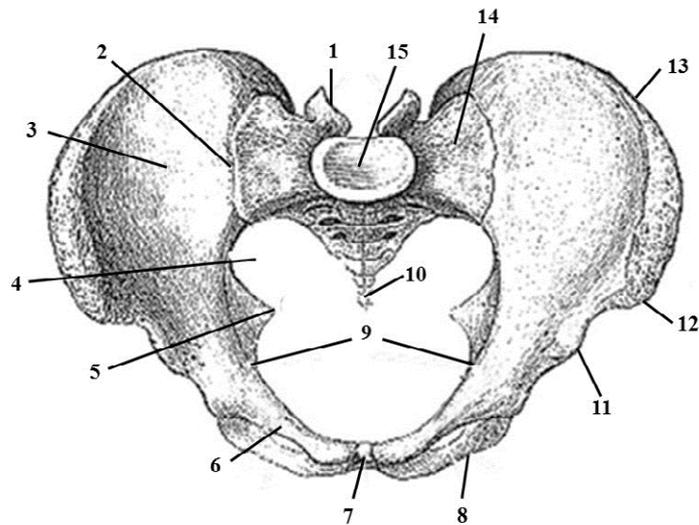


Fig. 1-1. Pelvis: superior view: 1. superior articular facets of S1, 2. sacroiliac joint, 3. iliac fossa, 4. greater sciatic notch, 5. ischial spine of ischium, 6. superior pubic ramus 7. symphysis pubis, 8. inferior pubic ramus 9. iliopubic line, 10. coccyx, 11. anterior inferior iliac spine, 12. anterior superior iliac spine 13. iliac crests, 14. sacral ala, 15. body of S1. (Modified from Gray 1918)

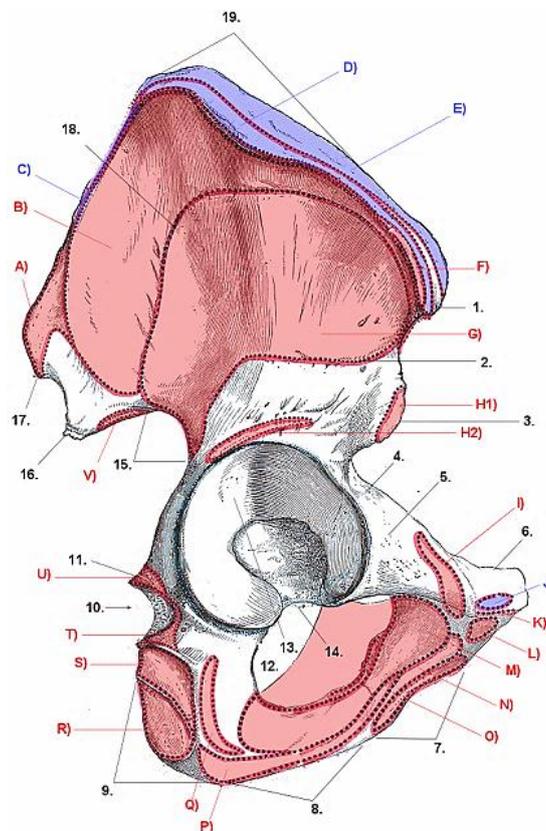


Fig. 1-2. Pelvic Girdle: Lateral view of the innominate bone showing: 1. ASIS, 2. inferior gluteal line, 3. AIIS, 4. iliopectineal eminence, 5. superior pubic ramus, 6. crest of pubis, 7. inferior pubic ramus, 8. inferior ramus of ischium, 9. ischial tuberosity, 10. lesser sciatic notch, 11. spine of ischium, 12. obturator foramen, 13. acetabulum, 14. acetabular notch, 15. greater sciatic notch, 16. PIIS, 17. PSIS, 18. anterior gluteal line, and 19. iliac crest. The alphabetical labels show muscle origins

(red) and insertions (blue): A) Gluteus maximus, B) gluteus medius, C) latissimus dorsi, D) external abdominal oblique, E) internal abdominal oblique, F) tensor fascia lata, G) gluteus minimus, H1 and 2) rectus femoris, I) pectineus, J) rectus abdominis, K) pyramidalis, L) adductor longus, M) obturator externus, N) adductor brevis, O) gracilis, P) adductor magnus, Q) quadratus femoris, R) semitendinosus and long head of biceps femoris, S) semimembranosus, T) gemellus inferior, U) gemellus superior, and V) piriformis. (Modified from Gray 1918)

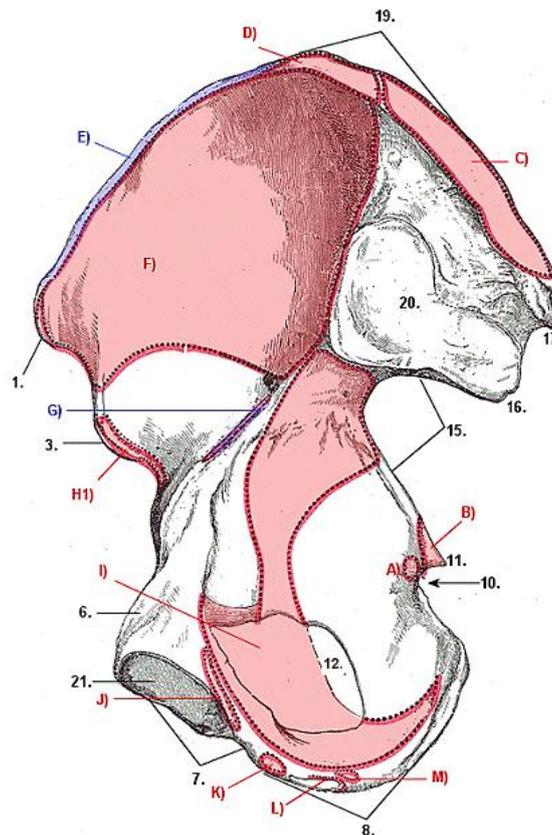


Fig. 1-3. Pelvic Girdle: Medial view of the innominate bone showing: 1. ASIS, 3. AIIIS, 6. crest of pubis, 7. inferior pubic ramus, 8. inferior ramus of ischium, 10 lesser sciatic notch, 11. spine of ischium, 12. obturator foramen, 15. greater sciatic notch, 16. PIIS, 17. PSIS, 19. iliac crest, 20 auricular articulation of sacroiliac joint, 21. Pubic symphysis articulation. The alphabetical labels show muscle origins (red) and insertions (blue): A) Levator ani, B) coccygeus, C) sacrospinalis, D) quadratus lumborum, E) transverse abdominis, F) iliacus, G) psoas minor, H1) rectus femoris (AIIIS origin), I) obturator internus, J) pubococcygeus, K) constrictor urethrae, L) ischicavernosus, and M) superficial perineal muscle. (Modified from Gray 1918)

PROXIMAL FEMUR (Fig. 1-4)

- 1) **HEAD** with small circular indentation called the **FOVEA CAPITIS**
- 2) **NECK** extends from the head to the greater and lesser trochanter
- 3) **GREATER TROCHANTER** lies lateral and posterolateral to the femoral neck
- 4) **LESSER TROCHANTER** lies posteromedial to the femoral neck
- 5) **INTERTROCHANTERIC CREST** lies posteriorly and runs from the greater to the lesser trochanter

- 6) **TROCHANTERIC FOSSA** that lies between the neck and the greater trochanter
 7) **INTERTROCHANTERIC LINE** lies anteriorly and runs from the greater to the lesser trochanter

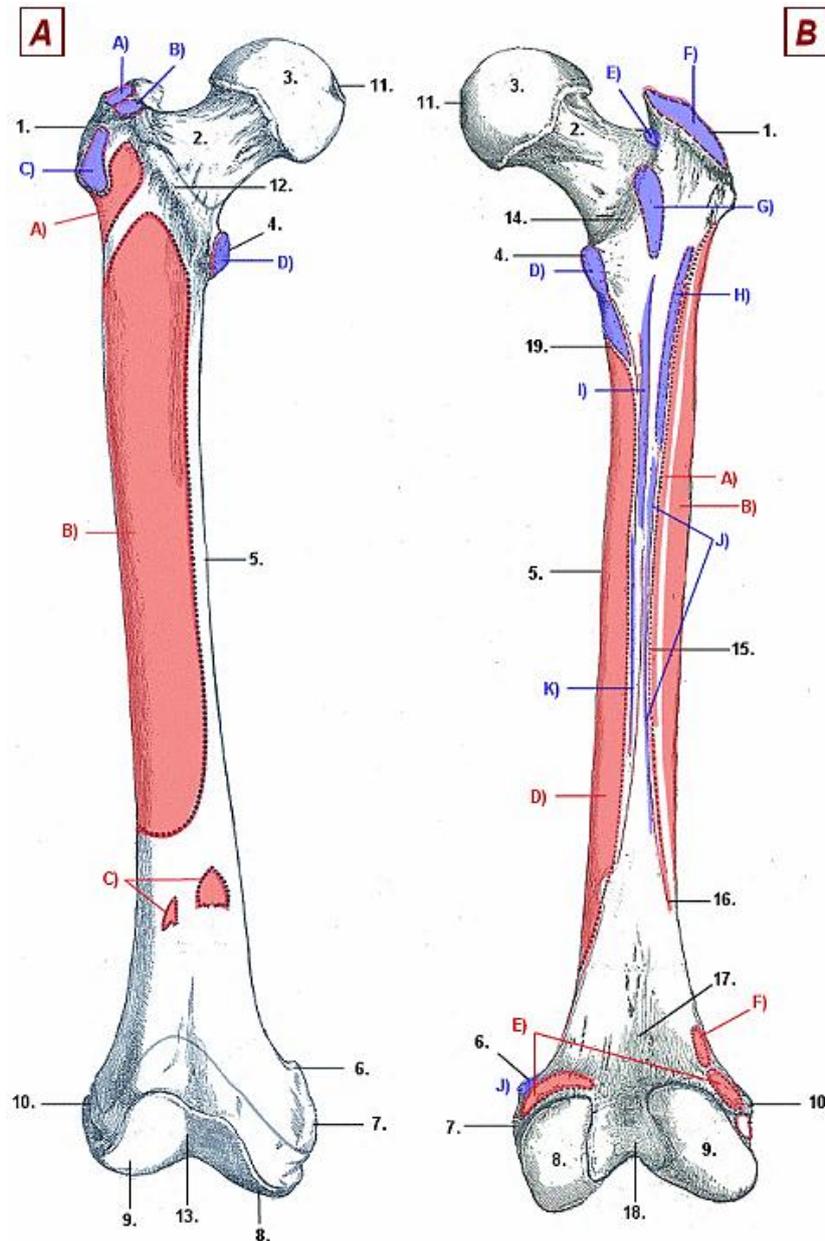


Fig. 1-4. Pelvic Girdle: Drawings of the femur in anterior (A) and posterior (B) view: 1. Greater trochanter, 2. neck, 3. head, 4. lesser trochanter, 5. shaft, 6. adductor tubercle, 7. medial epicondyle, 8. medial condyle, 9. lateral condyle, 10. lateral epicondyle, 11. fovea capitis, 12. intertrochanteric line, 13. patellar surface, 14. intertrochanteric crest, 15. linea aspera, 16. lateral supracondylar line, 17. popliteal surface, 18. intercondylar fossa, and 19. spiral line. The alphabetical labels show muscle origins (red) and insertions (blue). Origins: A) vastus lateralis, B) vastus intermedius, C) articularis genu, D) vastus medialis, E) gastrocnemius, and F) plantaris. Insertions: A) piriformis, B) obturator internus and gemelli, C) gluteus minimus, D) iliopsoas, E) obturator externus, F) gluteus medius, G) quadratus femoris, H) gluteus maximus, I) adductor brevis, J) adductor magnus, and K) adductor longus. (Modified from Gray 1918)

1.2 JOINTS, LIGAMENTS, BURSAE

1.2.1 JOINTS

SACROILIAC JOINT

- **AURICULAR SURFACE** of the **SACRUM**
- **AURICULAR SURFACE** of the **ILIUM**

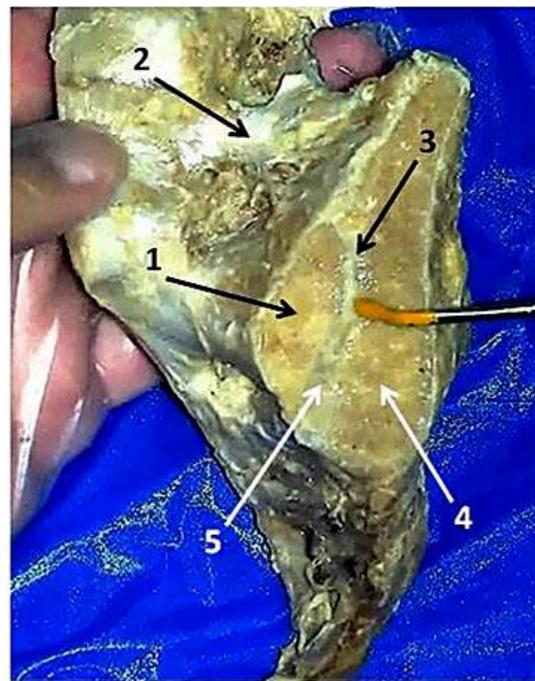
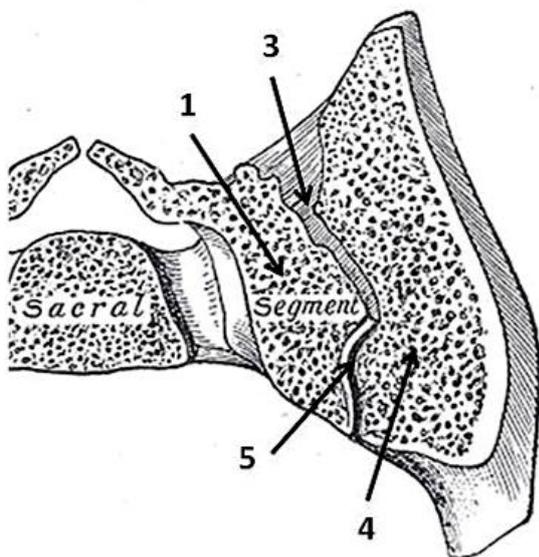


Fig. 1-5. Sacroiliac Joint (LEFT) Drawing of an oblique transverse section of the sacroiliac joint (modified from Gray 1918). (RIGHT) Photograph of an oblique sagittal section of the sacroiliac joint. 1. Sacrum, 2. Iliolumbar ligament, 3. Fibrous interosseous part of the joint, 4. Ilium, 5. Hyaline cartilage part of the joint.

PUBIC SYMPHYSIS (Fig. 1-1)

- fibrous type joint with fibrocartilage disc
- interconnects the anterior ends of the pubic bone.

HIP JOINT (Figs. 1-1, 1-2, 1-6, 1-8, 1-9)

- **FEMORAL HEAD** articulates with the **ACETABULUM** of innominate bone
- **ACETABULAR LABRUM** is a fibrocartilage lip that deepens acetabulum
- **ACETABULAR NOTCH** is an opening in inferior acetabulum that is bridged by the **TRANSVERSE ACETABULAR LIGAMENT**
- **FOVEA CAPITIS** on the femoral head for the **ROUND LIGAMENT** (ligamentum teres) of the **FEMUR** carrying blood to femoral head

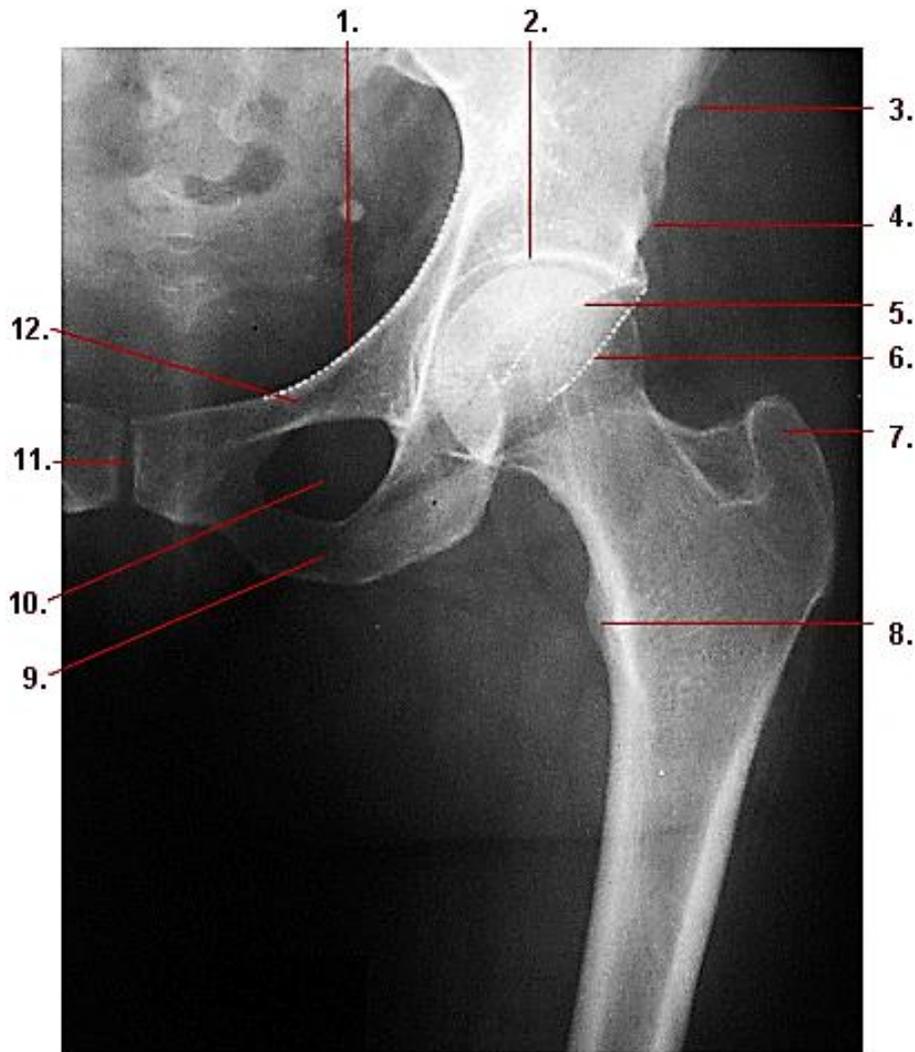


Fig. 1-6. Pelvic Girdle: AP radiograph of the left hip. 1. Iliopubic line, 2. hip joint, 3. ASIS, 4. AIIS, 5. anterior margin of acetabulum, 6. posterior margin of acetabulum, 7. greater trochanter, 8. lesser trochanter, 9. inferior pubic ramus, 10. obturator foramen, 11. pubic symphysis, and 12. superior pubic ramus.

1.2.2 LIGAMENTS

SACROILIAC JOINT (Fig. 1-7)

- **SHORT DORSAL SACROILIAC LIGAMENTS**
- **LONG DORSAL SACROILIAC LIGAMENTS**
- **STRONG INTEROSSEOUS LIGAMENTS**
- **VENTRAL SACROILIAC LIGAMENTS**
- **SACROSPINOUS and SACROTUBEROUS LIGAMENTS**

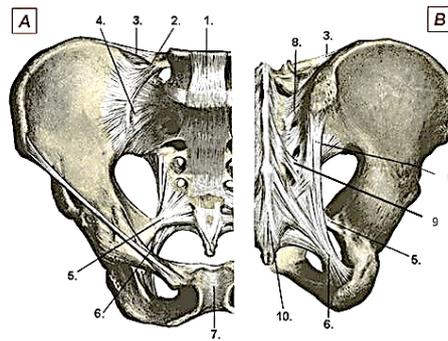


Fig. 1-7. Images, in anterior (A) and posterior (B) view, showing the iliolumbar and sacroiliac ligaments. 1. Ventral longitudinal ligament. 2. and 3. Iliolumbar ligament. 4. Ventral sacroiliac (SI) ligament. 5. Sacrospinous ligament. 6. Sacrotuberous ligament. 7. Pubic symphysis. 8. Short dorsal SI ligaments. 9. Long dorsal SI ligament. 10. Supraspinous ligament. (Modified from Gray 1918)

PUBIC SYMPHYSIS

- **SUPERIOR PUBIC LIGAMENT** between the pubic tubercles
- **ARCUATE LIGAMENT** connects to the pubic arch and the disc.

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HIP JOINT (Figs. 1-8, 1-9)

- **JOINT CAPSULE** with prominent inferior circular band called the **ZONA ORBICULARIS**
- **ILIOFEMORAL** or “**Y**” **LIGAMENT**
 - superior anterior part of the capsule.
 - attaches medially to the anterior inferior iliac spine and the adjacent body of the ilium
 - **SUPERIOR** (upper) and **INFERIOR** (lower) bands attach to the anterior greater trochanter and the intertrochanteric line
- **PUBOFEMORAL LIGAMENT**
 - inferior anterior part of the capsule
 - attaches medially to the pubic body and adjacent superior pubic ramus
 - blends with the Inferior (lower) band of the iliofemoral ligament to attach to lower anterior femoral neck
- **ISCHIOFEMORAL LIGAMENT**
 - posterior part of the joint capsule
 - attaches medially to posterior and inferior acetabulum
 - twists to attach to the posterior base of the greater trochanter and the femoral neck.

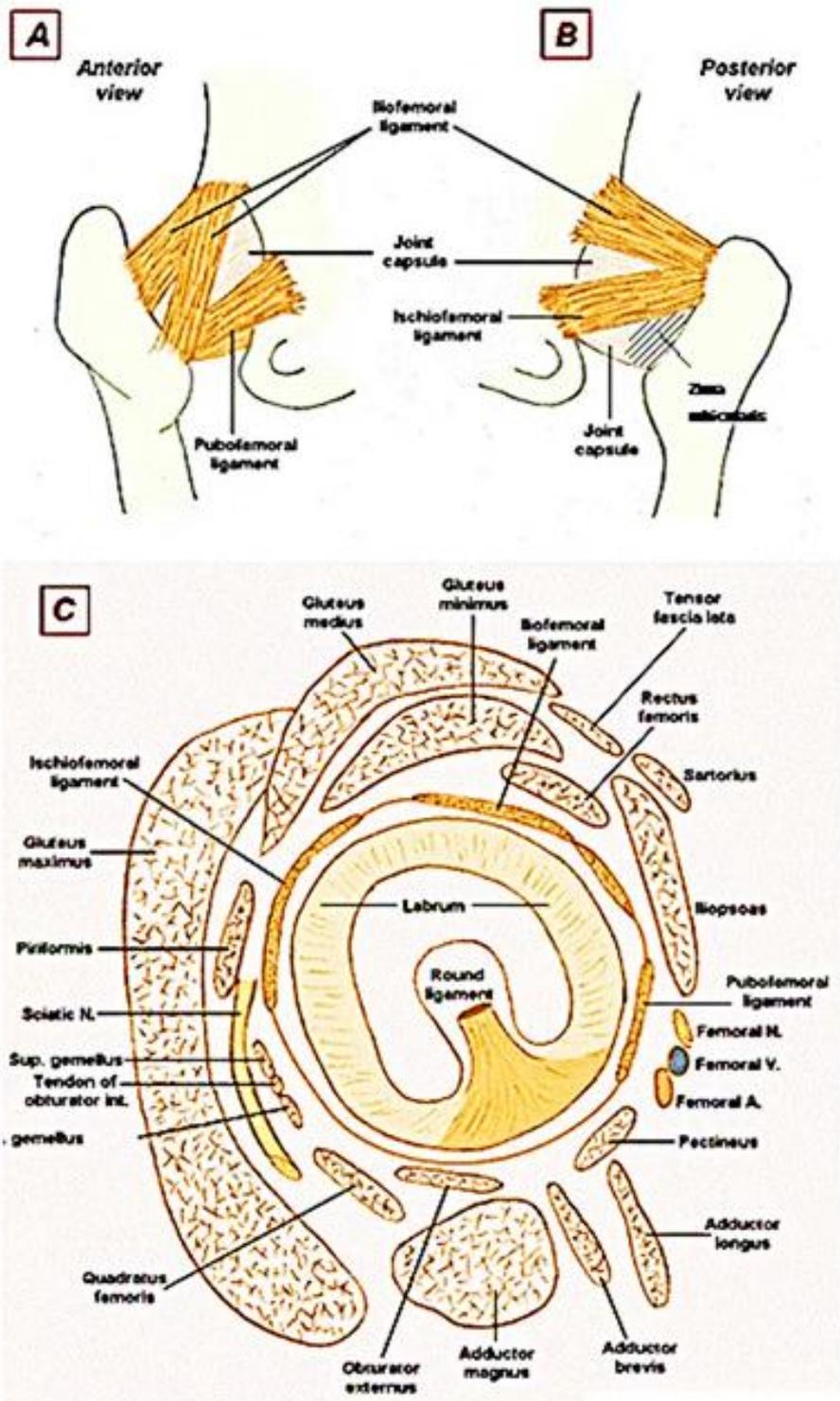


Fig. 1-8. Pelvic Girdle: Drawings of the hip joint in an anterior view (A) and posterior view (B) showing the iliofemoral, pubofemoral and ischiofemoral ligaments, and with the head of the femur removed (C) looking at the acetabulum – surrounding muscular and ligamentous structures.

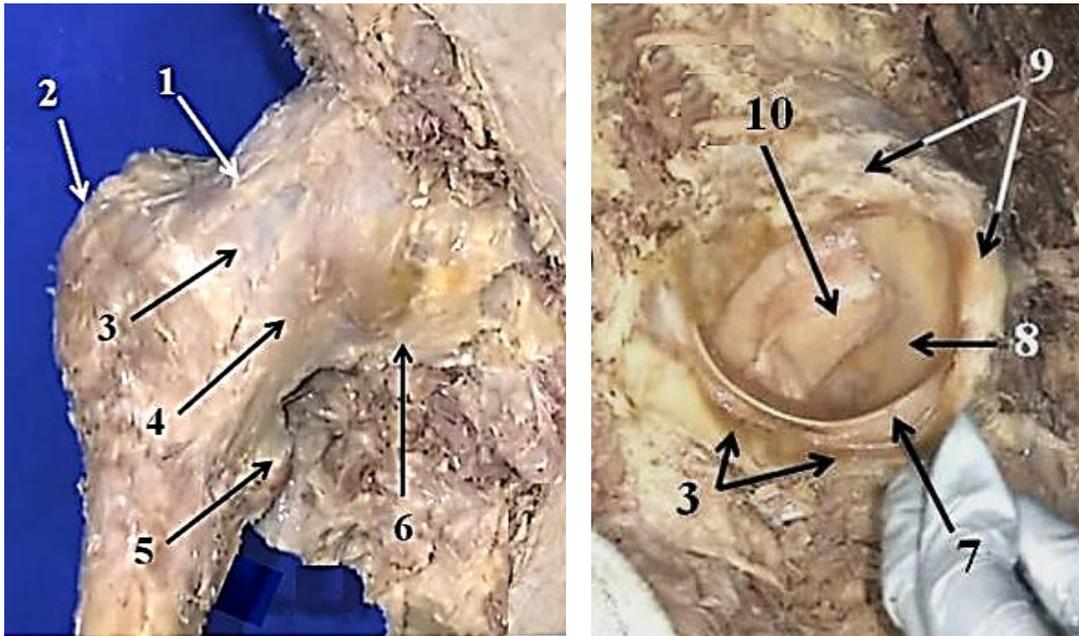


Fig. 1-9. Pelvic Girdle: Dissection of anterior hip joint (LEFT) and joint with femoral head removed (RIGHT).
1. Superior band of iliofemoral lig., 2. Greater trochanter, 3. Joint capsule, 4. Inferior band of iliofemoral lig., 5. Lesser trochanter, 6. Pubofemoral lig, 7. Acetabular labrum, 8. Articular surface of acetabulum, 9. Iliofofemoral lig. (cut), 10, Round lig. of the femur.



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1.2.3 BURSAE (FIG. 1-10)

- **OBTURATOR INTERNUS BURSA** between the tendon of the obturator internus muscle and the area between the ischial tuberosities and ischial spine that is crossed by this tendon
- **OBTURATOR EXTERNUS BURSA** between the tendon of the obturator externus and the posterior surface of the femoral neck
- **TROCHANTERIC BURSA** between the gluteus maximus and the greater trochanter of the femur
- **GLUTEOFEMORAL BURSA** between the gluteus maximus and the vastus lateralis division of the quadriceps femoris
- **ISCHIAL BURSA** between the gluteus maximus and the ischial tuberosity.

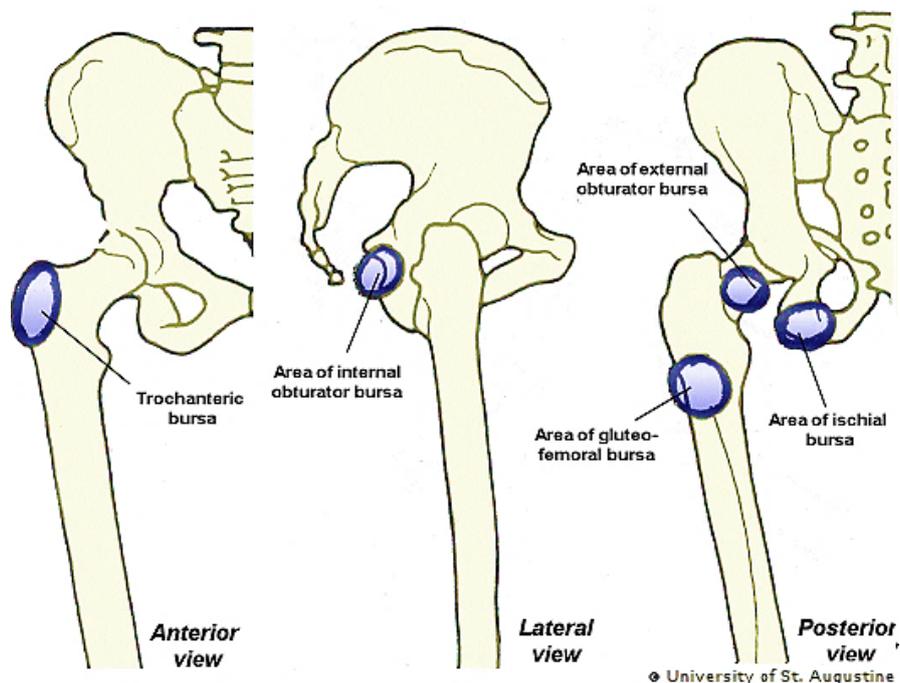


Fig. 1-10. Pelvic Girdle: Drawing showing the locations of the bursae of the pelvic girdle.

1 – Study questions:

- 1) What bones and ligaments comprise the sacroiliac joint?
- 2) What are the parts of the innominate bone?
- 3) What bones and ligaments comprise the hip joint?
- 4) The trochanteric bursa lies between what structures? What about the ischial bursa?

1.3 PELVIC ARTERIES (FIGS. 1-11, 1-12)

EXTERNAL ILIAC ARTERY

- off **COMMON ILIAC** from **ABDOMINAL AORTA**
- **DEEP CIRCUMFLEX ILIAC ARTERY** to abdominal wall
- **INFERIOR EPIGASTRIC ARTERY** to the abdominal wall
- **FEMORAL ARTERY** to the lower limb

INTERNAL ILIAC ARTERY

- **ANTERIOR DIVISION**
 - **UMBILICAL ARTERY** gives off **SUPERIOR VESICAL ARTERIES** to the superior aspect of the bladder
 - **OBTURATOR ARTERY** to muscles of the medial thigh
 - **MIDDLE RECTAL ARTERY** to the rectum in both genders and the prostate and seminal vesicles in males, and vagina in females
 - **INTERNAL PUDENDAL ARTERY** gives off the **INFERIOR RECTAL ARTERY** to rectum arteries to the perineum
 - **INFERIOR GLUTEAL ARTERY** to muscles in the gluteal region and posterior thigh.
 - **INFERIOR VESICAL ARTERY** (male) to inferior bladder, prostate, and seminal vesicles
 - **UTERINE ARTERY** (female) to the uterus and upper vagina.
 - **VAGINAL ARTERIES** (female) to the vagina, inferior bladder, and pelvic urethra.
 - **MEDIAN SACRAL ARTERY** to sacral spinal roots and posterior rectum
- **POSTERIOR DIVISION**
 - **ILIOLUMBAR ARTERY** to iliacus, psoas major, and quadratus lumborum muscles
 - **SUPERIOR GLUTEAL ARTERY** to the gluteal muscles in that region
 - **LATERAL SACRAL ARTERY** to meninges and sacral spinal nerve roots

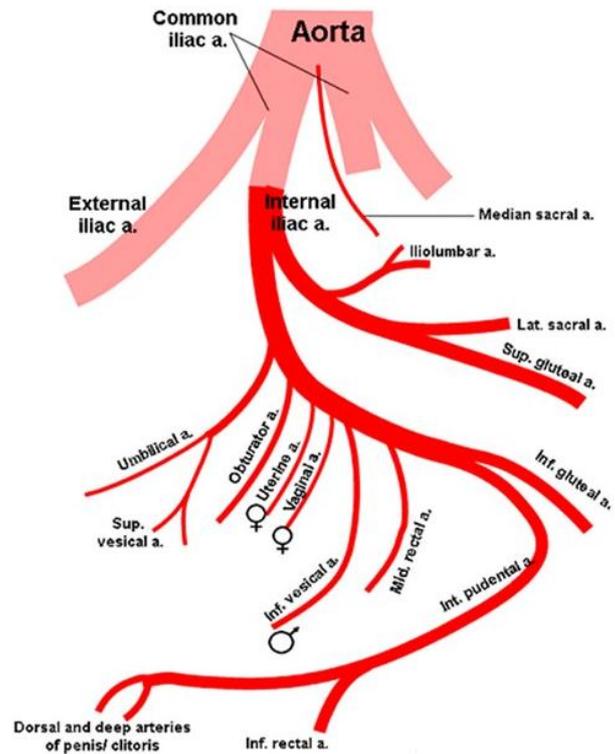


Fig. 1-11. Pelvis: Diagram of the internal iliac artery with its branches on one side in the pelvic region.

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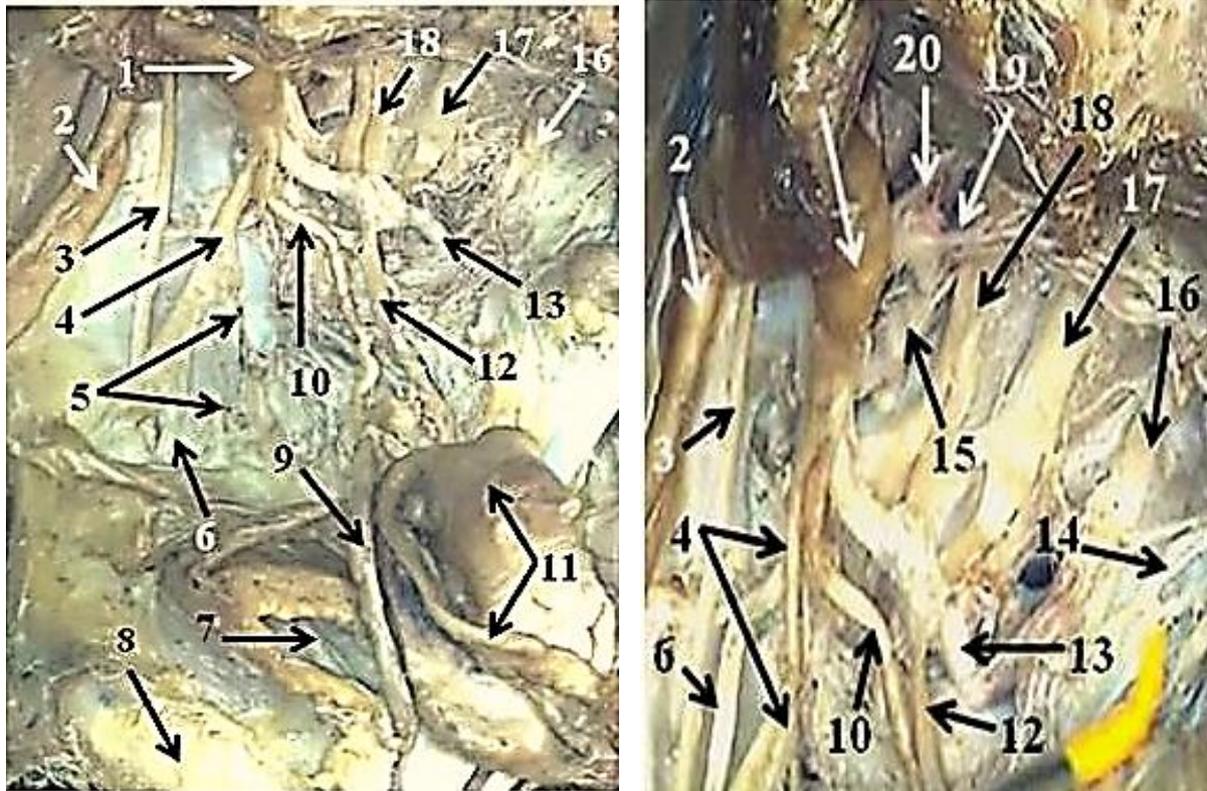


Figure 1-12. Female Pelvis: Photographs of the branches off the anterior division (LEFT) and posterior division (RIGHT) of the internal iliac artery. 1. Internal iliac artery, 2. External iliac artery, 3. Obturator nerve, 4. Umbilical artery, 5. Superior vesicular arteries, 6. Obturator artery, 7. Urinary bladder, 8. Pubic symphysis, 9. Ureter, 10. Uterine (vaginal artery comes off near the uterus and is not shown), 11. Uterus and Uterine tube, 12. Middle rectal artery, 13. Inferior gluteal artery, 14. Pelvic splanchnic nerves, 15. Superior gluteal artery, 16. S3 spinal nerve, 17. S2 spinal nerve, 18. S1 spinal nerve, 19. Lateral sacral artery, 20. Iliolumbar artery.

HIP JOINT BLOOD SUPPLY

- FEMORAL MEDIAL AND LATERAL CIRCUMFLEX ARTERIES
- OBTURATOR ARTERY
- SUPERIOR GLUTEAL ARTERY
- INFERIOR GLUTEAL ARTERY

2 – Study questions:

- 1) Which arteries arise from the posterior division of the internal iliac artery?
- 2) Which arteries off the internal iliac artery is found only in the male?
- 3) Describe what structures would be affected in the blockage of the following arteries:
 - a. Umbilical a.
 - b. Middle rectal a.
 - c. Uterine a.
 - d. Lateral sacral a.

1.4 PELVIC NERVES

LUMBAR PLEXUS (Figs. 1-12, 1-13, TABLE 1-2).

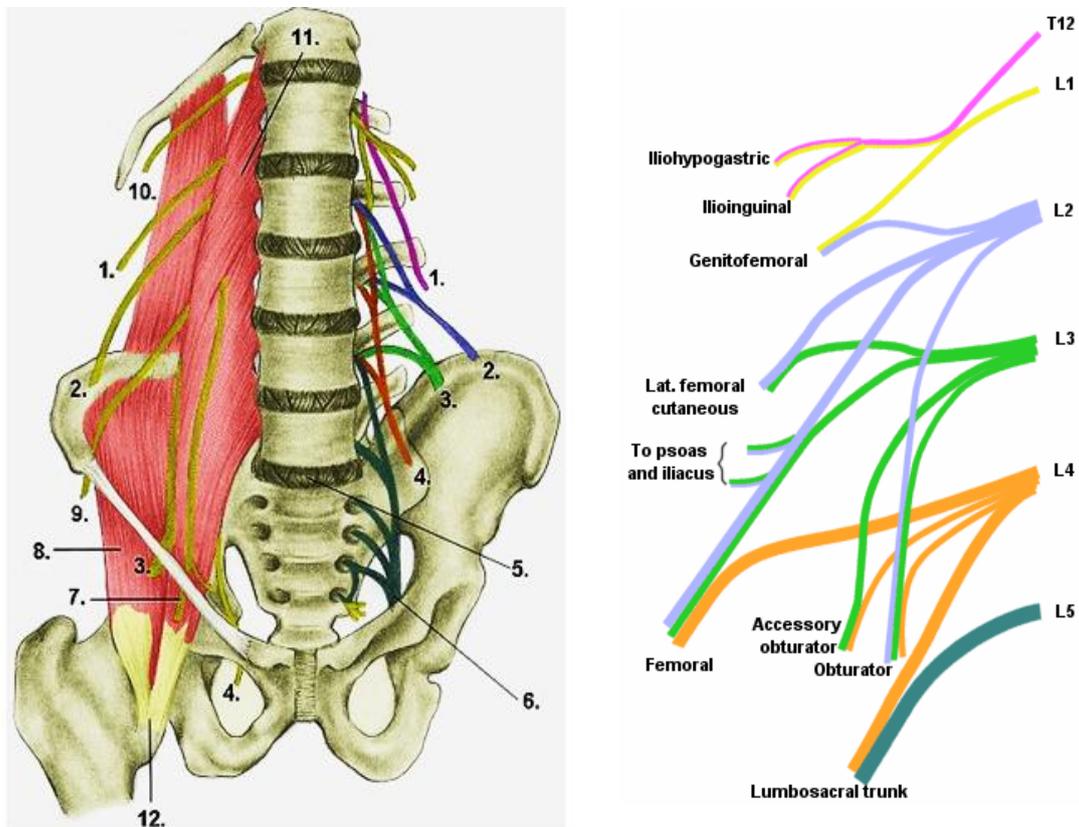


Fig. 1-13. Drawings of the posterior abdominal wall showing the muscles and the nerves of the lumbar plexus. 1. iliohypogastric N., 2. ilioinguinal N., 3. femoral N., 4. obturator N., 5. intervertebral disc, 6. sciatic N., 7. genitofemoral N., 8. iliacus muscle, 9. lateral femoral cutaneous N., 10. subcostal N., 11. psoas major and 12. iliopsoas tendon.

- **VENTRAL RAMI** of **L1** through **L5** spinal nerves
- **ILIOHYPOGASTRIC NERVE (L1)**
 - **SENSORY** to the lateral gluteal region, and hypogastric abdominal region
 - **MOTOR** to the external and internal abdominal obliques and transverse abdominis.
- **ILIOINGUINAL NERVE (L1)**
 - **SENSORY** to the pubic symphysis, inguinal region, anterior scrotum and labia majora
 - **MOTOR** to the internal abdominal oblique and transverse abdominis.
- **GENITOFEMORAL NERVE (L1; L2)**
 - **SENSORY** by **FEMORAL BRANCH** to femoral triangle and by **GENITAL BRANCH** to the anterior scrotum and anterior labia majora.
 - **MOTOR** none

- **LATERAL FEMORAL CUTANEOUS NERVE (L2, L3)**
 - **SENSORY** to the skin over the lateral thigh.
 - **MOTOR** none
- **FEMORAL NERVE (L2, L3, L4)**
 - **SENSORY** to the anterior thigh, medial leg, and medial ankle.
 - **MOTOR** to the anterior thigh muscles
- **OBTURATOR NERVE (L2, L3, L4)**
 - **SENSORY** to the medial thigh
 - **MOTOR** to the hip adductor muscles
- **LUMBOSACRAL TRUNK (L4; L5)**
 - **SENSORY** to join the sacral plexus
 - **MOTOR** to join the sacral plexus



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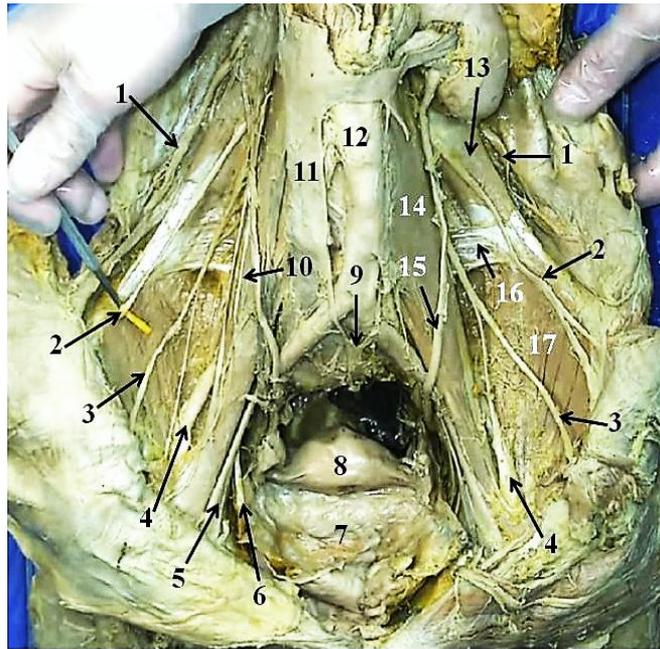


Figure 1-14. Photograph to a dissection of the posterior abdominal and pelvis. 1. Iliohypogastric nerve, 2. Ilioinguinal nerve, 3. Lateral femoral cutaneous nerve, 4. Femoral nerve, 5. External iliac artery, 6. Obturator nerve, 7. Urinary bladder, 8. Uterus, 9. Superior hypogastric plexus, 10. Genitofemoral nerve, 11. Inferior vena cava, 12. Abdominal aorta, 13. Quadrates lumborum muscle, 14. Psoas major muscle, 15. Ureter, 16. Iliolumbar ligament, 17. Iliacus muscle.

	L1	L2	L3	L4	L5	S1	S2	S3	S4
Iliohypogastric N. S= lat glut region, hypogastric region of abdomen M= external & internal abd obliques transverse abdominis	X								
Ilioinguinal N. S= skin over pubic symph, inguinal region, scrotum M= internal abd oblique, transverse abdominis	X								
Genitofemoral N. S= femoral br. to skin over femoral triangle; genital br. to scrotum/ labia major	X	X							
Lateral femoral cutaneous N. S= skin over lateral thigh		X	X						
Femoral N. S= skin of ant thigh & med leg and foot M= quadr fem, psoas major, iliacus, pectineus, sartorius		X	X	X					
Obturator N. S= skin of med thigh M= adductors of hip		X	X	X					
Lumbosacral trunk				X	X				
Sciatic N. Post thigh, lower leg, ankle, foot				X	X	X	X	X	
Superior gluteal N. S= post hip region M= gluteus med & min				X	X	X			
Inferior gluteal N. S= post hip region M= gluteus max					X	X	X		
N. to quadratus fem				X	X	X			
N. Obturator internus					X	X	X		
Pudendal N. S= external genitalia M= muscles of the perineum, ext anal sphincter							X	X	X
N. to piriformis						X	X		
N. to pelvic diaphragm M= levator ani, coccygeus								X	X

TABLE 1-1: Pelvic Nerves showing the sensory (S) and (M) components and the spinal nerve origins.

SACRAL PLEXUS (Figs. 1-15, 1-16, TABLE 1-1)

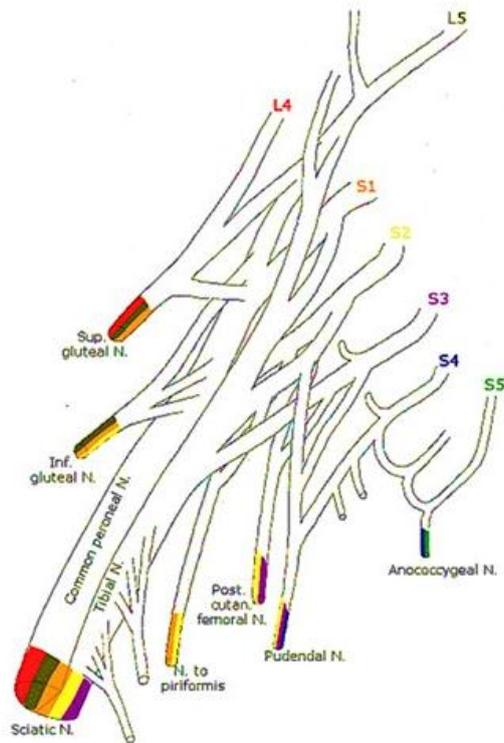


Fig. 1-15. Pelvis: Diagram of the sacral plexus.

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- **LUMBOSACRAL TRUNK (L4 and L5)** and **VENTRAL RAMI** of **S1 – S4**
- **SCIATIC NERVE (L4 – S3)** to the posterior thigh, lower leg, ankle, and foot
- **SUPERIOR GLUTEAL NERVE (L4 – S1)** to the gluteus medius and minimus and hip
- **INFERIOR GLUTEAL NERVE (L5 – S2)** to the gluteus maximus and hip
- **NERVE TO THE QUADRATUS FEMORIS (L4 – S1)** to quadratus femoris muscle and inferior gemellus muscle
- **NERVE TO THE OBTURATOR INTERNUS (L5 – S2)** to the obturator internus muscle and superior gemellus muscle
- **PUDENDAL NERVE (S2 – S4)** to the muscles of the perineum, the external anal sphincter, and to the external genitalia
- **NERVE TO THE PIRIFORMIS (S1 – S2)** to the piriformis muscle
- **NERVE TO THE PELVIC DIAPHRAGM (S3 – S4)** to the levator ani and coccygeus muscles

SENSORY INNERVATION OF HIP JOINT

- **FEMORAL NERVE** (Lumbar Plexus)
- **OBTURATOR NERVE** (Lumbar Plexus)
- **SCIATIC NERVE** by nerve to the quadratus femoris (Sacral Plexus)
- **SUPERIOR GLUTEAL NERVE** (Sacral Plexus)
- **INFERIOR GLUTEAL NERVE** (Sacral Plexus)

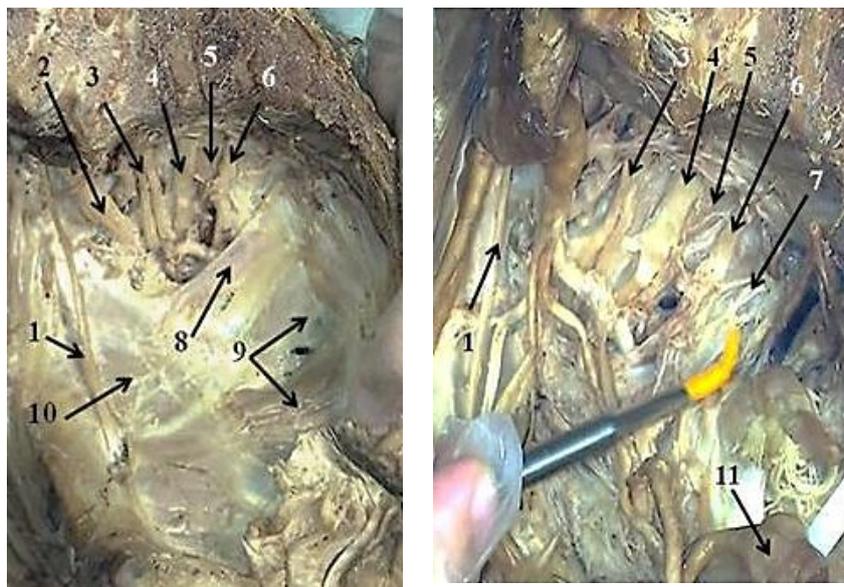


Fig 1-16. Dissections of the sacral plexus. (LEFT) Low magnification view of the pelvic floor showing the nerves and muscle in this region. (RIGHT) High magnification of the sacral plexus. 1. Obturator nerve. 2. Lumbosacral nerve trunk, 3. S1 nerve, 4. S2 nerve, 5. Piriformis muscle, 6. S3 nerve, 7. Pelvic splanchnic nerves off of S4 (probe), 8. Coccygeus muscle, 9. Levator ani, 10. Obturator internus muscle, 11. Uterus and Uterine tube.

1.5 **GLUTEAL REGION** (from the iliac crest superiorly to the gluteal fold inferiorly and to body midline medially)

1.5.1 **CONTENTS** (Figs. 1-11, 1-15, 1-16, 1-17, 1-18, 1-19, TABLE 1.1)

- 1) **ILIOHYPOGASTRIC** nerve
- 2) **SUPERIOR GLUTEAL** nerve, artery, and vein
- 3) **INFERIOR GLUTEAL** nerve, artery, and vein
- 4) **SCIATIC** nerve
- 5) **NERVE** to the **OBTURATOR INTERNUS**
- 6) **NERVE** to the **PIRIFORMIS**
- 7) **NERVE** to the **QUADRATUS FEMORIS**
- 8) **OBTURATOR NERVE**, artery and vein
- 9) **TEN MUSCLES** that move the hip joint

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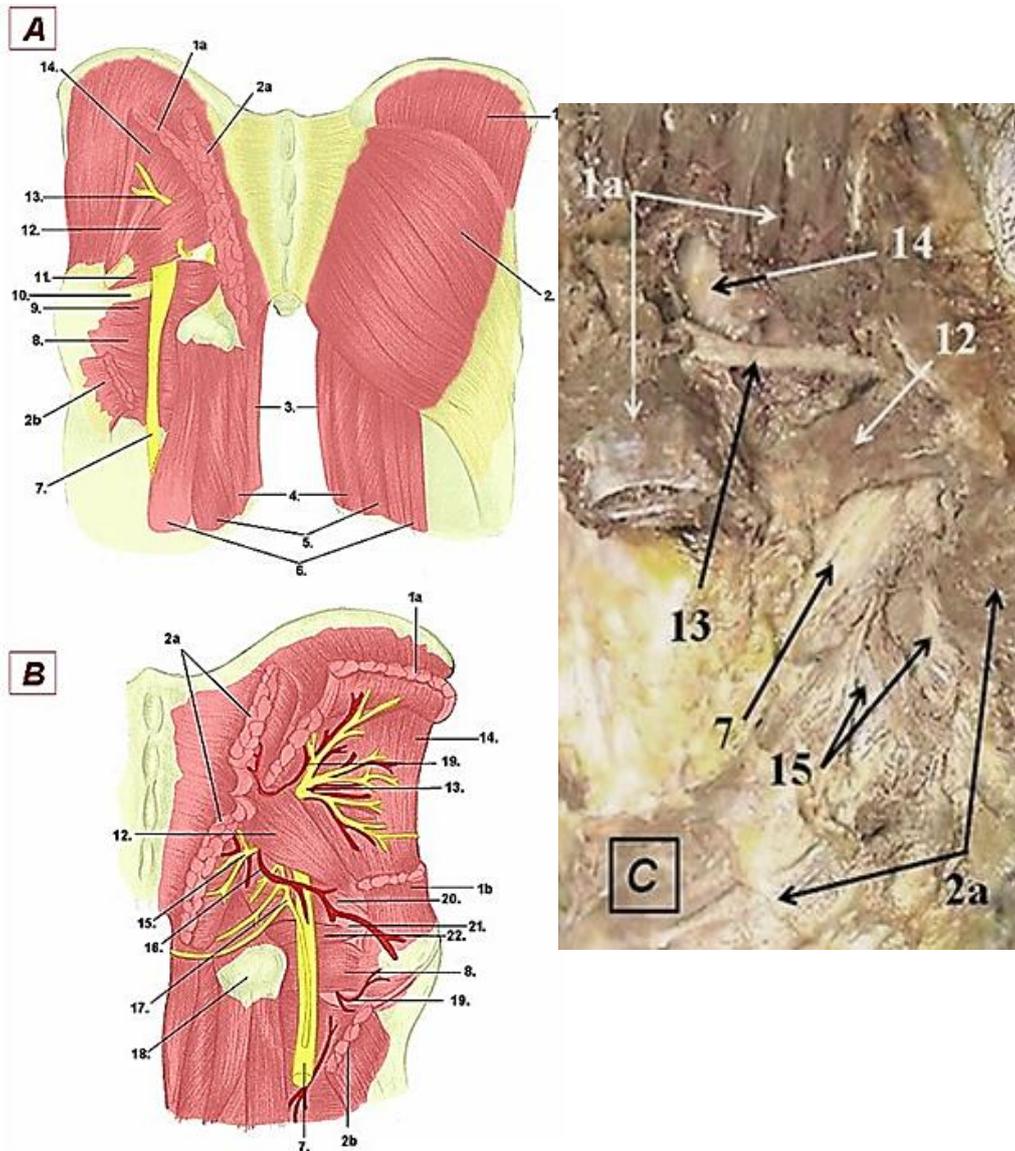


Fig. 1-17. Pelvic Girdle (A) superficial view, (B) deep view, (C) dissection of deep view.: 1. Gluteus medius (1a and 1b cut), 2. gluteus maximus, (2a and 2b cut) 3. gracilis, 4. semimembranosus, 5. semitendinosus, 6. biceps femoris, 7. sciatic N., 8. quadratus femoris, 9. and 22. inferior gemellus, 10. and 21. tendon internal obturator, 11. and 20. superior gemellus, 12. piriformis, 13. superior gluteal N., and 14. gluteus minimus. 15. inferior gluteal N., 16. inferior gluteal A., 17. posterior femoral cutaneous N., 18. ischial tuberosity, 19. superior gluteal A.

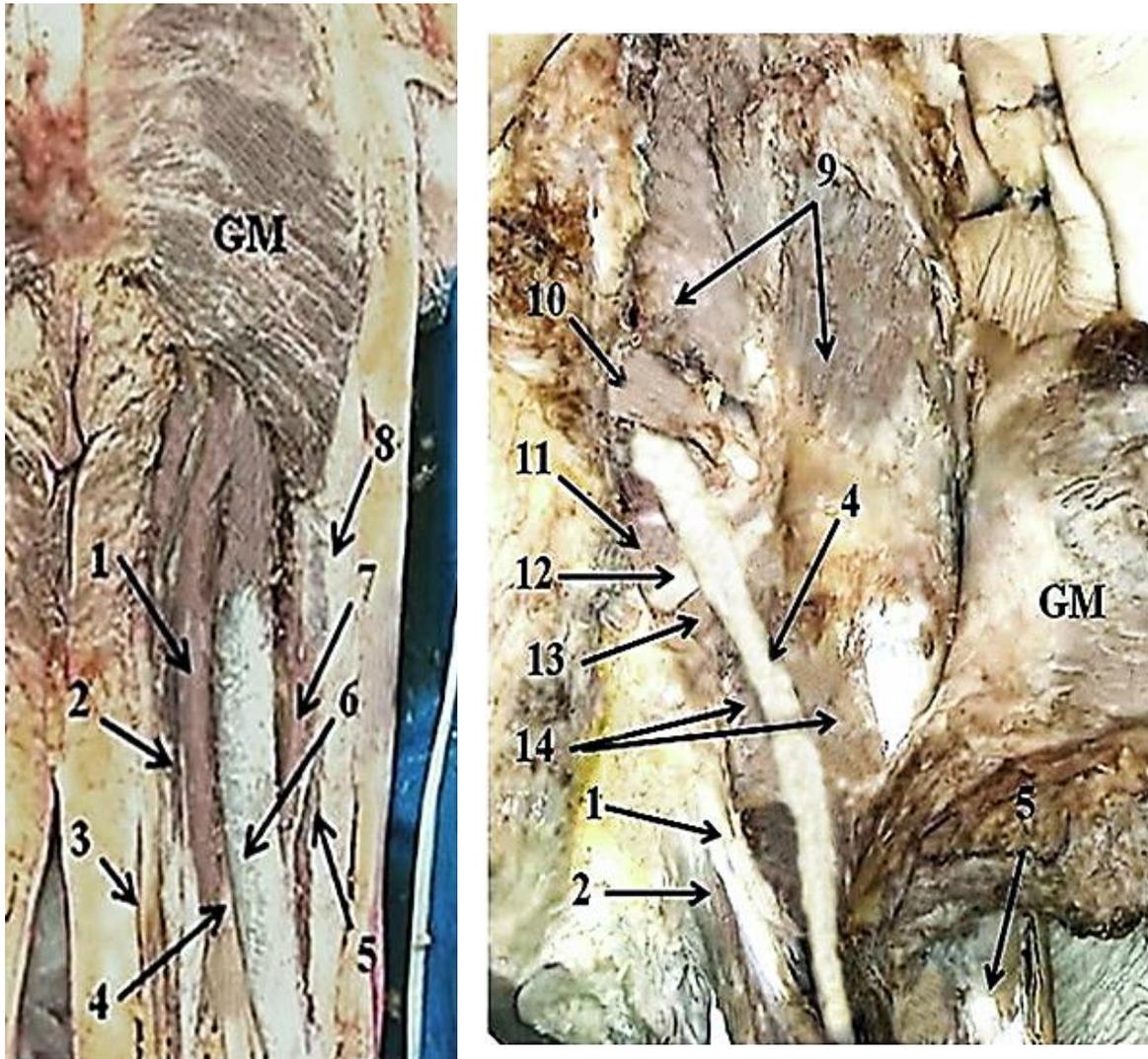


Fig. 1-18. Pelvic Girdle: 1. Semitendinosus, 2. Semimembranosus, 3. Gracilis, 4. Sciatic nerve, 5. Vastus lateralis, 6. Long head of Biceps femoris, 7. Short head of biceps femoris, 8. Iliotibial band, 9. Gluteus medius, 10. Piriformis, 11. Superior gemellus, 12. Tendon of the obturator internus, 13 Inferior gemellus, 14. Quadratus femoris, GM = Gluteus maximus.

1.5.2 MUSCLES OF THE GLUTEAL REGION (FIGS 1-17, 1-18, 1-19)

1. GLUTEUS MAXIMUS

- Superior attachment (origin): Posterior iliac crest, posterior sacrum and coccyx; sacrotuberous ligament
- Inferior attachment (insertion): Iliotibial band; gluteal tuberosity of the femur
- Nerve: Inferior gluteal nerve
- Action: Extension and external rotation of the femur; extension of the trunk; controls flexion of the trunk

2. **GLUTEUS MEDIUS**

- Superior attachment (origin): Posterior ilium below the iliac; deep to gluteus maximus
- Inferior attachment (insertion): Lateral greater trochanter of the femur
- Nerve: Superior gluteal nerve
- Action: Abduction and internal rotation of the femur; lateral stability of the pelvis

3. **GLUTEUS MINIMUS**

- Superior attachment (origin): Posterior ilium caudal to the gluteus medius; deep to the gluteus medius.
- Inferior attachment (insertion): Anterior greater trochanter of the femur
- Nerve: Superior gluteal nerve
- Action: Abduction and internal rotation of the femur; lateral stability of the pelvis

4. **PIRIFORMIS**

- Medial attachment (origin): Ventral sacrum; sacrotuberous ligament
- Lateral attachment (Insertion): Superior greater trochanter of the femur
- Nerve: Nerve to the piriformis
- Action: External rotation of the femur with the hip extended; internal rotation of the femur with the hip flexed greater than 90 degrees

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5. QUADRATUS FEMORIS

- Medial attachment (origin): Lateral ischial tuberosity.
- Lateral attachment (insertion): Intertrochanteric crest of the femur; quadrate tubercle
- Nerve: Nerve to the quadratus femoris
- Action: External rotation of the femur

6. SUPERIOR GEMELLUS

- Medial attachment (origin): Spine of the ischium.
- Lateral attachment (insertion): Greater trochanter with obturator internus
- Nerve: Nerve to the obturator internus
- Action: External rotation of the femur

7. GEMELLUS INFERIOR

- Medial attachment (origin): Superior ischial tuberosity
- Lateral attachment (insertion): Greater trochanter with obturator internus
- Nerve: Nerve to the quadratus femoris
- Action: External rotation of the femur

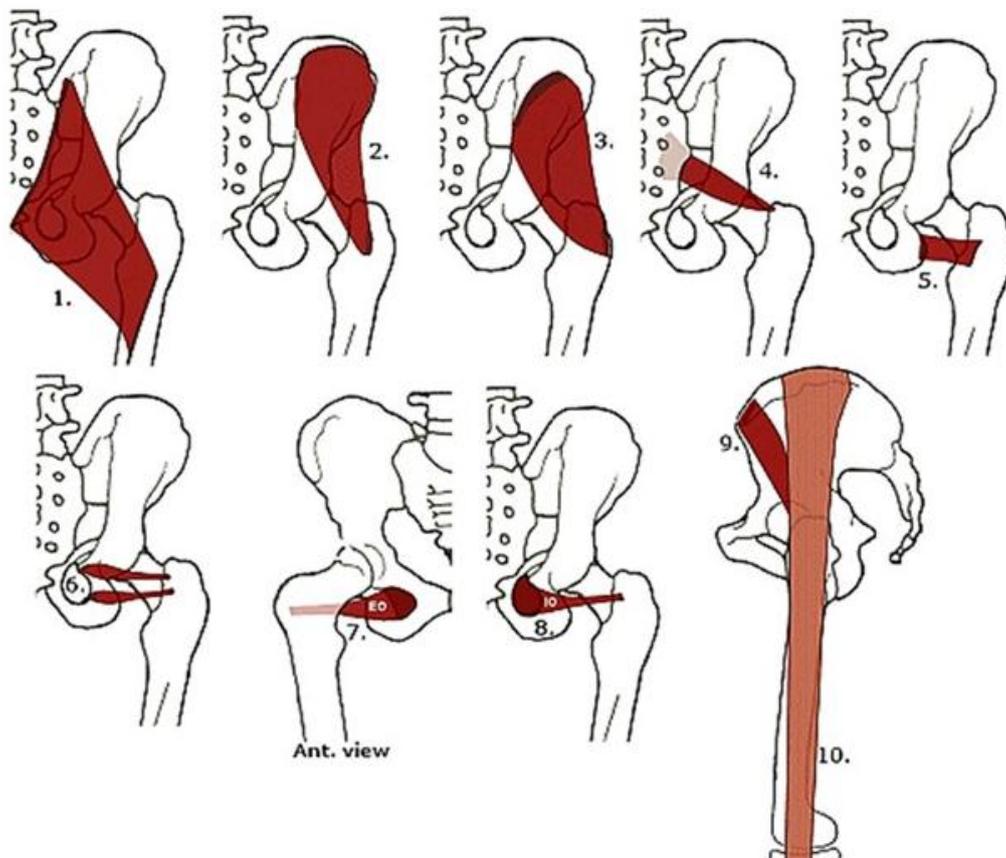


Fig. 1-19. Pelvic Girdle: Diagrams (posterior view, with exception of obturator externus) of: 1. gluteus maximus, 2. gluteus medius, 3. gluteus minimus, 4. piriformis, 5. quadratus femoris, 6. superior and inferior gemellus, 7. obturator externus, 8. obturator internus, 9. tensor fasciae latae, and 10. iliotibial band.

8. **OBTURATOR INTERNUS**

- Medial attachment (origin): Pelvic side of the obturator foramen
- Lateral attachment (insertion): Medial greater trochanter with superior and inferior gemelli
- Nerve: Nerve to the obturator internus
- Action: External rotation of the femur

9. **OBTURATOR EXTERNUS**

- Medial attachment (origin): External obturator foramen
- Lateral attachment (Insertion): Intertrochanteric fossa
- Nerve: Obturator nerve.
- Action: External rotation of the femur

10. **TENSOR FASCIAE LATA**

- Superior attachment (origin): Anterior superior iliac spine and the anterior crest of the ilium.
- Inferior attachment (insertion): Iliotibial band to the lateral tibial condyle
- Nerve: Superior gluteal nerve
- Action: Abduction, flexion and internal rotation of the femur

1.6 **MUSCLES OF THE ILIAC REGION (FIGS. 1-13, 1-14, 1-20)**

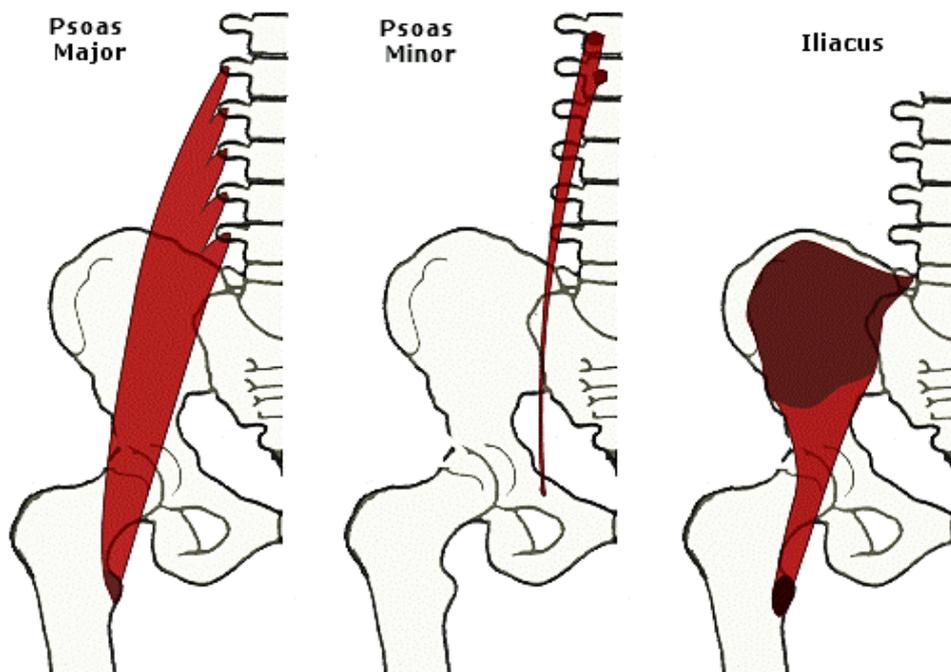


Fig. 1-20. Pelvic Girdle: Diagrams of the psoas major, psoas minor and iliacus showing bony attachments.

1. ILIACUS MUSCLE

- Superior attachment (origin): Iliac crest and fossa, ala of the sacrum, sacroiliac ligaments, anterior inferior iliac spine
- Inferior attachment (insertion): Joins psoas major to form **ILIOPSOAS** and attaches to the lesser trochanter
- Nerve: Femoral nerve
- Action: Flexion of the femur

2. PSOAS MAJOR

- Superior attachment (origin): Transverse processes of L1 – L5; intervertebral discs and bodies of T12 to L5.
- Inferior attachment (insertion): Joins the iliacus to form **ILIOPSOAS** and attaches to the lesser trochanter
- Nerve: Femoral nerve
- Action: Flexion of the femur; flexion and lateral bending of the lumbar spine

3. PSOAS MINOR

- Superior attachment (origin): Bodies of vertebrae T12 and L1
- Inferior attachment (insertion): Iliopectineal eminence
- Nerve: L1
- Action: Weak flexion of lumbar spine

3 – Study questions:

- 1) What nerves are in the pelvis?
- 2) What nerves are in the pelvis are NOT in the gluteal region?
- 3) Which gluteal muscles perform the following actions:
 - a. Abduction and internal rotation?
 - b. Extension and external rotation?
 - c. External rotation?
- 4) Damage to the superior gluteal nerve will affect which muscles and which actions?
- 5) Damage to the inferior gluteal nerve will affect which muscles and which actions?

2 THE THIGH AND KNEE

2.1 OSTEOLOGY

FEMUR (Figs. 2-1, 2-2, 2-3)

- **PROXIMAL FEMUS**

- **HEAD** with small circular indentation called the **FOVEA CAPITIS**
- **NECK** extends from the head to the greater and lesser trochanter
- **GREATER TROCHANTER** lies lateral and posterolateral to the femoral neck
- **LESSER TROCHANTER** lies posteromedial to the femoral neck
- **INTERTROCHANTERIC CREST** lies posteriorly and runs from the greater to the lesser trochanter
- **TROCHANTERIC FOSSA** that lies between the neck and the greater trochanter
- **INTERTROCHANTERIC LINE** lies anteriorly and runs from the greater to the lesser



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- **FEMORAL SHAFT**
 - **LINEA ASPERA** is a posterior roughened area with a medial and a lateral ridge
 - **MEDIAL SUPRACONDYLAR LINE** is the inferior continuation of the medial ridge of linea aspera
 - **LATERAL SUPRACONDYLAR LINE** is the inferior continuation of the lateral ridge of linea aspera
- **FEMORAL CONDYLAR REGION**
 - **MEDIAL CONDYLE** is the distal smooth, oral, medial articular surface for tibia
 - **LATERAL CONDYLE** is the distal smooth, oral, lateral articular surface for tibia
 - **INTERCONDYLAR GROOVE** is a deep posterior groove separating the condyles
 - **MEDIAL EPICONDYLE** is a rough elevation superior to medial condyle
 - **LATERAL EPICONDYLE** is a rough elevation superior to the lateral epicondyle
 - **ADDUCTOR TUBERCLE** is a small tubercle superior to the medial epicondyle
 - **CENTRAL PATELLAR GROOVE** is an anterior shallow, oval trough where the medial and lateral femoral condyles unite.

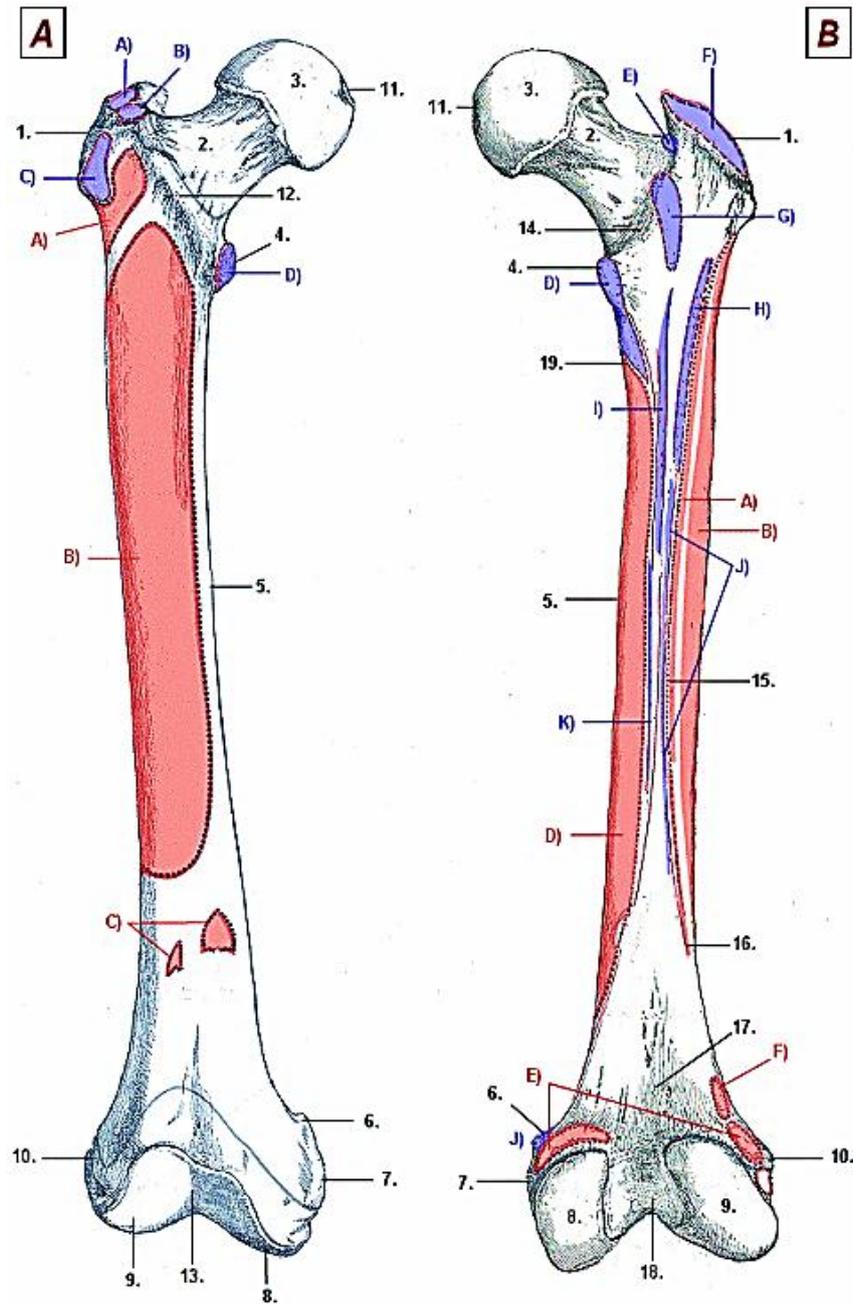


Fig. 2-1. Pelvic Girdle: Drawings of the femur in anterior (A) and posterior (B) view: 1. Greater trochanter, 2. neck, 3. head, 4. lesser trochanter, 5. shaft, 6. adductor tubercle, 7. medial epicondyle, 8. medial condyle, 9. lateral condyle, 10. lateral epicondyle, 11. fovea capitis, 12. intertrochanteric line, 13. patellar surface, 14. intertrochanteric crest, 15. linea aspera, 16. lateral supracondylar line, 17. popliteal surface, 18. intercondylar fossa, and 19. spiral line. The alphabetical labels show muscle origins (red) and insertions (blue). Origins: A) vastus lateralis, B) vastus intermedius, C) articularis genu, D) vastus medialis, E) gastrocnemius, and F) plantaris. Insertions: A) piriformis, B) obturator internus and gemelli, C) gluteus minimus, D) iliopsoas, E) obturator externus, F) gluteus medius, G) quadratus femoris, H) gluteus maximus, I) adductor brevis, J) adductor magnus, and K) adductor longus. (Modified from Gray 1918)

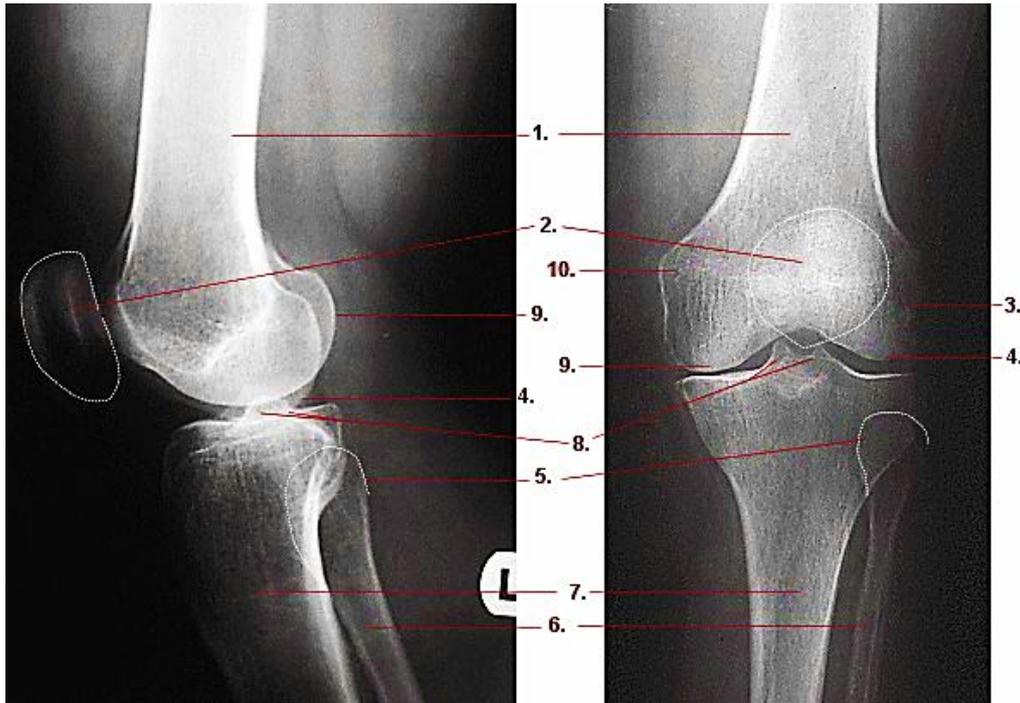


Fig. 2-2. Thigh: Lateral and AP radiographs of the knee. 1. Shaft of femur, 2. patella, 3. lateral epicondyle of femur, 4. lateral condyle of femur, 5. head of fibula, 6. shaft of fibula, 7. shaft of tibia, 8. intercondylar eminence, 9. medial condyle of femur, and 10. medial epicondyle of femur.

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PATELLA (Figs. 2-2, 2-3)

- large, triangular, sesamoid bone that lies anterior to the femoral condyle
- **SURFACES**
 - rounded superior pole and a pointed inferior pole.
 - anterior surface for attachment of **QUADRICEPS TENDON**
 - posterior surface for articulation with the femoral condyles
- **FACET ARFTICULATIONS**
 - **MEDIAL CONDYLOPATELLAR** facet for articulation with medial femoral condyle
 - **LATERAL CONDYLOPATELLAR** facet for articulation with lateral femoral condyle
 - **ODD FACET** is small and lies medial to the medial condylopatellar facet
 - **VERTICAL PATELLAR RIDGE** lies between the medial and lateral condylopatellar facets

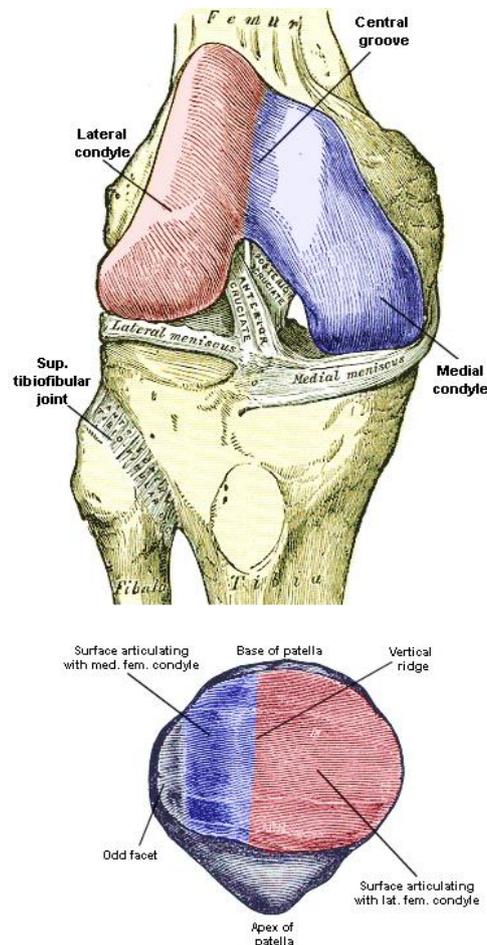


Fig. 2-3. Thigh: This drawing shows the articular surfaces of the femoral condyles (above) and corresponding surfaces on the posterior aspect of the patella (below). (Modified from Gray 1918)

PROXIMAL TIBIA (Figs. 2-2, 2-4)

- **TIBIAL PLATEAU** is the flat top of the tibia
- **MEDIAL TIBIAL CONDYLE** is on medial side of tibial plateau for articulations with the medial femoral condyle
- **LATERAL TIBIAL CONDYLE** is on lateral side of tibial plateau for articulations with the lateral femoral condyle
- **ANTERIOR INTERCONDYLAR FOSSA** is shallow fossa in the anterior tibial plateau
- **POSTERIOR INTERCONDYLAR FOSSA** is a shallow fossa in the posterior tibial plateau
- **INTERCONDYLAR EMINENCE** is a bony elevation in the middle of the tibial plateau bound by the condyles and intercondylar fossae
- **FIBULAR ARTICULAR SURFACE** is a rounded shallow depression inferior to the lateral tibial condyle

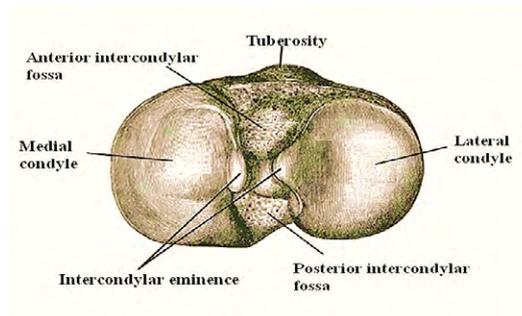


Fig 2-4. Thigh: Superior view of the tibial plateau
(Modified from Gray's 1918)

2.2 JOINTS, LIGAMENTS AND BURSAE

2.2.1 JOINTS



Fig. 2-5. Thigh: Radiograph of the knee joint

- **TIBIOFEMORAL JOINT** is the articulation of the medial and lateral femoral condyles with the medial and lateral tibial condyles on the tibial plateau
- **PATELLOFEMORAL JOINT** is the articulation of the medial and lateral femoral condyles with the condylopatellar facets of the patella

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2.2.2 LIGAMENTS

TIBIOFEMORAL JOINT EXTRA-ARTICULAR STRUCTURES (Figs. 2-6, 2-7)

- **Structures that stabilize the knee and lie external to the joint**
- **TENDON OF THE QUADRICEPS FEMORIS** muscle
- **PATELLAR LIGAMENT** from patella to tibia
- **LATERAL PATELLAR RETINACULUM** consists of a fibrous expansion from the tendon of the **VASTUS LATERALIS** and **ILIOTIBIAL (IT) BAND**
 - **LATERAL PATELLOFEMORAL LIGAMENT** lies in the lateral retinaculum and from the IT band to the lateral patella
 - **LATERAL PATELLOTIBIAL LIGAMENT** is a thick longitudinal band in the lateral retinaculum
- **MEDIAL PATELLAR RETINACULUM** consists of a fibrous expansion of the tendon of the **VASTUS MEDIALIS**
 - **MEDIAL PATELLOFEMORAL LIGAMENT** is a transverse band in the medial retinaculum that runs from the adductor tubercle to the vastus medialis and superior medial patella
 - **MEDIAL PATELLOTIBIAL LIGAMENT** is a thick longitudinal band in the medial retinaculum
- **TIBIAL (MEDIAL) COLLATERAL LIGAMENT** extends from the medial femoral epicondyle to the medial tibial condyle and medial tibial shaft, and attaches to the medial meniscus.
- **FIBULAR (LATERAL) COLLATERAL LIGAMENT** extends from the lateral femoral epicondyle to the head of the fibula but does not attach to the lateral meniscus
- **OBLIQUE POPLITEAL LIGAMENT** is a fibrous extension of the semimembranous tendon that lies posteriorly and runs from the medial tibial condyle to the posterior fibula
- **ARCUATE POPLITEAL LIGAMENT** begins at the fibular head, arches over the tendon of the popliteus muscle and attaches to the posterior tibial intercondylar area and the lateral femoral epicondyle

TIBIOFEMORAL JOINT INTRA-ARTICULAR STRUCTURES (Figs. 2-6, 2-8)

- **Structures that stabilize the knee and lie within the joint**
- **ANTERIOR CRUCIATE LIGAMENT** begins in the anterior intercondylar fossa of the tibia, runs posterolaterally to the intercondylar fossa side of the lateral femoral condyle
- **POSTERIOR CRUCIATE LIGAMENT** begins in the posterior intercondylar fossa of the tibia, runs anteromedially to the intercondylar fossa side of the medial femoral condyle

- **MEDIAL MENISCUS** is a C-shaped fibrocartilage plate that runs along the periphery of the medial tibial condyle, attaching to the medial (tibial) collateral ligament and to the anterior and posterior tibial intercondylar areas
- **LATERAL MENISCUS** is a ring-shaped fibrocartilage plate that runs along the periphery of the lateral tibial condyle, attaching to the anterior and posterior tibial intercondylar area but separated from the lateral (fibular) collateral ligament by the tendon and bursa of the popliteus muscle

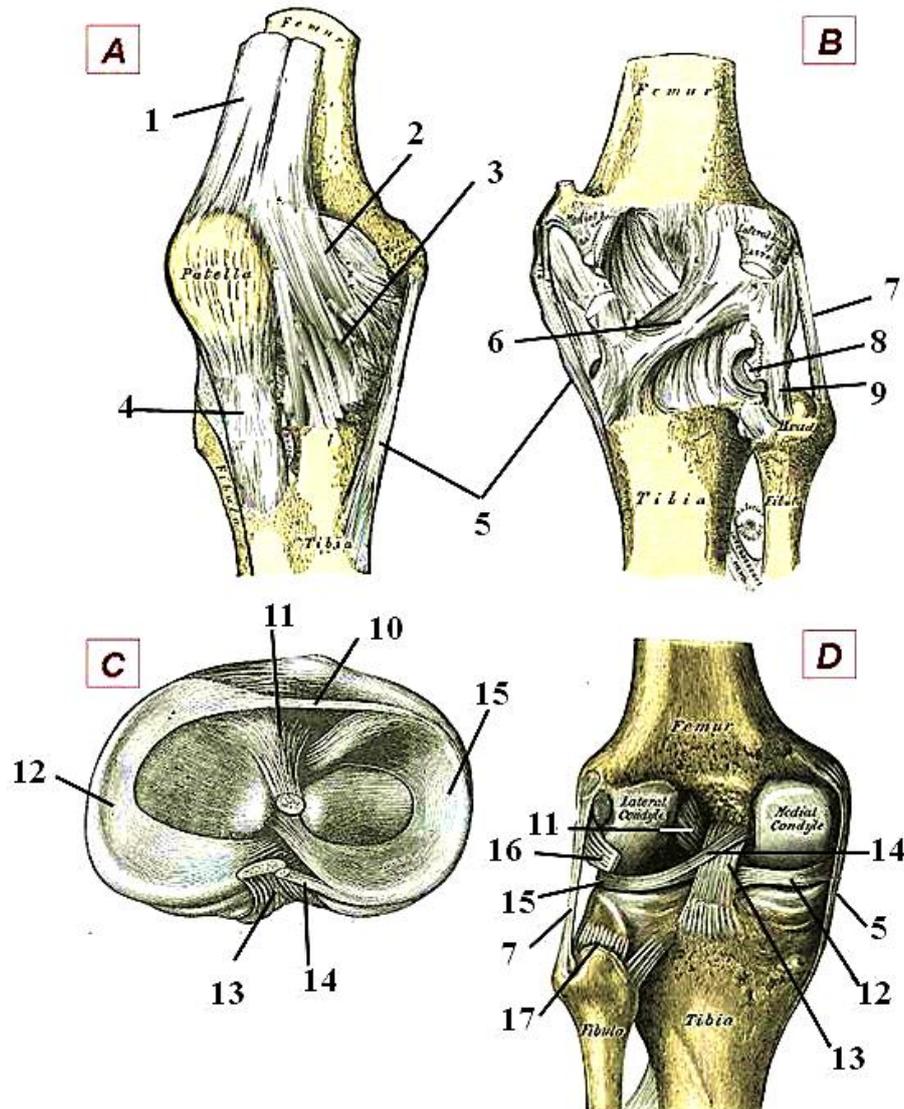


Fig. 2-6. Thigh: Drawings of the extracapsular structures of the tibiofemoral joint in A) Anteromedial view, B) Posterior view, C) Superior view, and D) Deep posterior view. 1. Quadriceps tendon, 2. + 3. Medial patellar retinaculum, 2. Medial patellofemoral ligament of retinaculum, 3. Medial patellotibial ligament of retinaculum, 4. Patellar ligament (tendon), 5. Medial collateral (tibial) ligament, 6. Oblique popliteal ligament, 7. Lateral collateral (fibular) ligament, 8. Groove for the popliteus tendon, 9. Arcuate ligament, 10. Transverse meniscal ligament, 11. Anterior cruciate ligament, 12. Medial meniscus, 13. Posterior meniscus, 14. Posterior menisiofemoral ligament, 15. Lateral meniscus, 16. Tendon of popliteus, 17. Proximal tibiofibular joint capsule. (Modified from Gray's 1918)

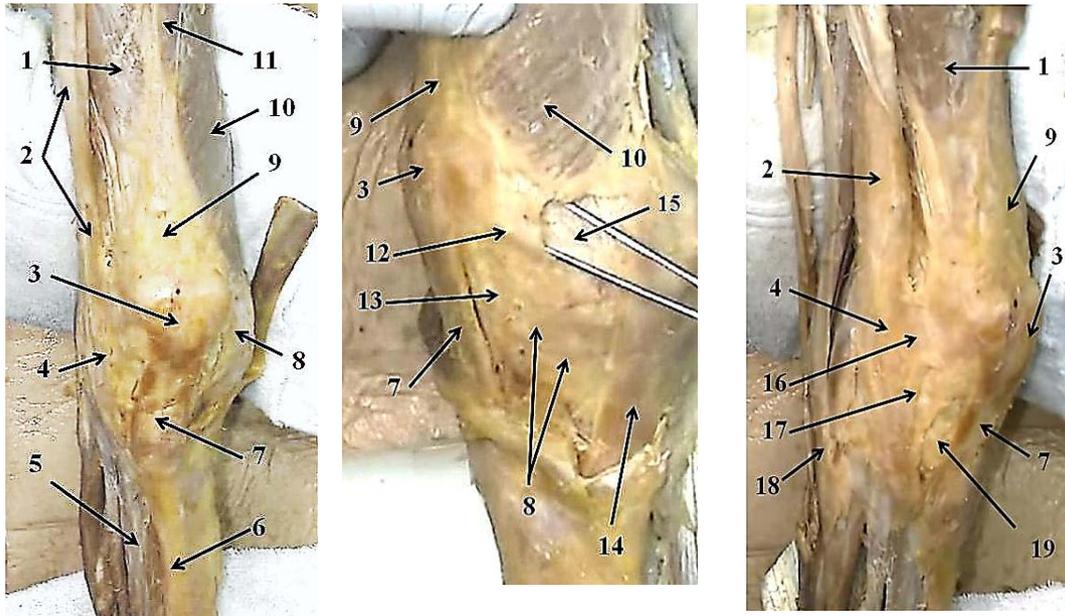


Fig. 2-7. Thigh: Dissection of the superficial knee in anterior view (LEFT), medial view (MIDDLE) and in lateral view (RIGHT). 1. Vastus lateralis, 2. Iliotibial band, 3. Patella, 4. Lateral retinaculum, 5. Tibialis anterior, 6. Crest of tibia, 7. Patella lig., 8. Medial retinaculum, 9. Quadriceps tendon, 10. Vastus medialis, 11. Rectus femoris, 12. Medial patellofemoral lig., 13. Medial patellotibial lig., 14. Medial collateral lig., 15. Joint capsule, 16. Lateral Patellofemoral lig., 17. Lateral patellotibial lig., 18. Tendon of biceps femoris, 19. Patella fat pad.

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- **CORONARY LIGAMENTS** attaches the outer edge of the medial and lateral menisci to the tibial condyles
- **TRANSVERSE MENISCAL LIGAMENT** connects the anterior horns (ends) of the medial and lateral menisci
- **POSTERIOR MENISCOFEMORAL LIGAMENT** (may be absent) lies on the posterior surface of the posterior cruciate, connecting the posterior cruciate and the medial femoral condyle to the lateral meniscus
- **ANTERIOR MENISCOFEMORAL LIGAMENT** (may be absent) lies on the anterior surface of the posterior cruciate, connecting the posterior cruciate and medial femoral condyle to the lateral meniscus

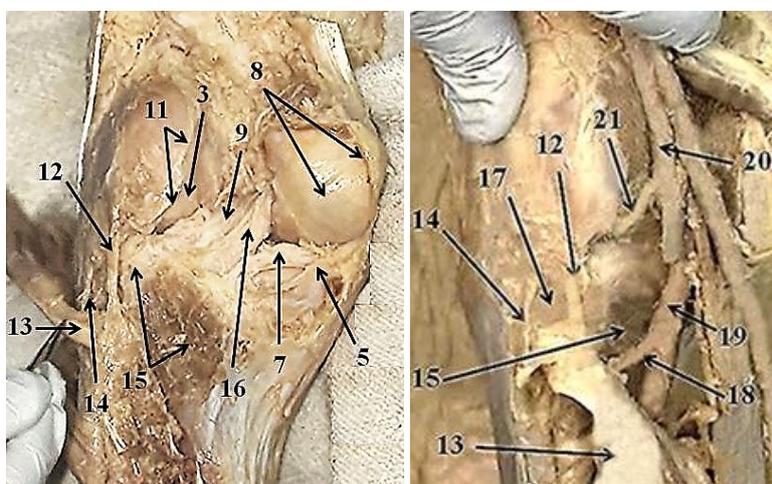
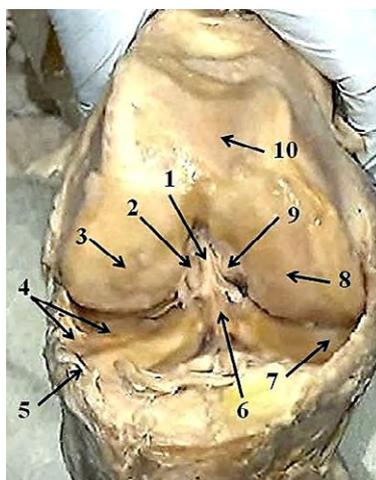


Fig. 2-8. Thigh: Dissection of knee joint. (TOP LEFT) Anterior view of the tibiofemoral articulation. (BOTTOM LEFT) Posterior view of tibiofemoral articulation. (BOTTOM RIGHT) Close up of the posterior lateral aspect of the tibiofemoral articulation. 1. Anterior medial band of the anterior cruciate lig. 2. Posterior lateral band of the anterior cruciate, 3. Wear on the lateral femoral condyle, 4. Lateral meniscus, 5. Coronary lig., 6. Intercondylar eminence, 7. Medial meniscus, 8. Medial femoral condyle, 9. Posterior cruciate, 10. Central groove for patella, 11. Joint capsule (cut), 12. Arcuate lig., 13. Tendon of biceps femoris (reflected), 14. Lateral collateral lig., 15. Popliteus, 16. Posterior meniscofemoral, 17. Popliteus tendon, 18. Inferior genicular artery, 19. Popliteal artery, 20. Popliteal vein, 21. Superior genicular vein.

2.2.3 PATELLOFEMORAL JOINT STRUCTURES (FIGS. 2-6, 2-7)

- **TENDON OF THE QUADRICEPS FEMORIS** muscle
- **PATELLAR LIGAMENT** from patella to tibia
- **LATERAL PATELLAR RETINACULUM** consists of a fibrous expansion from the tendon of the **VASTUS LATERALIS** and **ILIOTIBIAL (IT) BAND**
- **MEDIAL PATELLAR RETINACULUM** consists of a fibrous expansion of the tendon of the **VASTUS MEDIALIS**

2.2.4 BURSAE

- **ANTERIOR BURSAE**
 - **SUPRAPATELLAR (quadriceps) BURSA** lies superior to the patella and deep to the quadriceps tendon with the **ARTICULARIS GENU** muscle from the vastus intermedius holding the bursa in position
 - **PREPATELLAR BURSA** lies between the skin covering the patella and the anterior surface of the patella
 - **SUPERFICIAL INFRAPATELLAR BURSA** lies between the skin and the tibial tuberosity
 - **DEEP INFRAPATELLAR BURSA** lies between the patellar ligament and the infrapatellar fat pad and the superior margin of the tibia
- **POSTERIOR AND MEDIAL BURSAE**
 - **GASTROCNEMIUS BURSAE** lie deep to the medial and lateral heads of the gastrocnemius muscle.
 - **POPLITEUS BURSA** lies between the tendon of the popliteus muscle and the lateral tibial condyle and lateral meniscus.
 - **SEMIMEMBRANOUS BURSA** lies between the semimembranous tendon and the medial head of the gastrocnemius.
 - **ANSERINE BURSA** lies between the tendons of the **PES ANSERINE** (common tendon of attachment for the sartorius, gracilis, and semitendinosus to the upper medial tibia) and the proximal medial tibia and medial (tibial) collateral ligament.

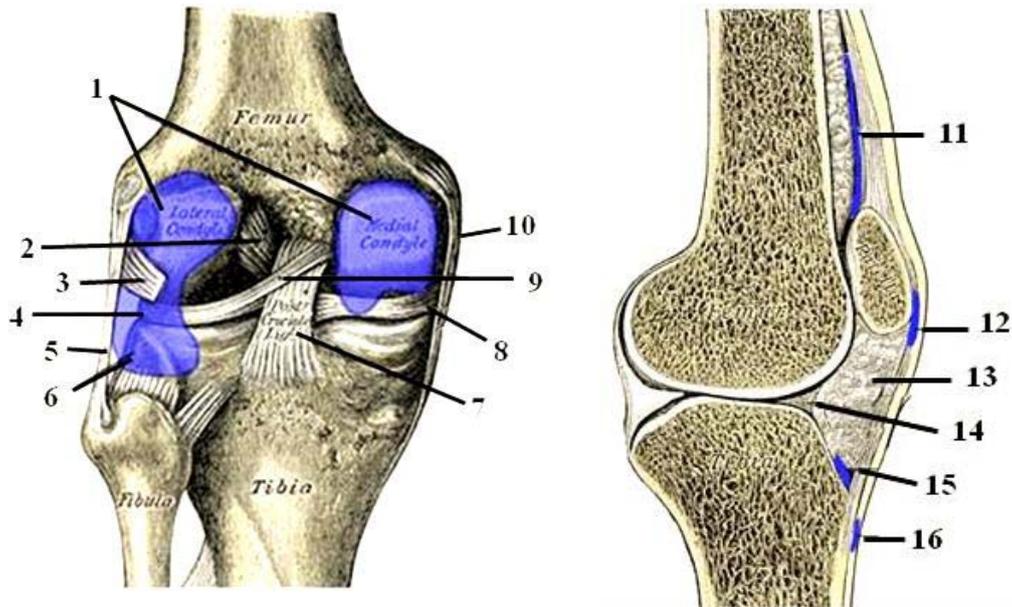


Fig. 2-9. Thigh: The posterior bursae (LEFT) and patellar bursae (RIGHT). Gastrocnemius bursa, 2. Anterior cruciate lig., 3. Popliteus tendon, 4. Lateral meniscus, 5. Lateral collateral lig., 6. Popliteus bursa, 7. Posterior cruciate lig., 8. Medial meniscus, 9. Posterior meniscofemoral lig. 10. Medial collateral lig., 11. Suprapatellar bursa, 12. Prepatellar bursa, 13. Patellar fat pad, 14. Meniscus 15. Deep infrapatellar bursa, 16. Superficial infrapatellar bursa. (Modified from Gray 1918)

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BLOOD SUPPLY TO KNEE

- **POPLITEAL** artery in popliteal fossa which is posterior to knee joint gives off genicular arteries
 - **SUPERIOR MEDIAL GENICULAR** artery to superior medial knee
 - **SUPERIOR LATERAL GENICULAR** artery to superior lateral knee
 - **INFERIOR MEDIAL GENICULAR** artery to inferior medial knee
 - **INFERIOR LATERAL GENICULAR** artery to inferior lateral knee

SENSORY INNERVATION TO KNEE

- **OBTURATOR NERVE** from lumbar plexus
- **FEMORAL NERVE** from lumbar plexus
- **COMMON FIBULAR (PERONEAL) NERVE** from sciatic nerve of sacral plexus
- **TIBIAL NERVE** from sciatic nerve of sacral plexus

4 – Study questions:

- 1) What are the extra-articular structures of the knee? Which of these are common to both the tibiofemoral and patellofemoral joints?
- 2) What are the intra-articular structures of the knee? Which of these are common to both the tibiofemoral and patellofemoral joints?
- 3) Name the bursae found in the following positions:
 - a. Over the tibial tuberosity
 - b. Deep to the quadriceps tendon
 - c. Superficial to the patella
 - d. Deep to the patellar ligament
 - e. Under the common tendon for the gracilis, sartorius, and semitendinosus
- 6) What is the sensory innervation of the knee joint?
- 7) What is the source of the blood supply to the knee?

2.3 ANTERIOR COMPARTMENT OF THE THIGH

2.3.1 CONTENTS

1. FEMORAL TRIANGLE (Figs. 2-10, 2-11)

- superior boundary is the **INGUINAL LIGAMENT**
- lateral boundary is the **SARTORIUS** muscle
- medial boundary is the **ADDUCTOR LONGUS** muscle
- inferiorly boundary is the junction of the **SARTORIUS** and **ADDUCTOR LONGUS** muscles
- floor is the **ILIOPSOAS MUSCLE**

2. FEMORAL NERVE (Figs. 2-11, 2-12, 2-13)

- **LUMBAR PLEXUS** spinal nerves L2 – L4
- **MOTOR** innervation to the **MUSCLES** of the **ANTERIOR THIGH**
- **SENSORY** innervation the anterior thigh by the **INTERMEDIATE AND MEDIAL FEMORAL CUTANEOUS NERVES**.
- **SAPHENOUS NERVE** is the end of the femoral nerve
 - innervates the skin of the medial lower leg and medial heel

3. OTHER SENSORY NERVES to the anterior thigh

- **FEMORAL BRANCH** of the **GENITOFEMORAL NERVE** to superior anterior thigh
- **ILIOINGUINAL NERVE** to superior anterior thigh.
- **LATERAL FEMORAL CUTANEOUS NERVE** to superior lateral thigh

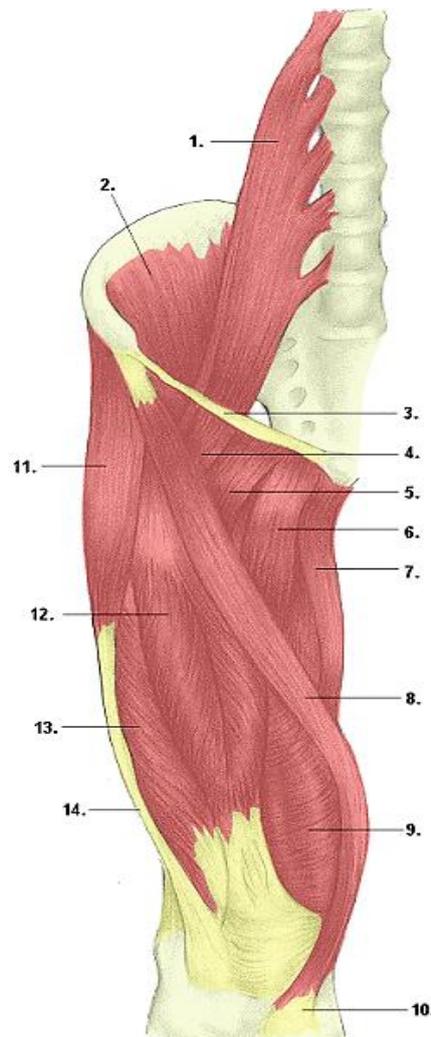


Fig. 2-10. Thigh: Drawing of an anterior view of the thigh showing muscles of the anterior and medial compartments. 1. psoas major, 2. iliacus, 3. inguinal ligament, 4. iliopsoas, 5. pectineus, 6. adductor longus, 7. gracilis, 8. sartorius, 9. vastus medialis, 10. pes anserine, 11. tensor fasciae latae, 12. rectus femoris, 13. vastus lateralis, and 14. iliotibial band.

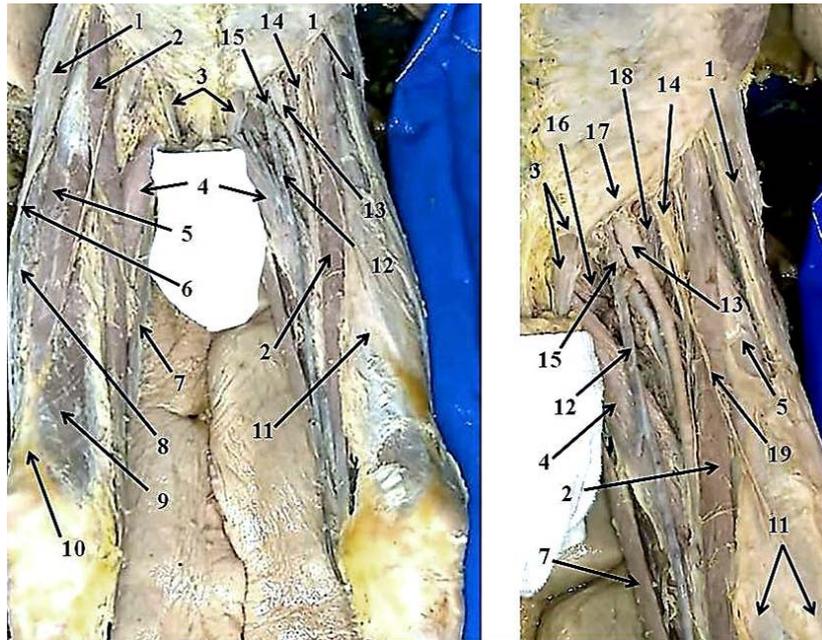


Fig. 2-11 Thigh: Dissection of (LEFT) anterior thigh and (RIGHT) the femoral triangle region. 1. Tensor fascia lata, 2. Sartorius, 3. Spermatic cord, 4. Adductor longus, 5. Rectus femoris, 6. Iliotibial band, 7. Gracilis, 8. Vastus Lateralis, 9. Vastus medialis, 10. Quadriceps tendon, 11. Fascia covering anterior thigh, 12. Great saphenous vein, 13. Femoral artery, 14. Femoral nerve, 15. Femoral vein, 16. Pectineus, 17. Inguinal lig., 18. Iliopsoas, 19. Saphenous nerve.

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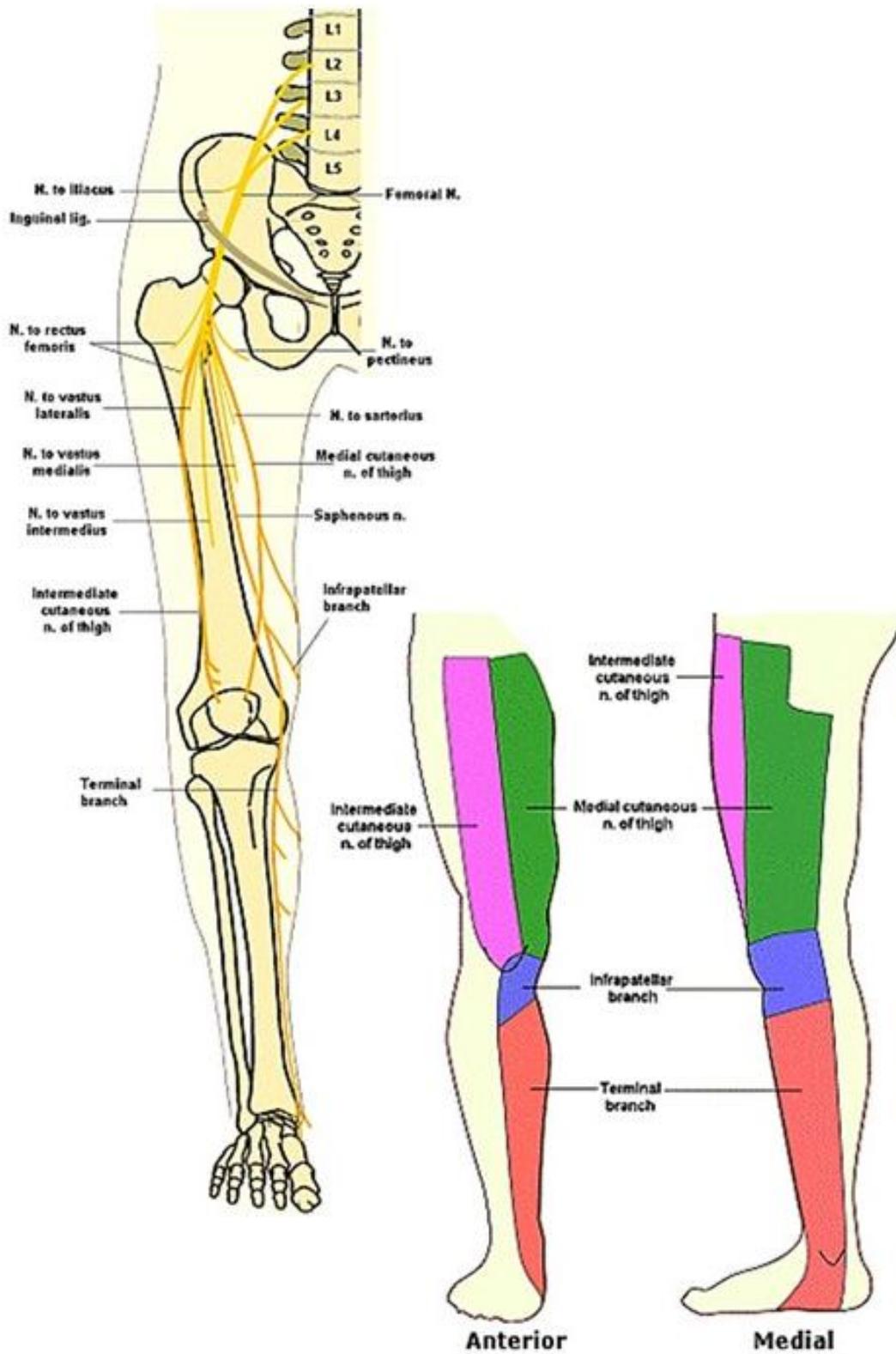


Fig. 2-12. Thigh: Diagram of the femoral nerve showing its motor and sensory distribution.

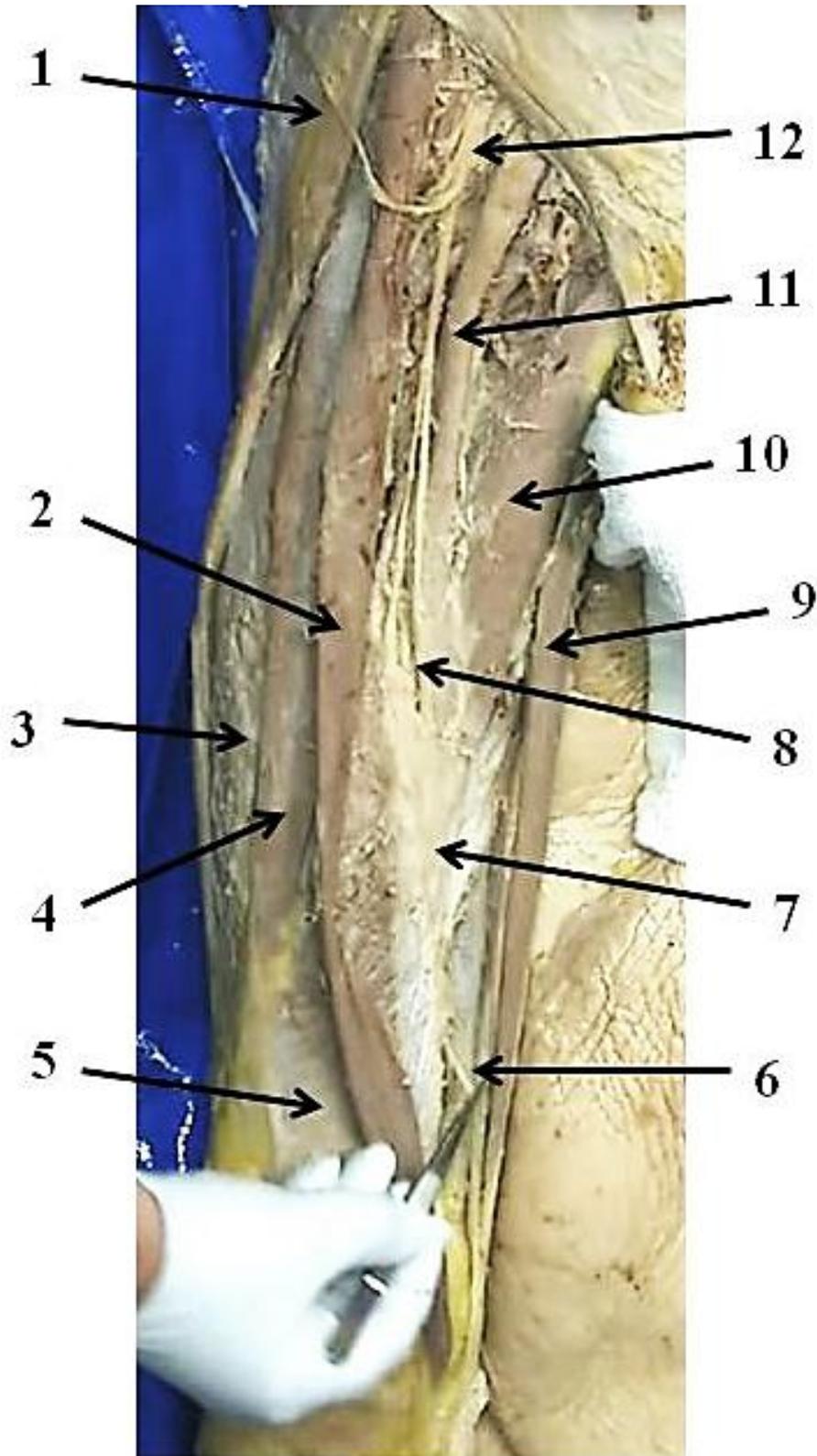


Fig. 2-13. Thigh: Dissection of saphenous nerve. 1. Tensor fascia lata, 2. Sartorius, 3. Vastus lateralis, 4. Rectus femoris, 5. Vastus medialis, 6. Saphenous nerve leaving the adductor canal, 7. Adductor canal, 8. Saphenous nerve entering adductor canal with femoral artery, 9. Gracilis, 10. Adductor longus, 11. Femoral Artery, 12. Femoral nerve.

4. FEMORAL ARTERY (Figs. 2-11, 2-13, 2-14)

- extension of the **EXTERNAL ILIAC ARTERY**
- **SUPERFICIAL EPIGASTRIC ARTERY** to the anterior abdominal wall below the umbilicus
- **SUPERFICIAL CIRCUMFLEX ILIAC ARTERY** to the superficial lateral inguinal region
- **EXTERNAL PUDENDAL ARTERY** to the superficial medial inguinal region and external genitalia
- **PROFUNDA FEMORAL ARTERY**
 - **MEDIAL CIRCUMFLEX FEMORAL ARTERY** supplies blood to the femoral head and neck, the acetabular fossa and muscles near the medial hip joint.
 - **LATERAL CIRCUMFLEX FEMORAL ARTERY** supplies the femoral head, tensor fascia lata and lateral part of the vastus lateralis and vastus intermedius.
 - **PERFORATING ARTERIES** supply the hamstrings, adductor magnus, and adductor brevis
- Femoral artery continues as the **POPLITEAL ARTERY** in the popliteal fossa



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5. **FEMORAL VEIN (Fig. 2-15)**

- continuous with **POPLITEAL VEIN** and ends at the **EXTERNAL ILIAC VEIN**
- **PROFUNDA FEMORAL VEIN** accompanies the profunda femoral artery and drains same as the artery
- **GREAT SAPHENOUS VEIN** is a superficial vein that begins at the dorsum of the foot, runs along the medial side of the leg, knee and thigh, and ends in the femoral vein
 - superficial epigastric vein, superficial circumflex iliac vein and the external pudendal vein drain into saphenous vein

6. **ADDUCTOR (Hunter's) CANAL (Fig 2-13)**

- anterior boundary is the **SARTORIUS** muscle
- lateral boundary is the **VASTUS MEDIALIS** muscles
- medial boundary is the **ADDUCTOR LONGUS** and **ADDUCTOR MAGNUS** muscles
- **CONTENTS**
 - **FEMORAL ARTERY**
 - **FEMORAL VEIN**
 - **SAPHENOUS NERVE**

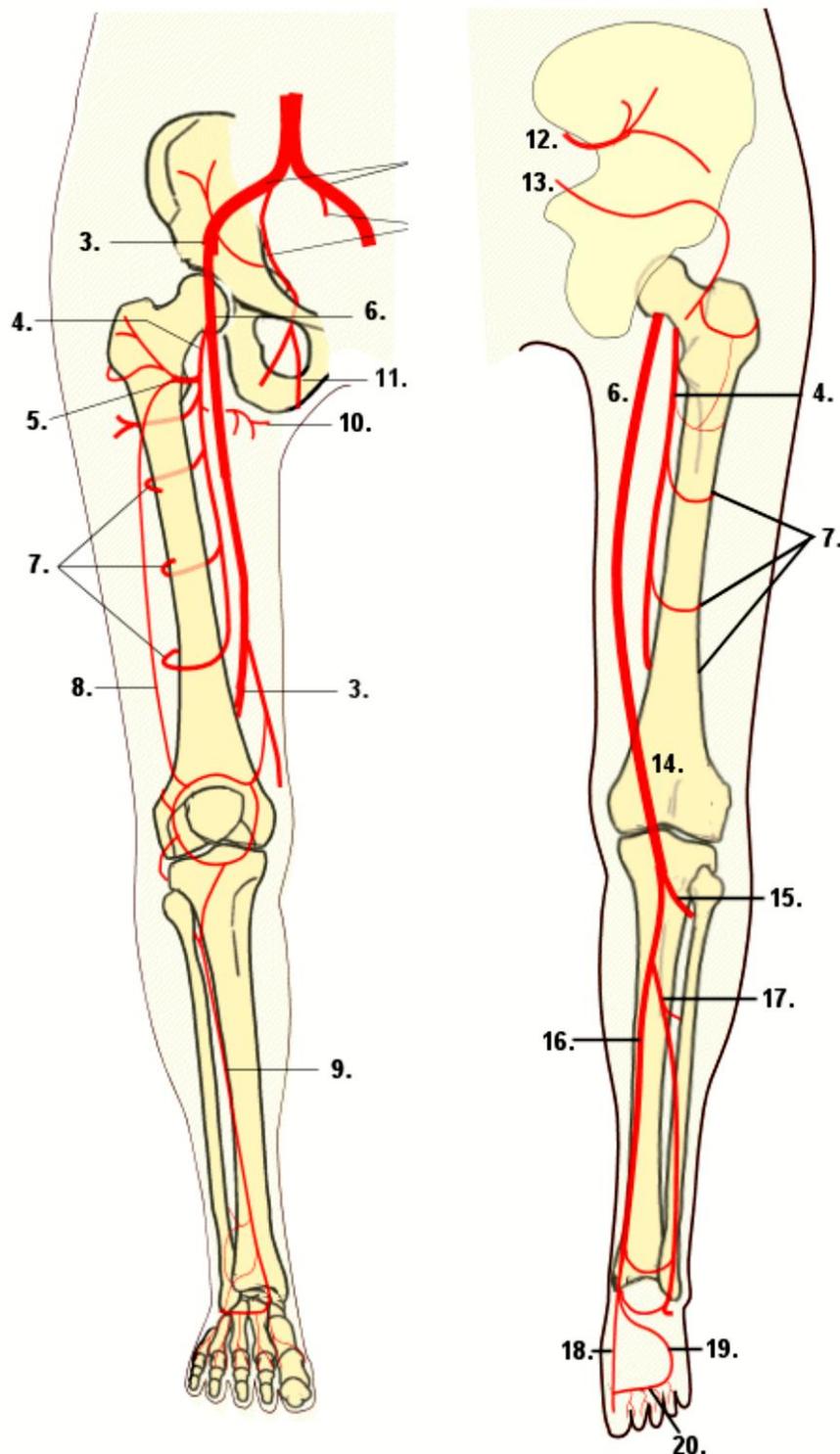


Fig. 2-14. Thigh: Diagram of the femoral artery and its branches in an anterior (left) and posterior (right) view. 1. External A., 2. internal iliac A., 3. femoral A., 4. profunda femoral A., 5. lateral circumflex A., 6. femoral A., 7. perforating As., 8. descending ramus branch of the lateral circumflex A., 9. anterior tibial A., 10. medial circumflex A., 11. obturator A., 12. superior gluteal A., 13. inferior gluteal A., 14. popliteal A., 15. anterior tibial A., 16. posterior tibial A., 17. fibular (peroneal) A., 18. medial plantar A., 19. lateral plantar A., and 20. plantar arch.

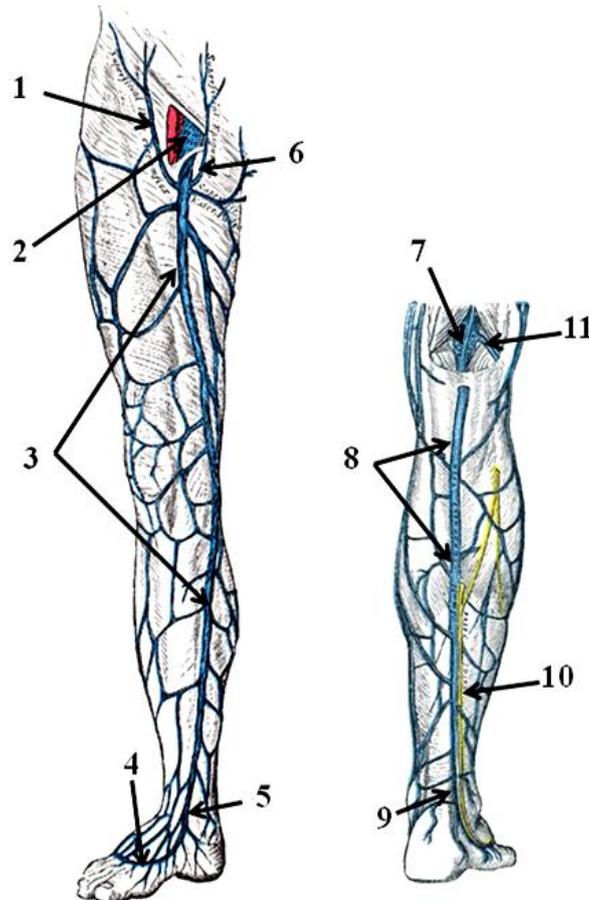


Fig. 2-15. Thigh: Superficial veins of the Lower Limb. 1. Superficial iliac circumflex vein, 2. Femoral vein, 3. Great saphenous vein, 4. Dorsal venous arch, 5. Medial marginal vein, 6. Superficial epigastric vein, 7. Popliteal vein, 8. Small saphenous Vein, 9. Lateral marginal vein, 10. Sural nerve, 11. Lateral genicular vein. (modified from Gray's 1918)

2.3.2 ANTERIOR COMPARTMENT MUSCLES (FIGS. 2-10, 2-11, 2-13, 2-16, 2-17)

1) SARTORIUS

- Superior attachment (origin): Anterior superior iliac spine
- Inferior attachment (insertion): Proximal medial tibial shaft via pes anserine
- Nerve: Femoral nerve.
- Action: Flexion, abduction and external rotation of the femur at the hip; flexion at the knee

2) PECTINEUS

- Superior attachment (origin): Superior ramus of the pubis along pectineal line.
- Inferior attachment (insertion): Pectineal line of the femur.
- Nerve: Femoral nerve
- Action: Flexion and adduction of the femur at the hip

3) ILIOPSOAS

- Superior attachment (origin): Iliacus muscle and psoas major muscle
- Inferior attachment (insertion): lesser trochanter of femur
- Nerve: Femoral nerve
- Action: Flexion of the femur; flexion and lateral bending of the lumbar spine



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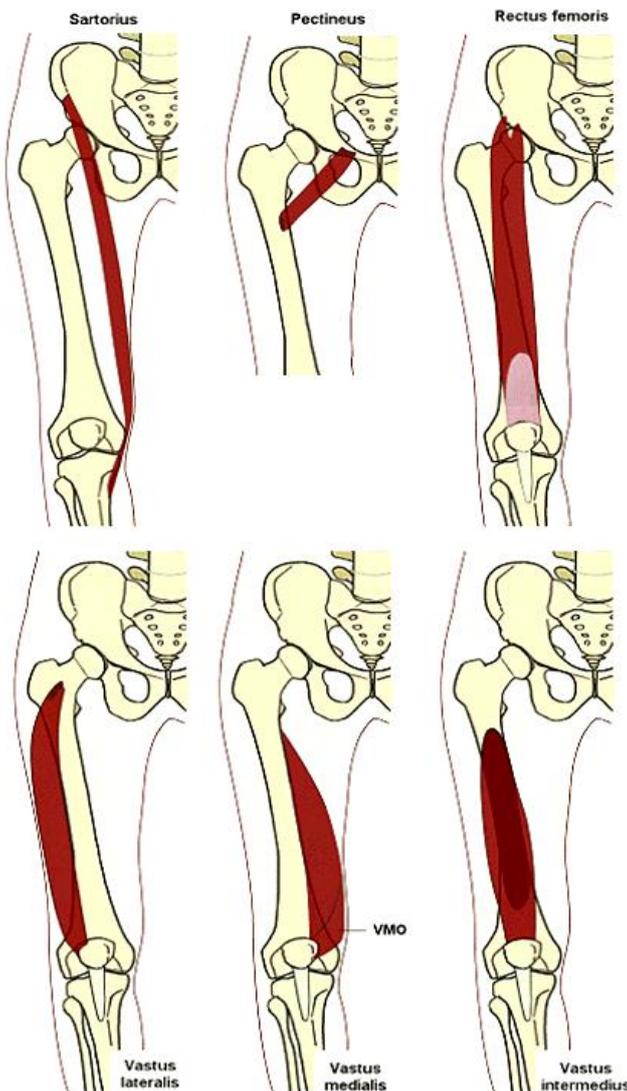


Fig. 2-16. Thigh: Diagrams of the sartorius, pectineus, rectus femoris, vastus lateralis, vastus medialis, vastus medialis obliquus (VMO) and vastus intermedius showing bony attachment sites

4) QUADRICEPS FEMORIS

- **RECTUS FEMORIS**

- Anterior attachment (origin): Anterior inferior iliac spine, superior acetabulum
- Inferior attachment (insertion): Superior patella by the quadriceps tendon; tibial tuberosity by the patella ligament
- Nerve: Femoral nerve
- Action: Extension of the knee joint, flexion of the femur at the hip

- **VASTUS LATERALIS**

- Superior attachment (origin): Inferior aspect of the greater trochanter, intertrochanteric line, lateral lip of the linea aspera
- Inferior attachment (insertion): Lateral aspect of the patella by the quadriceps tendon; the tibial tuberosity by the patellar ligament

- Nerve: Femoral nerve
- Action: Extension of the knee joint; lateral movement of the patella
- **VASTUS MEDIALIS**
 - Superior attachment (origin): Intertrochanteric line, medial lip of the linea aspera of the femur, medial supracondylar ridge
 - Inferior attachment (insertion): Medial patella by the quadriceps tendon; tibial tuberosity by the patellar ligament
 - Nerve: Femoral nerve
 - Action: Extension of the knee joint; medial movement of the patella
- **VASTUS INTERMEDIUS**
 - Superior attachment (origin): Anterior and lateral shaft of the proximal two-thirds of the femur; linea aspera
 - Inferior attachment (insertion): Superior aspect of the patella by the quadriceps tendon; tibial tuberosity by the patellar ligament
 - Nerve: Femoral nerve
 - Action: Extension of the knee joint

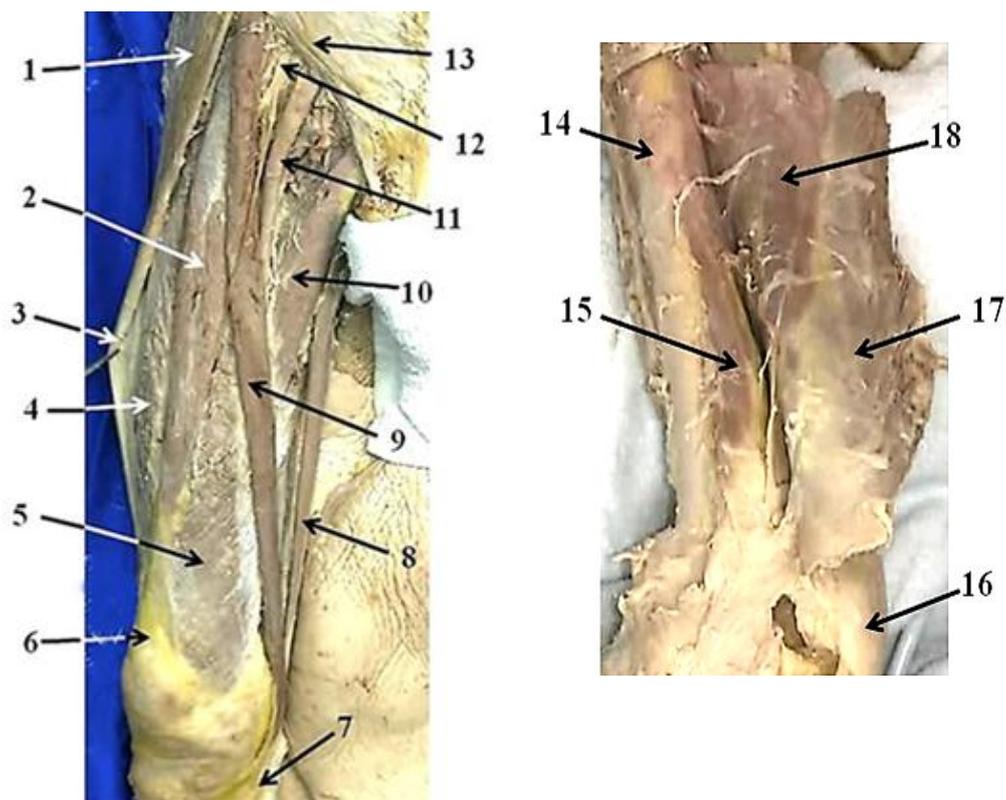


Fig 2-17. Thigh: (LEFT) Dissections showing muscles of anterior thigh muscles and (RIGHT) the articularis genu muscle deep to vastus intermedius and lateralis. 1. Tensor fascia lata, 2. Rectus femoris, 3. Iliotibial band, 4. Vastus lateralis, 5. Vastus medialis, 6. Quadriceps tendon, 7. Pes anserine, 8. Gracilis, 9. Sartorius, 10. Adductor longus, 11. Femoral artery, 12. Femoral nerve, 13. Inguinal lig., 14. Femur, 15. Articularis genu muscle, 16. Patella, 17. Vastus lateralis, 18. Vastus intermedius.

5 – Study questions:

- 1) Where the femoral triangle is and what does it contain?
- 2) With damage to the femoral nerve, what muscles could be involved and what movements and sensations could be impaired?
- 3) Blockage of which arteries will:
 - a. Affect the hip joint?
 - b. Affect the hamstrings?
 - c. Affect the quadriceps?
- 4) Which muscles of the anterior compartment perform the following actions:
 - a. Flex the hip?
 - b. Extend the knee?
 - c. External rotate the hip?

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2.4 MEDIAL COMPARTMENT OF THE THIGH

2.4.1 CONTENTS

1. OBTURATOR NERVE (Figs. 2-18, 2-20)

- **LUMBAR PLEXUS** from spinal nerves L2 – L4
- **ANTERIOR BRANCH** innervates the **GRACILIS**, and **ADDUCTOR LONGUS**, the **HIP JOINT** and the skin of the **MEDIAL THIGH**
- **POSTERIOR BRANCH** innervates the **ADDUCTOR BREVIS** and the anterior **ADDUCTOR MAGNUS**
- through the **OBTURATOR CANAL** along with the obturator artery and vein and innervates the **OBTURATOR EXTERNUS** muscle

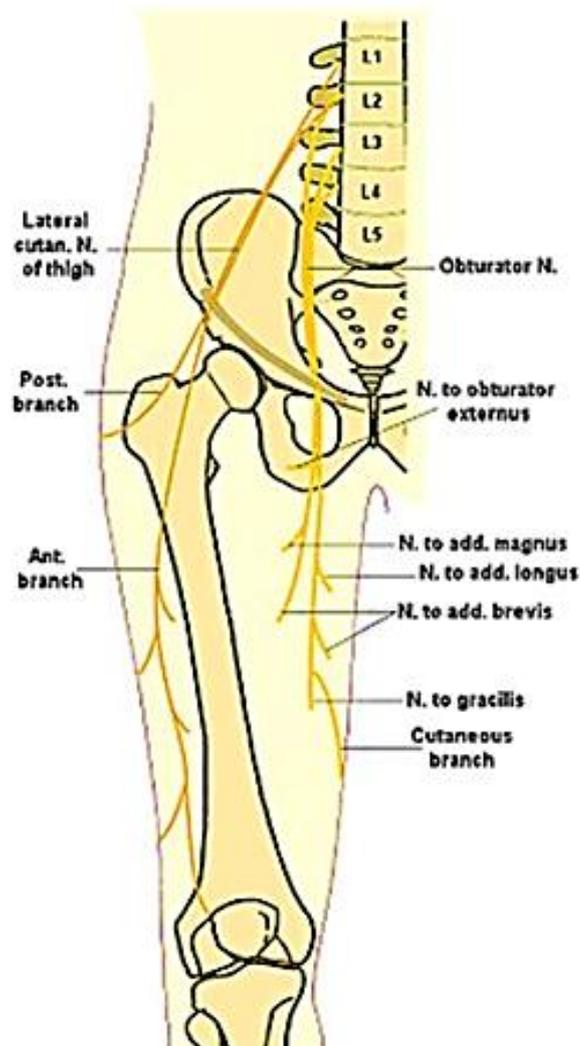


Fig 2-18. Thigh: Diagram of the obturator nerve showing its motor distribution.

2. OBTURATOR ARTERY (Fig. 2-14)

- **INTERNAL ILIAC** artery branch
- passes through the obturator canal and enters the medial thigh
- supplies **OBTURATOR EXTERNUS** muscle and the **FEMORAL HEAD** through the **ROUND LIGAMENT OF THE FEMUR**

3. OBTURATOR VEIN

- runs with the obturator artery
- empties into the internal iliac vein

4. OBTURATOR CANAL.

- osseofibrous canal lies at the superior margin of the obturator foramen
- transmits obturator nerve, artery and vein

2.4.2 MEDIAL COMPARTMENT MUSCLES (FIGS. 2-10, 2-13, 2-19, 2-20, 2-21)

1. GRACILIS

- Superior attachment (origin): Body and inferior ramus of the pubic bone
- Inferior attachment (insertion): Proximal medial tibial shaft via pes anserine
- Nerve: Obturator nerve
- Action: Adduction of the femur at the hip

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2. ADDUCTOR LONGUS

- Superior attachment (origin): Body of the pubic bone.
- Inferior attachment (insertion): medial lip of the linea aspera of the femur
- Nerve: Obturator nerve
- Action: Adduction of the femur at the hip

3. ADDUCTOR BREVIS

- Superior attachment (origin): Body and inferior ramus of the pubic bone.
- Inferior attachment (insertion): Pectineal line, medial lip of the linea aspera of the femur.
- Nerve: Obturator nerve.
- Action: Adduction of the femur at the hip

4. ADDUCTOR MAGNUS

- Superior attachment (origin): Inferior ramus of the pubic bone, ramus of the ischium, ischial tuberosity.
- Inferior attachment (insertion): Gluteal tuberosity; medial lip of the linea aspera of the femur; medial supracondylar ridge; adductor tubercle of the femur.
- Nerve: Obturator nerve, sciatic nerve (L4 component of the tibial nerve)
- Action: Adduction of the femur at the hip

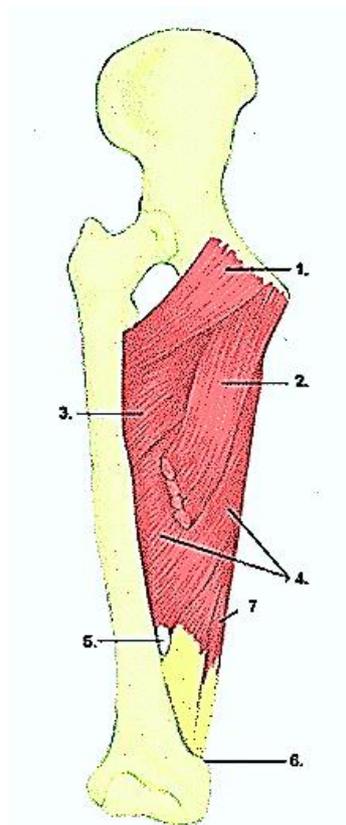


Fig 2-19. Thigh: Drawing of the medial thigh showing the muscles of this region. 1. Pectineus, 2. adductor longus, 3. adductor brevis, 4. adductor magnus, 5. adductor hiatus, 6. adductor tubercle and 7. gracilis.

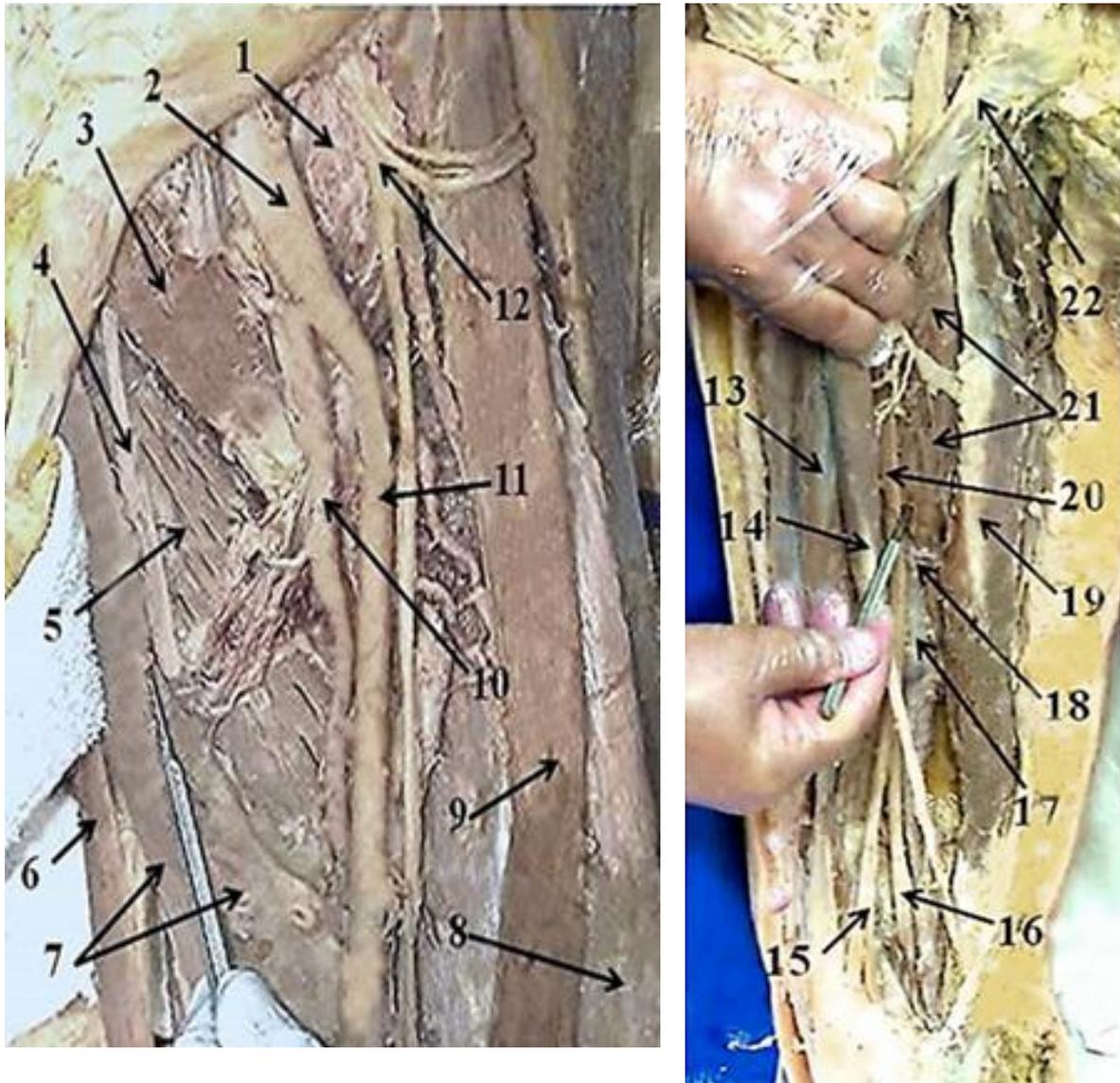


Fig 2-20. Thigh: Dissection showing (LEFT) obturator nerve and adductor muscles and (RIGHT) adductor magnus deep to hamstrings. 1. Iliopsoas, 2. Femoral artery, 3. Pectineus, 4. Obturator nerve, 5. Adductor brevis, 6. Gracilis, 7. Adductor longus (reflected), 8. Rectus femoris, 9. Sartorius, 10. Profunda femoral artery, 11. Femoral artery, 12. Femoral nerve, 13. Long head of biceps femoris, 14. Semitendinosus (pulled laterally), 15. Common fibular nerve, 16. Tibial nerve, 17. Popliteal vein covering popliteal artery, 18. Adductor hiatus, 19. Semimembranosus, 20. Sciatic nerve, 21. Adductor magnus, 22. Attachment of semitendinosus.

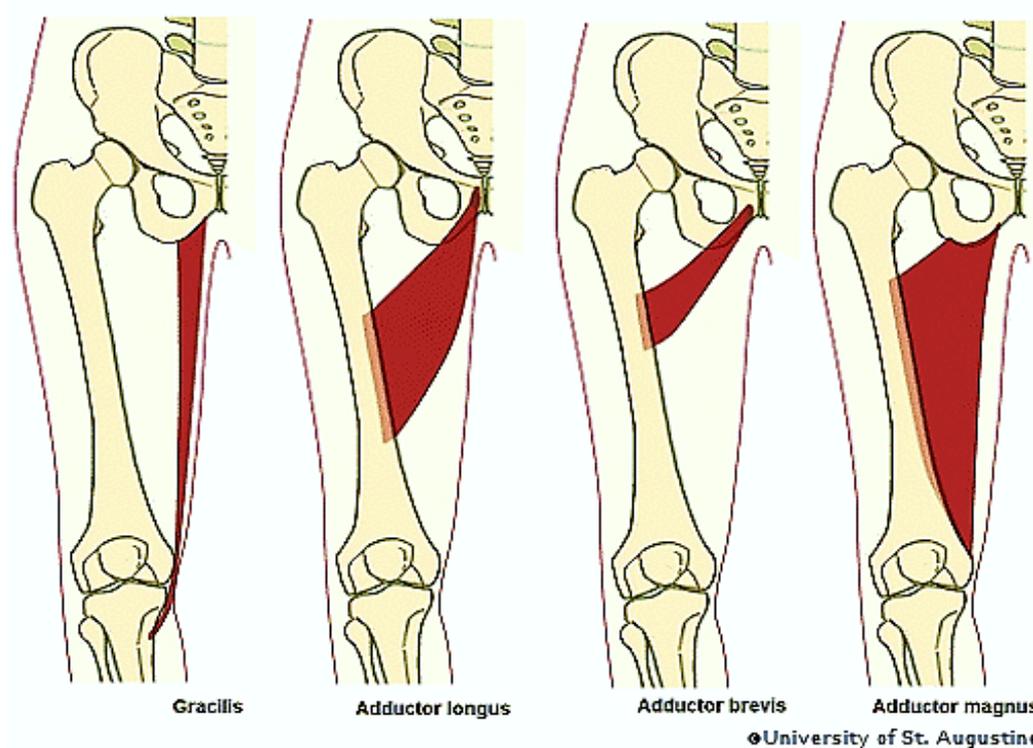


Fig 2-21. Thigh: Diagrams of the gracilis, adductor longus, adductor brevis, and adductor magnus showing bony attachment sites.

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6 – Study questions:

- 1) Damage to the obturator nerve could involve which muscles of the medial thigh and impair which movements of the hip? Would there be any sensory impairment? If so, what would it be?
- 2) Which of the medial compartment muscles is innervated by two different nerves? What might you find if only one of these nerves were damaged?
- 3) As the femoral and obturator nerves both arise from the L2-4 of the lumbar plexus, how could you differentiate between a spinal nerve lesion and a lesion of either the femoral and obturator nerve?

2.5 POSTERIOR COMPARTMENT OF THE THIGH

2.5.1 CONTENTS

1. **SCIATIC NERVE (Figs. 2-20, 2-22, 2-23, 2-24)**
 - **TIBIAL NERVE** branches from sciatic nerve to posterior lower leg and plantar surface of foot
 - **COMMON FIBULAR (peroneal) NERVE** branches from sciatic nerve to anterior and lateral lower leg and dorsum of foot

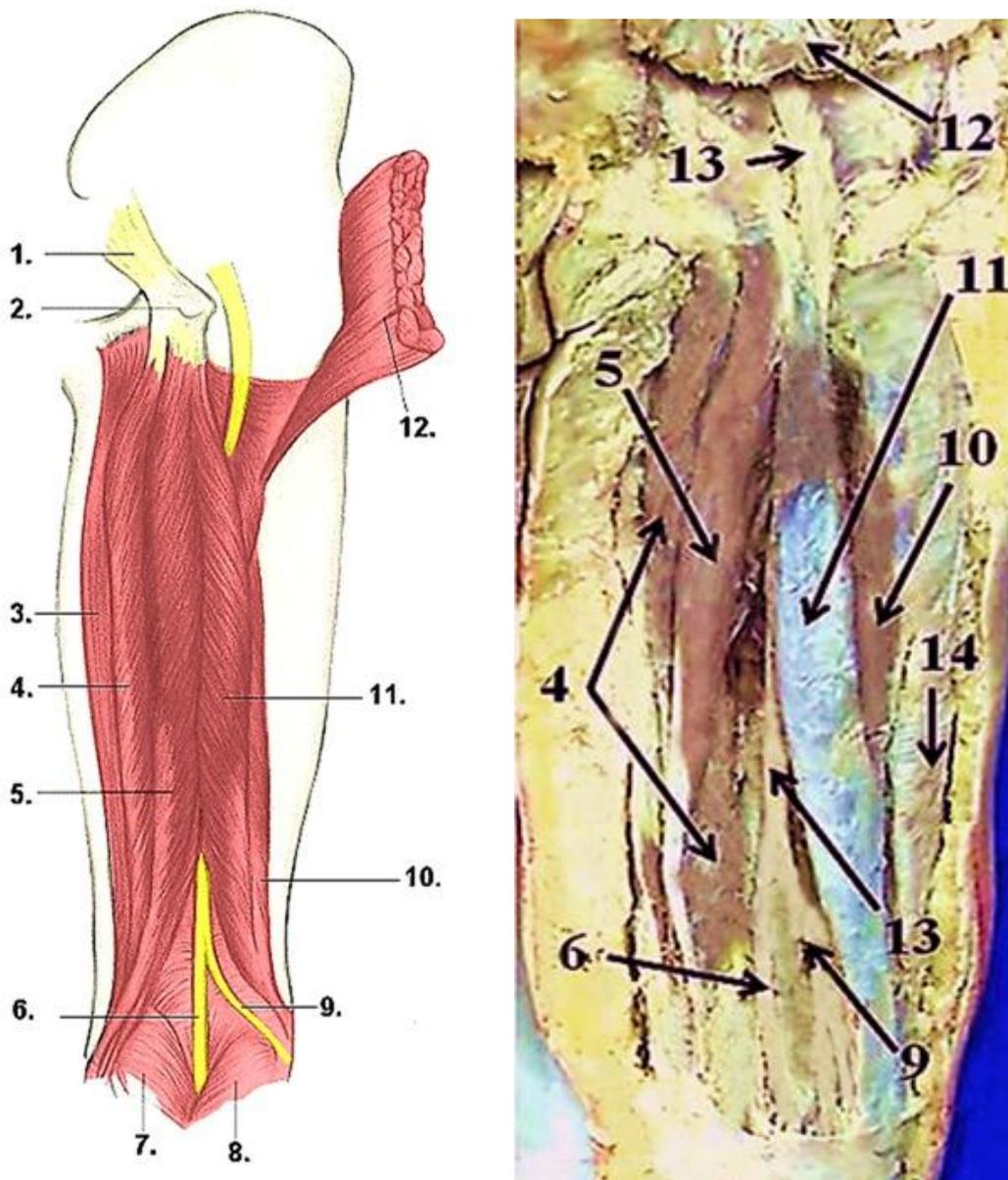


Fig 2-22. Thigh: Drawing of the posterior compartment of the thigh showing the muscles and nerves of this region. 1. Sacrotuberous ligament, 2. ischial tuberosity, 3. gracilis, 4. semimembranosus, 5. semitendinosus, 6. tibial N., 7. gastrocnemius medial head and 8. lateral head, 9. common fibular (peroneal) N., 10. short head of biceps, 11. long head of biceps, 12. gluteus maximus, 13. Sciatic nerve, 14. Vastus Lateralis.

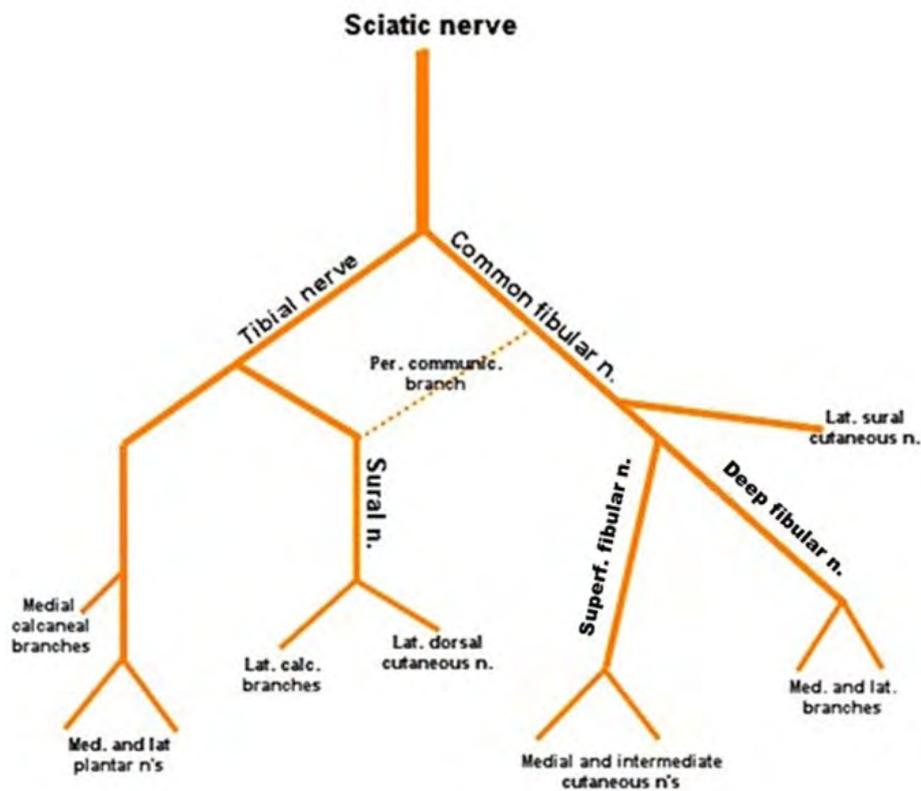


Fig 2-23. Thigh: A schema showing the distribution of the sciatic N.

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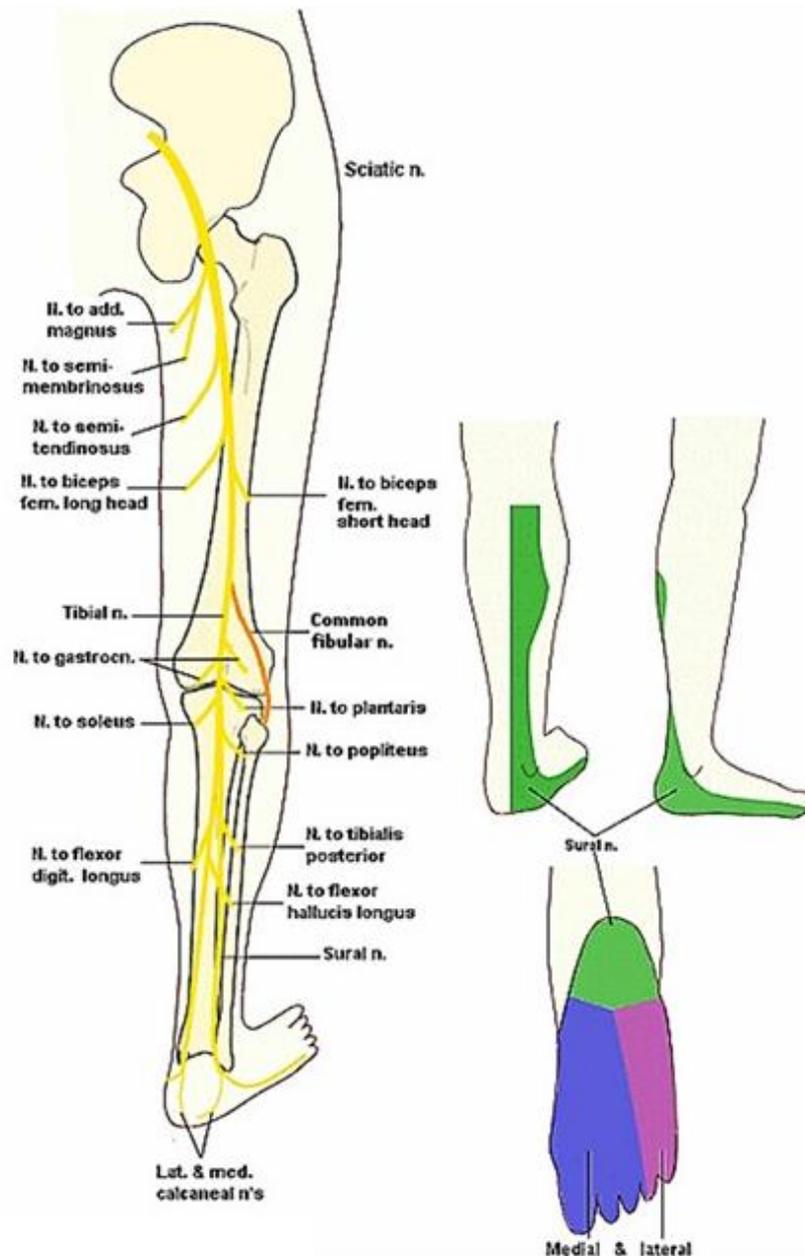


Fig 2-24. Thigh: Diagram of the sciatic nerve showing its motor and sensory distribution.

2. PROFUNDA FEMORAL ARTERY (Figs. 20-14, 20-20)

- **MEDIAL CIRCUMFLEX FEMORAL ARTERY** supplies blood to the femoral head and neck, the acetabular fossa and muscles near the medial hip joint.
- **LATERAL CIRCUMFLEX FEMORAL ARTERY** supplies the femoral head, tensor fascia lata and lateral part of the vastus lateralis and vastus intermedius.
- **PERFORATING ARTERIES** supply the hamstrings, adductor magnus, and adductor brevis

3. PROFUNDA FEMORAL VEIN accompanies the profunda femoral artery

2.5.2 POSTERIOR COMPARTMENT MUSCLES

1. BICEPS FEMORIS (Figs. 2-22, 2-25)

- Superior attachment (origin): **LONG HEAD** from the ischial tuberosity; **SHORT HEAD** lateral lip of the linea aspera of the femur and lateral supracondylar ridge
- Inferior attachment (insertion): Lateral condyle of the tibia and the fibular head
- Nerve: Tibial nerve to the **long head**; common fibular (peroneal) nerve to the **short head**
- Action: Flexion of the knee joint; extension of the hip by the long head; lateral (external) rotation of the tibia.

2. SEMIMEMBRANOSUS

- Superior attachment (origin): Ischial tuberosity
- Inferior attachment (insertion): medial condyle of the tibia
- Nerve: Tibial nerve
- Action: Flexion of the knee joint; extension of the hip; medial rotation of the tibia

3. SEMITENDINOSUS

- Superior attachment (origin): Ischial tuberosity
- Inferior attachment (insertion): pes anserine
- Nerve: Tibial nerve
- Action: Flexion of the knee joint; extension of the hip; medial rotation of the tibia

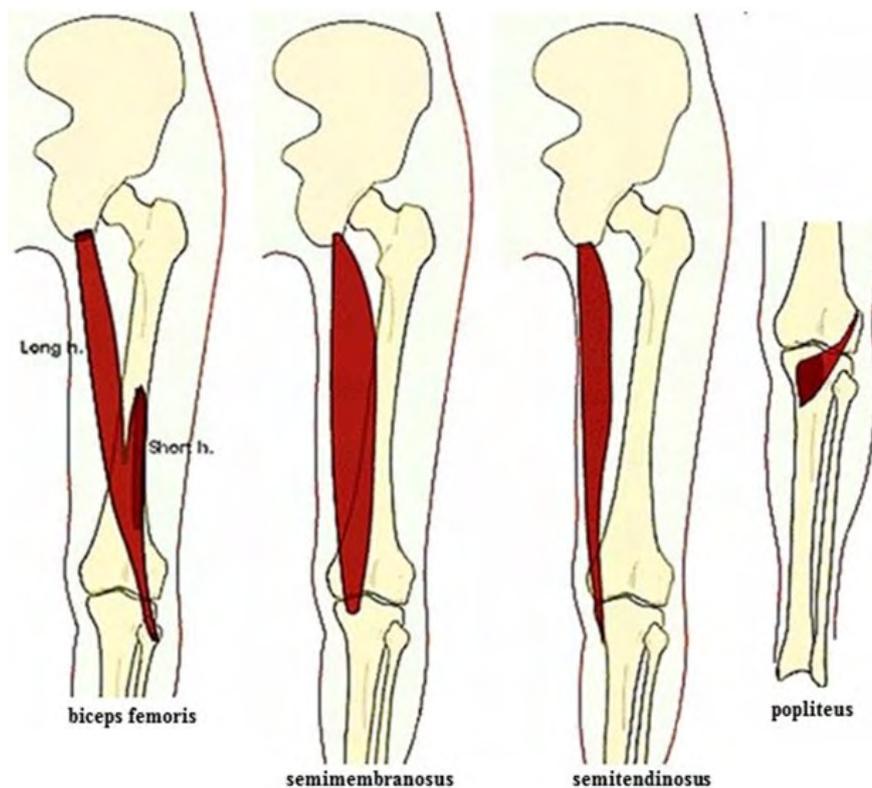


Fig 2-25. Thigh: Diagrams of the biceps femoris, semimembranosus, semitendinosus and popliteus showing bony attachment sites.

7 – Study questions:

- 1) What artery supplies blood to the muscles of the posterior compartment?
- 2) Damage to the tibial nerve could affect which posterior compartment muscles and what actions?
- 3) Damage to the common fibular (peroneal) nerve could affect which posterior compartment muscles and what actions?
- 4) Which of the posterior compartment muscles perform the following actions:
 - a. Flex the knee?
 - b. Internally rotate the tibia?
 - c. Extend the hip?
 - d. Externally rotate the tibia?



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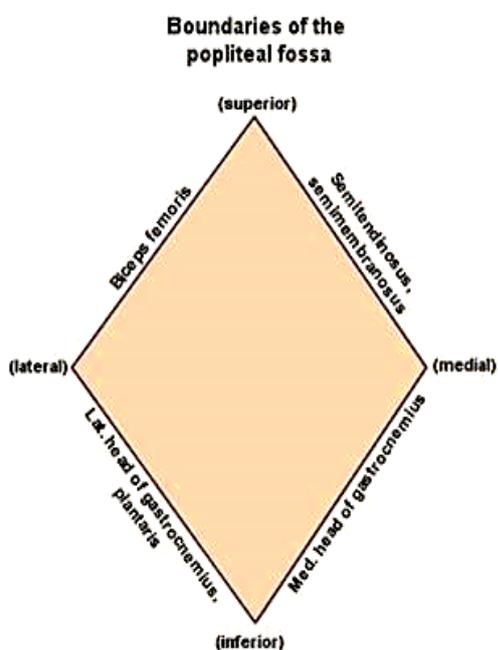
2.6 POPLITEAL FOSSA

2.6.1 BOUNDARIES (FIGS. 2-22, 2-26, 20-27)

- diamond shaped fossa posterior to the knee joint
- superior and lateral boundary by the **BICEPS FEMORIS** tendon
- superior and medial boundary by the tendons of the **SEMIMEMBRANOSUS AND SEMITENDINOSUS**
- inferior and lateral boundary by the lateral head of the **GASTROCNEMIUS**
- inferior and medial boundary by the medial head of the **GASTROCNEMIUS**

2.6.2 CONTENTS

- **TIBIAL NERVE (Figs. 2-20, 2-22, 2-23, 2-24, 2-27)**
 - **SUPERIOR MEDIAL GENICULAR NERVE** to the knee
 - **INFERIOR MEDIAL GENICULAR NERVE** to the knee
 - **MIDDLE GENICULAR NERVE** to the knee
 - **MEDIAL SURAL NERVE** joins the **FIBULAR (PERONEAL) COMMUNICATING BRANCH** of common fibular nerve to form the sural nerve
 - **SURAL NERVE** to the skin of the posterolateral the leg and the lateral ankle and foot
- **COMMON FIBULAR (peroneal) NERVE (Figs. 2-20, 2-22, 2-23, 2-24, 2-27)**
 - **SUPERIOR LATERAL GENICULAR NERVE** to the knee
 - **INFERIOR LATERAL GENICULAR NERVE** to the knee
 - **FIBULAR (peroneal) COMMUNICATING BRANCH** joins medial sural nerve to form the sural nerve
 - **LATERAL SURAL CUTANEOUS NERVE** to the skin of the lateral leg
 - **SUPERFICIAL FIBULAR (peroneal) NERVE** to muscles of the lateral leg and skin on the dorsum of the foot
 - **DEEP FIBULAR (peroneal) NERVE** to the muscles of the anterior leg



Contents:

- 1) posterior femoral cutaneous nerve
- 2) small saphenous vein
- 3) tibial nerve:
 - medial sural cutaneous nerve
 - muscular branches
 - superior med., inferior med. and middle genicular nerves to knee joint
- 4) common fibular nerve:
 - lateral sural cutaneous nerve
 - superior lateral, inferior lateral genicular and recurrent genicular nerves to knee joint
- 5) popliteal vein
- 6) popliteal artery:
 - anterior and posterior arteries
 - superior medial and lateral, inferior medial and lateral, middle genicular arteries to knee joint

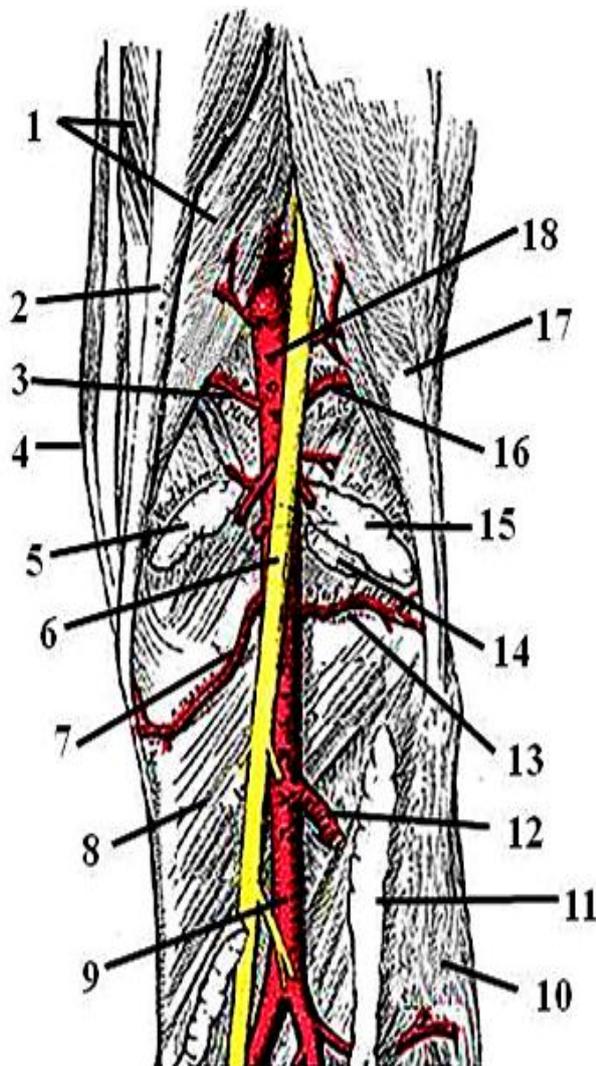


Fig. 2-26. Thigh: (LEFT) Diagram showing the borders and listing the contents of the popliteal fossa. (RIGHT) Drawing of the popliteal fossa showing the popliteal artery and its branches, tibial nerve and popliteus and surrounding muscles. 1. Semimembranosus, 2. Semitendinosus, 3. Superior medial genicular artery, 4. Gracilis, 5. Medial head of gastrocnemius (cut), 6. Tibial nerve, 7. Inferior medial genicular artery, 8. Popliteus, 9. Posterior tibial artery, 10. Adductor longus, 11. Soleus (cut), 12. Anterior tibial artery, 13. Inferior lateral genicular artery, 14. Plantaris (cut), 15. Lateral head of gastrocnemius (cut), 16. Superior lateral genicular artery, 17. Biceps femoris, 18. Popliteal artery. (Modified from Gray's 1918)

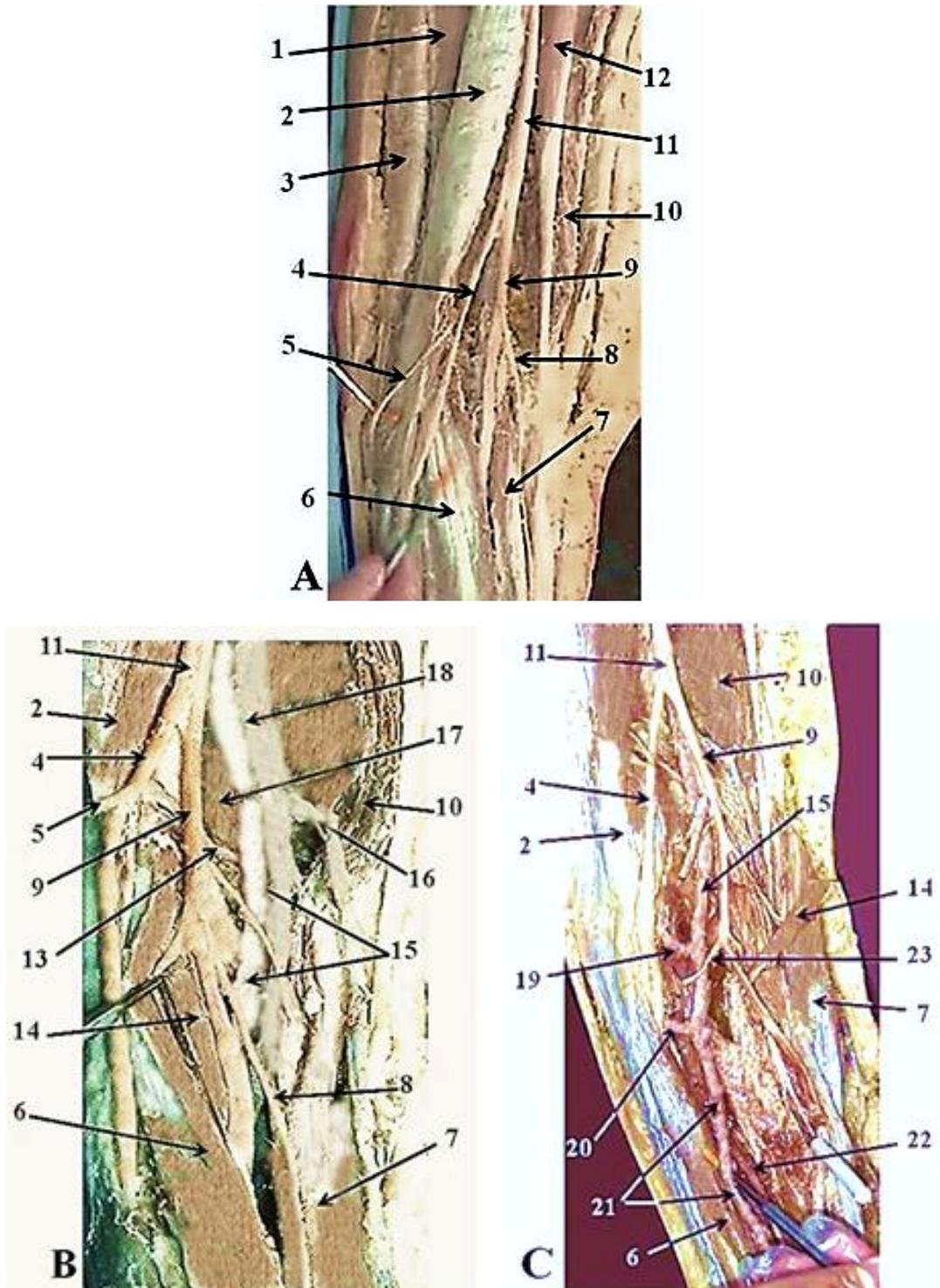


Fig. 2-27. Thigh: Dissection of popliteal fossa (A) Superficial view of the popliteal region, (B) magnified view of popliteal regions showing nerves, (C) View of popliteal region showing arteries. 1. Short head of biceps femoris, 2. Long head of biceps femoris, 3. Vastus lateralis, 4. Common fibular nerve, 5. Lateral sural nerve, 6. Lateral head of gastrocnemius, 7. Medial head of gastrocnemius, 8. Sural nerve, 9. Tibial nerve, 10. Semimembranosus, 11. Sciatic nerve, 12. Semitendinosus, 13. Medial genicular nerve, 14. Plantaris, 15. Popliteal artery, 16. Small saphenous vein, 17. Popliteus, 18. Popliteal vein, 19. Inferior lateral genicular artery, 20. Anterior tibial artery, 21. Posterior tibial artery, 22. Fibular artery, 23. Inferior lateral genicular nerve.

- **POPLITEAL ARTERY (Figs. 2-14, 2-26, 2-27)**
 - **FEMORAL ARTERY** continuation
 - **LATERAL SUPERIOR GENICULAR ARTERY** to knee
 - **LATERAL INFERIOR GENICULAR ARTERY** to knee
 - **MEDIAL SUPERIOR GENICULAR ARTERY** to knee
 - **MEDIAL INFERIOR GENICULAR ARTERY** to knee
 - **MIDDLE GENICULAR ARTERY** to knee
 - **ANTERIOR TIBIAL ARTERY** to the anterior lower leg
 - **POSTERIOR TIBIAL ARTERY** to the posterior leg
 - **FIBULAR (peroneal) ARTERY** off posterior tibial artery to the posterolateral lower leg
- **POPLITEAL VEIN (Fig. 2-15)**
 - branches accompany branches of the popliteal artery
 - **SMALL SAPHENOUS VEIN** from the superficial posterior leg
 - **FEMORAL VEIN** continuation

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2.6.3 MUSCLES OF THE POPLITEAL FOSSA

- 1) **POPLITEUS (Figs. 2-25, 2-26, 2-27)**
 - Superior attachment (origin): Lateral femoral condyle and the lateral meniscus.
 - Inferior attachment (insertion): Posterior proximal tibia above the soleal line
 - Nerve: Tibial nerve.
 - Action: Medial rotation of the tibia; lateral rotation of the femur, flexion of the knee joint.
- 2) **SEMITENDINOUS (Figs. 2-22, 2-25, 2-26, 2-27; See posterior compartment muscles for details)**
- 3) **SEMIMEMBRANOUS (Figs. 2-22, 2-25, 2-26, 2-27; See posterior compartment muscles for details)**
- 4) **BICEPS FEMORIS (Figs. 2-22, 2-25, 2-26, 2-27; See posterior compartment muscles for details)**
- 5) **GASTROCNEMIUS (Figs. 2-22, 2-25, 2-26, 2-27; See posterior compartment muscles for details)**

8 – Study questions:

- 1) Trauma to the popliteal fossa could damage what muscles, what nerves, and what arteries?
- 2) What arteries in the popliteal fossa supply blood directly to the knee joint?
- 3) Would damage to the tibial or common fibular (peroneal) nerves in the popliteal fossa affect motor or sensory innervation in the following areas (yes/ no):
 - a. Posterior thigh?
 - b. Anterior leg?
 - c. Medial thigh?
 - d. Posterior leg?
 - e. Anterior thigh?
 - f. Foot?

3 LEG, ANKLE AND FOOT

3.1 OSTEOLOGY

3.1.1 TIBIA

- **PROXIMAL TIBIA** (Figs. 3-1, 2-2, 2-4; see **Thigh and Knee** for details)
- **TIBIAL SHAFT** (Fig. 3-1)
 - **INTEROSSEOUS RIDGE** for the attachment of the **INTEROSSEOUS MEMBRANE**
 - **TIBIAL TUBEROSITY** anteriorly for the attachment of the patellar ligament
 - **SOLEAL LINE** posteriorly for the attachment of the soleus muscle
- **DISTAL TIBIA** (Fig. 3-1)
 - **MEDIAL MALLEOLUS** is a downward medial protuberance
 - **MALLEOLAR SULCUS** for transmission of the tendons of the tibialis posterior, flexor digitorum longus and flexor hallucis longus
 - **FIBULAR NOTCH** is deep, distal fossa for the **DISTAL TIBIOFIBULAR JOINT**

FIBULA

- **FIBULAR HEAD** (Fig. 3-1)
 - enlarged **PROXIMAL END OF FIBULA**
 - **APEX OF THE HEAD** is a upward projection of the head
 - **NECK OF THE FIBULA** is a narrow between head and shaft
- **FIBULAR SHAFT** (Fig. 3-1)
 - **INTEROSSEOUS RIDGE** for the attachment of the interosseous membrane
 - **FIBULAR (PERONEUS) SULCUS** is inferior for the tendons of the fibularis longus and brevis muscles.
 - **LATERAL MALLEOLUS** is the slightly enlarged distal end of the fibular
 - **SUPERIOR FIBULAR FACET** articulates with the fibular notch of the tibia
 - **INFERIOR FIBULAR FACET** articulates with the talus.

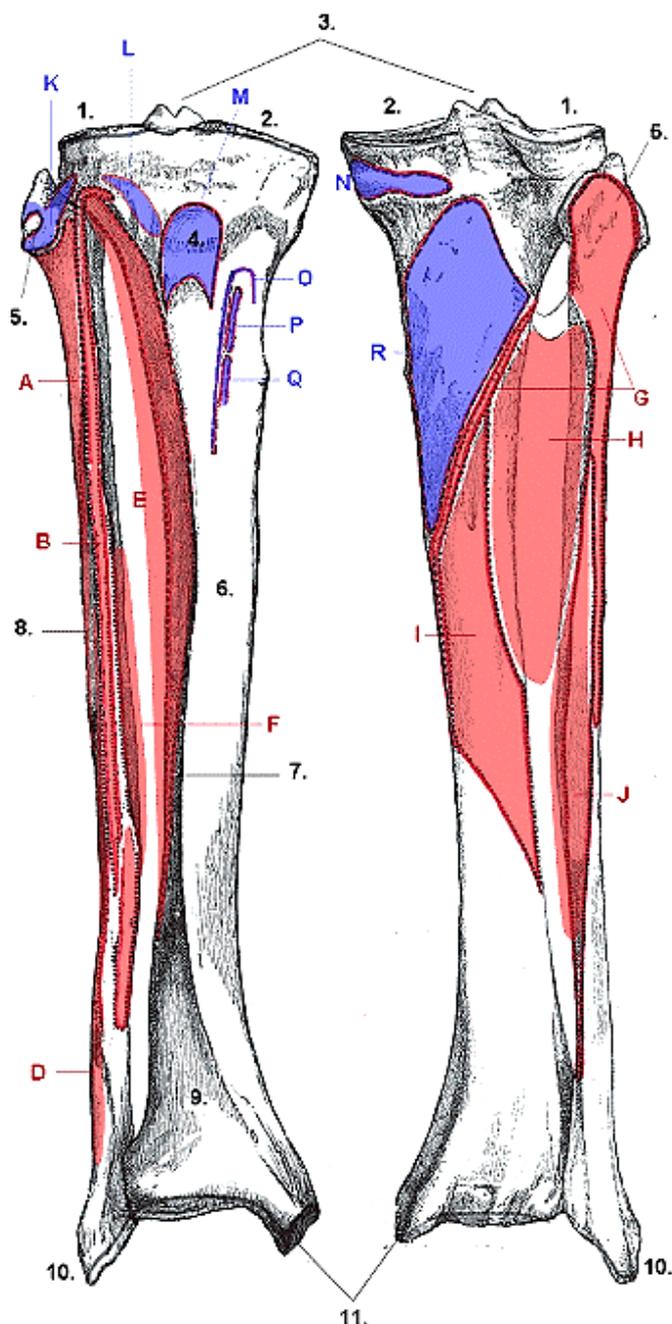


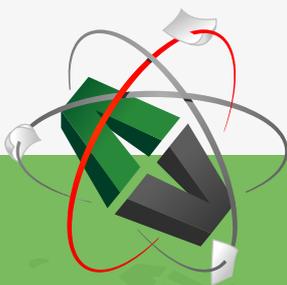
Fig 3-1. Leg: Anterior and posterior views of tibia and fibula. The alphabetical labels indicate muscle origins (red) and muscle insertions (blue). 1. Lateral condyle, 2. medial condyle, 3. tubercles of intercondylar eminence, 4. tibial tuberosity, 5. head of fibula, 6. medial surface of tibia, 7. anterior border of tibia, 8. shaft of fibula, 9. anterior surface of tibia, 10. lateral malleolus, and 11. medial malleolus. **Muscle attachments:** A) fibularis (peroneus) longus, B) extensor digitorum longus, D) fibularis (peroneus) tertius, E) tibialis anterior, F) extensor hallucis longus, G) soleus, H) tibialis posterior, I) flexor digitorum longus, J) flexor hallucis longus, K) biceps femoris, L) fascia lata, M) quadriceps femoris, N) semimembranosus, O) sartorius, P) gracilis, Q) semitendinosus, and R) popliteus. (Modified from Gray 1918)

3.1.2 FOOT (FIGS. 21-02, 21-03, 21-04)

DIVISIONS

- **HINDFOOT** (rear foot) containing the **TALUS** and **CALCANEUS**
- **MIDFOOT** containing the **NAVICULAR, CUBOID** and the three **CUNEIFORM BONES**
- **FOREFOOT** containing the **METATARSALS** and **PHALANGES**

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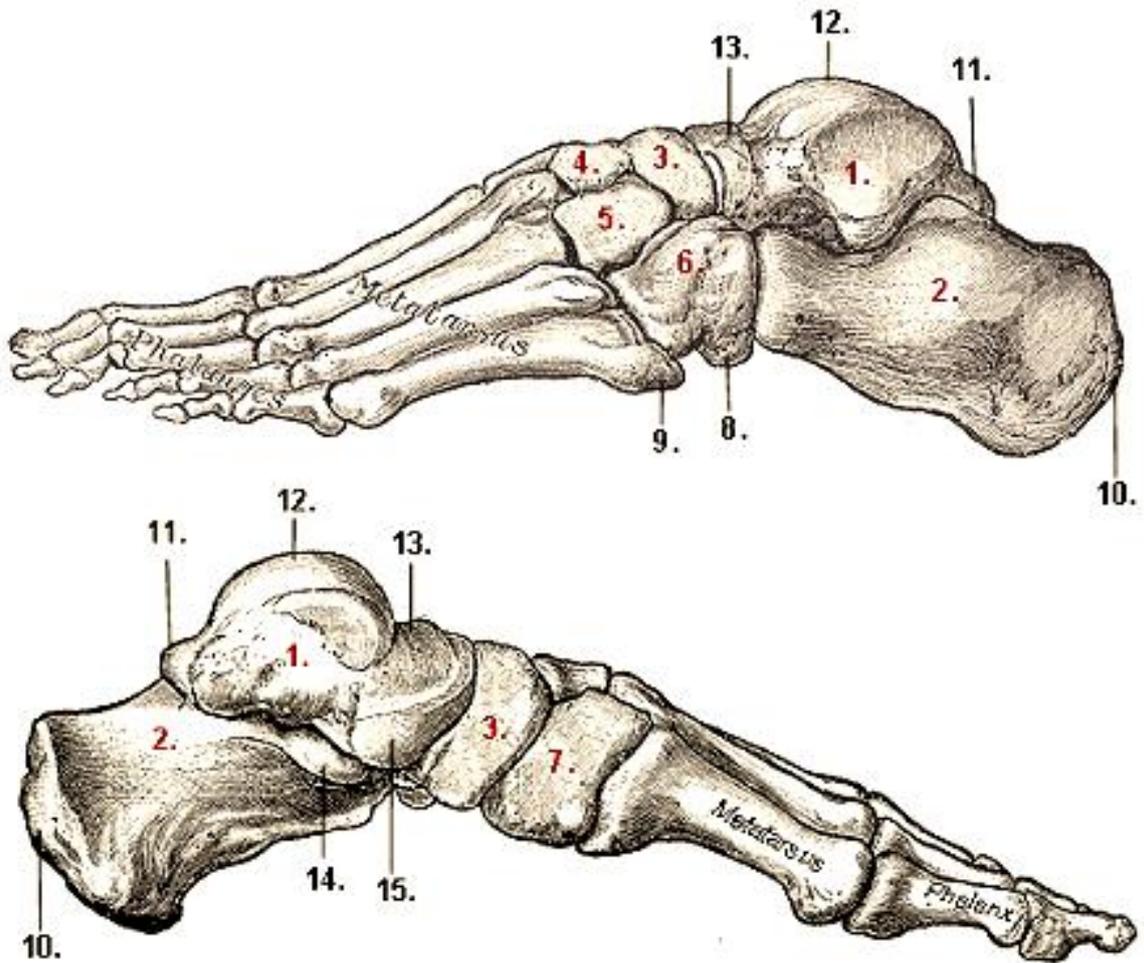


Fig. 3-2. Leg: Lateral (above) and medial (below) views of the foot. 1. Talus, 2. calcaneus, 3. navicular, 4. middle cuneiform, 5. lateral cuneiform, 6. cuboid, 7. medial cuneiform, 8. tuberosity of cuboid, 9. tuberosity at the base of the 5th metatarsal, 10. tuberosity of calcaneus, 11. posterior tubercle of talus, 12. dome of talus, 13. neck of talus, 14. sustentaculum tali, and 15. head of the talus. (Modified from Gray 1918)

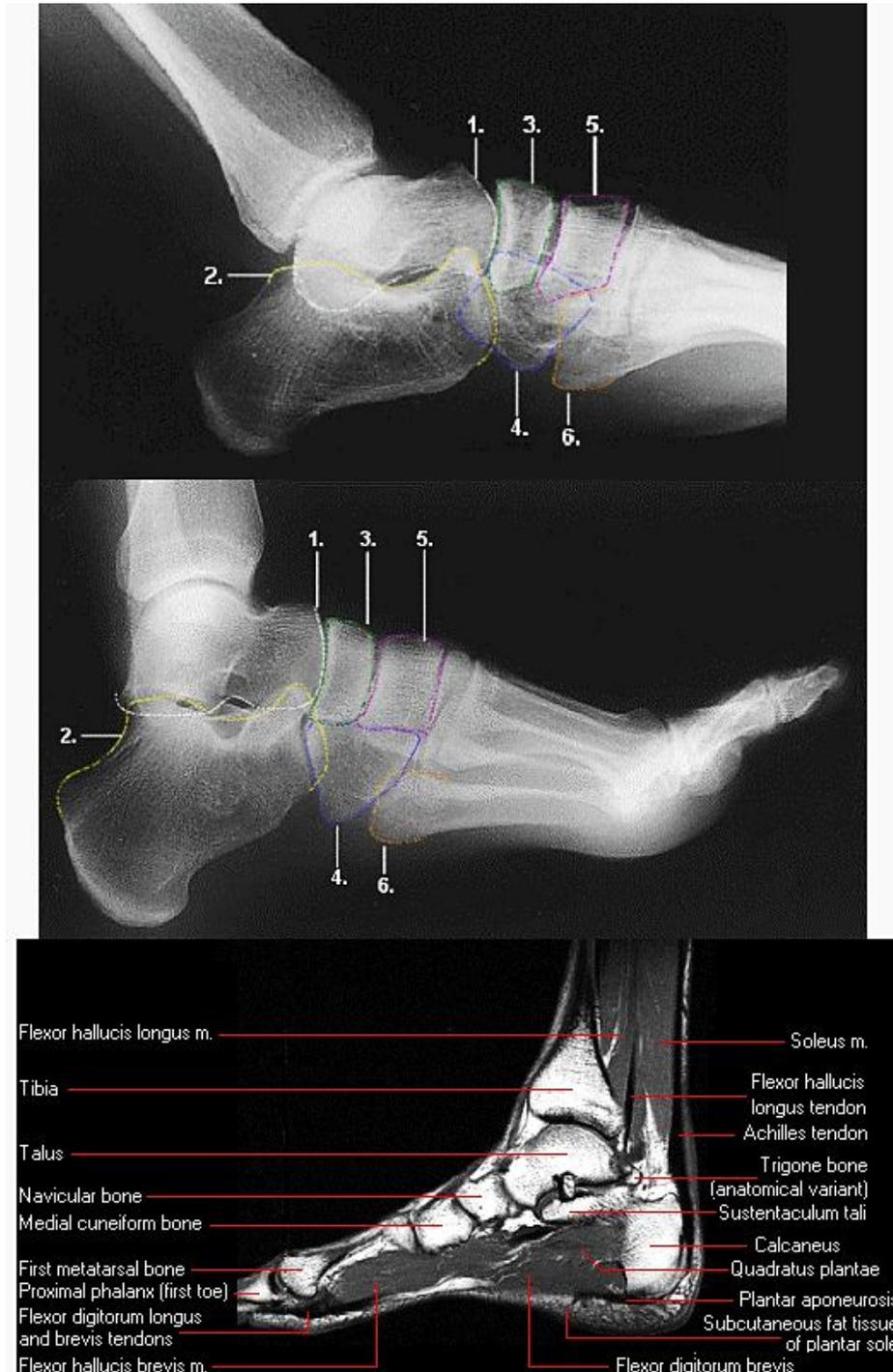


Fig. 3-3. Leg: Lateral radiographs of the ankle and foot and a MRI to the ankle, hindfoot and midfoot. 1. head of the talus, 2. calcaneus, 3. navicular, 4. cuboid, 5. medial cuneiform, and 6. tuberosity at the base of the 5th metatarsal.

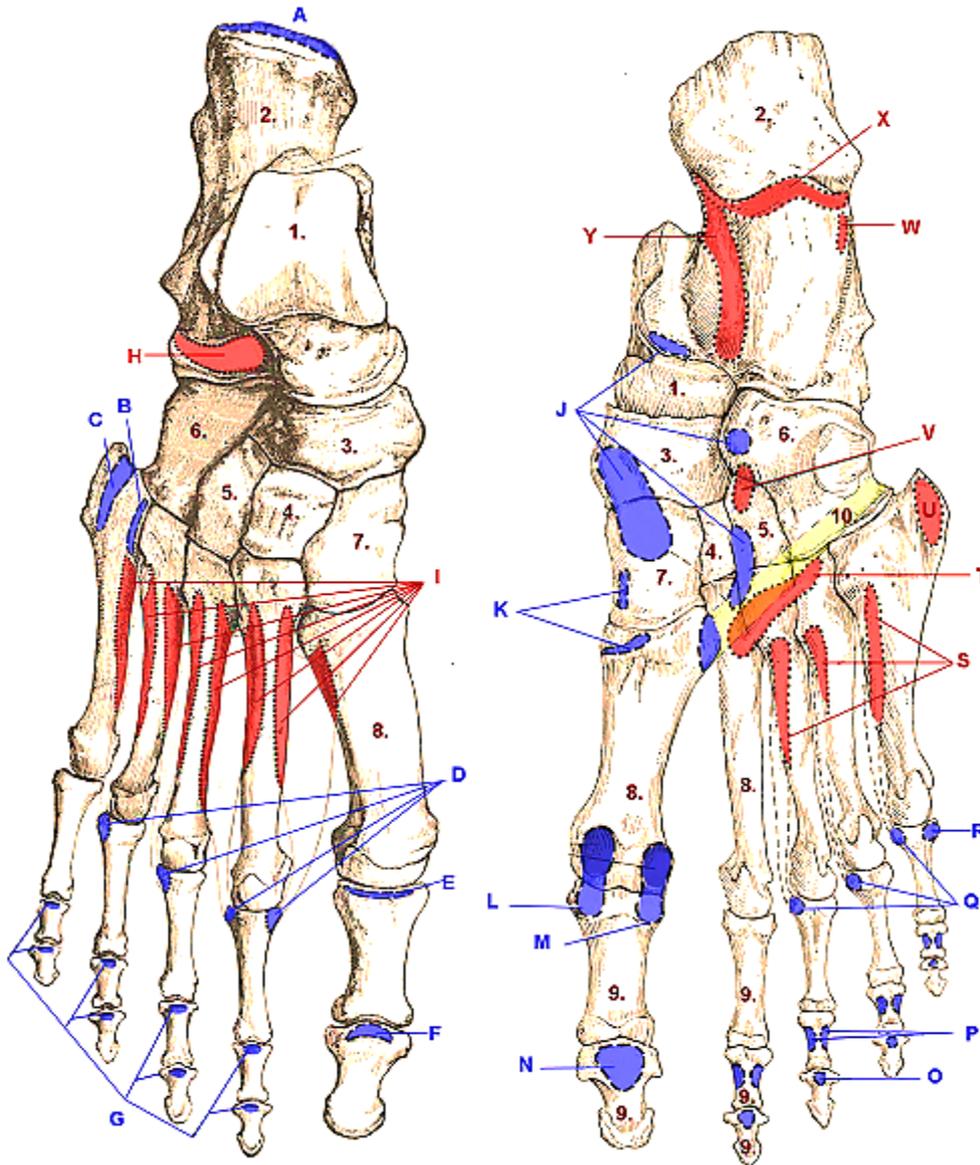


Fig. 3-4. Leg: A superior (left) and inferior (right) views of the foot. The alphabetical labels indicate muscle origins (red) and muscle insertions (blue). 1. Talus, 2. calcaneus, 3. navicular, 4. middle cuneiform, 5. lateral cuneiform, 6. cuboid, 7. medial cuneiform, 8. metatarsals, 9. phalanges, and 10. groove for peroneus longus tendon. **Muscle attachments:** A) triceps surae, B) fibularis (peroneus) tertius, C) fibularis (peroneus) brevis, D) insertion of dorsal interossei, E) extensor hallucis brevis, F) extensor hallucis longus, G) extensor digitorum longus and brevis (insertions), H) origin of extensor digitorum brevis, I) origins of dorsal interossei, J) tibialis posterior, K) tibialis anterior, L) abductor hallucis brevis and flexor hallucis brevis, M) insertion of adductor hallucis brevis and flexor hallucis brevis, N) flexor hallucis longus, O) flexor digitorum longus, P) flexor digitorum brevis, Q) insertion of plantar interossei, R) abductor and flexor digiti minimi, S) origins of plantar interossei, T) origin of adductor hallucis (oblique head), U) origin of flexor digiti minimi, V) origin of flexor hallucis brevis, W) lateral head of quadratus plantae, X) origins of flexor and abductor digiti minimi. Y) medial head of quadratus plantae (Modified from Gray 1918)

TARSAL BONES (Figs. 3-2, 3-3, 3-4)

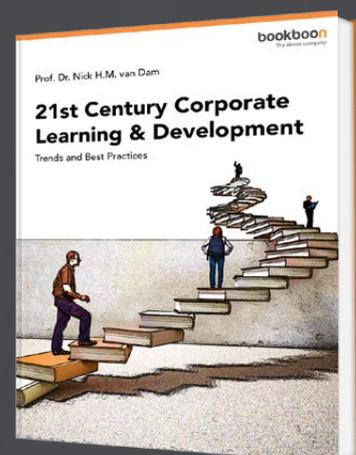
- **CALCANEUS**

- largest tarsal bones.
- **POSTERIOR, ANTERIOR AND MIDDLE ARTICULATION** for the **TALUS**
- **CUBOID BONE ARTICULATION**
- **FIBULAR TROCHLEA** and **GROOVE FOR THE FIBULARIS LONGUS TENDON**
- **SUSTENTACULUM TALI** is self-like projections medially with inferior for the **GROOVE FOR THE FLEXOR HALLICUS LONGUS TENDON**
- **CALCANEAL TUBEROSITY (TUBER CALCANEI)** for the attachment of the **TENDO-CALCANEUS** (Achilles tendon)
- **MEDIAL and LATERAL TUBERAL PROCESSES** on calcaneal tuberosity for attachment of muscles of the sole of the foot

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- **TALUS**
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 - **CALCANEAL ARTICULATION**
 - **HEAD** with the **NAVICULAR BONE ARTICULATION**
 - **MEDIAL and LATERAL TUBERCLES** forming the sides for the **GROOVE FOR THE FLEXOR HALLUCIS LONGUS TENDON**
- **NAVICULAR**
 - **HEAD OF THE TALUS ARTICULATION**, posteriorly
 - **CUNEIFORM BONES ARTICULAR FACETS**, anteriorly
 - medial facet for the **FIRST (MEDIAL) CUNEIFORM**
 - superolateral facet for the **SECOND (INTERMEDIATE) CUNEIFORM**
 - inferolateral facet for the **THIRD (LATERAL) CUNEIFORM**
 - **CUBOID ARTICULATION**, laterally
 - **NAVICULAR TUBEROSITY** for the attachment of the tibialis posterior muscle
- **CUBOID**
 - **CALCANEUS ARTICULATION**, posteriorly
 - **NAVICULAR ARTICULATION**, medially
 - **THIRD CUNEIFORM BONE**, superomedially
 - **FOURTH METATARSAL BASE AND FIFTH METATARSAL BASE**, anteriorly
 - **TUBEROSITY OF THE CUBOID** with anterior **GROOVE FOR THE FIBULARIS LONGUS TENDON**.
- **MEDIAL CUNEIFORM**
 - **NAVICULAR ARTICULATION**, posteriorly
 - **SECOND CUNEIFORM BONE ARTICULATION**, laterally
 - **SECOND METATARSAL BASE ARTICULATION**, laterally
 - **FIRST METATARSAL BASE ARTICULATION**, anteriorly
- **SECOND INTERMEDIATE CUNEIFORM**
 - **NAVICULAR ARTICULATION**, posteriorly
 - **FIRST CUNEIFORM BONE ARTICULATION**, medially
 - **THIRD CUNEIFORM BONE ARTICULATION**, laterally
 - **SECOND METATARSAL BASE ARTICULATION**, anteriorly
- **LATERAL CUNEIFORM**
 - **NAVICULAR ARTICULATION**, posteriorly
 - **CUBOID ARTICULATION**, laterally
 - **SECOND CUNEIFORM BONE ARTICULATION**, medially
 - **SECOND METATARSAL BASE ARTICULATION**, medially
 - **THIRD METATARSAL BASE ARTICULATION**, anteriorly

METATARSAL BONES (Figs. 3-2, 3-4)

- **BASE** is proximal and articulates with the tarsal bones
- **BODY** or shaft is the middle part
- **HEAD** is distal and articulates with the base of a proximal phalanx

PHALANGES (Figs. 3-2, 3-4)

- **PROXIMAL, MIDDLE, and DISTAL PHALANGES** are in toes 2–5
- **PROXIMAL and DISTAL PHALANGES** are in first (big) toe
- Each phalanx has a **PROXIMAL BASE**, a **BODY OR SHAFT**, and **DISTAL HEAD**

FOOT ARCHES (Fig. 3-2)

- **MEDIAL LONGITUDINAL ARCH** is from the calcaneus through the navicular, the cuneiform bones and the medial three metatarsal bones
- **LATERAL LONGITUDINAL ARCH** is from the calcaneus through the cuboid and the fourth and fifth metatarsal.
- **TRANSVERSE ARCH** crosses the cuboid, the three cuneiform bones, and the bases of the five metatarsals

3.2 JOINTS, LIGAMENTS AND BURSAE

3.2.1 ANKLE JOINT COMPLEX (FIGS. 3-5)

- **DISTAL TIBIOFIBULAR JOINT**
 - fibrous joint
 - superior to ankle joint
 - articulation between the **MEDIAL DISTAL FIBULA** and the **FIBULAR NOTCH** on the lateral **DISTAL TIBIA**
- **FIBULOTALAR JOINT**
 - lateral part of the ankle joint
 - articulation between the malleolar articular surface of the **LATERAL MALLEOLUS** and the **LATERAL TROCHLEA OF THE TALUS**

- **TIBIOTALAR JOINT**
 - superior and medial part of the ankle joint
 - articulation of the **INFERIOR TIBIA** and the malleolar articular surface of the **MEDIAL MALLEOLUS** with the **SUPERIOR AND MEDIAL TROCHLEA OF THE TALUS**
- **MORTISE**
 - inverted “U” shaped cup formed by the articular surfaces of the **LATERAL AND MEDIAL MALLEOLI** and the **INFERIOR TIBIA**
 - covers the **TROCHLEA OF THE TALUS** and is important in ankle stability



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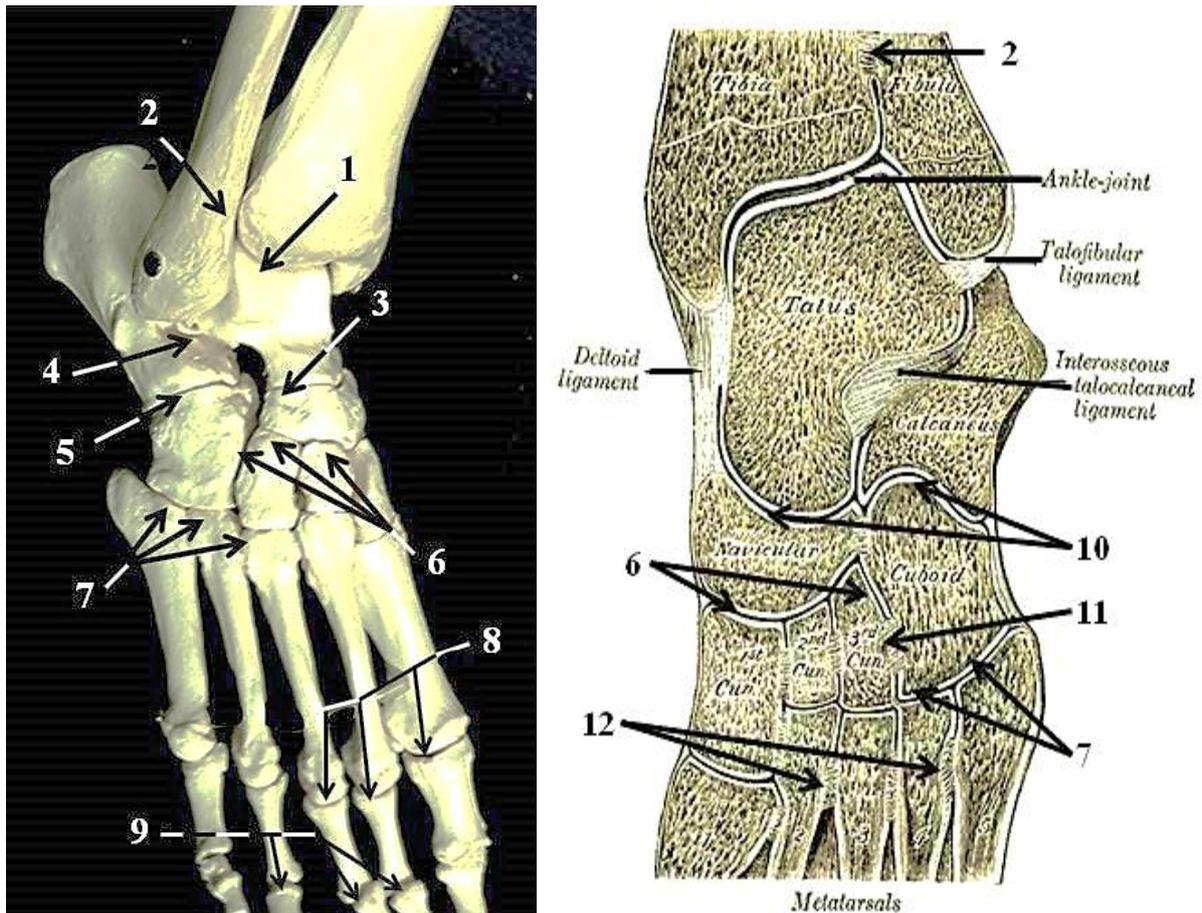


Fig. 3-5. Leg: (LEFT) Skelton showing joint location in ankle and foot. (RIGHT) Oblique section through the ankle and foot (Modified from Gray's 1918) 1. Ankle joint, 2. Distal Tibiofibular joint, 3. Calcaneonavicular joint, 4. Subtalar joint, 5. Calcaneocuboid joint, 6. Intertarsal joints 7. Tarsometatarsal joints, 8. Metatarsophalangeal joints, 9. Proximal interphalangeal joints, 10. Transverse tarsal (Midtarsal) joint formed by the calcaneonavicular and calcaneocuboid joints, 11. Interosseous intertarsal lig., 12. Interosseous intermetatarsal lig.

3.2.2 FOOT JOINTS (FIG. 3-5)

- **SUBTALAR JOINT**
 - plane synovial joint
 - articulation between the **ANTERIOR, MIDDLE, AND POSTERIOR CALCANEAL FACETS** with the **TALAR CALCANEAL ARTICULATION**

- **MIDTARSAL JOINT** (transverse tarsal or Chopart's)
 - **CALCANEOCUBOID AND TALONAVICULAR JOINTS** combined
 - **CALCANEOCUBOID ARTICULATION**
 - plane synovial joint
 - articulation between the **POSTERIOR CUBOID ARTICULATION** and the anterior body of the **CALCANEUS**

- **TALONAVICULAR ARTICULATION**
 - shallow ball and socket synovial joint
 - articulation between the oval convex **TALAR HEAD ARTICULATION** and the oval concave posterior navicular articulation

- **TARSOMETATARSAL JOINTS**
 - plane synovial joints
 - anterior articulation of the **MEDIAL CUNEIFORM** and the base of the **FIRST METATARSAL**
 - anterior articulation of the **INTERMEDIATE CUNEIFORM** and the base of the **SECOND METATARSAL**
 - anterior articulation of the **LATERAL CUNEIFORM** and the base of the **THIRD METATARSAL**
 - anterior medial **CUBOID ARTICULAR FACET** and the base of the **FOURTH METATARSAL**
 - anterior lateral **CUBOID ARTICULAR FACET** and the base of the **FIFTH METATARSAL**

- **METATARSOPHALANGEAL JOINTS**
 - condyloid type synovial joints
 - articulation between the **CONVEX METATARSAL HEAD** and the concave **BASE OF THE PROXIMAL PHALANX**

- **INTERPHALANGEAL JOINTS OF TOES 2–5**
 - hinge type synovial joint
 - articulation between **HEAD OF THE PROXIMAL PHALANX** with the **BASE OF THE MIDDLE PHALANX**
 - articulation between **HEAD OF THE MIDDLE PHALANX** with the **BASE OF THE DISTAL PHALANX**

- **INTERPHALANGEAL JOINTS OF BIG TOE**
 - hinge type synovial joint
 - articulation between **HEAD OF THE PROXIMAL PHALANX** with the **BASE OF THE DISTAL PHALANX**

3.2.3 LIGAMENTS OF THE ANKLE COMPLEX

- **DISTAL TIBIOFIBULAR JOINT (Figs. 3-5, 3-6, 3-9, 3-10)**
 - **SYNDESMOSIS with no joint capsule**
 - **INTEROSSEUS TIBIOFIBULAR LIGAMENT**
 - **ANTERIOR TIBIOFIBULAR LIGAMENT**
 - **POSTERIOR TIBIOFIBULAR LIGAMENT**
 - Blood supply from the **FIBULAR ARTERY**, a malleolar branch off the **ANTERIOR TIBIAL ARTERY**, and a malleolar branch off the **POSTERIOR TIBIAL ARTERY**
 - Innervation from the **DEEP FIBULAR NERVE**, the **TIBIAL NERVE**, and the **SAPHENOUS NERVE**



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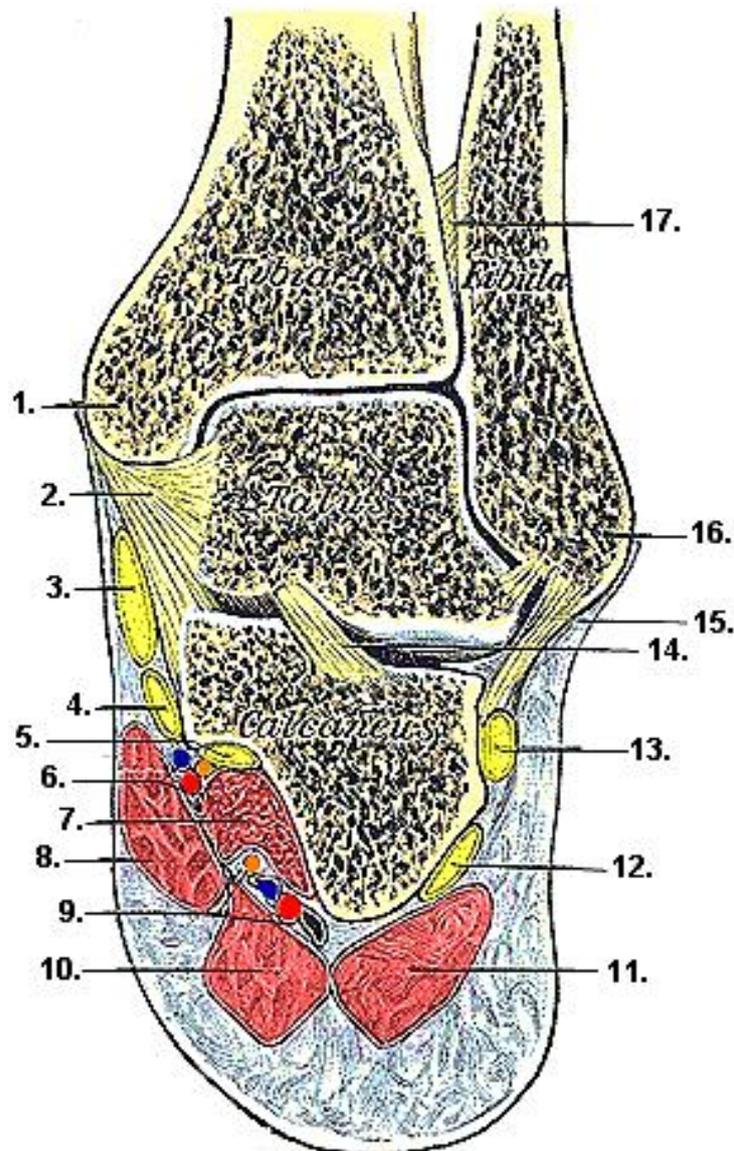


Fig. 3-6. Leg: Cross section through the inferior tibiofibular, ankle, and subtalar joints. 1. Medial malleolus, 2. medial tibiocalcaneal ligament. Tendons of: 3. tibialis posterior, 4. flexor digitorum longus, and 5. flexor hallucis longus. 6. medial plantar nerves and vessels, 7. quadratus plantae, 8. abductor hallucis, 9. lateral plantar nerve and vessels, 10. flexor digitorum brevis, 11. abductor digiti quinti, 12. tendon of peroneus (fibularis) longus, 13. tendon of peroneus (fibularis) brevis, 14. interosseous talocalcaneal ligament, 15. calcaneofibular ligament, 16. lateral malleolus, and 17. tibiofibular syndesmosis. (Modified from Gray's 1918)

- **ANKLE (TALOCRURAL) JOINT (Figs. 3-5, 3-6, 3-7, 3-8, 3-9, 3-10)**
 - **MEDIAL COLLATERAL or DELTOID LIGAMENT**
 1. **TIBIONAVICULAR LIGAMENT**
 2. **ANTERIOR TIBIOTALAR LIGAMENT**
 3. **TIBIOCALCANEAL LIGAMENT**
 4. **POSTERIOR TIBIOTALAR**

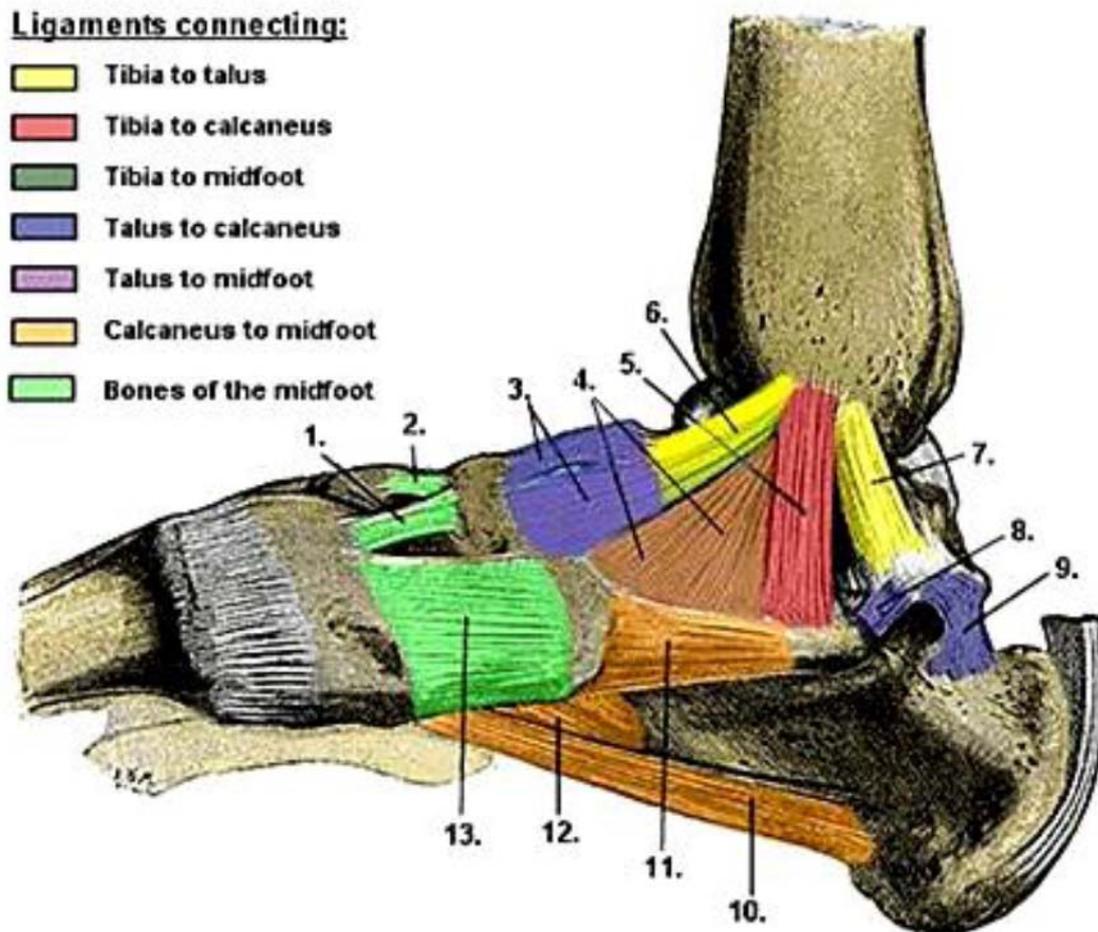


Fig. 3-7. Leg: Foot and ankle ligaments: Medial aspect of foot and ankle. 1. 1st dorsal cuneonavicular ligament, 2. 2nd dorsal cuneonavicular ligament, 3. Talonavicular ligament, 4. Tibionavicular ligament, 5. Tibiocalcaneal ligament, 6. Anterior tibiotalar ligament, 7. Posterior tibiotalar ligament, 8. Medial talocalcaneal ligament, 9. Posterior talocalcaneal ligament, 10. Long plantar ligament, 11. Plantar calcaneonavicular (spring) ligament, 12. Plantar calcaneocuboid ligament (short plantar) and 13. Dorsal cuneonavicular lig. (Modified from Gray's 1918)

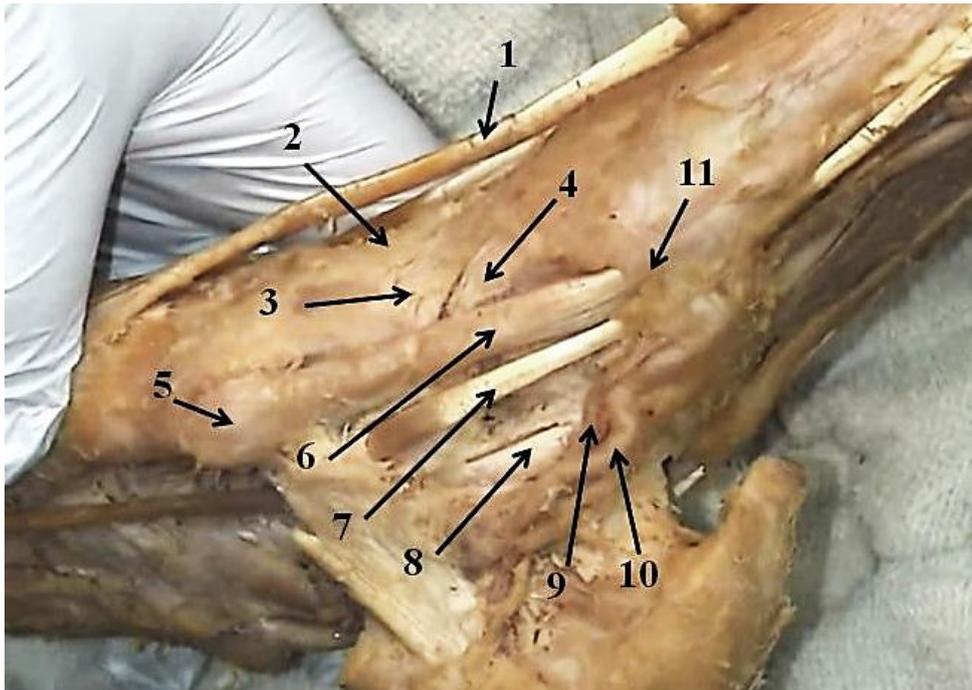


FIG 3-8. Leg: Dissection of medial ankle. 1. Tibialis anterior tendon, 2. Anterior tibiotalar lig., 3. Tibionavicular lig., 4. Tibiocalcaneal lig., 5. Tubercle of the navicular with tibialis posterior tendon attachment 6. Tibialis posterior tendon, 7. Flexor digitorum longus tendon, 8. Flexor hallucis longus tendon, 9. Tibial nerve, 10. Posterior tibial artery, 11. Flexor retinaculum.

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 1. **ANTERIOR TALOFIBULAR LIGAMENT**
 2. **POSTERIOR TALOFIBULAR LIGAMENT,**
 3. **CALCANEOFIBULAR LIGAMENT**
- Ankle blood supply from **MALLEOLAR ARTERIES** off the **FIBULAR ARTERY**, **ANTERIOR TIBIAL ARTERY**, and the **POSTERIOR TIBIAL ARTERY**
- Innervation to ankle from the **TIBIAL NERVE** and the **DEEP FIBULAR NERVE**

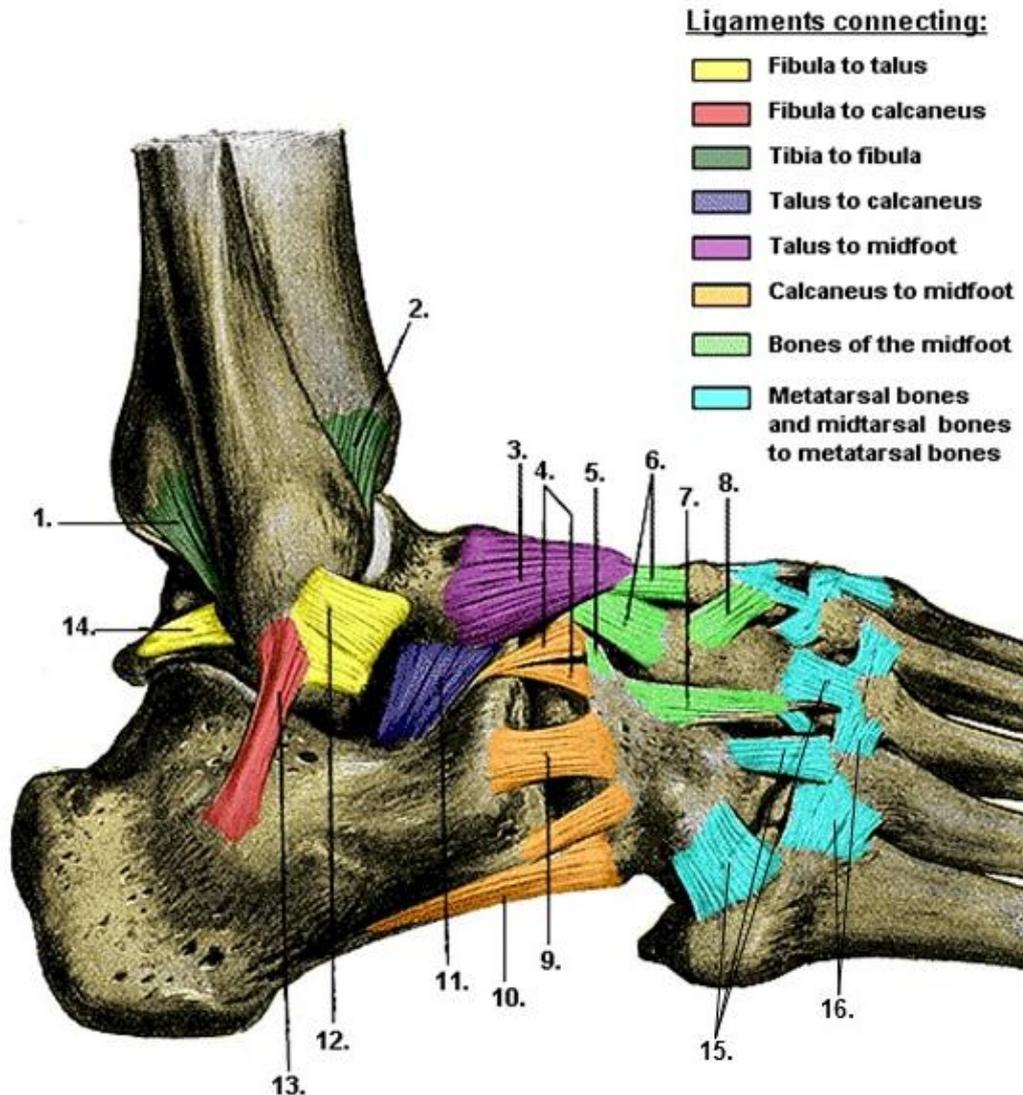


Fig. 3-9. Leg: Foot and Ankle Ligaments: Lateral aspect of foot and ankle. 1. Posterior and 2. Anterior tibiofibular ligament, 3. Dorsal talonavicular ligament, 4. Bifurcate ligament, 5. Dorsal cuboideonavicular ligament, 6. Dorsal cuneonavicular ligaments, 7. Dorsal cuneocuboid ligament, 8. Dorsal intercuneiform ligament, 9. Dorsal calcaneocuboid ligament, 10. Long plantar ligament, 11. Interosseous talocalcaneal ligament, 12. Anterior talofibular ligament, 13. Calcaneofibular ligament, 14. Posterior talofibular ligament, 15. Dorsal tarsometatarsal ligaments, and 16. Intermetatarsal ligaments. (Modified from Gray's 1918)

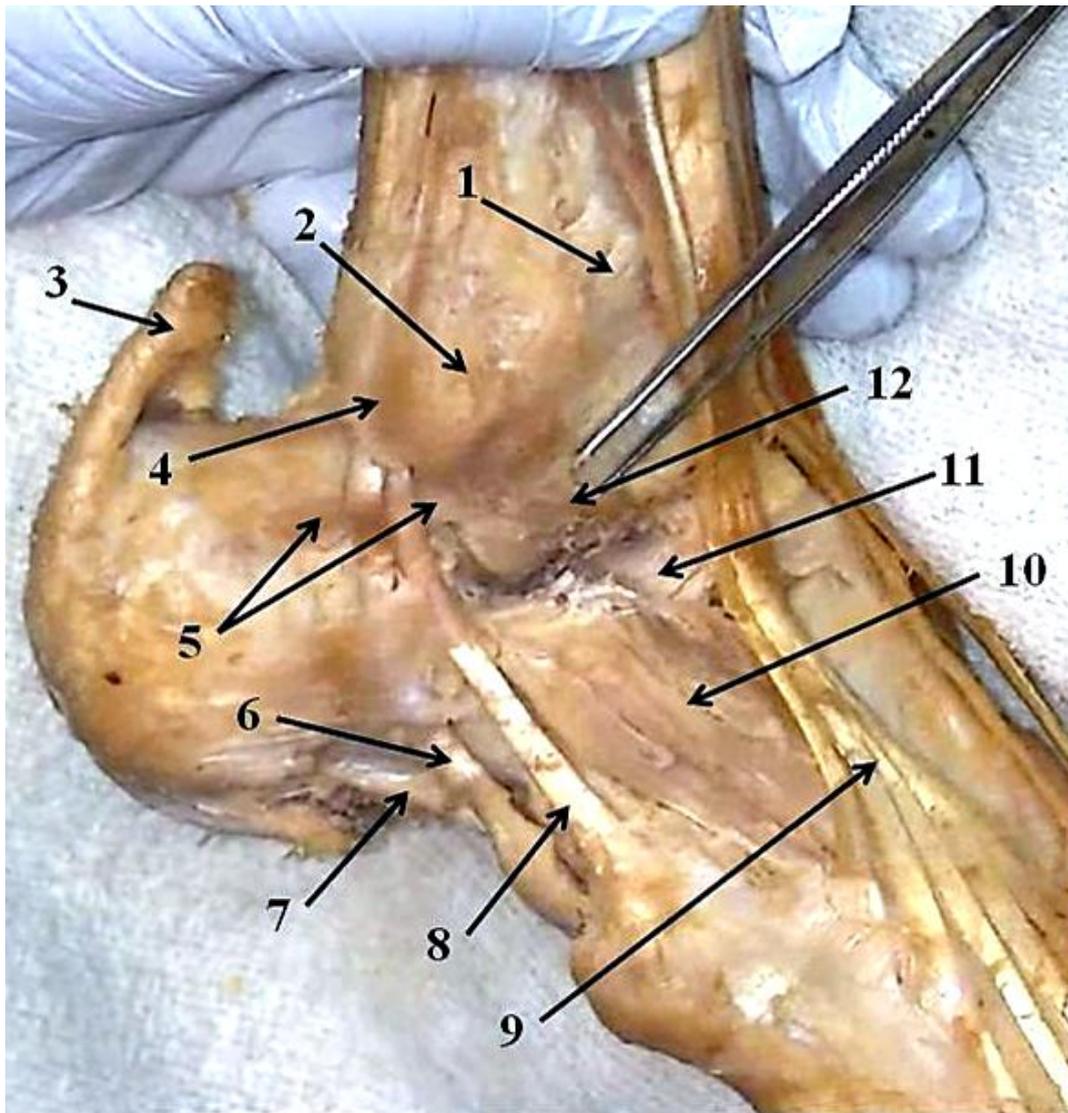


Fig. 3-10. Leg: Dissection of lateral ankle. 1. Anterior tibiofibular lig., 2. Lateral malleolus, 3. Tendo calcaneus cut (Achilles tendon), 4. Fibular retinaculum, 5. Calcaneofibular lig., 6. Fibularis longus tendon, 7. Long plantar lig., 8. Fibularis brevis tendon, 9. Extensor digitorum longus tendons, 10. Extensor digitorum brevis, 11. Interosseous talocalcaneal lig., 12. Anterior talofibular lig.

3.2.4 LIGAMENTS OF THE FOOT

- **SUBTALAR JOINT LIGAMENTS (Figs. 3-6, 3-7, 3-8, 3-9, 3-10)**
 - **MEDIAL TALOCALCANEAL**
 - **LATERAL TALOCALCANEAL**
 - **POSTERIOR TALOCALCANEAL**
 - **CALCNEOFIBULAR**
 - **TIBIOCALCANEAL**
 - **INTEROSSEOUS TALOCALCANEAL**

- **CALCANEOCUBOID JOINT LIGAMENTS of MIDTARSAL JOINT (Figs. 3-7, 3-9, 3-10, 3-11, 3-12)**
 - **DORSAL CALCANEOCUBOID**
 - **CALCANEOCUBOID LIGAMENT of BIFURCATE LIGAMENT**
 - **PLANTAR CALCANEOCUBOID (SHORT PLANTAR)**
 - **LONG PLANTAR**
- **TALONAVICULAR JOINT LIGAMENTS OF MIDTARSAL JOINT (FIGS. 3-7, 3-9, 3-10, 3-11, 3-12)**
 - **DORSAL TALONAVICULAR**
 - **CALCANEONAVICULAR LIGAMENT of BIFURCATE LIGAMENT**
 - **PLANTAR CALCANEONAVICULAR (SPRING LIGAMANT)**



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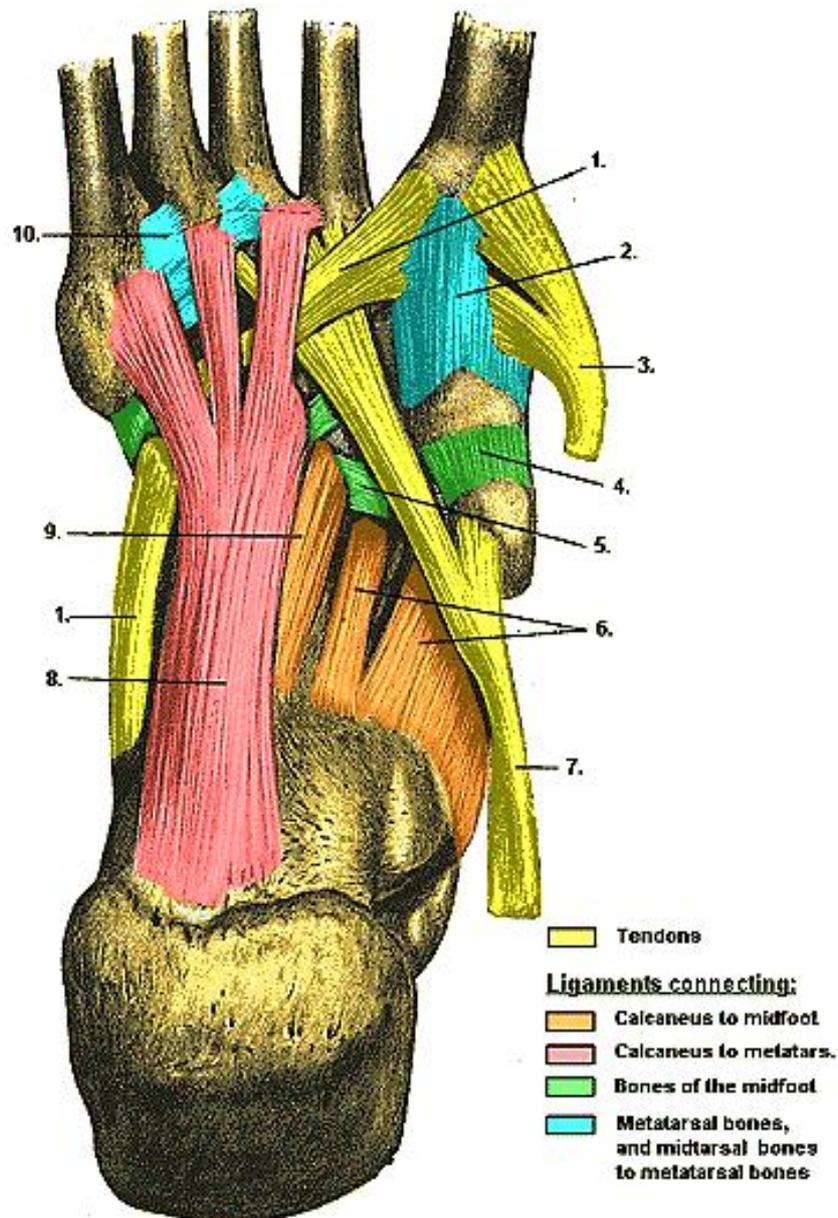


Fig. 3-11. Leg: Inferior aspect of the foot and ankle. 1. Fibularis (peroneus) longus tendon, 2. Plantar tarsometatarsal ligament, 3. Tibialis anterior tendon, 4. Plantar cuneobuboid ligament, 5. Plantar cuboideonavicular ligament, 6. Plantar calcaneonavicular (spring) ligament, 7. Tibialis posterior tendon, 8. Long plantar ligament, 9. Plantar calcaneocuboid (short plantar) ligament, and 10. Intermetatarsal ligaments. (Modified from Gray's 1918)

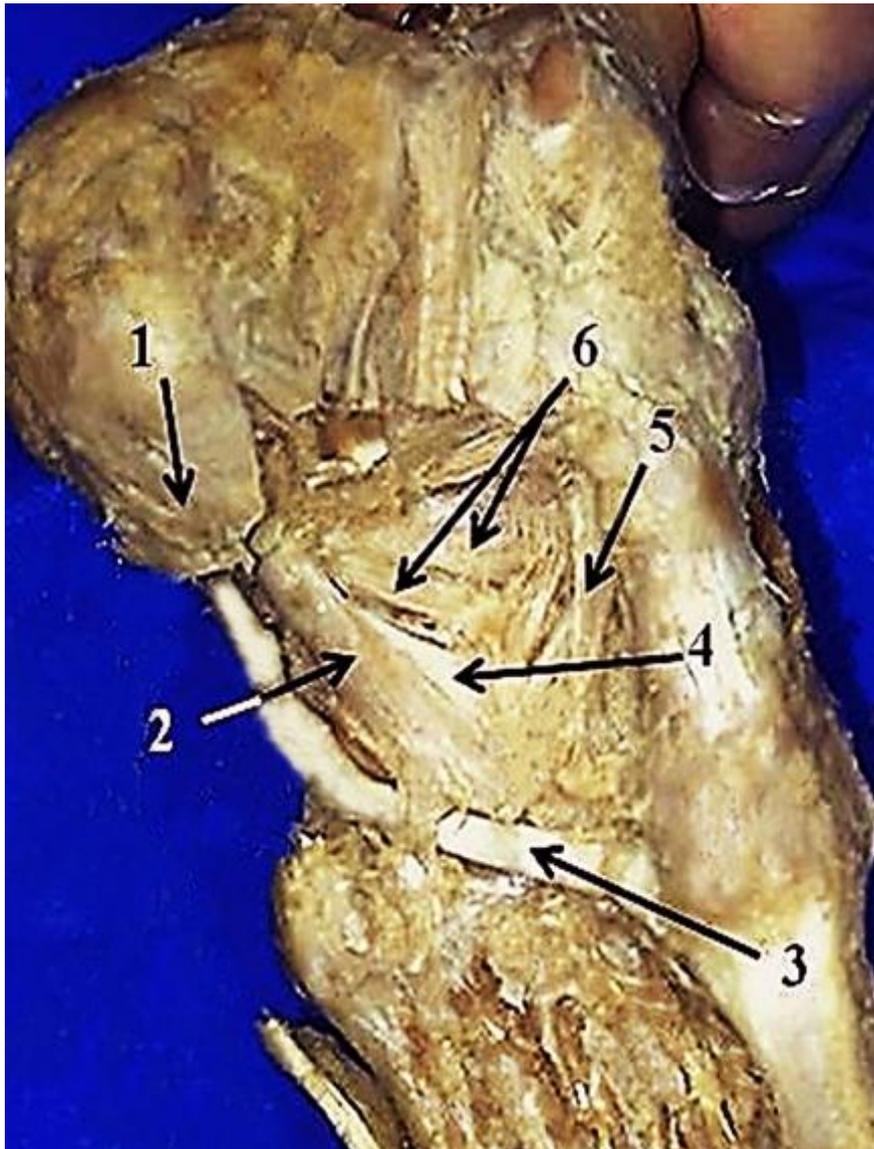
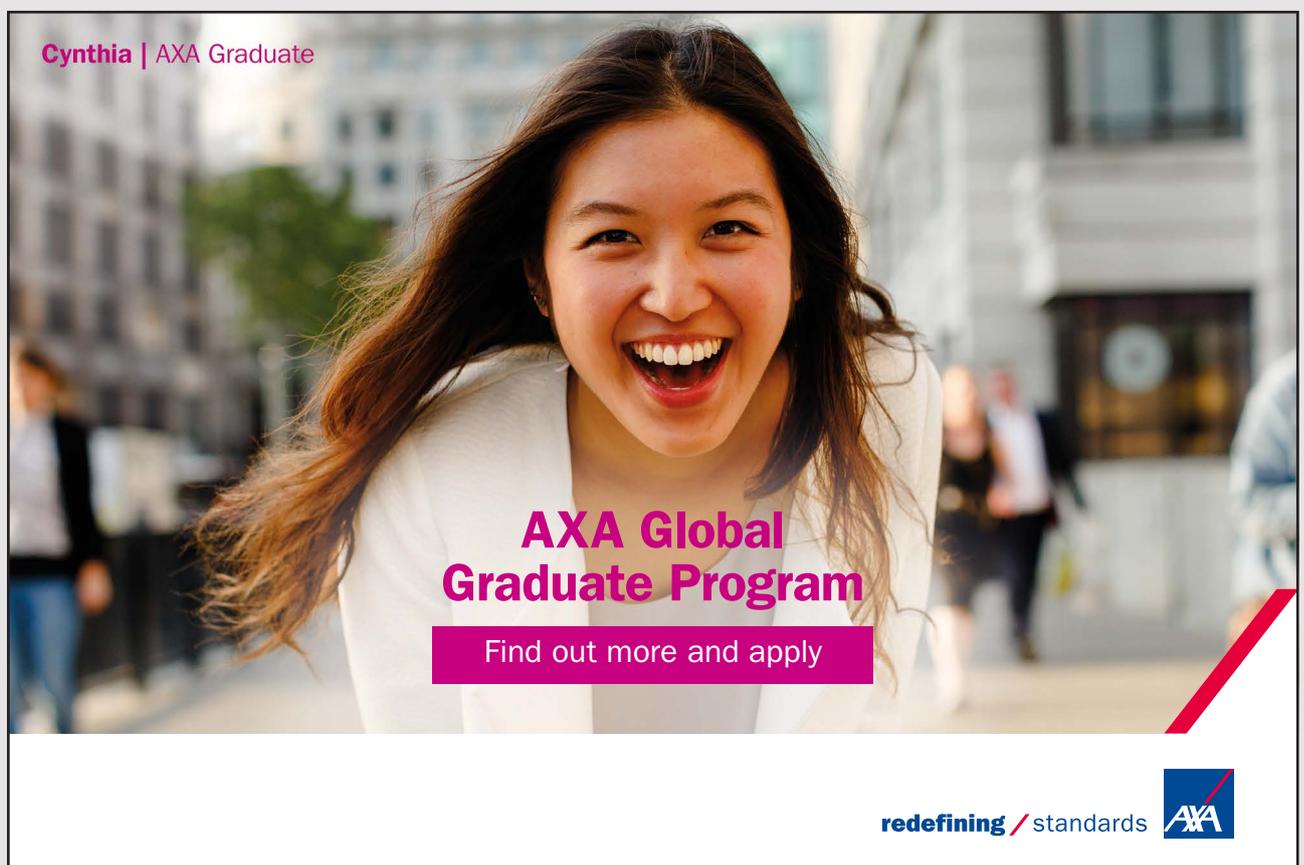


Fig. 3-12. Leg: Dissection of deep plantar ligaments. 1. Plantar aponeurosis (cut), 2. Long plantar ligament, 3. Fibularis longus tendon, 4. Plantar calcaneocuboid (short plantar) ligament, 5. Tibialis posterior tendon, 6. Plantar calcaneonavicular (spring) ligament.

- **TARSOMETATARSAL JOINT LIGAMENTS (Figs. 3-9, 3-11)**
 - **DORSAL TARSOMETATARSAL**
 - **PLANTAR TARSOMETATARSAL**
 - **INTEROSSEOUS TARSOMETATARSAL**
 - **MEDIAL and LATERAL INTEROSSEOUS TARSOMETATARSAL**

- **METATARSOPHALANGEAL JOINT LIGAMENTS (Fig. 3-13)**
 - LATERAL COLLATERAL
 - MEDIAL COLLATERAL
 - PLANTAR LIGAMENT (PLATE)
 - DEEP TRANSVERSE METATARSAL LIGAMENT

- **INTERPHALANGEAL JOINT LIGAMENTS (Fig. 3-13)**
 - MEDIAL COLLATERAL
 - LATERAL COLLATERAL
 - PLANTAR PLATE LIGAMENT



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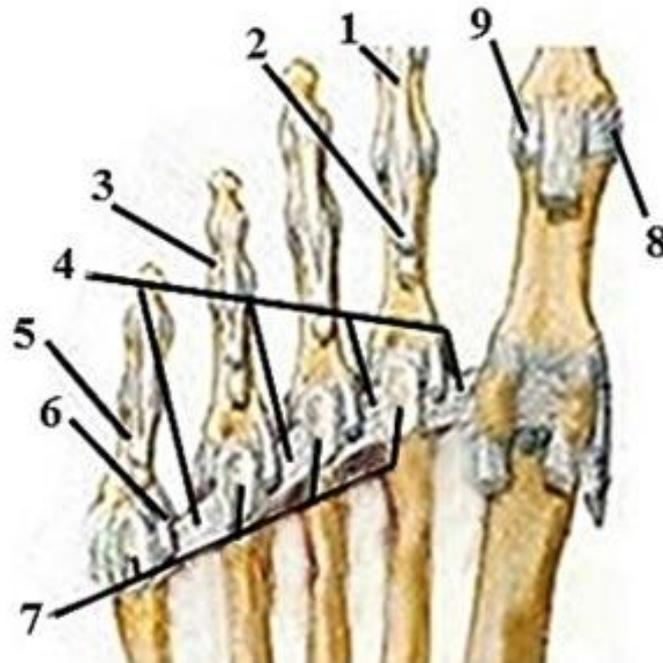


Fig. 3-13. Leg. 1. Flexor digitorum longus tendon, 2. Flexor digitorum brevis tendon, 3. Proximal interphalangeal joint, 4. Deep transverse metatarsal ligament, 5. Proximal phalanx, 6. Medial collateral metatarsophalangeal ligament, 7. Plantar plate ligament, 8. Medial collateral ligament, 9. Lateral collateral ligament

3.2.5 BURSAE

TENDO CALCANEAL BURSA between the calcaneus and the tendocalcaneus (Achilles tendon).

9 – Study questions:

- 1) A lateral sprain of the ankle could damage which lateral ankle ligaments?
- 2) A medial sprain of the ankle could damage which medial ankle ligaments?
- 3) What two joints form the midtarsal joint?
- 4) What ligaments stabilize the subtalar joint?
- 5) Where are the medial and lateral collateral ligaments and the plantar plate ligament located?

COMPARTMENTS OF THE LEG (Fig. 3-14)

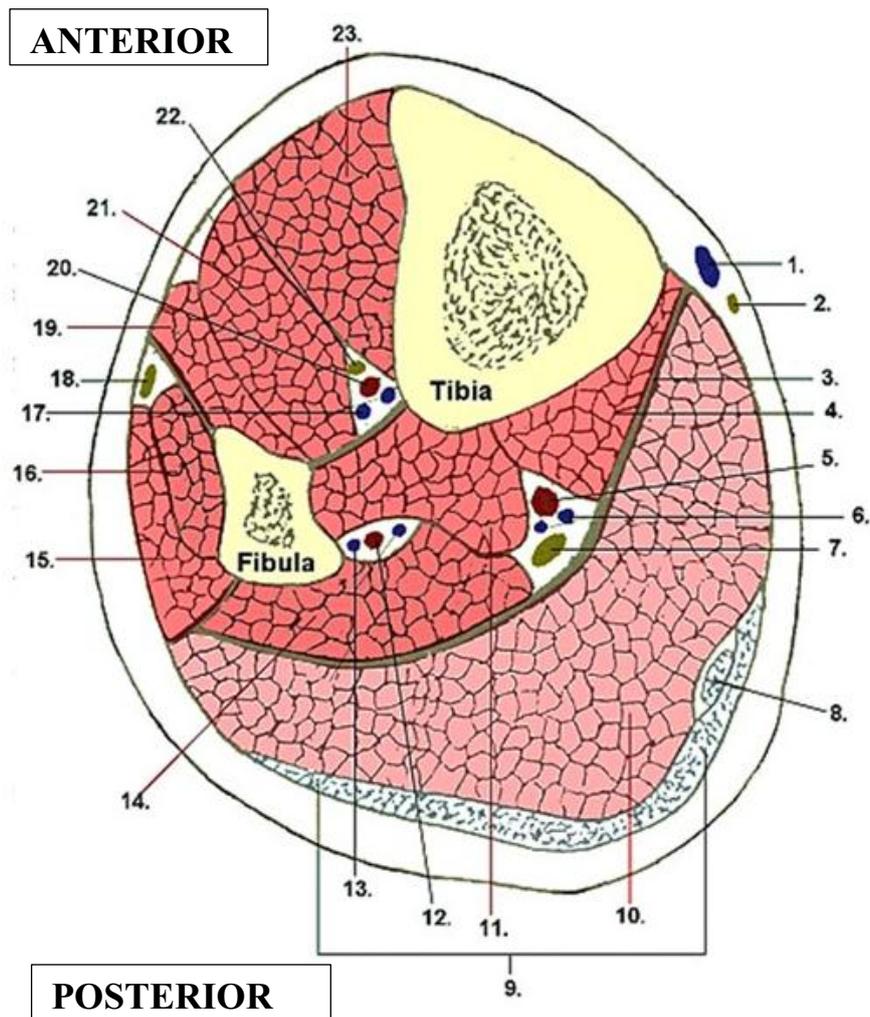


Fig. 3-14. Leg: Diagram of the cross-section through the lower 1/3 of the leg showing the intermuscular septa and the contents of the anterior, lateral and posterior compartments. The ANTERIOR COMPARTMENT is bordered by the lateral surface of the tibia, the interosseous membrane, the anterior surface of the fibula, and the anterior intermuscular septum. The LATERAL COMPARTMENT is bordered by the anterior intermuscular septum, lateral surface of the fibula and posterior intermuscular septum. The SUPERFICIAL POSTERIOR COMPARTMENT is bordered by the skin and the transverse intermuscular septum. The DEEP POSTERIOR COMPARTMENT is bordered by the posterior surface of the tibia, the interosseous membrane, the posterior and medial borders of the fibula, the posterior intermuscular septum and the transverse intermuscular septum.

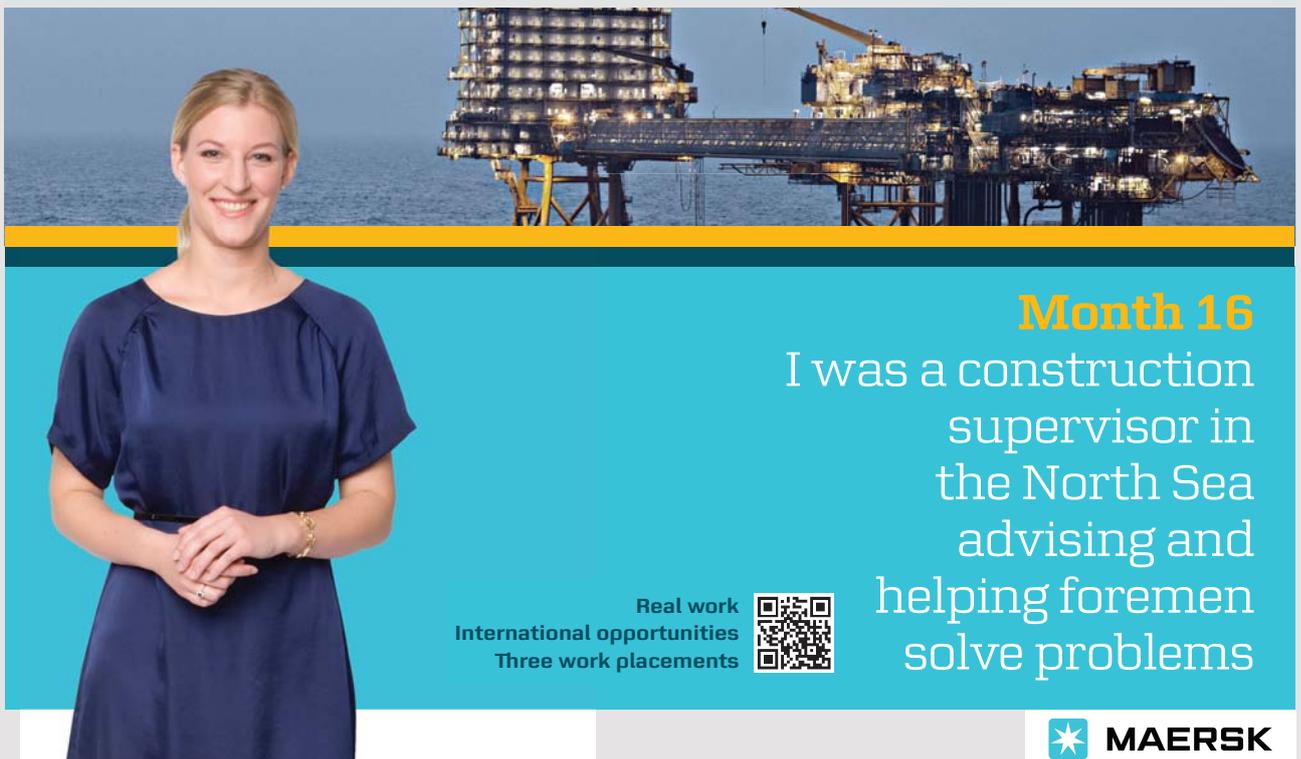
1. Great saphenous vein, 2. Saphenous nerve, 3. Transverse intermuscular septum, 4. Flexor digitorum longus, 5. Posterior tibial artery, Posterior tibial veins, 7. Tibial nerve, 8. Tendon of plantaris, 9. Tendon of gastrocnemius, 10. Soleus, 11. Tibialis posterior, 12. Fibular (peroneal) artery, 13. Fibular (peroneal) veins, 14. Flexor hallucis longus, 15. Fibularis (peroneus) longus, 16. Fibularis (peroneus) brevis, 17. Anterior tibial vein, 18. Superficial fibular (peroneal) nerve, 19. Extensor digitorum longus, 20. Anterior tibial artery, 21. Extensor hallucis longus, 22. Deep fibular (peroneal) nerve, and 23. Tibialis anterior.

3.3 ANTERIOR COMPARTMENT CONTENTS

- **ANTERIOR TIBIAL ARTERY (Figs. 3-14, 3-15, 3-29)**
 - division of the popliteal artery.
 - runs with the deep fibular nerve
 - **ANTERIOR MEDIAL MALLEOLAR ARTERY** to ankle
 - **ANTERIOR LATERAL MALLEOLAR ARTERY** to ankle
 - continues as the **DORSALIS PEDIS ARTERY** on the dorsum of the foot
- **ANTERIOR TIBIAL VEINS**
 - run with anterior tibial artery
 - paired set of veins
 - drain into the popliteal vein

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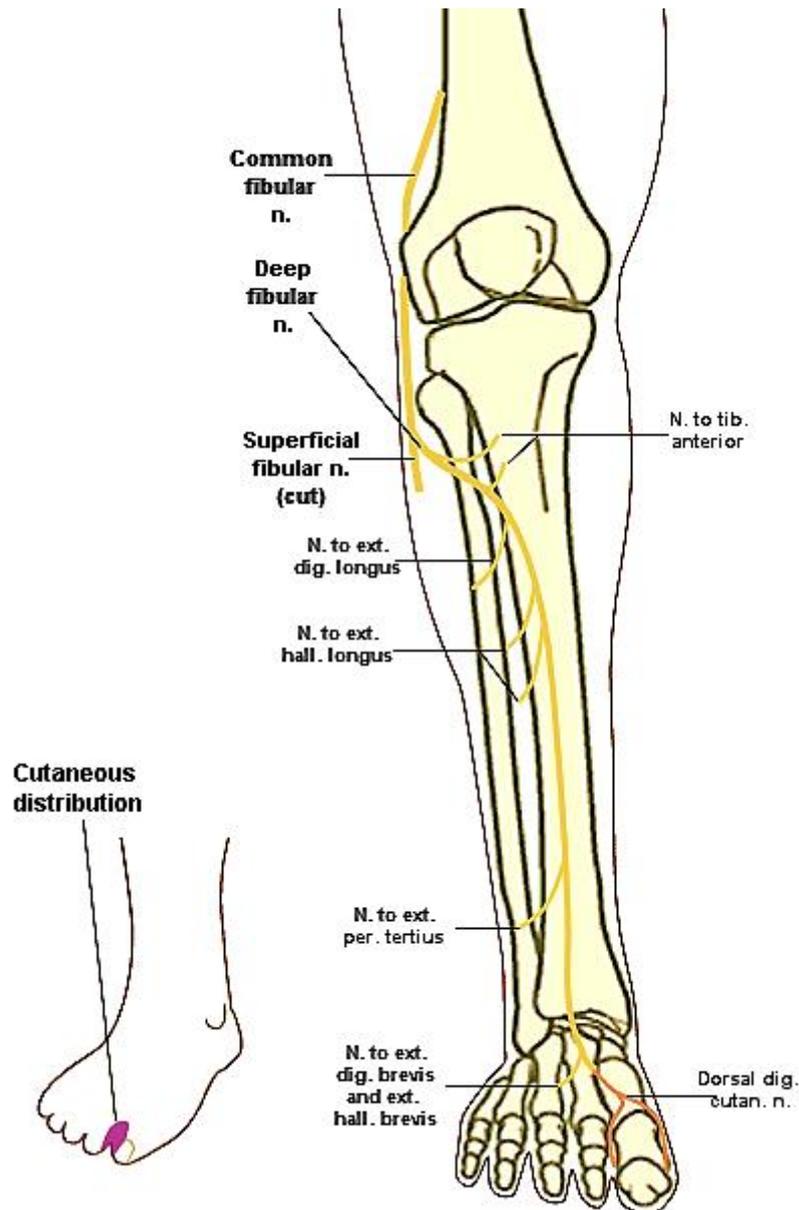


Fig. 3-16: Diagram of the deep fibular nerve showing its motor and sensory distribution.

- **SUPERIOR EXTENSOR RETINACULUM (Figs. 3-17, 3-18)**
 - runs between the lower tibia and fibula, just above the medial and lateral malleoli.
- **INFERIOR EXTENSOR RETINACULUM (Fig. 3-17)**
 - thick upper and lower bands
 - runs laterally from superolateral calcaneus to medial malleolus and the medial plantar fascia of the foot

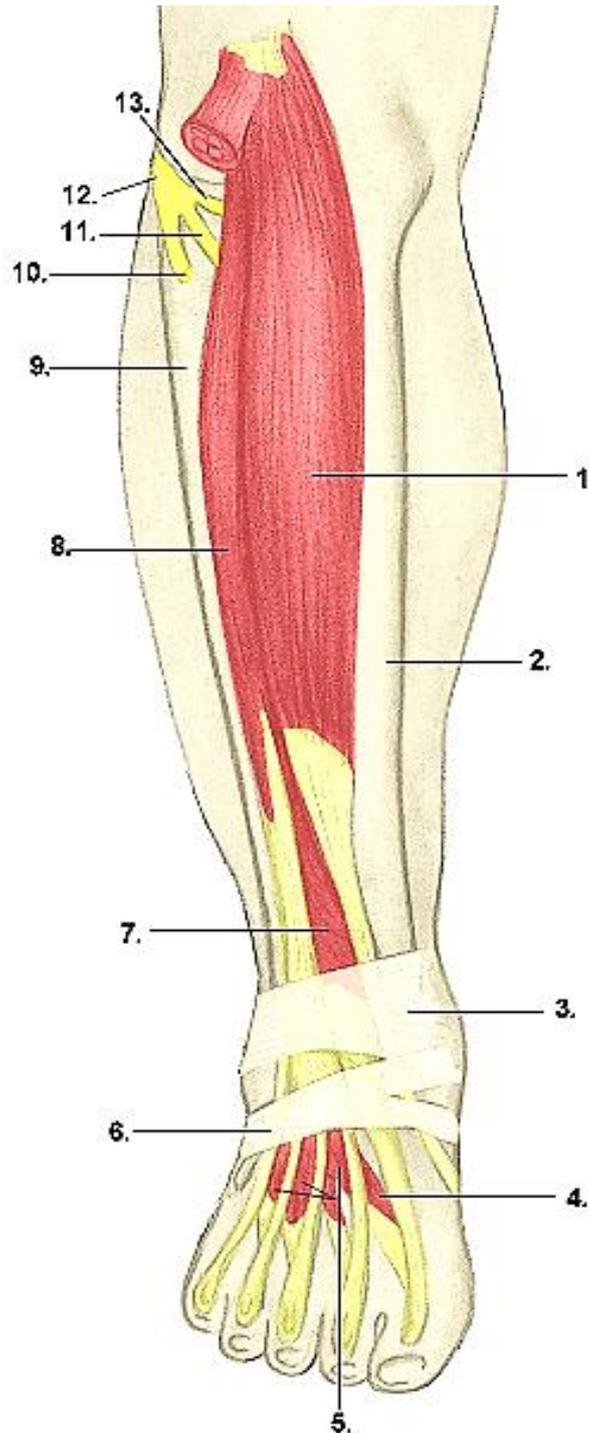


Fig. 3-17. Leg: Drawing of the anterior leg and dorsum of the foot showing the muscles of the anterior compartment, extensor retinacula and muscles of the dorsum of the foot. 1. Tibialis anterior, 2. Tibia, 3. Superior extensor retinaculum, 4. Extensor hallucis brevis, 5. Extensor digitorum brevis, 6. Inferior extensor retinaculum, 7. Extensor hallucis longus, 8. Extensor digitorum longus, 9. Fibula, 10. Superficial fibular (peroneal) nerve, 11. Deep fibular nerve, 12. Common fibular nerve, and 13. Nerve to tibialis anterior.

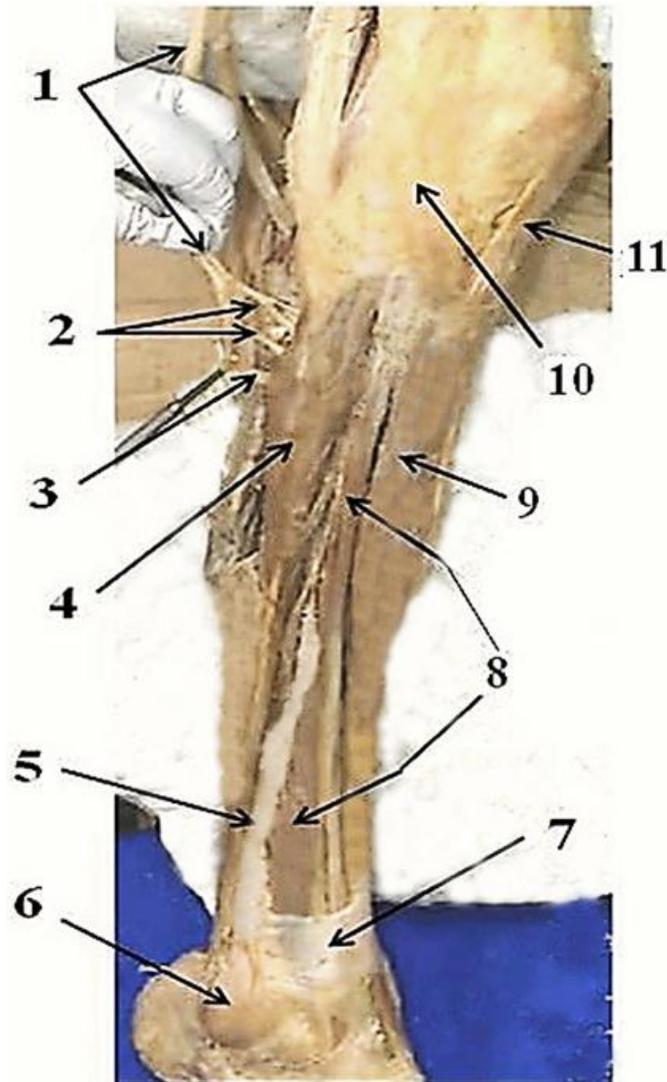


Fig. 3-18. Leg: Dissection of anterior leg and lateral leg. 1. Common Fibular nerve, 2. Deep fibular with nerve to tibialis anterior, 3. Superficial fibular nerve, 4. Fibularis longus, 5. Fascial septum separating lateral and anterior compartments, 6. Lateral malleolus, 7. Extensor retinaculum, 8. Extensor digitorum longus 9. Tibialis anterior, 10. Lateral patellar tibial lig . of lateral patellar retinaculum, 11..Patellar tendon

3.3.1 ANTERIOR COMPARTMENT MUSCLES

1) TIBIALIS ANTERIOR (Figs. 3-14, 3-17, 3-18, 3-19)

- Superior attachment (origin): Lateral condylar of tibia; proximal lateral tibia; interosseous membrane
- Inferior attachment (insertion): Base of first metatarsal, medial and plantar aspects of first cuneiform
- Nerve: Deep fibular nerve
- Action: Dorsiflexion of the ankle joint, inversion of the foot

2) **EXTENSOR HALLUCIS LONGUS (Figs. 3-14, 3-17, 3-18, 3-19)**

- Superior attachment (origin): Middle of anterior fibula; interosseous membrane
- Inferior attachment (insertion): Dorsal base of distal phalanx of big toe
- Nerve: Deep fibular nerve
- Action: Extension of the interphalangeal joint of the big toe, dorsiflexion of the ankle

3) **EXTENSOR DIGITORUM LONGUS (Figs. 3-14, 3-17, 3-18, 3-19)**

- Superior attachment (origin): Lateral condylar of tibia; the proximal anterior fibula; interosseous membrane
- Inferior attachment (insertion): Dorsal base of middle and distal phalanx of 2–5 digits
- Nerve: Deep fibular (peroneal) nerve
- Action: Extension of the interphalangeal and metatarsal phalangeal joints, dorsiflexion of the ankle

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- 4) **FIBULARIS TERTIUS (Fig. 3-19; part of the extensor digitorum longus muscle)**
- Superior attachment (origin): Distal anterior fibula; interosseous membrane; lateral extension of the extensor digitorum longus
 - Inferior attachment (origin): Dorsal base of fifth metatarsal
 - Nerve: Deep fibular nerve
 - Action: Dorsiflexion and eversion of the foot

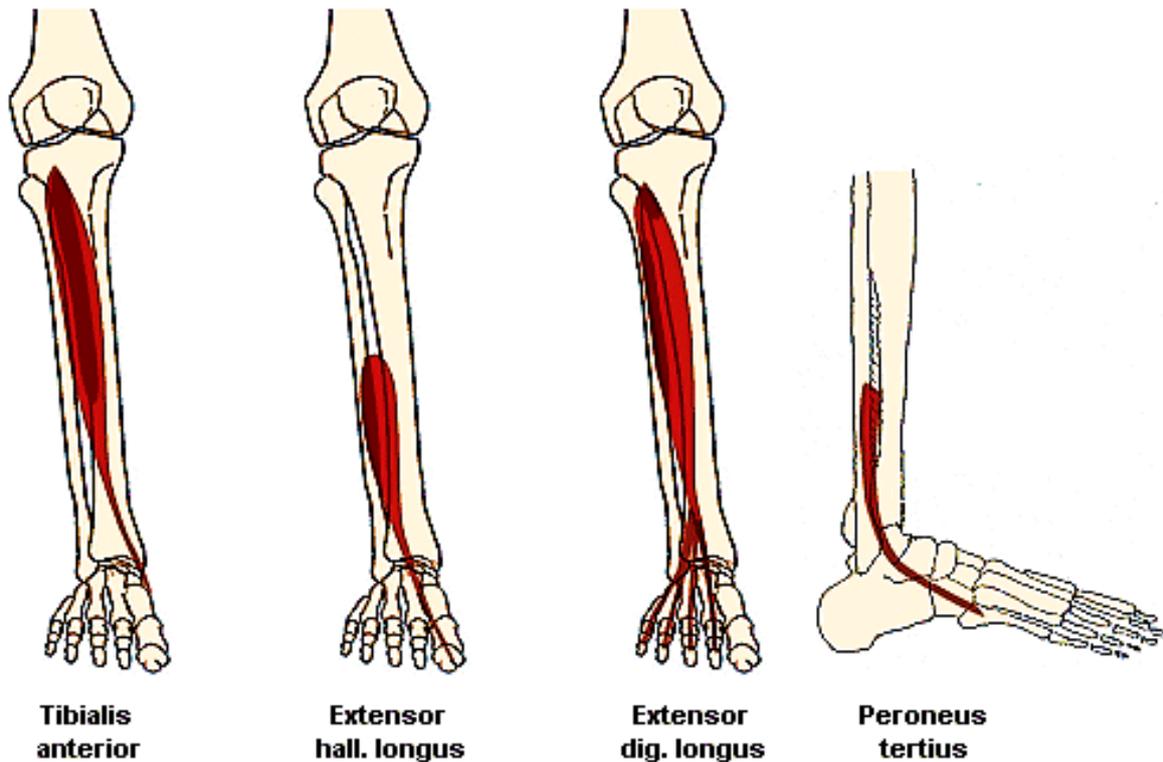


Fig. 3-19. Leg: Diagrams of the anterior tibialis, extensor hallucis longus, extensor digitorum longus, and fibularis (peroneus) tertius showing bony attachment sites.

10 – Study questions:

- 1) What muscles and actions could be affected with damage to the deep fibular nerve? How about the common fibular nerve?
- 2) What sensory impairment could result from damage to the deep fibular nerve?
- 3) What common ankle movement results from the action of the anterior tibialis, extensor hallucis longus, and extensor digitorum?
- 4) What is the difference in the actions of the anterior tibialis, as compared to the extensor hallucis longus, and extensor digitorum?

3.4 POSTERIOR COMPARTMENT CONTENTS

- **POSTERIOR TIBIAL ARTERY (Figs. 3-14, 3-15, 3-29)**
 - division of popliteal artery
 - **FIBULAR CIRCUMFLEX ARTERY** to the fibularis muscles and the knee joint
 - **FIBULAR ARTERY**
 - to popliteus and muscles in the posterior and lateral compartments
 - **POSTERIOR LATERAL MALLEOLAR** to lateral ankle
 - **LATERAL CALCANEAL BRANCHES** to lateral calcaneus and subtalar joint
 - **POSTERIOR MEDIAL MALLEOLAR** to medial ankle
 - **CALCANEAL BRANCHES** to calcaneus and subtalar joint
 - **MEDIAL PLANTAR ARTERY** to medial sole of the foot
 - **LATERAL PLANTAR ARTERY** to the lateral sole of the foot

- **POSTERIOR TIBIAL VEINS**
 - run with posterior tibial artery
 - paired set of veins
 - drain into the popliteal vein

- **TIBIAL NERVE (Figs. 3-14, 3-20, 3-21)**
 - terminal branch of the sciatic nerve
 - innervates muscles in posterior compartment of the leg and muscles of the sole of the foot
 - **SUPERIOR MEDIAL GENICULAR NERVE** to the knee
 - **INFERIOR MEDIAL GENICULAR NERVE** to the knee
 - **MIDDLE GENICULAR NERVE** to the knee
 - **MEDIAL SURAL NERVE** joins the **FIBULAR COMMUNICATING BRANCH** of common fibular nerve to form the sural nerve
 - **SURAL NERVE** to the skin of the posterolateral the leg and the lateral ankle and foot
 - **MEDIAL CALCANEAL BRANCHES** to calcareous
 - **MEDIAL PLANTAR NERVE** to the muscles and skin of the sole of the foot
 - **LATERAL PLANTAR NERVE** to the muscles and skin of the sole of the foot

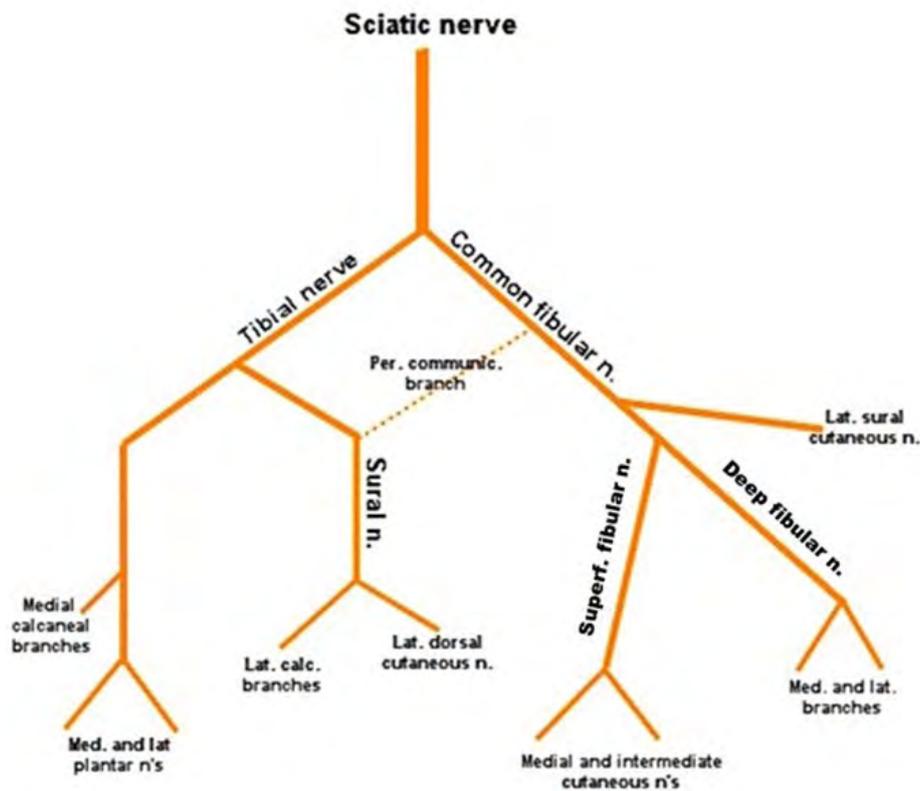


Fig. 3-20. Leg. Schematic of sciatic nerve showing the branches of the Tibial nerve.

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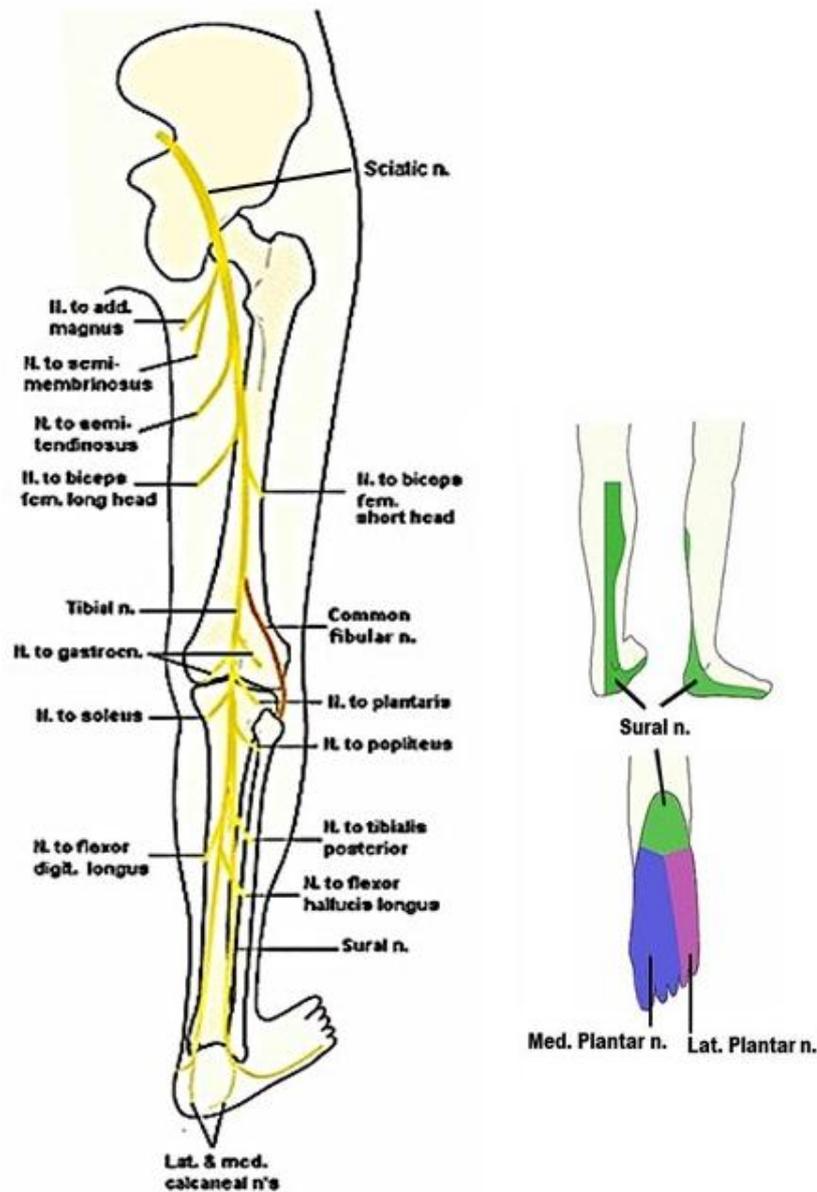


Fig 3-21. Thigh: Diagram of the Sciatic nerve showing the Tibial nerve and its motor and sensory distribution

- **FLEXOR RETINACULUM (Fig. 3-22)**

- extends from the posterior medial malleolus to the medial posterior calcaneus
- forms **FOUR TUNNELS** containing a tendon and synovial sheath
 - 1) anterior most tunnel, containing the tendon of the **TIBIALIS POSTERIOR**
 - 2) posterior to the first, containing the tendon of the **FLEXOR DIGITORUM LONGUS**
 - 3) posterior to the second, containing the **TIBIAL NERVE** and **POSTERIOR TIBIAL VESSELS**
 - 4) posterior most tunnel, containing the tendon of the **FLEXOR HALLUCIS LONGUS**

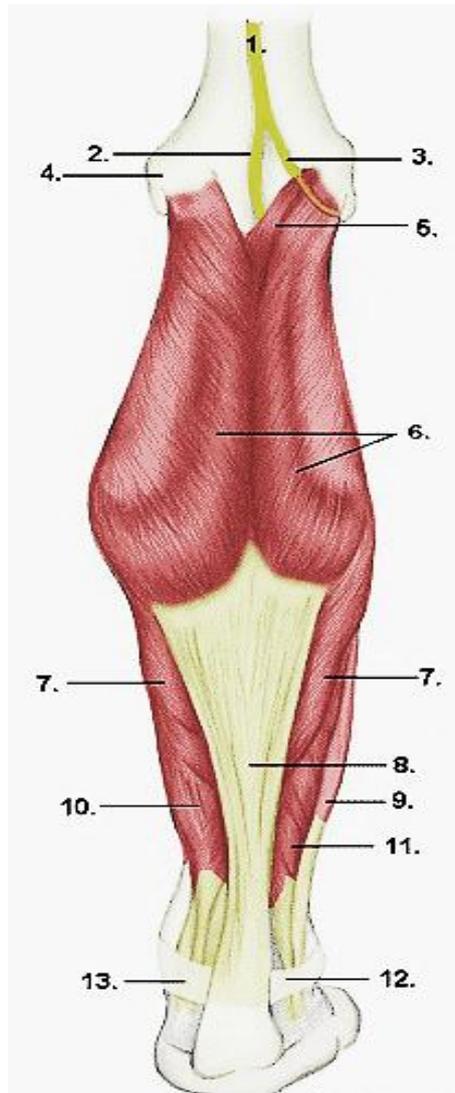


Fig. 3-22. Leg: Drawing of the posterior leg showing the muscles in this region. 1. Sciatic nerve, 2. Tibial nerve, 3. Common fibular (peroneal) nerve, 5. Plantaris, 6. Gastrocnemius, 7. Soleus, 8. Tendo calcaneus, 9. Fibularis (peroneus) longus, 10. Flexor digitorum longus, 11. Fibularis (peroneus) brevis, 12. Superior fibular retinaculum, and 13. Flexor retinaculum

• **POSTERIOR COMPARTMENT SUPERFICIAL MUSCLES**

1) **GASTROCNEMIUS (Figs. 3-14, 3-22, 3-23, 3-24)**

- Superior attachment (origin): LATERAL HEAD: posterior lateral femoral condyle, MEDIAL HEAD: posterior medial femoral condyle
- Inferior attachment (Insertion): Tendo calcaneus (Achilles tendon) to the middle posterior aspect of the calcaneus with the soleus and plantaris
- Nerve: Tibial nerve
- Action: Plantar flexion of the ankle, flexion of the knee, supination of the subtalar joint of foot

2) **SOLEUS (Figs. 3- 14, 3-22, 3-23, 3-24)**

- Superior attachment (origin): Soleal line and proximal posterior tibia; posterior fibular head; proximal posterior fibula
- Inferior attachment (insertion): Tendo calcaneus (Achilles tendon) with the gastrocnemius and plantaris
- Nerve: Tibial nerve
- Action: Plantar flexion of the ankle, supination of the subtalar joint off foot

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3) **PLANTARIS (Figs. 3- 14, 3-22, 3-23)**

- Superior attachment (origin): Lateral supracondylar ridge of femur
- Inferior attachment (insertion): Tendo calcaneus (Achilles tendon) with the gastrocnemius and soleus
- Nerve: Tibial nerve
- Action: Plantar flexion of the ankle

• **POSTERIOR COMPARTMENT DEEP MUSCLES**

1) **FLEXOR DIGITORUM LONGUS (Figs 3-14, 3-22, 3-23, 3-24)**

- Superior attachment (origin): Posteromedial tibia; distal soleal line
- Inferior attachment (insertion): Plantar bases of the distal phalanges of 2–5 digits
- Nerve: Tibial nerve
- Action: Flexion of the metatarsal phalangeal and interphalangeal joints, plantarflexion of the ankle

2) **FLEXOR HALLUCIS LONGUS (Figs. 3-14, 3-22, 3-23, 3-24)**

- Superior attachment (origin): Distal posterior fibula; interosseous membrane
- Inferior attachment (insertion): Plantar base of the distal phalanx of the big toe.
- Nerve: Tibial nerve
- Action: Flexion of the metatarsophalangeal and interphalangeal joints of the big toe, plantar flexion of the ankle

3) **TIBIALIS POSTERIOR (Figs. 3- 14, 3-22, 3-23, 3-24)**

- Superior attachment (origin): Posterolateral tibia; proximal posterior fibula; interosseous membrane
- Inferior attachment (insertion): Tuberosity of the navicular bone; plantar surface of the cuboid, cuneiform bones and bases of the 2–4 metatarsals
- Nerve: Tibial nerve
- Action: Inversion of the foot, plantarflexion of the ankle, supination of the subtalar joint of foot

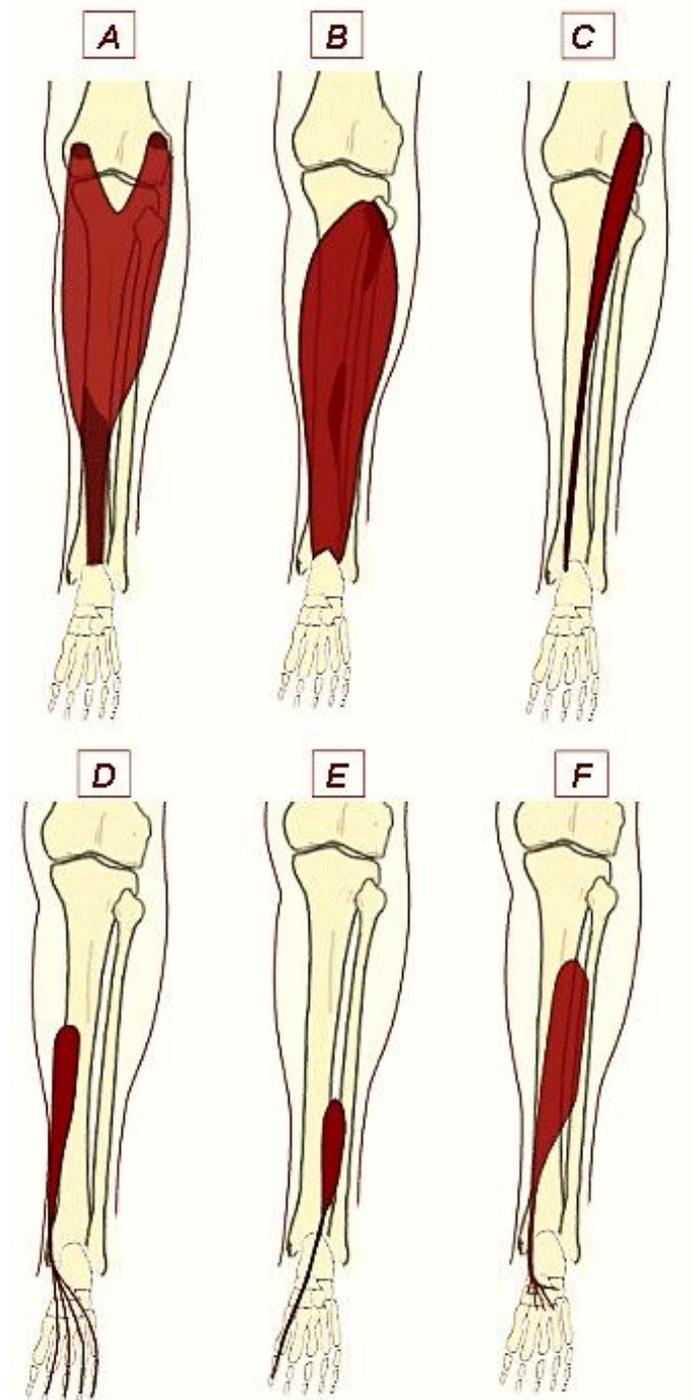


Fig. 3-23. Leg: Diagrams of: A) Gastrocnemius, B) Soleus, C) Plantaris, D) Flexor digitorum longus, E) Flexor hallucis longus, and F) Posterior tibialis, showing bony attachment sites.

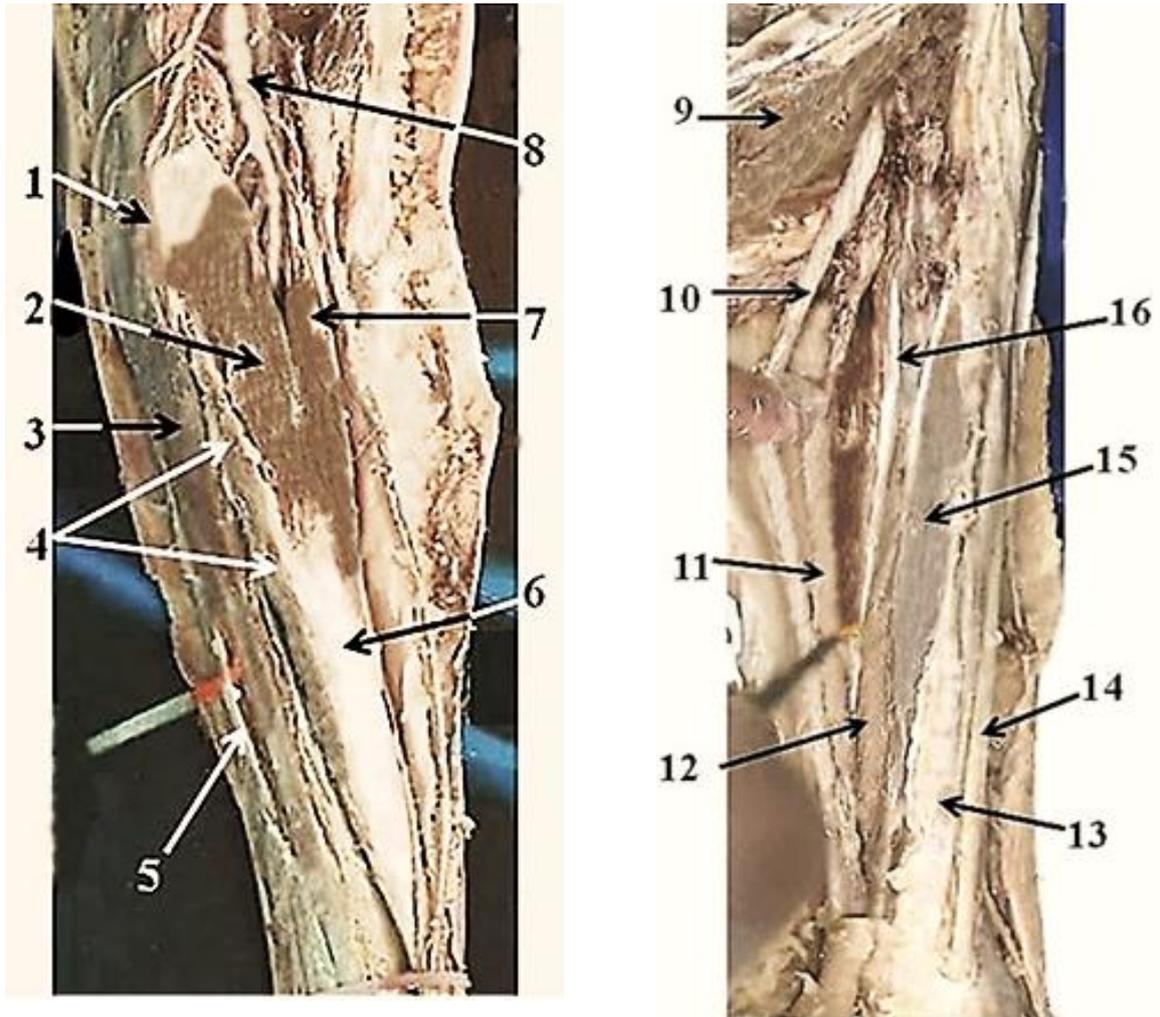


Fig 3-24. Leg: Dissection of posterior leg. 1. Common fibular nerve, 2. Lateral head of Gastrocnemius, 3. Fibularis longus, 4. Soleus, 5. Superficial fibular nerve, 6. Tendo calcaneus (Achilles tendon), 7. Medial head of Gastrocnemius, 8. Tibial nerve, 9. Soleus reflected, 10. Tibial nerve medially, 11. Posterior tibial artery, 12. Flexor digitorum longus, 13. Fascial septum between posterior and lateral compartments, 14. Fibularis longus tendon, 15. Flexor hallucis longus 16. Tibialis posterior

11 – Study questions:

- 1) What posterior compartment muscles and actions could be involved with damage to the tibial nerve in the popliteal fossa? How about damage to the tibial nerve at the ankle? Will there be a difference?
- 2) Rupture of the Achilles tendon would affect what muscles and what actions?
- 3) What muscles in the posterior compartment produce the following actions?
 - a. Ankle plantarflexion
 - b. Ankle dorsiflexion
 - c. Foot inversion
 - d. Knee flexion
 - e. Foot eversion

3.5 LATERAL COMPARTMENT CONTENTS

- **SUPERFICIAL FIBULAR NERVE (Figs. 3-25, 3-26)**
 - a division of the common fibular nerve.
 - innervates the muscles of the lateral compartment of the leg and skin of the lateral leg and dorsum of the foot
 - **MEDIAL CUTANEOUS BRANCH** to the dorsum of the foot
 - **LATERAL CUTANEOUS BRANCH** to the dorsum of the foot

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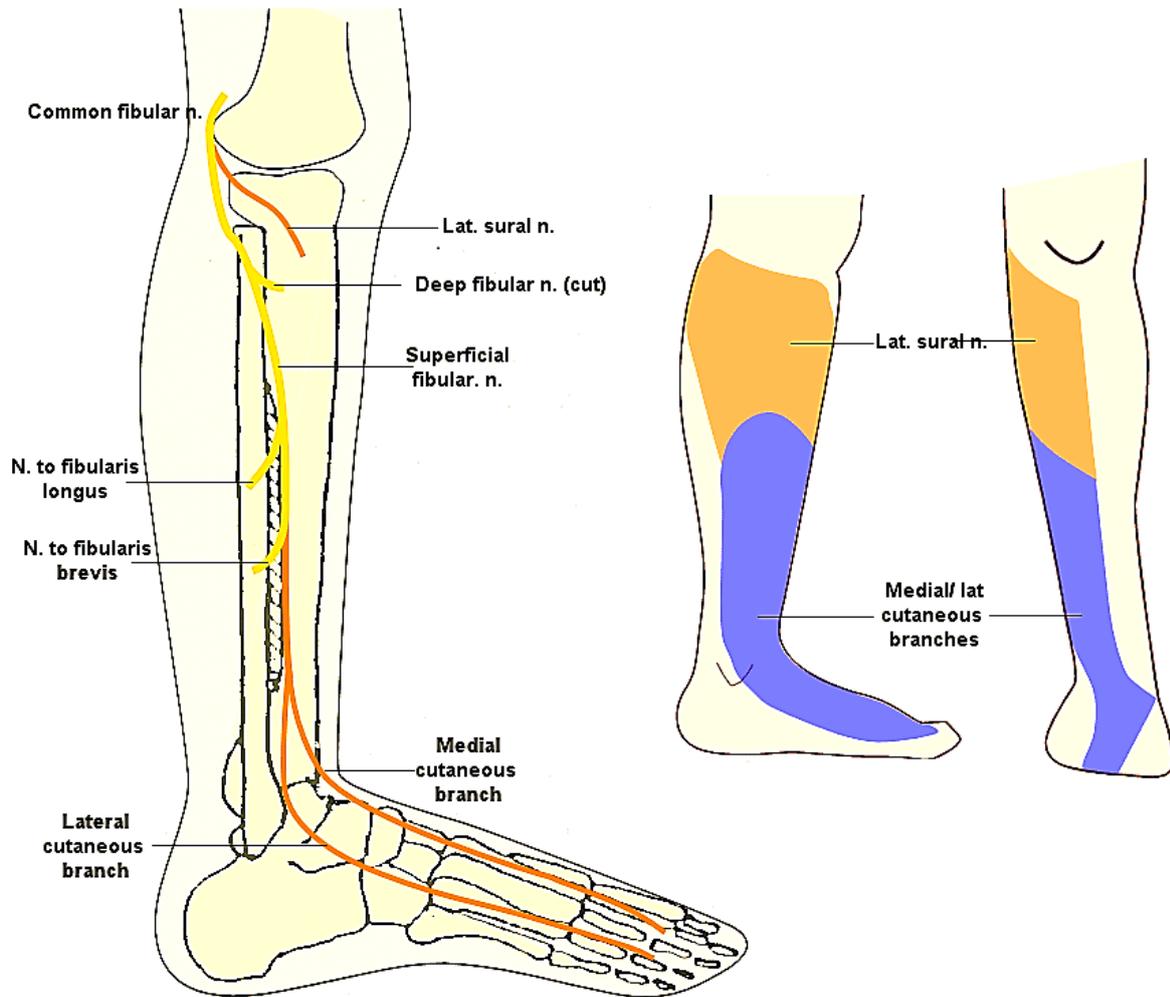


Fig. 3-25. Leg: Diagram of the superficial fibular (peroneal) nerve showing its motor and sensory distribution.

- **SUPERIOR and INFERIOR FIBULAR RETINACULA (Figs. 3-22, 3-26)**
 - lie on the **LATERAL ANKLE**
 - **SUPERIOR RETINACULUM** extends from the lateral malleolus to the lateral calcaneus
 - **INFERIOR RETINACULUM** extends from the lateral margin of the superior retinaculum to the lateral calcaneus
 - **FIBULARIS LONGUS AND BREVIS TENDONS** and synovial sheaths run deep to both retinacula

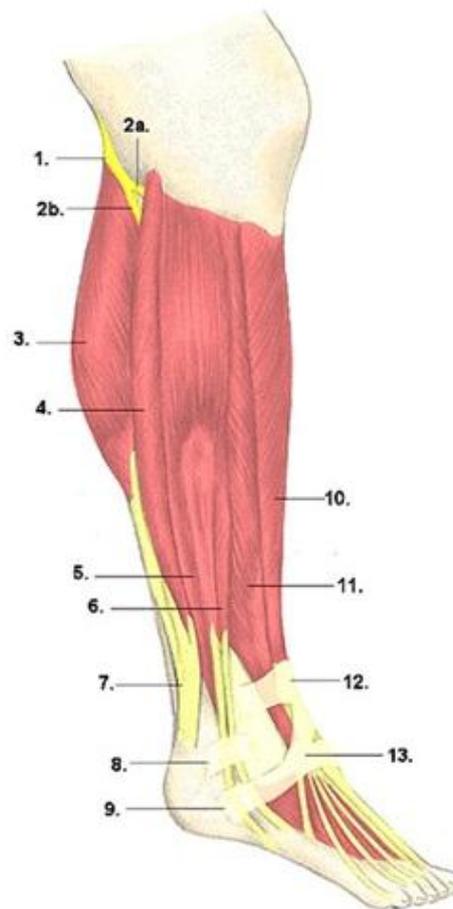


Fig. 3-26. Leg: Drawing of the lateral leg showing the muscles of the lateral compartment relative to those of the anterior and posterior compartments: 1. Common fibular nerve, 2a. deep fibular nerve, 2b. superficial fibular nerve, 3. gastrocnemius, 4. soleus, 5. fibularis longus, 6. fibularis (peroneus) brevis, 7. Tendo calcaneus, 8. superior fibular (peroneal) retinaculum, 9. inferior fibular retinaculum, 10. tibialis anterior, 11. extensor digitorum longus, 12. superior extensor retinaculum, and inferior extensor retinaculum

- **LATERAL COMPARTMENT MUSCLES**

- 1) **FIBULARIS LONGUS (Figs. 3-14, 3-24, 3-26, 3-27)**

- Superior attachment (origin): Lateral fibular head and proximal lateral fibula
- Inferior attachment (insertion): Base of the first metatarsal and the lateral surface of the medial cuneiform.
- Nerve: Superficial fibular nerve.
- Action: Eversion of the foot

- 2) **FIBULARIS BREVIS (Figs. 3-14, 3-24, 3-26, 3-27)**

- Superior attachment (origin): Distal lateral shaft fibula
- Inferior attachment (insertion): Dorsal lateral base of the fifth metatarsal
- Nerve: Superficial fibular nerve
- Action: Eversion of the foot

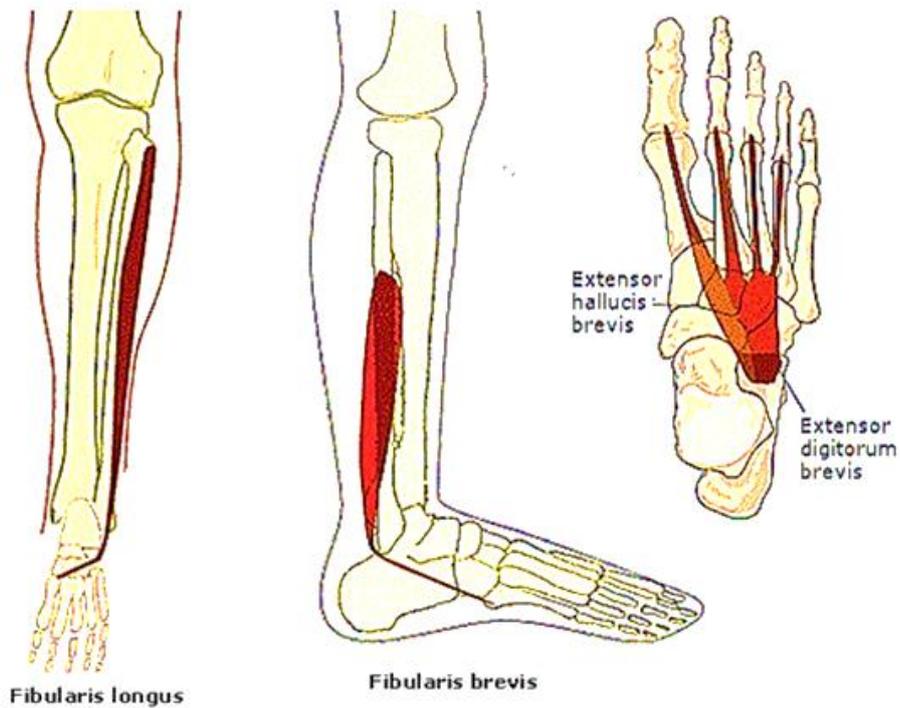


Fig. 3-27. Leg: Muscles of Lateral Compartment and Dorsum of Foot: Diagrams of the fibularis (peroneus) longus, fibularis brevis, extensor digitorum brevis and extensor hallucis brevis showing bony attachment sites

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12 – Study questions:

- 1) Which muscles and what actions could be affected with damage to the superficial fibular nerve? What about sensation in the foot?
- 2) Which muscles in the lower leg and what actions could be affected with damage to the common fibular nerve? What about sensation in the foot?
- 3) How would the results of the superficial fibular nerve damaged near the knee, differ from that when the superficial fibular nerve is damaged at the ankle?

3.6 DORSUM OF THE FOOT CONTENTS

- **TENDONS OF TIBIALIS ANTERIOR MUSCLE, EXTENSOR DIGITORUM LONGUS MUSCLE, and EXTENSOR HALLUCIS LONGUS MUSCLE** from anterior compartment of the leg (**Figs. 3-26, 3-30**)
- **SUPERFICIAL FIBULAR NERVE (Fig. 3-25)**
 - **MEDIAL CUTANEOUS BRANCH** is sensory to the medial foot, the dorsomedial big toe, the dorsum and lateral second toe, and the dorsum and medial third toe
 - **LATERAL CUTANEOUS BRANCH** is sensory to the lateral third toe and dorsum and medial fourth toe
- **DEEP FIBULAR NERVE BRANCHES (Figs. 3-16, 3-30)**
 - **MEDIAL BRANCH** innervates the skin between the big toe and the second toe
 - **LATERAL BRANCH** innervates the extensor digitorum brevis, the extensor hallucis brevis, and joints in the region.
- **DORSALIS PEDIS ARTERY (Figs. 3-29, 3-30)**
 - anterior tibial artery continuation
 - **LATERAL MALLEOLAR ARTERY** to the ankle
 - **MEDIAL and LATERAL TARSAL ARTERIES** to the tarsal joints
 - **ARCUATE ARTERY** is a division of the dorsalis pedis artery
 - **DORSAL METATARSAL ARTERIES** off arcuate to metatarsal spaces of toes
 - **DORSAL DIGITAL ARTERIES** from dorsal metatarsal arteries to the sides of the toes
 - **DEEP PLANTAR ARTERY** is the continuation of the dorsalis pedis that passes between the big and second toes to form part of the **PLANTAR ARCH**
- **DORSAL VEINS (Fig. 3-28)**
 - **DORSAL DIGITAL VEINS** from the toes form **COMMON DORSAL DIGITAL VEINS**
 - common dorsal digital veins converge to form the **DORSAL VENOUS ARCH**
 - arch drains laterally into the **SMALL SAPHENOUS VEIN**
 - arch drains medially into the **GREAT SAPHENOUS VEIN**

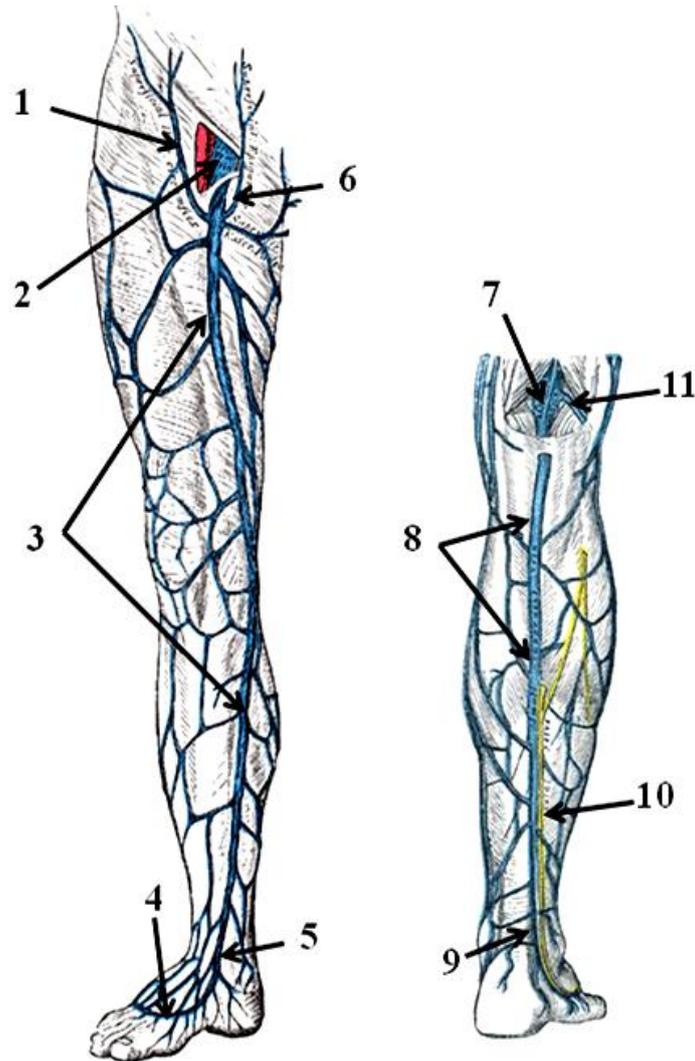


Fig. 3-28. Thigh: Superficial veins of the Lower Limb. 1. Superficial iliac circumflex vein, 2. Femoral vein, 3. Great saphenous vein, 4. Dorsal venous arch, 5. Medial marginal vein, 6. Superficial epigastric vein, 7. Popliteal vein, 8. Small saphenous Vein, 9. Lateral marginal vein, 10. Sural nerve, 11. Lateral genicular vein. (modified from Gray's 1918)

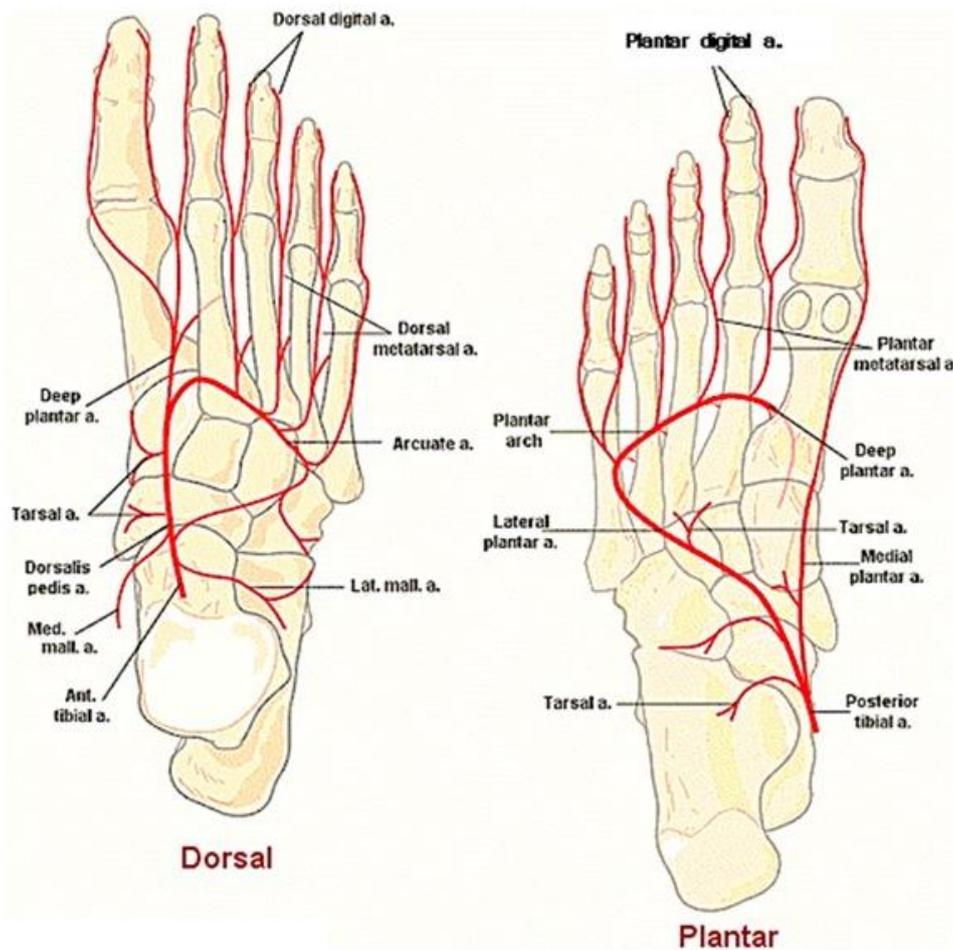


Fig. 3-29. Leg: Diagrams of the arteries on the dorsal (left) and plantar (right) surfaces of the foot.

• **DORSAL MUSCLES OF THE FOOT**

1) **EXTENSOR DIGITORUM BREVIS (Figs. 3-17, 3-27, 3-30)**

- Posterior attachment (origin): Anterior and lateral dorsal calcaneus, lateral talocalcaneal ligament, inferior extensor retinaculum
- Anterior attachment (insertion): Tendons of the extensor digitorum longus to toes by the extensor digitorum longus tendons to the middle and distal phalanges of the toes
- Nerve: Deep fibular nerve
- Action: Extension of the metatarsophalangeal and interphalangeal joints of toes

2) **EXTENSOR HALLUCIS BREVIS (Figs. 3-17, 3-27, 3-30)**

- Posterior attachment (origin): Anterior dorsal calcaneus; inferior extensor retinaculum
- Anterior attachment (insertion): Dorsal base of the proximal phalanx of the big toe
- Nerve: Deep fibular nerve
- Action: Extension of the metatarsophalangeal joint of the big toe

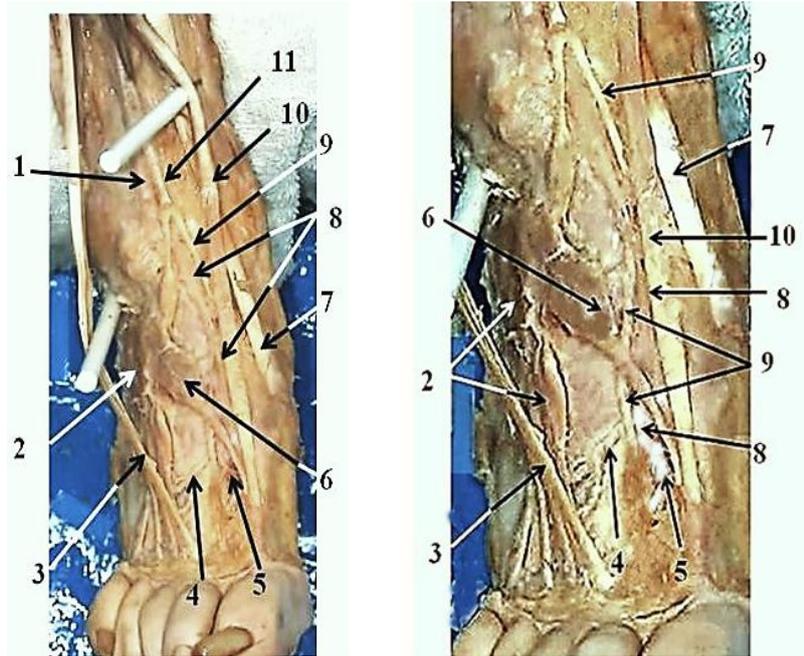


Fig. 3-30. Leg: Dissection of the dorsum of the foot. Image on the right is a close-up view of the image on the left. 1. Anterior tibial artery, 2. Extensor digitorum brevis, 3. Extensor digitorum longus tendons 4. Arcuate artery 5. Deep plantar artery, 6. Extensor hallucis brevis, 7. Tibialis anterior tendon, 8. Dorsalis pedis artery 9. Medial branch of the deep fibular nerve, 10. Extensor hallucis longus tendon, 11. Deep fibular nerve.

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13 – Study questions:

- 1) What structures of the anterior compartment of the leg extend into the dorsum of the foot? Which structures lie only in the dorsum of the foot?
- 2) How could damage to each of the following nerves affect the dorsum of the foot?
 - a. Common fibular n.
 - b. Superficial fibular n.
 - c. Deep fibular n.
 - d. Tibial n.
- 3) What do muscles in the anterior compartment of the leg and dorsum of the foot have in common?

3.7 SOLE OF THE FOOT CONTENTS

- **PLANTAR APONEUROSIS (Figs. 3-31, 3-32, 3-33)**
 - superficial thick, tough, central fascia
 - extends from the tuberosity of the calcaneus to each toe
 - **LATERAL and a MEDIAL INTERMUSCULAR SEPTUM**
 - from the sides of the proximal plantar aponeurosis
 - divide the foot into **MEDIAL, LATERAL AND CENTRAL COMPARTMENTS**

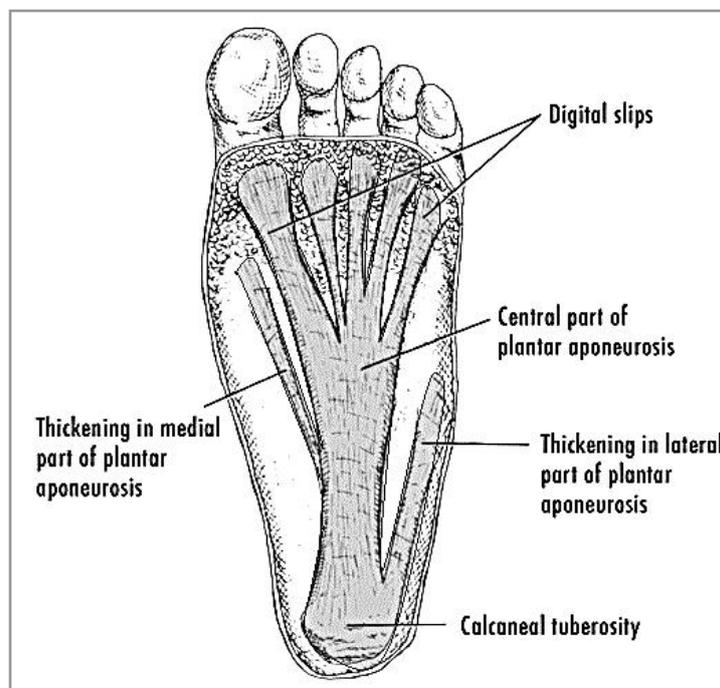


Fig. 3-31. Leg: Drawing showing the plantar aponeurosis and the medial and lateral septa

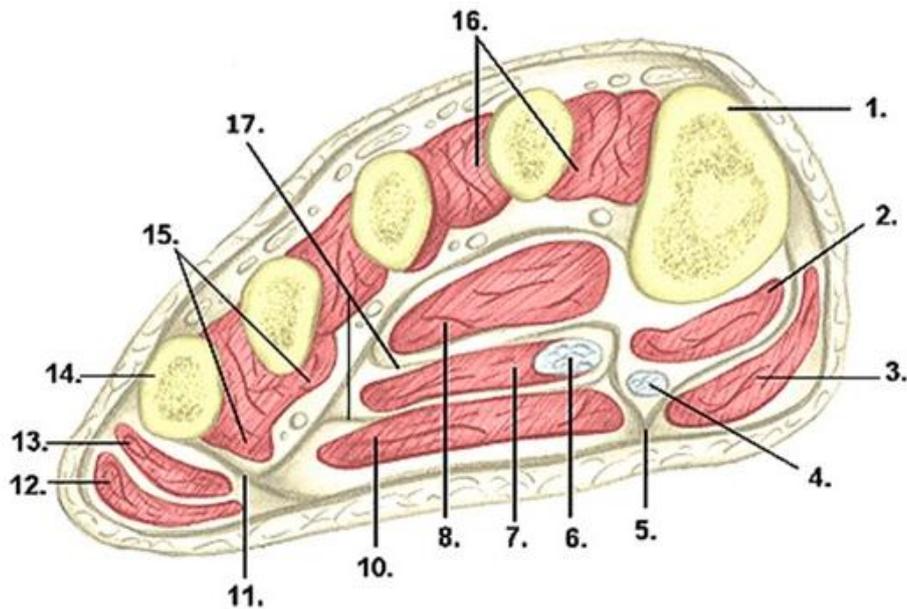


Fig. 3-32. Leg: Drawing of a cross-section through the forefoot showing the plantar aponeurosis, medial and lateral intermuscular septa, and muscles of the sole of the foot. 1. 1st metatarsal, 2. Flexor hallucis brevis, 3. Abductor hallucis, 4. Tendon of flexor hallucis longus, 5. Medial intermuscular septum off the plantar aponeurosis, 6. Tendon of flexor digitorum longus, 7. Quadratus plantae, 8. Adductor hallucis, 10. Flexor digitorum brevis, 11. Lateral intermuscular septum off the plantar aponeurosis, 12. Abductor digiti minimi, 13. Flexor digiti minimi brevis, 14. 5th metatarsus, 15. Plantar interossei, 16. Dorsal plantar interossei and 17 Transverse septa.

- **MEDIAL PLANTAR ARTERY (Figs. 3-33, 3-37, 3-38, 3-39)**
 - supplies the muscles, skin and joints of the medial foot
 - ends as digital branches to the big toe and the medial second digit
- **LATERAL PLANTAR ARTERY (Figs. 3-33, 3-37, 3-38, 3-39)**
 - gives off calcaneal, muscular, cutaneous and articular branches
 - joins the **DEEP PLANTAR ARTERY** from the **DORSALIS PEDIS ARTERY**
- **PLANTAR ARCH (Fig. 3-33)**
 - union of the **LATERAL PLANTAR ARTERY** with the **DEEP PLANTAR ARTERY**
 - gives off **PLANTAR METATARSAL ARTERIES** which bifurcate into **PLANTAR DIGITAL ARTERIES**
 - gives off **PERFORATING ARTERIES** and **ARTICULAR ARTERIES** to the tarsal and tarsometatarsal joints
 - **MUSCULAR ARTERIES** to the muscles in the area

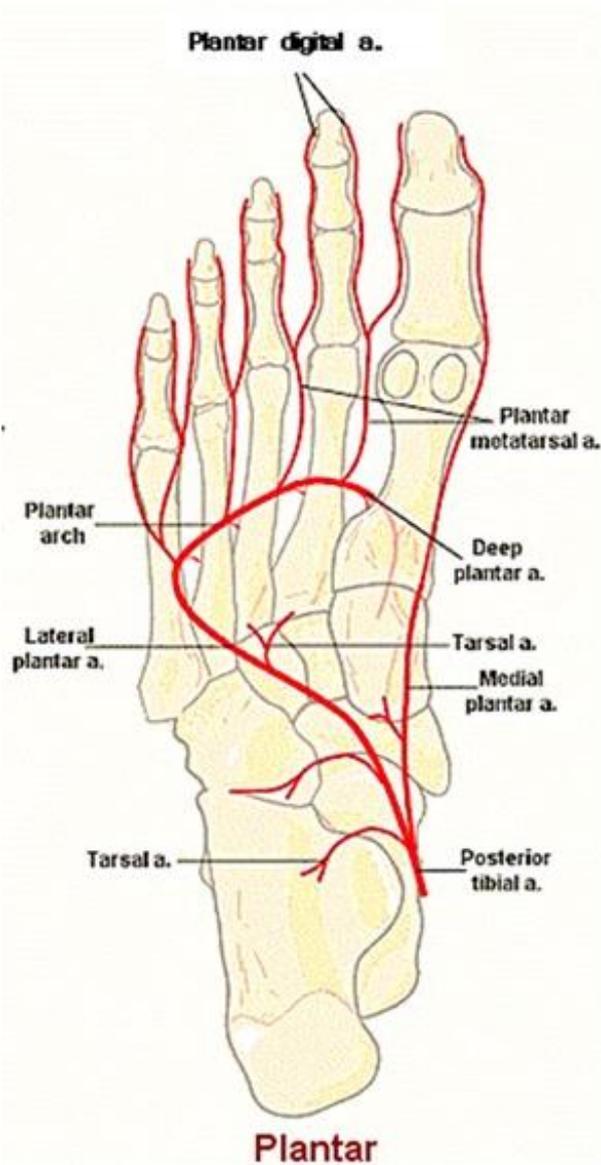


Fig. 3-33. Foot. Drawing of the medial and lateral plantar arteries.

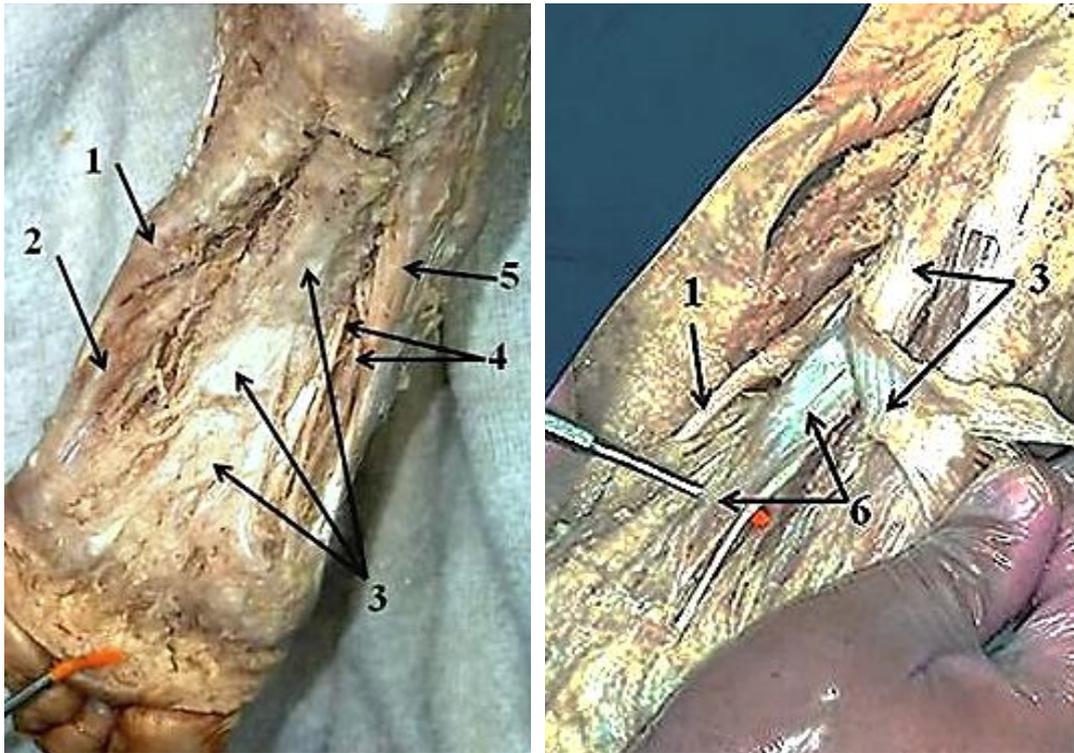


Fig. 3-34. Leg: Dissection of plantar aponeurosis. 1. Abductor digiti minimi, 2. Flexor digiti minimi, 3. Plantar aponeurosis, 4. Medial plantar nerve and artery, 5. Abductor hallucis, 6. Flexor digitorum brevis.

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- **SUPERFICIAL PLANTAR VEINS (Fig. 3-28)**
 - **PLANTAR CUTANEOUS VENOUS ARCH** from plantar cutaneous digital veins
 - arch drains laterally into **LATERAL MARGINAL VEINS** which empty into the **SMALL SAPHENOUS VEIN**
 - arch drains medially into **MEDIAL MARGINAL VEINS** which empty into the **GREAT SAPHENOUS VEIN**
- **DEEP PLANTAR VEINS**
 - follow the branches of the plantar arteries
 - **PLANTAR METATARSAL VEINS** converge to form the **DEEP PLANTAR VENOUS ARCH**
 - arch drains medially into the **MEDIAL PLANTAR VEIN** to **TIBIAL VEIN**
 - laterally into the **LATERAL PLANTAR VEIN** to **TIBIAL VEIN**
- **MEDIAL PLANTAR NERVE (Figs. 3-34, 3-35, 3-36, 3-38, 3-39)**
 - from **TIBIAL NERVE**
 - **MOTOR** to the (1) flexor digitorum brevis, (2) abductor hallucis, (3) flexor hallucis brevis, (4) the first lumbrical
 - **SENSORY** to the skin of the medial plantar foot and as **PROPER DIGITAL NERVES** to toes 1-3 and the medial one-half of 4
- **LATERAL PLANTAR NERVE (Figs. 3-35, 3-36, 3-38, 3-39)**
 - from **TIBIAL NERVE**
 - **MOTOR** to (1) the quadratus plantae and (2) the abductor digiti minimi with **SUPERFICIAL LATERAL PLANTAR NERVE** to (3) the flexor digitorum minimi brevis and **DEEP LATERAL PLANTAR NERVE** to (4) all the interossei, (5) the lumbricals of toes two, three and four, and (6) the adductor hallucis muscle
 - **SENSORY** from **PROPER PLANTAR DIGITAL NERVES** off superficial lateral plantar nerve to (4) the skin of the toes 4 and 5.

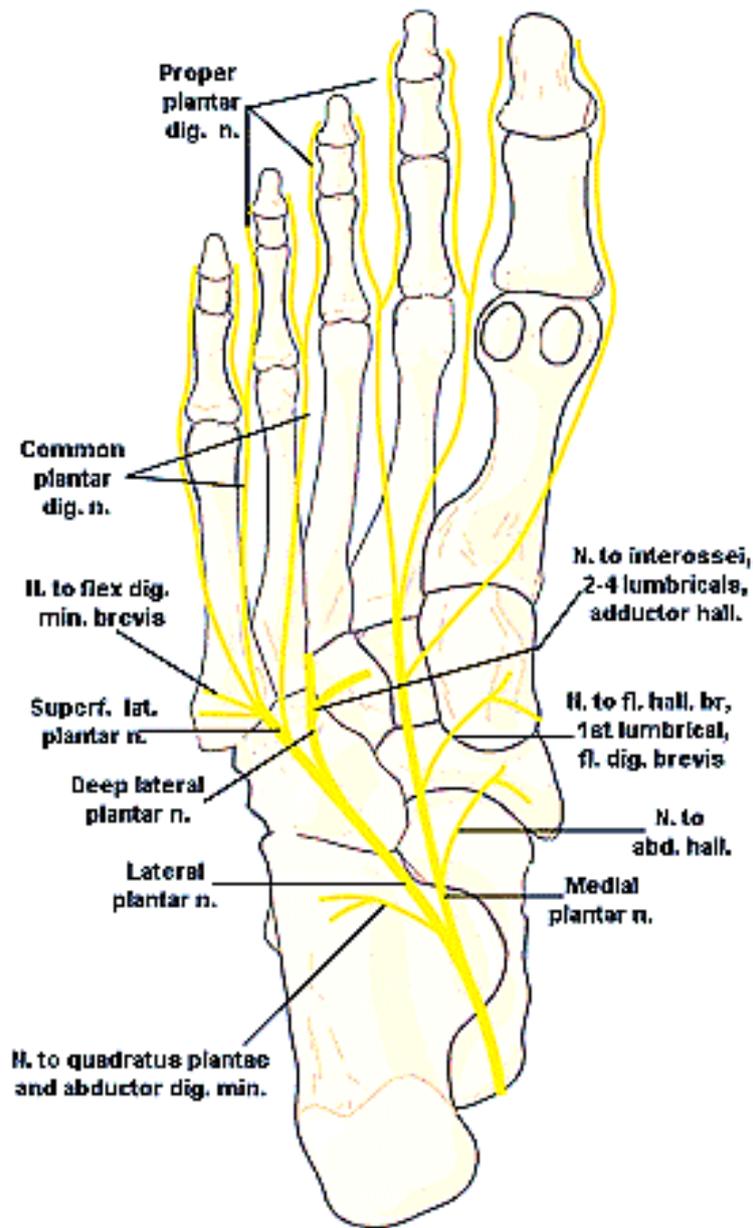


Fig. 3-35. Leg: Diagrams of the nerves on the plantar surface of the foot

- **PLANTAR FOOT MUSCLES AND LAYERS**

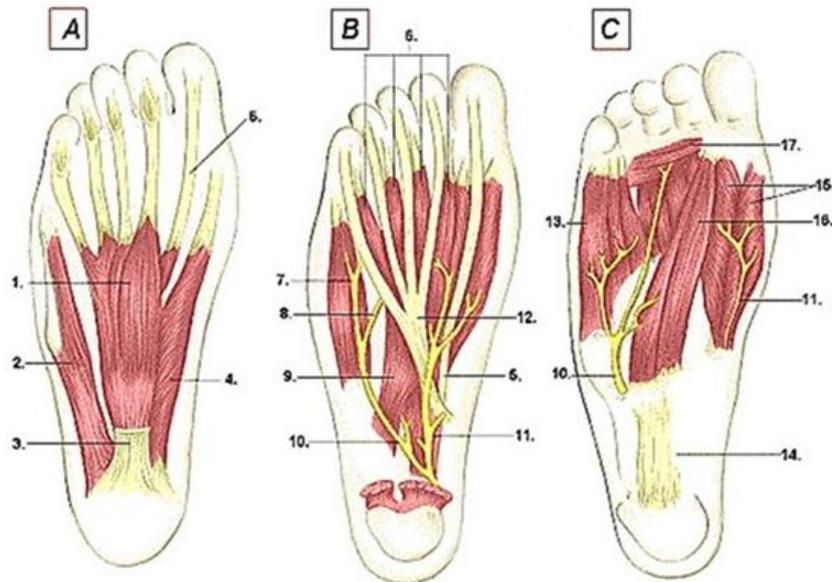


Fig. 3-36. Leg: Drawings of plantar surface of the foot showing the contents of layer 1 (A), layer 2 (B), and layer 3 (C). 1. Flexor digitorum brevis, 2. Abductor digiti minimi, 3. Plantar aponeurosis (cut), 4. Abductor hallucis, 5. Flexor hallucis longus tendon, 6. Lumbricals, 7. Superficial lateral plantar nerve, 8. Deep lateral plantar nerve, 9. Quadratus plantae, 10. Lateral plantar nerve, 11. Medial plantar nerve, 12. Tendon of flexor digitorum longus, 13. Flexor digiti minimi brevis, 14. Long plantar ligament, 15. Flexor hallucis brevis, 16. Oblique head of adductor hallucis, and 17. Transverse head of adductor hallucis.



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- **LAYER 1 OF PLANTAR MUSCLES (most superficial layer of plantar muscles)**
 - 1) **ABDUCTOR HALLUCIS (Figs. 3-32, 3-34, 3-36, 3-37, 3-38, 3-39)**
 - Proximal attachment (origin): Medial process of the calcaneus; flexor retinaculum; plantar aponeurosis.
 - Distal attachment (insertion): Medial base and medial sesamoid bone of big toe proximal phalanx
 - Nerve: Medial plantar nerve
 - Action: Abduction of the metatarsophalangeal joint
 - 2) **FLEXOR DIGITORUM BREVIS (Figs. 3-32, 3-34, 3-36, 3-37, 3-38, 3-39)**
 - Proximal attachment (origin): Medial process of the calcaneus; plantar aponeurosis.
 - Distal attachment (insertion): Medial and lateral aspects of the middle phalanx of digits 2–5.
 - Nerve: Medial plantar nerve
 - Action: Flexion of the metatarsophalangeal joints and proximal interphalangeal joints of toes 2–5
 - 3) **ABDUCTOR DIGITI MINIMI (Figs. 3-32, 3-34, 3-36, 3-37, 3-38, 3-39)**
 - Proximal attachment (origin): Medial and lateral processes of the calcaneus; plantar aponeurosis.
 - Distal attachment (insertion): Lateral base of the proximal phalanx of the fifth digit (little toe).
 - Nerve: Lateral plantar nerve
 - Action: Abduction of the metatarsophalangeal joint of the fifth toe
- **LAYER 2 OF PLANTAR MUSCLES**
 - 1) **TENDONS OF THE FLEXOR DIGITORUM LONGUS (See posterior compartment of leg; Figs 3- 14, 3-22, 3-23, 3-24)**
 - 2) **TENDON OF THE FLEXOR HALLUCIS LONGUS (See posterior compartment of leg; Figs 3-14, 3-22, 3-23, 3-24)**
 - 3) **QUADRATUS PLANTAE (Figs. 3-32, 3-36, 3-37)**
 - Proximal attachment (origin):
 - **MEDIAL HEAD:** Medial plantar body of the calcaneus.
 - **LATERAL HEAD:** Lateral plantar body of calcaneus.
 - Distal attachment (insertion): Lateral tendons of the flexor digitorum longus.
 - Nerve: Lateral plantar nerve
 - Action: Flexion of the metatarsophalangeal and interphalangeal joints of toes 2–5

4) **LUMBRICALES** (Figs. 3-32, 3-36, 3-37, 3-38, 3-39)

- Proximal attachment (origin): Tendons of the flexor digitorum longus
- Distal attachment (insertion): Medial bases of the proximal phalanges of toes 2–5; extensor tendons of the extensor digitorum longus to toes 2–5.
- Nerve: Medial plantar nerve to first lumbrical to 2nd toe; lateral plantar nerve to lumbricals two, three and four to toes 3–5.
- Action: Flexion of the metatarsophalangeal joint and extension of the interphalangeal joint of toes 2–5.

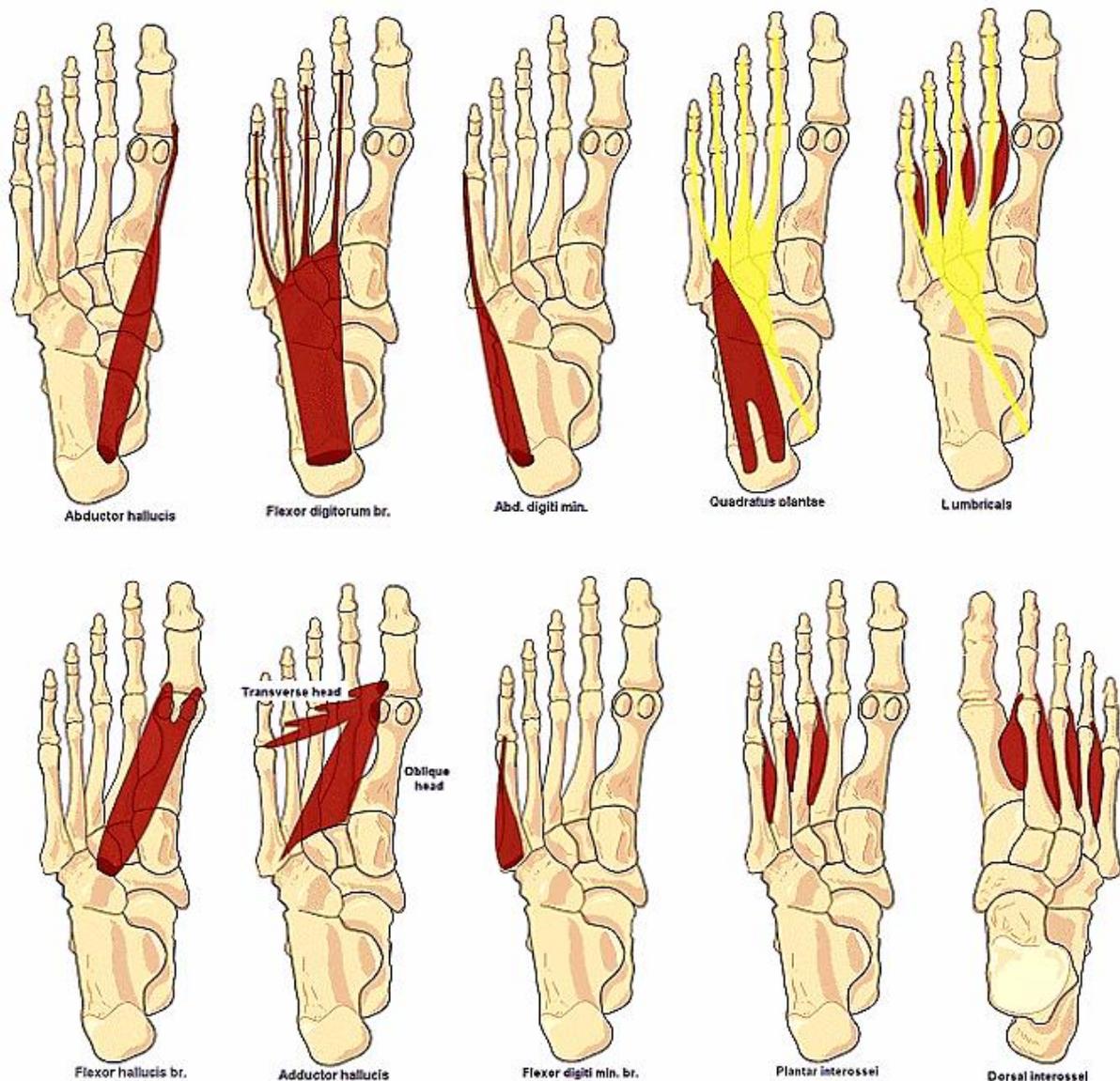


Fig. 3-37. Leg: Diagrams of the abductor hallucis, flexor digitorum brevis, abductor digiti minimi, quadratus plantar, lumbricals, flexor hallucis brevis, adductor hallucis, flexor digiti minimi brevis, plantar interossei, and dorsal interossei showing the attachment sites. Note that dorsal interossei are shown from the dorsal view.

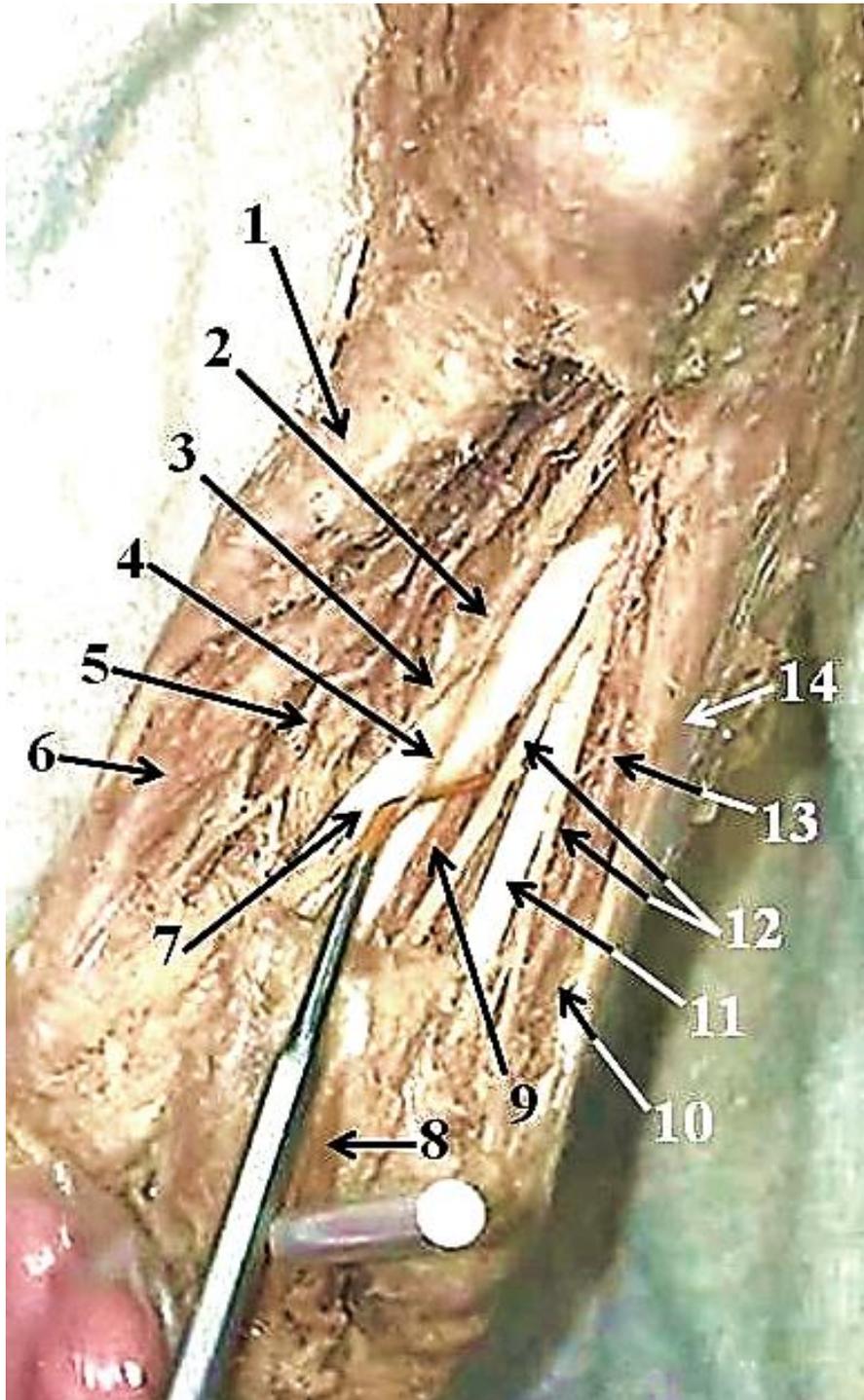


Fig. 3-38. Leg: Dissection of plantar foot. 1. Abductor digit minimi, 2. Lateral plantar nerve, 3. Deep lateral plantar nerve, 4. Superficial lateral plantar nerve, 5. Lateral plantar artery, 6. Flexor digiti minimi, 7. Flexor digitorum longus tendons, 8. Flexor digitorum brevis reflected, 9. Lumbrical, 10. Flexor hallucis brevis, 11. Flexor hallucis longus tendon, 12. Medial plantar nerve, 13. Medial plantar artery, 14. Abductor hallucis.

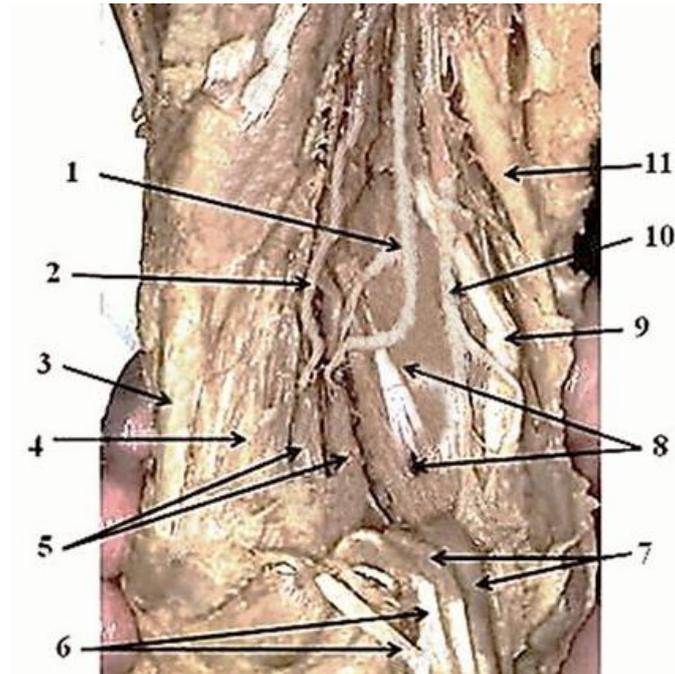


Fig. 3-39. Leg: Dissection of deep plantar foot. 1. Lateral plantar nerve, 2. Lateral plantar artery, 3. Abductor digit minimi, 4. Flexor digiti minimi, 5. Plantar interossei, 6. Flexor digitorum longus tendons, 7. Lumbrical, 8. Adductor hallucis, 9. Flexor hallucis longus tendon, 10. Medial plantar nerve, 11. Abductor hallucis.



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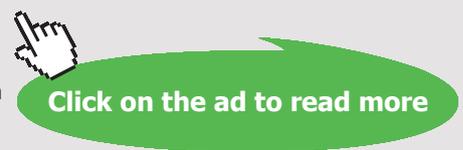
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○ **LAYER 3 OF PLANTAR MUSCLES**

1) **FLEXOR HALLUCIS BREVIS (Figs. 3-32, 3-36, 3-37, 3-38)**

- Proximal attachment (origin): Medial plantar surface of cuboid bone and plantar surface of the third (lateral) cuneiform.
- Distal attachment (insertion):
 - **MEDIAL PART:** Medial base and medial sesamoid bone of big toe proximal phalanx
 - **LATERAL PART:** lateral base and lateral sesamoid bone of big toe proximal phalanx
- Nerve: Medial plantar nerve
- Action: Flexion of the metatarsophalangeal joint of the big toe

2) **ADDUCTOR HALLUCIS (Figs. 3-32, 3-36, 3-37, 3-38, 3-39)**

- Proximal attachment (origin):
 - **TRANSVERSE HEAD:** plantar metatarsophalangeal ligaments of toes 2–5.
 - **OBLIQUE HEAD:** plantar bases of metatarsals 2–5; tendon sheath of the peroneus longus
- Distal attachment (insertion): Lateral base and lateral sesamoid bone of big toe proximal phalanx
- Nerve: Deep branch of the lateral plantar nerve.
- Action: Adduction of the metatarsophalangeal joint of the big toe

3) **FLEXOR DIGIT MINIMI BREVIS (Figs. 3-32, 3-36, 3-37)**

- Proximal attachment (origin): Plantar base of the fifth metatarsal; tendon sheath of the fibularis longus.
- Distal attachment (insertion): Lateral base of the proximal phalanx of the fifth toe
- Nerve: Superficial branch of the lateral plantar nerve
- Action: Flexion of the metatarsophalangeal joint of the fifth toe

○ **LAYER 4 OF PLANTAR MUSCLES**

1) **DORSAL INTEROSSEI (Figs. 3-32, 3-36, 3-37)**

- Proximal attachment (origin): By two heads from the adjacent metatarsal bones.
- Distal attachment (insertion):
 - **FIRST INTEROSSEUS:** medial side of the base of the proximal phalanx of toe 2.
 - **SECOND–4TH INTEROSSEI:** lateral side of the bases proximal phalanges of toes 2–4.
- Nerve: Deep branch of the lateral plantar nerve.
- Action: Abduction of the metatarsophalangeal joint

2) **PLANTAR INTEROSSEI (Figs. 3-32, 3-36, 3-37, 3-39)**

- Proximal attachment (origin): Medial side and bases of the metatarsals of toes 3–5
- Distal attachment (insertion): Medial bases of the proximal phalanx of toes 3–5
- Nerve: Deep branch of the lateral plantar nerve
- Action: Adduction of the metatarsophalangeal joint

3.8 SENSATION OF THE LOWER LIMB

- sensation to the anterior, medial and lateral aspects of the lower limb are generally from lumbar spinal nerves
- sensation to the posterior aspect of the lower limb is generally from sacral spinal nerves
- sensory nerves to the anterior, medial and lateral thigh are from the lumbar plexus
- sensory nerves to the posterior lower leg are from the sacral plexus

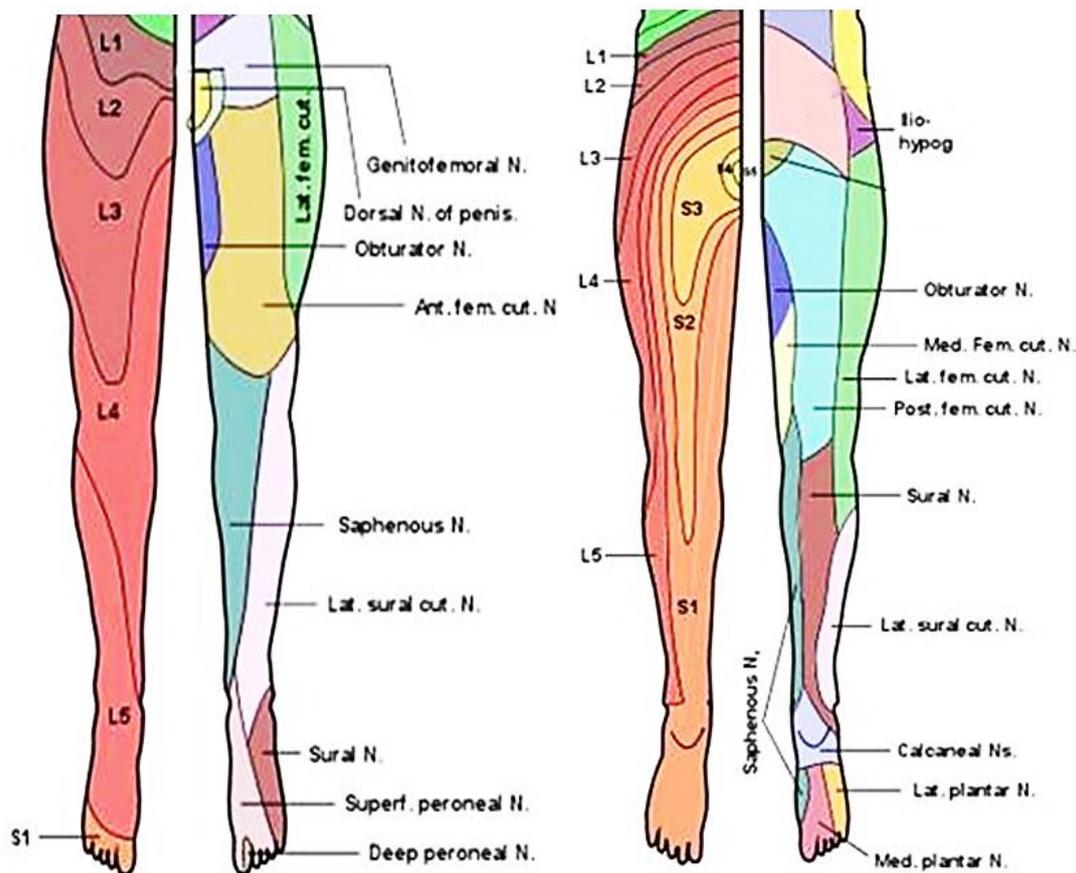


Fig. 3-38. Leg: The drawing shows the dermatome and peripheral nerve innervation of the lower limb. The figure on the viewer's left is a ventral view and the one on the right is a dorsal view. The left side of each image shows to dermatome level; the right-side gives the names of the peripheral nerves. Dermatome charts do vary especially in the foot with the distribution of L4, L5, S1.

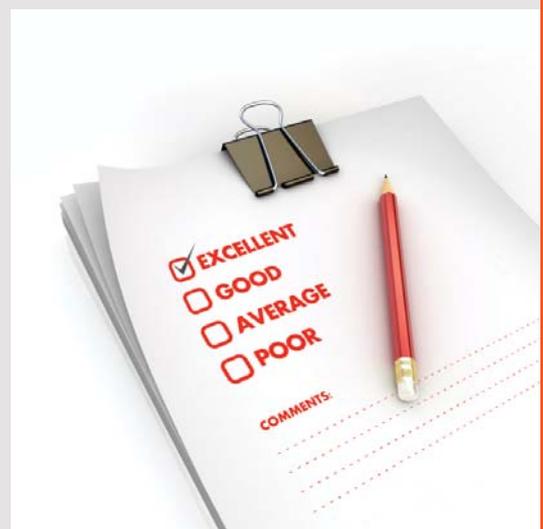
14 – Study questions:

- 1) What forms the plantar arch?
- 2) Occlusion of which arteries will decrease blood supply to the plantar aspect of the foot (answer yes or no)?
 - a. Popliteal a.
 - b. Anterior tibial a.
 - c. Fibular a.
 - d. Posterior tibial a.
 - e. Inferior genicular a.
- 3) Which muscles and what actions would be affected by damage to the deep lateral plantar nerve?
- 4) Which muscles and what actions would be affected by damage to the medial plantar nerve?
- 5) What would be the sensory impairment expected for the foot with damage to the following nerves:
 - a. L 5?
 - b. Lateral plantar?
 - c. Deep fibular?
 - d. S 1?
 - e. Medial Plantar?
 - f. Tibial?
 - g. Common fibular?
- 6) What muscles lie in layer three of the plantar aspect of the foot?

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4 LOWER LIMB INJURIES

Nerves of the Lower Limb Showing the Motor and Sensory Innervations

Nerve	Plexus	Spinal Cord Level	Motor Innervations	Sensory Innervations
Iliohypogastric Nerve	Lumbar	L1	External, internal abdominal obliques, transverse abdominis muscles	Skin of lateral gluteal region, hypogastric region of abdominal wall, pubic symphysis.
Ilioinguinal Nerve	Lumbar	L1	Internal abdominal oblique, transverse abdominis muscles	Skin of inguinal region, anterior scrotum and anterior labia majora, pubic symphysis
Genitofemoral Nerve	Lumbar	L1, L2	none	Skin over the femoral triangle, anterior scrotum, anterior labia majora, pubic symphysis
Lateral Femoral Cutaneous Nerve	Lumbar	L2, L3	none	Skin over the lateral thigh
Femoral Nerve	Lumbar	L2, L3, L4	Quadriceps femoris, psoas major, iliacus, pectineus, and sartorius muscles	Skin of anterior thigh, medial leg, medial ankle, hip and knee joints
Obturator Nerve	Lumbar	L2, L3, L4	Gracilis, adductor longus, adductor brevis, adductor magnus muscles	skin of medial thigh, sacroiliac joint, hip and knee joints
Lumbosacral Trunk	Lumbar	L4, L5	Sacral plexus	Sacral plexus, sacroiliac joint
Sciatic Nerve	Sacral	L4 – S3	Hamstrings, anterior, posterior and lateral leg muscles, dorsal and plantar foot muscles	Skin of posterior thigh, lower leg, ankle, foot, and hip, knee ankle joints.

Lower Limb Nerve Injuries at Spinal Nerve Level, Pelvis and Thigh

Nerve and Damage Site	Motor in Thigh	Sensory in Thigh	Motor in Leg	Sensory in Leg	Motor in Foot	Sensory in Foot
Femoral at Spinal Nerve Level	Iliopsoas, pectineus, quadriceps	Anterior thigh	None	Saphenous n. -medial leg Medial leg	None	None
Femoral in Pelvis	Iliopsoas, pectineus, quadriceps	Anterior thigh	None	Saphenous n. -medial leg Medial leg	None	None
Femoral in Thigh	Pectineus, quadriceps	Anterior thigh	None	Saphenous n. -medial leg Medial leg	None	None
Obturator at Spinal Nerve Level	Hip adductors	Medial thigh	None	None	None	None
Obturator in Pelvis	Hip adductors	Medial thigh	None	None	None	None
Obturator in Thigh	Hip adductors	Medial thigh	None	None	None	None
Sciatic at Spinal Nerve Level	Hamstrings	Posterior thigh	Popliteus, gastrocnemius, soleus, posterior tibiae, flexor digitorum and hallucis longus, fibularis longus and brevis, Anterior tibialis, extensor digitorum and hallucis longus	Posterior leg	Flexor digitorum and hallucis, extensor digitorum and hallucis, abductor hallucis and digiti minimi, flexor hallucis and digiti minimi, lumbricals, adductor hallucis, dorsal and plantar interossei	Dorsum and plantar foot

Nerve and Damage Site	Motor in Thigh	Sensory in Thigh	Motor in Leg	Sensory in Leg	Motor in Foot	Sensory in Foot
Sciatic in Pelvis	Same as at spinal nerve level	Posterior thigh	Same as at spinal level	Posterior thigh	Same as at spinal nerve level	Dorsum and plantar foot
Sciatic in Thigh	Same as at spinal nerve level	Posterior thigh	Same as at spinal nerve level	Posterior thigh	Same as at spinal nerve level	Dorsum and plantar foot

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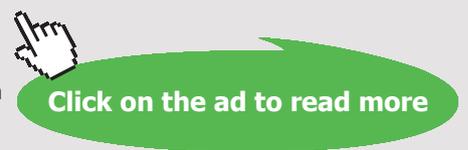
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Lower Limb Nerve Injuries at Popliteal Fossa and Leg

Nerve and Damage Site	Motor in Leg	Sensory in Leg	Motor in Foot	Sensory in Foot
Tibial in Popliteal Fossa	Popliteus, gastrocnemius, soleus, posterior tibias, flexor digitorum and hallucis longus	Posterior leg	Flexor digitorum and hallucis, extensor digitorum and hallucis, abductor hallucis and digiti minimi, flexor hallucis and digiti minimi, lumbricals, adductor hallucis, dorsal and plantar interossei	Plantar foot
Common Fibular in Popliteal Fossa/knee	Anterior tibialis, extensor digitorum and hallucis longus, fibularis longus and brevis	Lateral leg	Extensor digitorum and hallucis brevis	Web between big toe and second toe; dorsum of foot
Tibial in Leg	Gastrocnemius, soleus, posterior tibias, flexor digitorum and hallucis longus	Posterior leg	Same as at popliteal fossa	Plantar foot
Superficial Fibular in Leg	Fibularis longus and brevis	Anterior and lateral leg	None	Dorsum of foot

Lower Limb Nerve Injury at Ankle and Foot

Nerve and Damage Site	Motor in Foot	Sensory in Foot
Tibial at medial malleolus of ankle	Flexor digitorum and hallucis brevis, extensor digitorum and hallucis brevis, abductor hallucis and digiti minimi, flexor hallucis and digiti minimi, lumbricals, adductor hallucis, dorsal and plantar interossei	Plantar foot
Superficial fibular at ankle	None	Dorsum of foot
Deep fibular at ankle	Extensor digitorum and hallucis brevis	Web between big toe and second toe
Lateral plantar	Abductor digiti minimi, flexor digiti minimi, 2–4 lumbricals, adductor hallucis, dorsal and plantar interossei	Lateral third of plantar foot
Medial plantar	Flexor digitorum and hallucis brevis, abductor hallucis, first lumbricals,	Medial two-thirds of plantar foot

5 STUDY QUESTIONS ANSWERS

1 – STUDY QUESTIONS

What bones and ligaments comprise the sacroiliac joint?

A = auricular surfaces of sacrum and ilium

A = long and short sacroiliac ligaments, ventral sacroiliac ligament, interosseous sacroiliac ligament, sacrospinous ligament, sacrotuberous ligament

What are the parts of the innominate bone?

A = ilium, ischium, pubic bone

What bones and ligaments comprise the hip joint?

A = head of femur and acetabulum of innominate bone

A = iliofemoral ligament, pubofemoral ligament, ischiofemoral ligament, round ligament of the femur

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The trochanteric bursa lies between what structures? What about the ischial bursa?

A = trochanteric bursa is between the greater tuberosity of the femur and the gluteus maximus

A = ischial bursa is between the ischial tuberosity and gluteus maximus

2 – STUDY QUESTIONS

Which arteries arise from the posterior division of the internal iliac artery?

A = Iliolumbar, lateral sacral, superior gluteal

Which artery off the internal iliac artery is found only in the male?

A = Inferior vesical artery

Describe what structures would be affected in the blockage of the following arteries:

- Umbilical. A = Urinary bladder
- Middle rectal. A = Rectum, prostate and seminal vesicles in male, vagina in female
- Uterine. A = Urinary bladder, uterus, vagina
- Lateral sacral. A = Ventral rami, spinal nerve root of sacral nerves and meninges of sacral canal

3 – STUDY QUESTIONS

What nerves are in the pelvis?

A = Genitofemoral, lateral femoral cutaneous, femoral, obturator, ilioinguinal, lumbosacral trunk, sciatic, superior gluteal, inferior gluteal, nerve to the quadratus femoris, nerve to the obturator internus, pudendal nerve, nerve to the piriformis

What nerves are in the pelvis are NOT in the gluteal region?

A = Genitofemoral, lateral femoral cutaneous, femoral, obturator, ilioinguinal, lumbosacral trunk

Which gluteal muscles perform the following actions:

- Abduction and internal rotation. A = gluteus medius and minimus
- Extension and external rotation. A = gluteus maximus
- External rotation. A = gluteus maximus, piriformis, quadratus femoris, superior and inferior gemelli, internal and external obturators

Damage to the superior gluteal nerve will affect which muscles and which actions?

A = The gluteus medius and minimus which are abductors and internal rotators of the hip and the tensor fasciae lata which abducts and flexes the hip

Damage to the inferior gluteal nerve will affect which muscles and which actions?

A = The gluteus maximus which is an extensor and external rotator of the hip

4 – STUDY QUESTIONS

What are the extra-articular structures of the knee? Which of these are common to both the tibiofemoral and patellofemoral joints?

A = The extra-articular structures are the patellar ligament (tendon), quadriceps tendon, medial and lateral patellar retinacula, lateral (fibular) collateral lig., medial (tibial) collateral lig., oblique popliteal lig., arcuate popliteal lig. The patellar lig., quadriceps tendon, and the medial and lateral retinacula are common to the tibiofemoral and patellofemoral joints.

What are the intra-articular structures of the knee? Which of these are common to both the tibiofemoral and patellofemoral joints?

A = The intra-articular structures are the medial and lateral menisci, anterior and posterior cruciate ligaments, meniscofemoral lig., coronary lig., and the transverse lig. of the knee. None of the intra-articular structures are common to the tibiofemoral and patellofemoral joints.

Name the bursa that is found in the following positions:

- a. Over the tibial tuberosity. A = Superficial infrapatellar
- b. Deep to the quadriceps tendon. A = Suprapatellar
- c. Superficial to the patella. A = Prepatellar
- d. Deep to the patellar ligament. A = Deep infrapatellar
- e. Over the lateral tibial condyle. A = Popliteal
- f. Under the common tendon for the gracilis, sartorius, and semitendinosus. A = Pes anserine

What is the sensory innervation of the knee joint?

A = Femoral N., obturator N., common peroneal (fibular) N., and tibial N.

What is the blood supply to the knee?

A = superomedial and superolateral genicular arteries off popliteal artery, inferior medial and inferior lateral off the popliteal artery

5 – STUDY QUESTIONS

Where is the femoral triangle and what does it contain?

A = The femoral triangle is bound superiorly by the inguinal ligament, laterally by the sartorius, medially by the adductor longus, and posteriorly by the iliopsoas. It contains the femoral nerve, artery and vein.

With damage to the femoral nerve what muscles could be involved and what movements and sensations could be impaired?

A = The psoas major, iliacus, sartorius, pectineus, and quadriceps femoris would be involved and hip flexion, external hip rotation (slight), knee extension and knee flexion (slight) would be impaired as would sensation of the anterior thigh, medial knee/leg and medial foot.

Blockage of which arteries will:

- Affect the hip joint: A = Femoral, profunda femoral, medial and lateral femoral circumflex, obturator, superior gluteal, inferior gluteal.
- Affect the hamstrings: A = Femoral, profunda femoral, perforating arteries (off profunda femoral a.)
- Affect the adductor magnus: A = Obturator, femoral, profunda femoral, perforating
- Affect the quadriceps: A = Femoral



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Which muscles of the anterior compartment perform the following actions:

- a. Flex the hip. A = iliopsoas, sartorius, rectus femoris, pectineus
- b. Extend the knee. A = Vastus lateralis, vastus medialis, rectus femoris, vastus intermedius
- c. Externally rotate the hip. A = Sartorius

6 – STUDY QUESTIONS

Damage to the obturator nerve could involve which muscles of the medial thigh and impair which movements of the hip? Would there be any sensory impairment? If so, what would it be?

A = The gracilis, adductor longus, adductor brevis, and adductor magnus would be involved and hip adduction, medial rotation, flexion (slightly) and extension (slight) would be impaired as would sensation of the medial thigh.

Which of the medial compartment muscles is innervated by two different nerves? What might you find if only one of these nerves were damaged?

A = The adductor magnus is innervated by the obturator N. and tibial N. (component of the sciatic N). If either of these nerves is damaged and the adductor magnus is involved, there would be weakness in hip adduction and medial rotation and there could be slight weakness in hip extension when the hip is flexed.

As the femoral and obturator nerves both arise from the L2-4 of the lumbar plexus, how could you differentiate between a spinal nerve lesion and a lesion of either the femoral or obturator nerve?

A = If the spinal nerves are involved then both the femoral and obturator nerves would be involved. There would be weakness in hip flexion, adduction, and medial rotation and in knee extension. There would be sensory involvement/deficit on the anterior and medial thigh and along the medial knee/leg and foot. If only the femoral nerve was only involved, then only the anterior compartment muscle and anterior thigh, medial leg and foot involvement would be present. The medial compartment muscles would not be involved nor would sensation of the medial thigh. If only the obturator nerve was involved, then the medial thigh muscles and sensation from the medial thigh would be impaired but not the anterior thigh muscles or sensation from the anterior thigh.

7 – STUDY QUESTIONS

What artery supplies blood to the muscles of the posterior compartment?

A = Profunda femoral by perforating arteries

Damage to the tibial nerve could affect which posterior compartment muscles and what actions?

A = The semitendinous, semimembranous, and long head of the biceps femoris would be involved. Hip extension, knee flexion and tibial external and internal rotation would be affected.

Damage to the common peroneal (fibular) nerve could affect which posterior compartment muscles and what actions?

A = The short head of the biceps femoris. Knee flexion and external tibial rotation.

Which of the posterior compartment muscles perform the following actions:

- a. Flex the knee. A = Semitendinous, semimembranous, long and short heads of the biceps femoris
- b. Internally rotate the tibia. A = Semitendinous, semimembranous
- c. Extend the hip. A = Semitendinous, semimembranous, long head of the biceps femoris
- d. Externally rotate the tibia. A = Long and short heads of the biceps femoris

8 – STUDY QUESTIONS

Trauma to the popliteal fossa could damage what muscles, what nerves, and what arteries?

A = Muscles = semitendinous, semimembranous, biceps femoris, popliteus, gastrocnemius; nerves = common peroneal (fibular), tibial, medial and lateral sural, genicular, posterior fem. cutaneous; arteries = popliteal, genicular

What arteries in the popliteal fossa supply blood directly to the knee joint?

A = Superior medial genicular, superior lateral genicular, middle genicular, inferior medial genicular, inferior lateral genicular

Would damage to the tibial or common fibular (peroneal) nerves in the popliteal fossa affect motor or sensory innervation in the following areas (yes/no):

- a. Posterior thigh. A = No – damage distal to the posterior thigh
- b. Anterior leg. A = Yes – deep fibular N. off of common peroneal (fibular) N.
- c. Medial thigh. A = No – obturator N. – damage distal to nerve
- d. Posterior leg. A = Yes – tibial N.
- e. Anterior thigh. A = No – femoral N – damage distal to nerve
- f. Foot. A = Yes – innervation to the foot from tibial and common fibular N.

9 – STUDY QUESTIONS

A lateral sprain of the ankle resulting from excessive inversion of the foot could damage which ankle ligaments?

A = Lateral sprain by foot inversion = lateral collateral which consist of the anterior talofibular, calcaneofibular, posterior talofibular – the anterior talofibular and calcaneofibular are the two most commonly involved

What about a medial sprain of the ankle due to excessive eversion of the foot?

A = Medial sprain by foot eversion = deltoid which consists of the anterior tibiotalar, posterior tibiotalar, tibiocalcaneal, tibionavicular

What two joints form the midtarsal joint?

A = Calcaneocuboid, talonavicular

What ligaments stabilize the subtalar joint?

A = Medial, lateral and posterior talocalcaneal, calcaneofibular, tibiocalcaneal, interosseous talocalcaneal



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Where are the medial and lateral collateral foot ligaments and plantar plate ligaments located?

A = metatarsophalangeal joints and interphalangeal joints of the foot

10 – STUDY QUESTIONS

What muscles and actions could be affected with damage to the deep fibular nerve? How about the common fibular nerve?

A = The anterior tibialis, extensor digitorum longus and brevis and the extensor hallucis longus and brevis would be involved and the actions of ankle dorsiflexion, foot inversion, extension of the toes and big toe would be weakened. These same anterior compartment muscles and actions would be affected with damage to the common fibular N. Damage to the common fibular nerve would also affect the superficial fibular nerve and include the fibularis longus and brevis. Weakness in plantar flexion and eversion would be seen.

What sensory impairment could result from damage to the deep fibular nerve?

A = Decreased sensation to the skin between the big toe and the second toe

What common ankle movement results from the action of the anterior tibialis, extensor hallucis longus, and extensor digitorum?

A = Ankle dorsiflexion

What is the difference in the action of the anterior tibialis, as compared to extensor hallucis longus, and extensor digitorum?

A = The anterior tibialis does not extend the toes and the extensors do not invert the foot.

11 – STUDY QUESTIONS

What posterior compartment muscles and actions could be involved with damage to the tibial nerve in the popliteal fossa? How about damage to the tibial nerve at the ankle? Will there be a difference?

A = Damage to the tibial nerve in the popliteal fossa will affect the popliteus, gastrocnemius, soleus, plantaris, posterior tibialis, flexor digitorum longus, flexor hallucis longus and the muscles of the plantar foot. This damage will affect knee flexion, tibial internal rotation, ankle plantar flexion, toe flexion, foot inversion, and the actions of the muscles of the plantar foot (see later questions for plantar muscle and actions). Damage to the tibial nerve at the ankle will not affect the popliteus, gastrocnemius, soleus, plantaris, posterior tibialis, flexor

digitorum longus, and flexor hallucis longus but it would affect the muscles of the plantar foot. Thus, knee flexion, tibial internal rotation, ankle plantar flexion, and foot inversion would not be involved but there would be involvement of the plantar muscles which would involve flexion of the toes as well as big and little toe abduction, big toe adduction and muscle stability of the foot.

Rupture of the Achilles tendon would affect what muscles and what actions?

A = It would affect the gastrocnemius, plantaris, and soleus. Actions of plantar flexion of the ankle and inversion of the foot would be affected.

What muscles in the posterior compartment produce the following actions?

- a. Ankle plantarflexion. A = Gastrocnemius, soleus, plantaris, posterior tibialis, flexor digitorum longus, flexor hallucis longus
- b. Ankle dorsiflexion. A = None
- c. Foot inversion. A = Gastrocnemius, soleus, plantaris, posterior tibialis
- d. Knee flexion. A = Gastrocnemius
- e. Foot eversion. A = None

12 – STUDY QUESTIONS

Which muscles and what actions could be affected with damage to the superficial fibular nerve? What about sensation in the foot?

A = The fibularis longus and brevis muscles which evert the foot and plantar flex the ankle would be involved. Sensory involvement would include the lateral and anterior lateral skin of the distal leg and the dorsum of the foot but not the area between the big and second toe.

Which muscles in the lower leg and what actions could be affected with damage to the common fibular nerve? What about sensation in the foot?

A = The muscles of the anterior compartment and dorsum of the foot (ant. tib., ext. dig. longus and brevis, ext. hallucis longus and brevis) and lateral compartment (fibularis (peroneus) longus and brevis) would be involved. Involvement of these muscles would result mainly in a decrease in ankle dorsiflexion, foot inversion and eversion, and extension of the toes, and may result in a slight decrease of ankle plantar flexion. Sensation would be involved over the lateral and anterior lateral skin of the distal leg and the dorsum of the foot, including the area between the big and second toe.

How would the results of the superficial fibular nerve, damaged near the knee, differ from that when the superficial fibular nerve is damaged at the ankle?

A = At the knee, superficial peroneal (fibular) nerve damage would affect the muscles of the lateral compartment and the skin of the distal leg and dorsum of the foot innervated by this nerve. At the ankle, the muscles of the lateral compartment and the skin of the distal leg would be intact and only the skin on the dorsum of the foot would be involved.

13 – STUDY QUESTIONS

What structures of the anterior compartment of the leg extend into the dorsum of the foot? Which structures lie in the dorsum of the foot?

A = The deep fibular nerve, anterior tibial artery as the dorsalis pedis, and the tendons of the anterior tibialis, extensor digitorum longus, and extensor hallucis longus extend from the anterior compartment to the dorsum of the foot. The extensor digitorum brevis, extensor hallucis brevis, dorsalis pedis, A., arcuate A., deep plantar A., malleolar A., tarsal A, dorsal metatarsal and digital A., and the medial and lateral cutaneous branches of the superficial fibular N.

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How could damage to each of the following nerves affect the dorsum of the foot?

- a. Common fibular N. A = Affect action of the extensor digitorum brevis and extensor hallucis brevis and sensation to the dorsum of the foot including the area between the big and second toe.
- b. Superficial fibular N. A = Sensation to the dorsum of the foot but not between the big and second toe.
- c. Deep fibular N. A = Action of the extensor digitorum brevis and extensor hallucis brevis and sensation to the dorsal skin area between the big and second toe
- d. Tibial N. A = No effect on the dorsum of the foot

What do muscles in the anterior compartment of the leg and dorsum of the foot have in common?

A = Both are extensors of the toes and are innervated by the deep fibular nerve.

14 – STUDY QUESTIONS

What forms the plantar arch?

A = The deep plantar artery from the dorsalis pedis and the lateral plantar artery from the posterior tibial artery

Occlusion of which arteries will decrease blood supply to the plantar aspect of the foot (answer yes or no)?

- a. Popliteal a. A = Yes – affect posterior and anterior tibial arteries
- b. Anterior tibial a. A = Yes – affects dorsalis pedis and thus deep plantar
- c. Fibular a. A = No – does not reach the foot
- d. Posterior tibial A = Yes – gives off the lateral and medial plantar arteries to the foot
- e. Inferior genicular a. A = No – goes to knee only

Which muscles and what actions would be affected by damage to the deep lateral plantar nerve?

The dorsal and plantar interossei, lateral 3 lumbricals (#2, #3, #4), and adductor hallucis would be involved. The actions involved would be flexion of the metatarsophalangeal joints of toes 2–5, flexion of the interphalangeal joints of toes 2–5, adduction of the big toe, abduction and adduction of the metatarsophalangeal joints of toes 2–5, extension of the interphalangeal joints of toes 2–5.

Which muscles and what actions would be affected by damage to the medial plantar nerve?

The muscle involved would be the flexor digitorum brevis, abductor hallucis, flexor hallucis brevis, and first lumbrical. The actions involved would be flexion and abduction of the big toe, flexion of the toes, flexion of the metatarsophalangeal joint of toe 2 and extension of the interphalangeal joints of toe 2.

What would be the sensory impairment expected for the foot with damage to the following nerves:

- a. L5. A = Dorsum of foot
- b. Lateral plantar N. A = Lateral plantar surface of the foot up to but not including the 3rd (middle) toe
- c. Deep fibular N. A = Dorsal skin between the big and second toes
- d. S1. A = Plantar surface of foot, dorsal and plantar surface of little toe, dorsum of toes
- e. Medial plantar N. A = Medial plantar surface of the foot up to but not including the 4th toe
- f. Tibial N. A = Entire plantar surface of the foot
- g. Common fibular N. A = Dorsum of foot except for lateral border

What muscles lie in layer three of the plantar aspect of the foot?

A = Flexor hallucis brevis, flexor digiti minimi, adductor hallucis

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