THE KNEE (膝部)

LEARNING OBJECTIVES

- Understand the knowledge of anatomy, especially that which is on the surface or creates superficial bony landmarks in the knee
- Recognize the locations of muscles and their actions in the knee

REFERENCES


BONY ANATOMY OF THE KNEE

- Osseous parts
  - Femur → distal part
  - Patella
  - Tibia → proximal part
  - Fibula → proximal part
- Joints
  - Tibiofemoral joint → medial and lateral articulation
  - Patellofemoral joint
  - Proximal tibiofibular joint ← belongs to the leg
**BONY ANATOMY OF THE KNEE**

- Femur
- Patella
- Tibiofemoral joint
- Tibia
- Proximal tibiofibular joint
- Fibula

**PATELLA**

- The largest sesamoid bone in the body
- An attachment site for the rectus femoris tendon
- The base lies superiorly and the apex distally
- Fixed in flexion and mobile in extension
  - In knee flexion, the patella slides caudally and sinks into the space between proximal tibia and femoral condyles (trochlear groove or intercondylar groove)
- Palpation:
  - Supine with the knee extended
  - Located on the anterior surface of the knee
  - Slide down from the apex of the patella to palpate the patellar tendon

**BONY PALPATION**

**PALPATING THE PATELLA**

- Passively flex and extend the knee as you explore the patellar movement

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**Trochlear Groove (Intercondylar Groove)**

- The lateral wall is higher than the medial and has clinical significance.


**Tibial Tuberosity**

- A superficial knob located distal to the patella on the shaft of the tibia
- An attachment site for the patellar tendon
- **The shaft of the tibia** runs superficially along the anterior leg
- Palpation:
  - Have the subject sit with knee flexed
  - Locate the patella and slide your fingers inferiorly to explore the tuberosity
  - Continue to palpate inferiorly along the shaft of the tibia

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**Tibiofemoral Joint Line**

- Serves as central points of orientation for palpation of the medial or lateral aspect of the knee
- Palpation:
  - Place your thumbs on the anterior portion of the knee and press into the soft tissue depressions on either side of the patellar tendon
  - The line can be confirmed by passively rotating or extending the knee

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EDGES OF THE MEDIAL AND LATERAL FEMORAL CONDYLES
- The edges of the femoral condyles can be located on either side of the patella.
- Play an important role in tracking of the patella.
- Palpation:
  - Supine or sitting with the knee flexed 90°
  - Locate the joint lines of the knee on both sides of the patella.
  - Explore the edges of the femoral condyles.
  - Compare the size and height of the two edges (the lateral edge > the medial edge).

EPICONDYLES OF THE FEMUR
- The lateral epicondyle:
  - A bald, knobby area located on the lateral surface of the knee.
  - An attachment site for the fibular (lateral) collateral ligament.
- The medial epicondyle:
  - Deep to the tendon of the sartorius, distal to the vastus medialis muscle.
  - An attachment site for the tibial (medial) collateral ligament.
- Palpation:
  - Supine with the knee flexed. Locate the patella.
  - Slide directly lateral from the patella to the lateral epicondyle on the outside of the knee or slide to the medial epicondyle on the inside of the knee.

PALPATING THE CONDYLES & EPICONDYLES OF THE FEMUR

ADDUCTOR TUBERCLE
- Located proximal to the medial epicondyle.
- An attachment site for the adductor magnus tendon.
- Tender to the touch.
- Palpation:
  - Supine with the knee flexed. Locate the medial epicondyle of the femur.
  - Slide superiorly along the medial side of the femur.
  - Strum across the adductor magnus tendon by rubbing your thumbpad anteriorly and posteriorly → Have your partner gently adduct his hip to feel the tension of the tendon of the magnus.
**PALPATING THE ADDUCTOR TUBERCLE**

![Adductor magnus tendon](Image)

*Adductor magnus tendon*

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**LATERAL TUBERCLE OF TIBIA (GERDY’S TUBERCLE)**

- A large bony prominence immediately below the lateral tibial plateau
- An attachment site for iliotibial tract (band)
- Palpation:
  - Sit with the knee flexed
  - Locate the lateral joint line
  - Slide inferiorly from the lateral tibial plateau to palpate this tubercle


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**TIBIAL PLATEAUS**

- The medial and lateral plateaus: located on the proximal end of the tibia
- The plateaus cannot be palpated, but their edges, located inferiorly on either side of the tibiofemoral joint line, are easily accessible.
- Palpation:
  - Sit with the knee flexed. Place your thumbs on either side of the patellar tendon.
  - Slide inferiorly until you feel the plateau edges

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**HEAD OF FIBULA**

- Located on the lateral side of the leg
- An attachment site for the biceps femoris tendon and a portion of the soleus muscle as well as the fibular collateral ligament
- The same level as the tibial tuberosity
- Palpation:
  - Sit with the knee flexed
  - Locate the tibial tuberosity
  - Slide your fingers laterally 3-4 inches toward the outside of the leg to palpate the head of fibula
PALPATING THE HEAD OF THE FIBULA

Biceps femoris tendon (cut)
Head of the fibula

(7.19) Lateral view of flexed right knee

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SOFT TISSUE PALPATION

QUADRICEPS FEMORIS

- Includes: rectus femoris, vastus medialis, vastus lateralis, and vastus intermedius
- Primary muscle action: extend the knee
- Palpation:
  - Supine with knee flexion
  - Ask your partner to extend his knee

PALPATING THE QUADRICEPS FEMORIS

- Rectus femoris: prominent on anterior thigh
- Vastus medialis: prominent on medial thigh
- Vastus lateralis: prominent on lateral thigh

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**MEDIAL (TIBIAL) COLLATERAL LIGAMENTS**

- A broad, fan-shaped ligament
- Connects the medial femoral epicondyle and the medial tibia
- Palpation:
  - Sit with the knee flexed
  - Locate the medial joint line
  - As your fingers move medially and posteriorly along the joint line → the ligament lies directly under your fingertips

**MEDIAL MENISCUS**

- Menisci: fibrocartilaginous discs attached to the tibial condyles
- Functions: weight distribution, friction reduction and help the femoral condyles sit upon the flat tibial plateaus
- The edge of the medial meniscus can be palpated just above the edge of the medial tibial plateau
- Palpation:
  - Sit with the knee flexed
  - Press your thumbpad down from the medial tibiofemoral joint line
  - Slowly rotate the knee medially → the medial edge becomes more prominent and palpable
  - Rotate the knee laterally → the meniscus retracts

**PALPATING THE MEDIAL MENISCUS**

**PES ANSERINUS (“GOOSE’S FOOT”)**

- Three tendons of the thigh converge at the medial knee: sartorius (S), gracilis (G) and semitendinosus (ST) → medial and slightly distal to the tibial tuberosity
- Palpation:
  - Sit with the knee flexed. Locate the tibial tuberosity.
  - Slide medially 1 inch and explore its flat surface and any palpable tendons

*PA—The pes anserinus bursa

Byfield D & Kinsinger S. A manual therapist’s guide to surface anatomy & palpation skills. 2002. P 120.
LATERAL (FIBULAR) COLLATERAL LIGAMENTS

- A strong, thin strap that joins the lateral epicondyle of the femur to the head of the fibula
- Superficial and located between the biceps femoris tendon and the iliotibial tract (band)
- Palpation:
  - Sit with the knee flexed
  - Locate the head of the fibula and the lateral epicondyle
  - Ask your partner to cross his leg → let his ankle rests upon the opposite knee
  - Roll your finger between these two bony landmarks to palpate the ligament

ANATOMY OF THE ILIOTIBIAL TRACT (BAND)

- A superficial sheet of fascia with vertical fibers that run along the lateral thigh
- It is entirely accessible.
- The distal cable portion, anterior to the biceps femoris tendon, is the easiest part to isolate
- The palpable point: around the lateral tibial tubercle (insertion area)
- Palpation:
  - Have the subject supine and raise his one leg with the knee extended
  - Immediately lateral to the superior pole of the patella is the most available for palpation

PALPATING THE LATERAL (FIBULAR) COLLATERAL LIGAMENT

ILIOTIBIAL TRACT (BAND)
PALPATING THE ILIOTIBIAL (IT) TRACT (BAND)


RELATIONSHIP OF THE TFL AND IT TRACT (BAND)

Kendall FP et al. Muscles: testing and function, with posture and pain. 4E. P 216.

ANATOMY OF THE HAMSTRINGS

Biel A. Trial guide to the body: how to locate muscles, bones, and more. 3E. PP 305 & 306.

TENDONS OF THE HAMSTRINGS

- When the knee is flexed, the tendons of the hamstrings becomes prominent around the posterior knee
- **Tendon of the biceps femoris:** insert into the fibular head
  - Muscle actions:
    - Flex/laterally rotate the flexed knee
    - Extend/laterally rotate the hip
  - Palpation: laterally rotate the flexed knee to bring the muscle into greater activity
- **Tendon of semitendinosus**
  - Muscle actions: the same as the biceps femoris, except medially rotate the knee and hip
  - Palpation: medially rotate the flexed knee to bring the muscle into greater activity
**Palpating the Tendons of the Lateral Hamstrings**

**Palpating the Tendons of the Medial Hamstrings**

**Common Peroneal (Fibular) Nerve**
- Branching off from the sciatic nerve
- Lies along the posterior/lateral side of the knee and medial to the biceps femoris tendon
- Particularly accessible (and vulnerable) along the posterior surface of the head of the fibula
- Palpation:
  - Flex the knee and locate the biceps femoris tendon and head of the fibula
  - Gently roll your thumb from side to side, exploring the region just distal to the biceps tendon, on the posterior surface of the fibular head (below the fibular head lying on the neck of the fibula)
POPLITEAL FOSSA

- Superior lateral border: bicep femoris tendon
- Superior medial border: semimembranosus and semitendinosus tendons
- Inferior medial and lateral border: two heads of the gastrocnemius muscles
- Significant structures: tibial nerve, popliteal vein and artery

SUMMARY

- Find, recognize the shape and position of the bone in the knee
- Palpate the bony feature and recognize different structures around the bony landmark in the knee
- Recognize and palpate the muscle actions in the knee and trace their attachments