Hip

✓ The hip joint is one of the **largest** and **most stable joints** in the body.

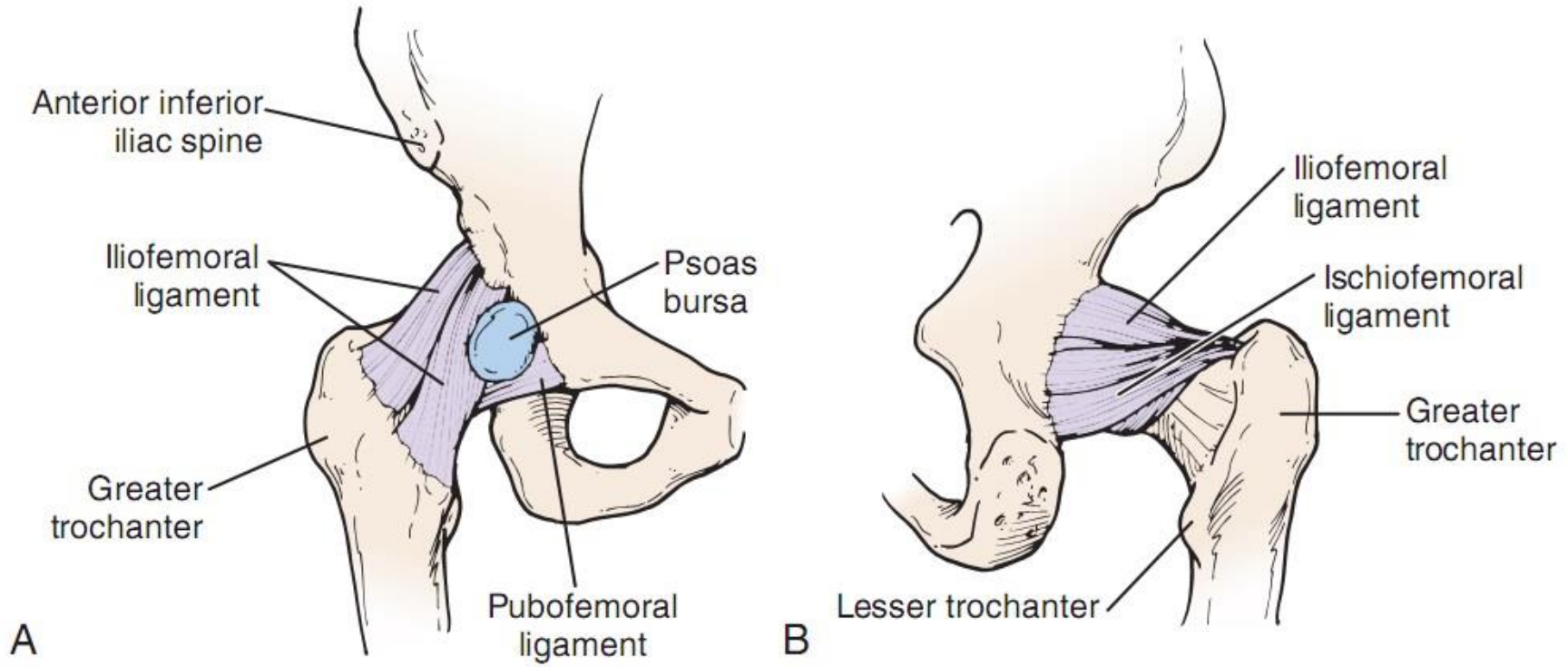
✓ If it is injured or exhibits pathology, the lesion is usually immediately perceptible during **walking**.

✓ The hip joint is a **multiaxial ball-and-socket** joint that has **maximum stability** because of the deep insertion of the head of the femur into the acetabulum.

✓ The hip, like the shoulder, has a **labrum**, which helps to deepen and stabilize the joint.

✓ The joint has a **strong capsule** and **very strong muscles** that control its actions.

✓ The hip, already is supported by three strong ligaments: the **iliofemoral**, the **ischiofemoral**, and the **pubofemoral** ligaments.



Ligaments of the hip. A, Anterior view. **B,** Posterior view.

PATIENT HISTORY

1. If trauma was involved, what was the mechanism of injury?

- ✓ A careful determination of the **mechanism of injury** often leads to a diagnosis of the problem.
- ✓Did the patient land on the **outside of the hip** (e.g., trochanteric bursitis) or **land on or hit the knee**, thus jarring the hip (e.g., **subluxation**, **acetabularlabral tear**)?

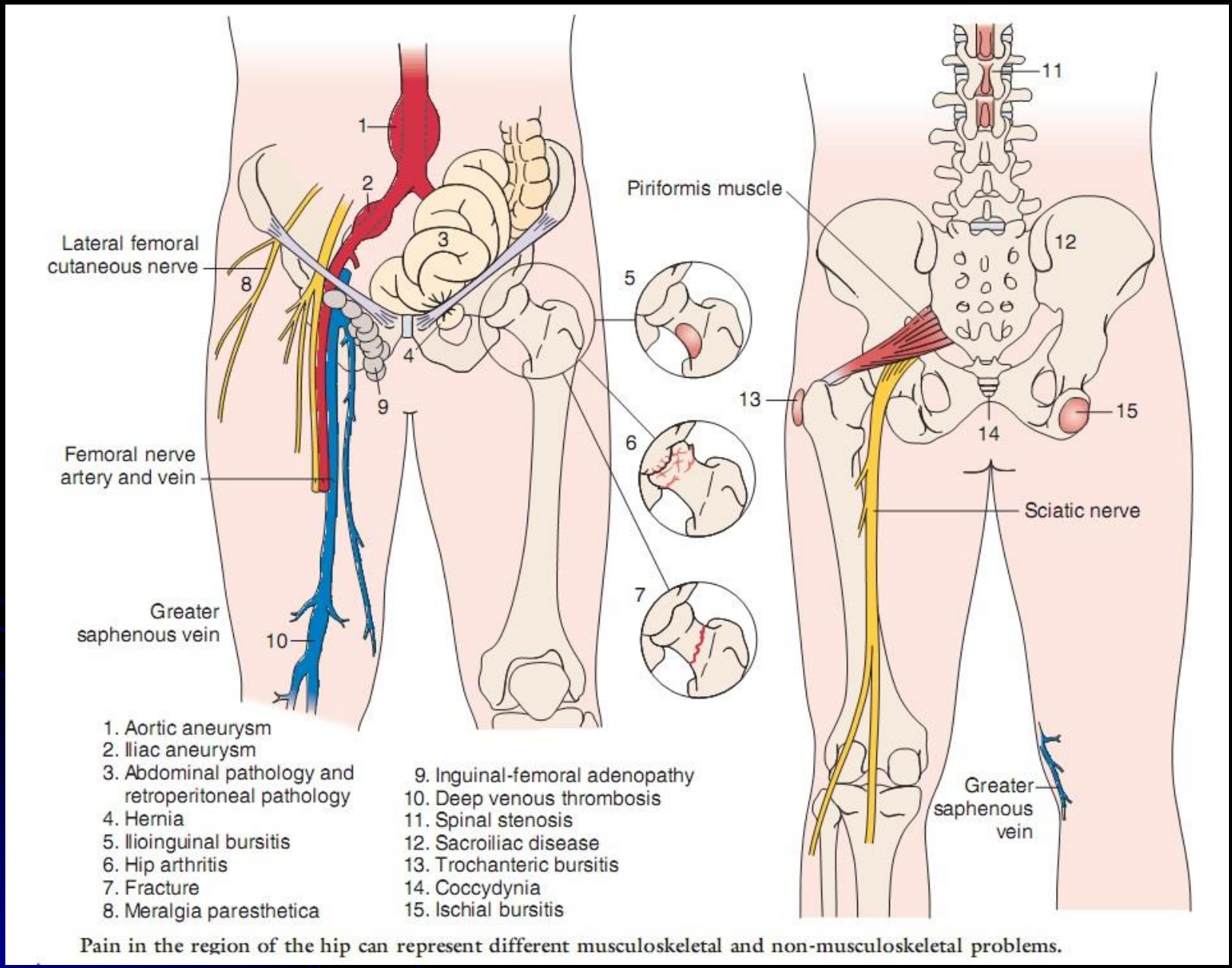
✓ Was the patient involved in **repetitive loading activity** (e.g., femoral stress fracture or osteoporotic)?

✓ **Mechanical hip problems** are reported as symptoms getting worse with activity, **twisting movements** are painful, **sitting** is uncomfortable, **getting up** from sitting may cause catching, **ascending** and **descending** stairs are difficult as is **getting in** and **out** of an automobile, and the patient may have difficulty **putting on** shoes and/or socks.

2. What are the details of the present pain and other symptoms?

✓ **Hip intra-articular pain**, including **labral tears** and **anterior impingement**, is felt mainly in the **groin** and along the **front or medial side of the thigh** to the knee.

✓ Pain may also be referred to the hip area from **several structures**.



Pain in the region of the hip can represent different musculoskeletal and non-musculoskeletal problems.

✓ Hip pain may also be referred to the **knee** or **back** and may increase on walking.

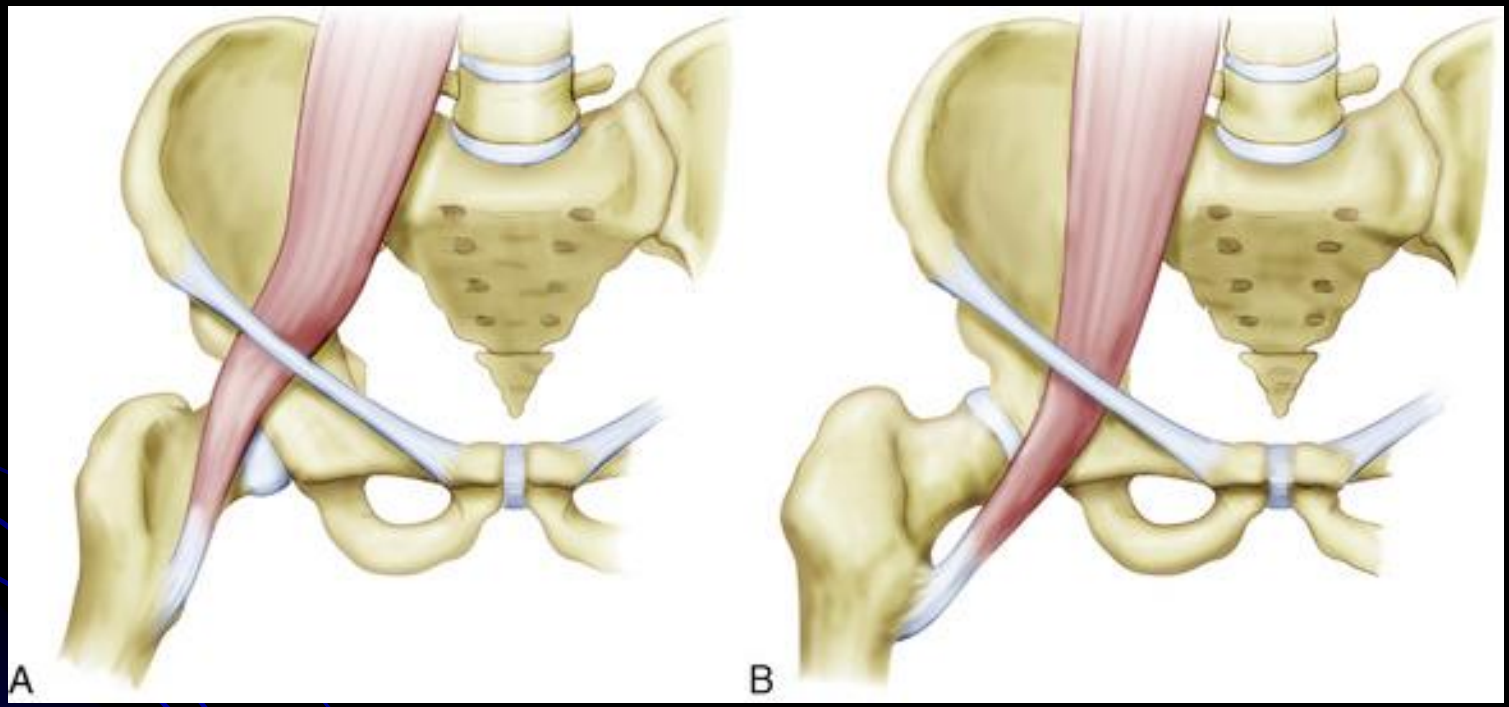
➢ **Clicking** is common with **labral tears**.

➢ **Snapping** in and around the hip **has many causes**.

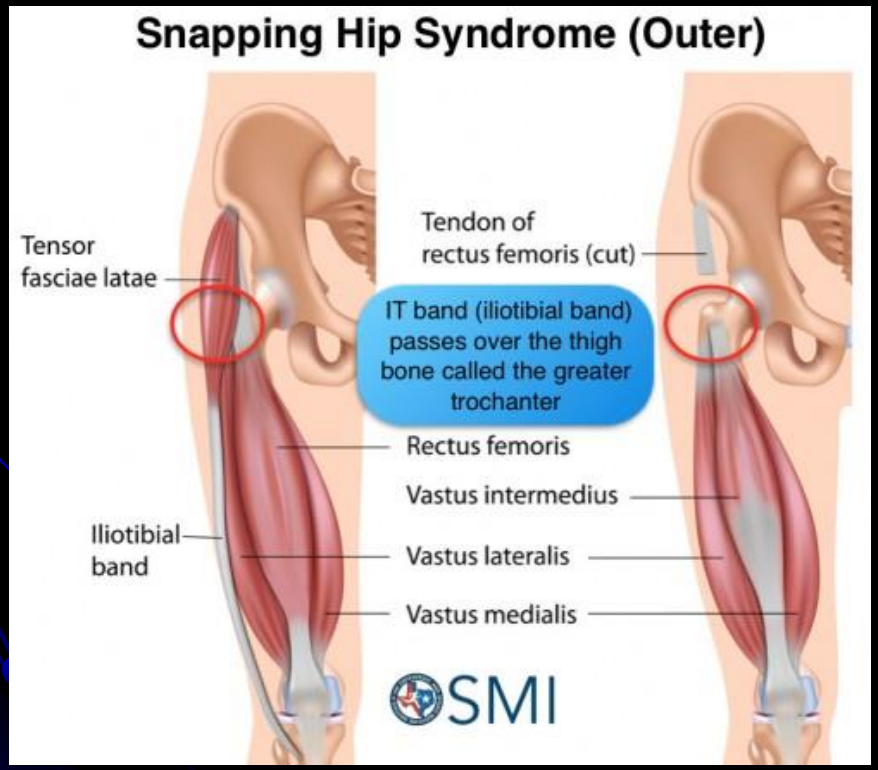
Snapping hip syndromes:

✓ **First** and most commonly, it may be caused by slipping of the **iliopsoas** tendon over the osseous ridge of the lesser trochanter (**internal snapping**).

✓ If due to the **iliopsoas** tendon or **iliofemoral ligament**, the snapping often occurs at approximately **45° of flexion** when the hip is moving from flexion to extension, especially with the hip abducted and laterally rotated **(snapping hip sign)**.


A
B

✓ **Second**, the snapping may be caused by a **tight iliotibial band** or **gluteus maximus** tendon riding over the greater trochanter of the femur (**external snapping**).



✓ The **third** cause of a snapping hip is **acetabularlabral tears** or **loose bodies**, which may be the result of trauma or degeneration (**intra-articular snapping**).

✓In this case, the patient (commonly between 20 to 40 years) complains of a **sharp pain** into the groin and anterior thigh, especially on **pivoting movements**.

3. Does any type of activity ease the pain or make it worse?

Are there any movements that the patient feels are weak or abnormal?

✓ For example, **trochanteric bursitis** often results from **abnormal running mechanics** with the feet crossing midline (increased adduction), **wide pelvis** and **genu valgum**.

- In **piriformis syndrome,** the sciatic nerve may be compressed, the piriformis muscle is tender, and hip abduction and lateral rotation are weak.

OBSERVATION

✓ As the patient comes into the assessment area, the **gait** should be observed.

✓ If the hip is affected, the **weight** is lowered **carefully** on the affected side and the **knee bends slightly** to absorb the shock.

✓ The **length of the step** on the affected side is **shorter** so that weight can be taken off the leg quickly.

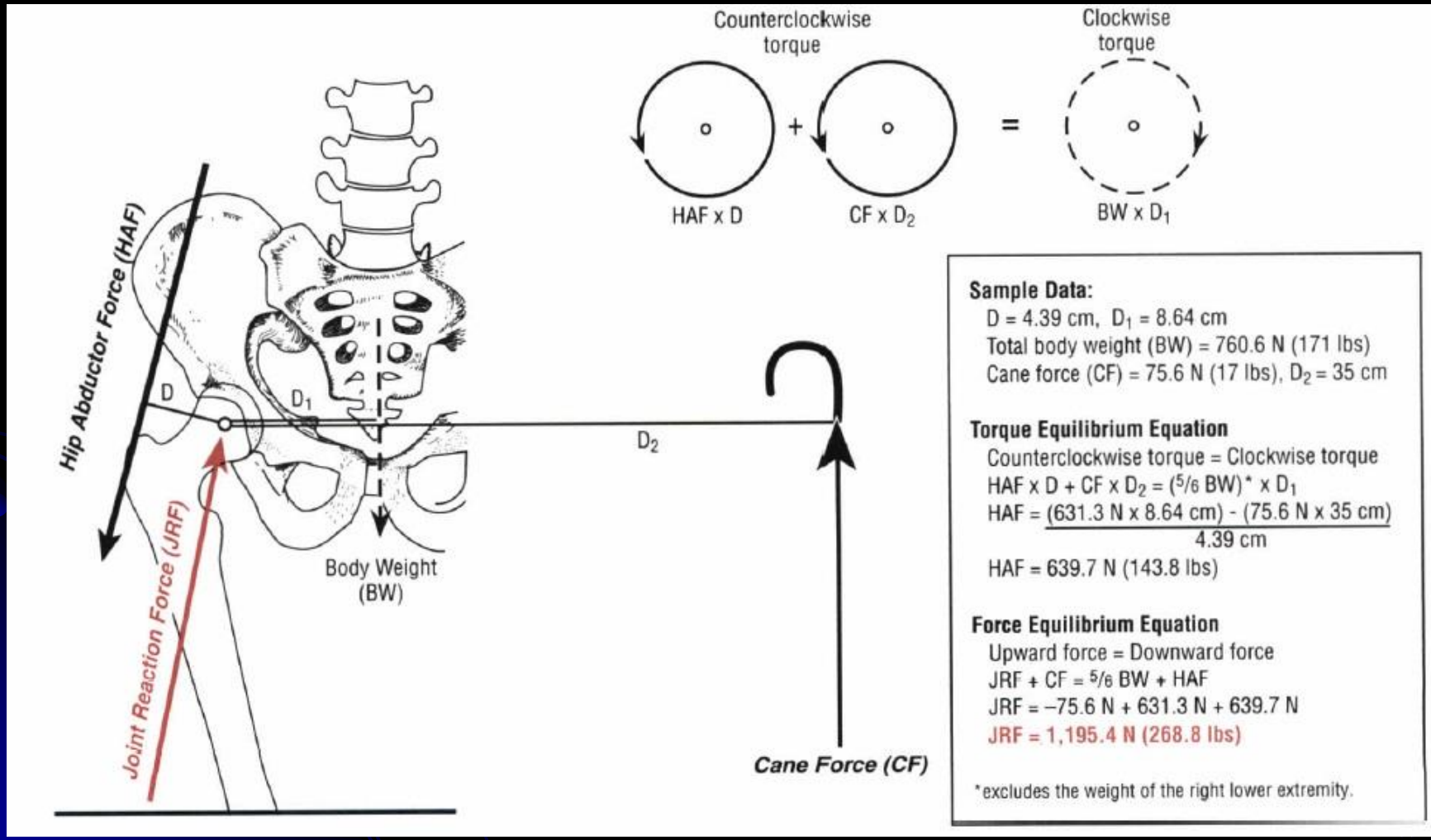
✓ In standing, the patient commonly has the **hip slightly flexed** if there is pain in the hip.

✓ Pathology in the hip region can lead to **tight** adductors, iliopsoas, piriformis, tensor fasciae latae, rectus femoris, and hamstrings while, at the same time, the **gluteus maximus, medius,** and **minimus** become **weak**.

- ✓ **Weak abductors** can lead to a **Trendelenburg gait** or an "**abductor lurch**."
- ✓ **Internal hip pathology** or a **flexion contracture** may lead to a "**pelvic wink**."
- ✓ This is **excessive rotation** in the axial plane (more than 40°) toward the affected hip.

✓ If the patient uses a **cane**, it should be held in the hand **opposite the affected side** to negate some of the force of gravity on the affected hip.

✓ The use of a cane can **decrease the load** on the hip by as much as **40%.**



Sample Data:

D = 4.39 cm, D_1 = 8.64 cm
Total body weight (BW) = 760.6 N (171 lbs)
Cane force (CF) = 75.6 N (17 lbs), D_2 = 35 cm

Torque Equilibrium Equation

Counterclockwise torque = Clockwise torque
HAF x D + CF x D_2 = ($^5/_6$ BW)* x D_1

$$HAF = \frac{(631.3\ N \times 8.64\ cm) - (75.6\ N \times 35\ cm)}{4.39\ cm}$$

HAF = 639.7 N (143.8 lbs)

Force Equilibrium Equation

Upward force = Downward force
JRF + CF = $^5/_6$ BW + HAF
JRF = –75.6 N + 631.3 N + 639.7 N
JRF = 1,195.4 N (268.8 lbs)

*excludes the weight of the right lower extremity.

1. Posture: The examiner should watch for pelvic obliquity caused by, for example, unequal leg length, muscle contractures, or scoliosis.

2. Balance: It is important to check the patient's proprioceptive control in the joints being assessed.

Stork standing test

3. Any obvious shortening of a leg:

Shortening of the leg may be demonstrated by a spinal scoliosis if the shortening is present in only one lower limb.

4. Color and texture of the skin, Any **scars** or **Swelling**.

5. Increased or decreased **lumbar lordosis.**

EXAMINATION

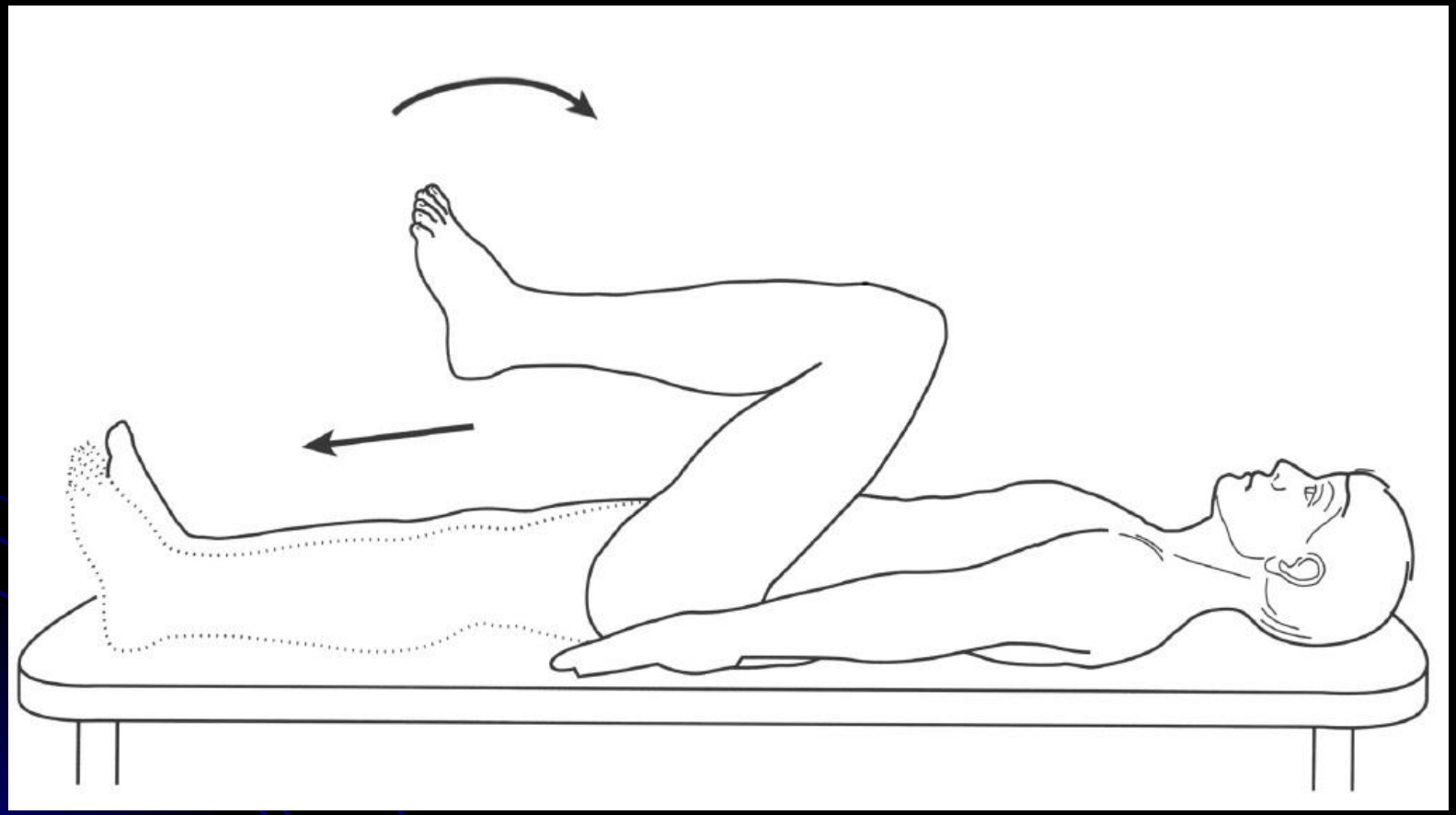
Active Movements

- You should have the patient perform the following movements: flexion and extension on the frontal axis, abduction and adduction on the sagittal axis, and medial and lateral rotation on the longitudinal axis.

Active Movements of the Hip

- Flexion (110° to 120°)
- Extension (10° to 15°)
- Abduction (30° to 50°)
- Adduction (30°)
- Lateral rotation (40° to 60°)
- Medial rotation (30° to 40°)

Flexion

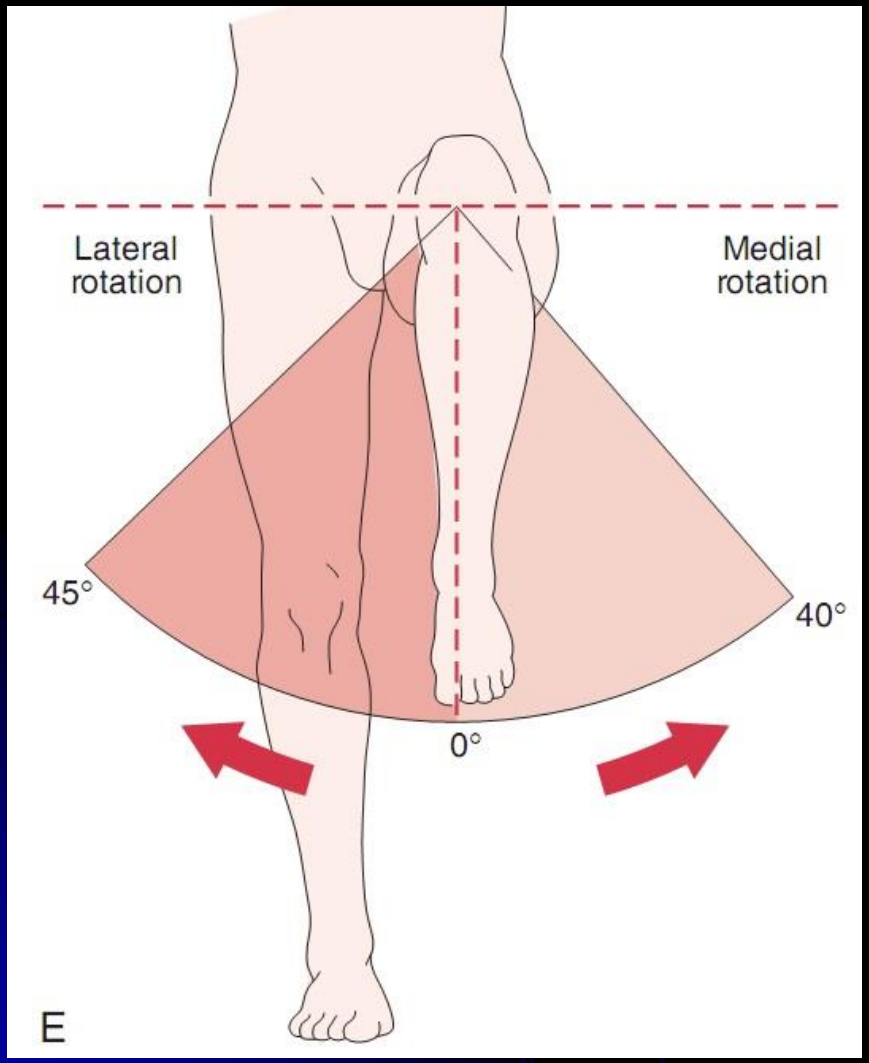


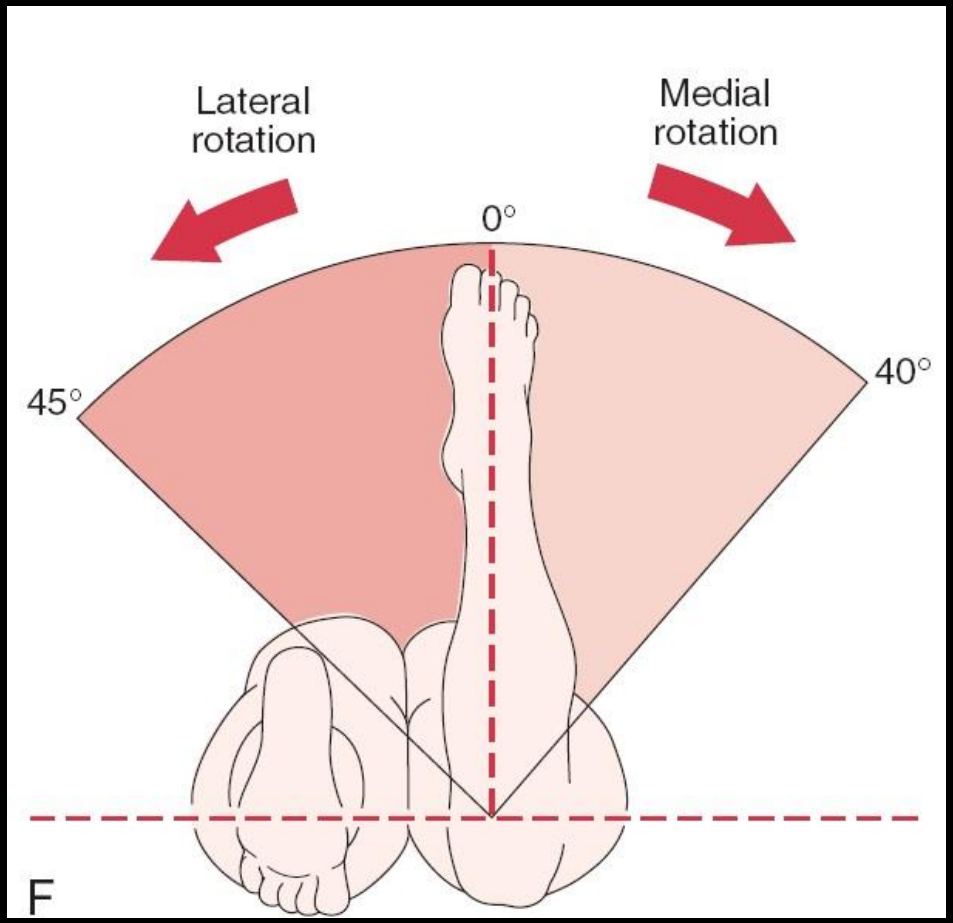
Extension

Abduction

Adduction

Internal & External rotation



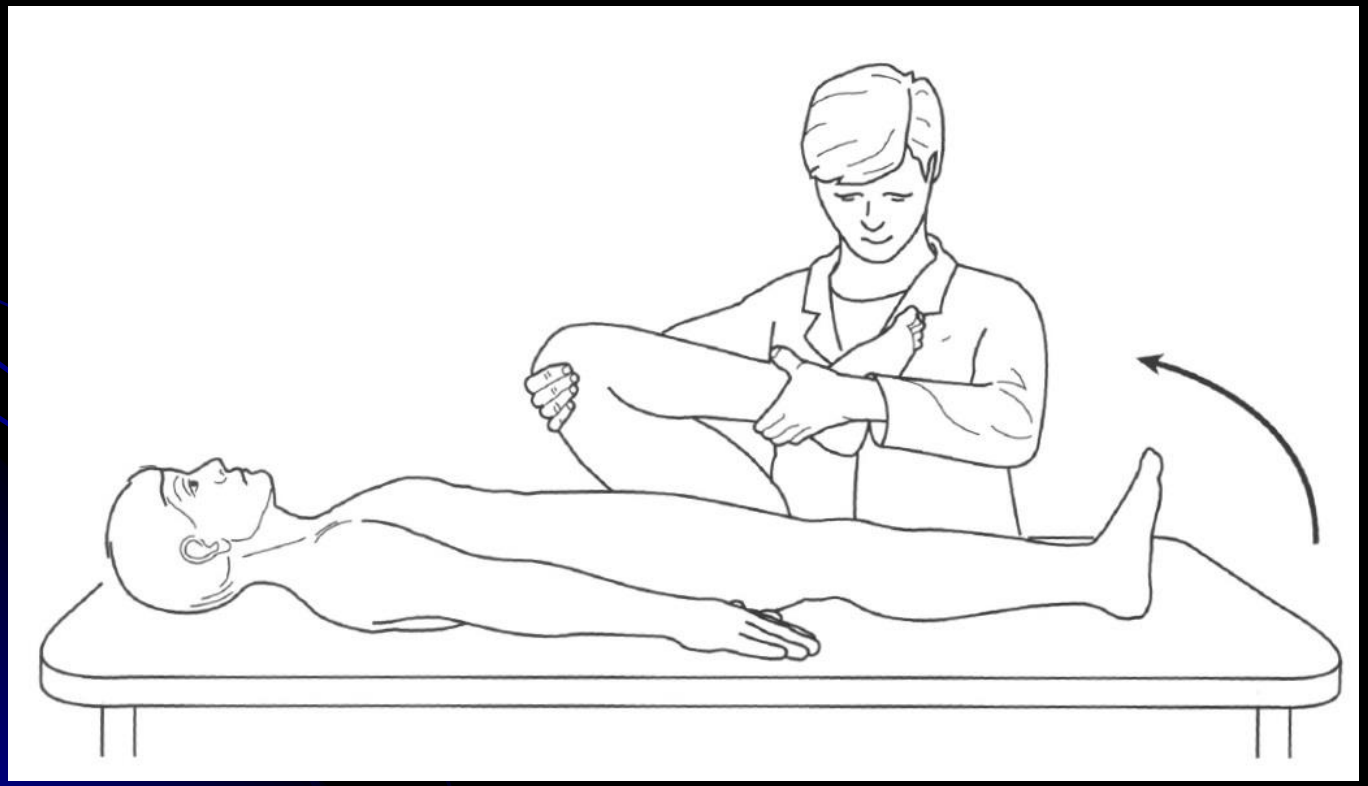


Passive Movements

- The **capsular pattern** of the hip is **flexion**, **abduction**, and **medial rotation**.

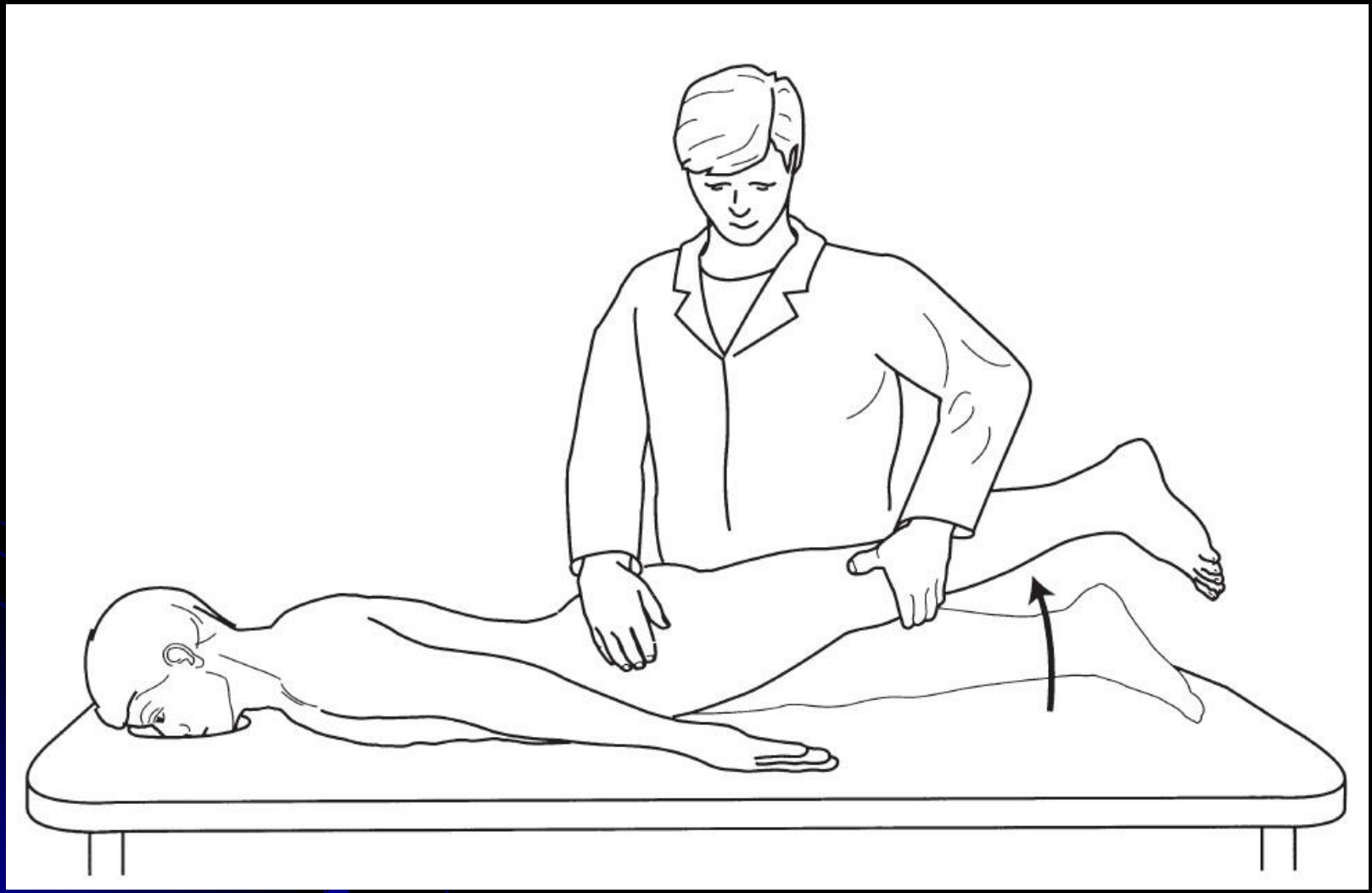
Flexion

- Hip flexion is normally blocked by the **approximation** of the anterior part of the thigh and the abdomen.
- Normal range of motion is 0–120 degrees



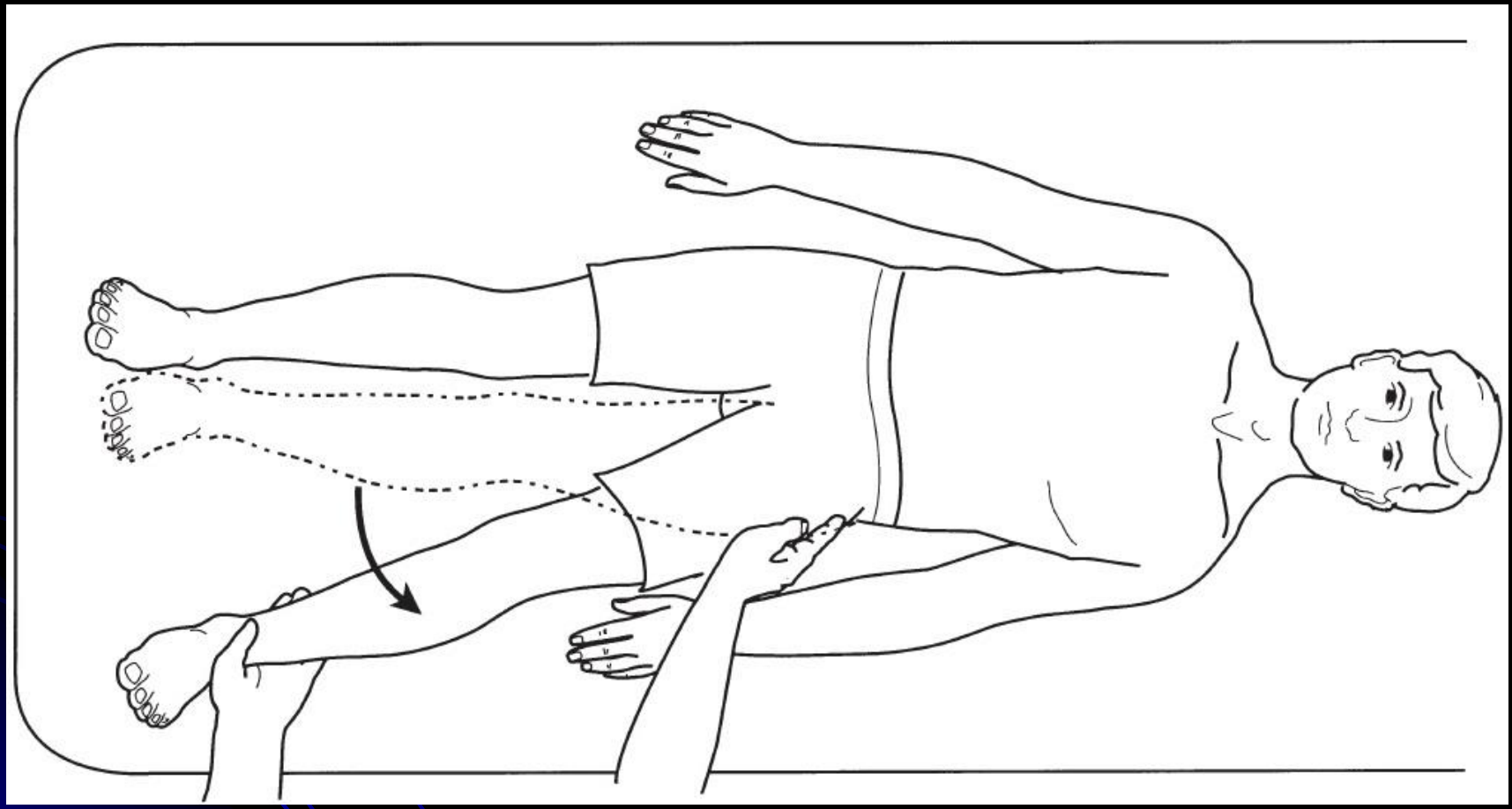
Extension

- The normal end feel is **firm (ligamentous)** due to tension from the anterior capsular ligaments.
- Normal range of motion is 0–30 degrees.



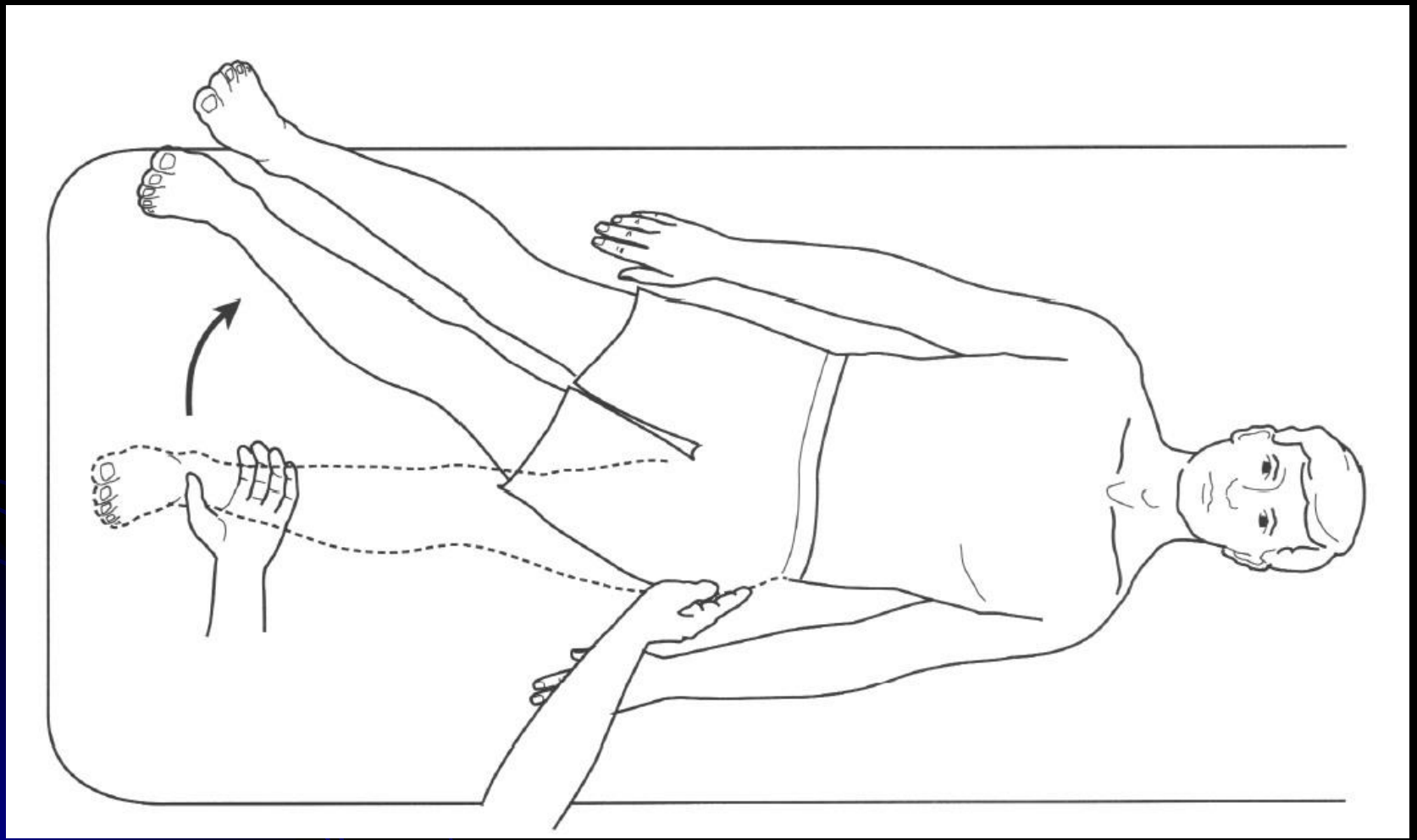
Abduction

- Normal end feel is **firm (ligamentous)** due to tension from the medial capsular ligaments.
- Normal range of motion is 45 degrees.



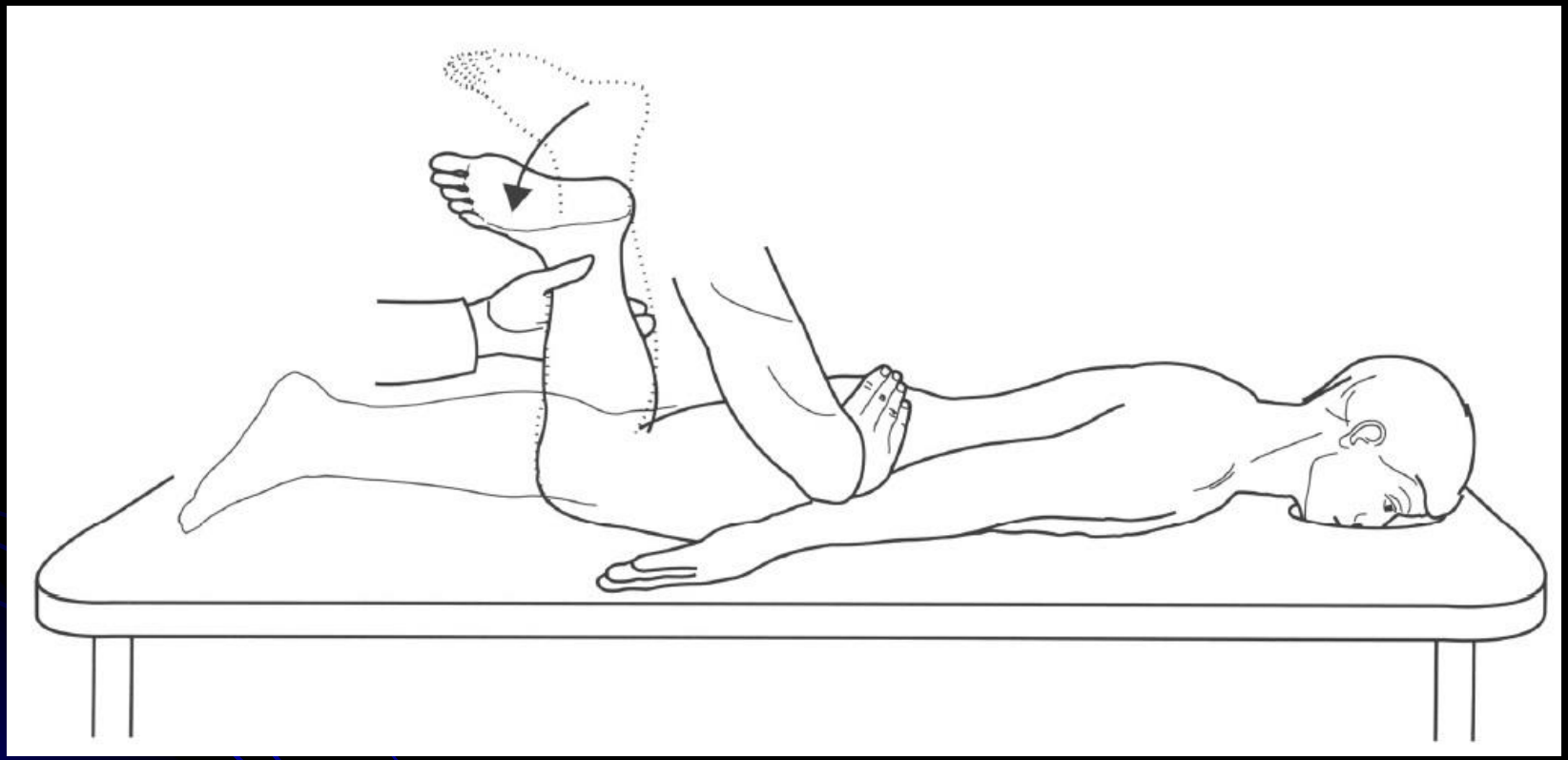
Adduction

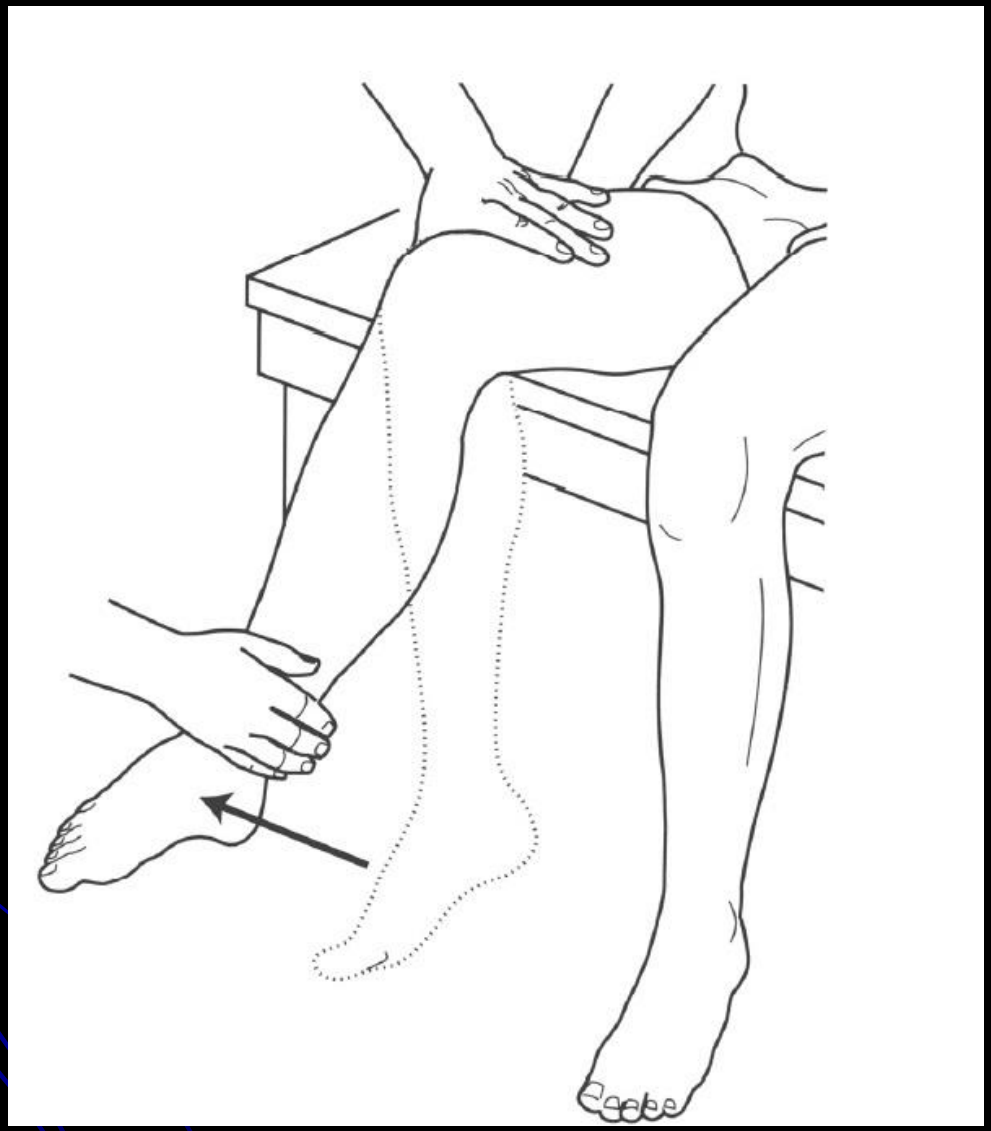
- Normal end feel is **firm (ligamentous)** due to tension from the lateral capsule and superior band of the iliofemoral ligament.
- Normal range of motion is 0-30 degrees.



Medial (Internal) Rotation

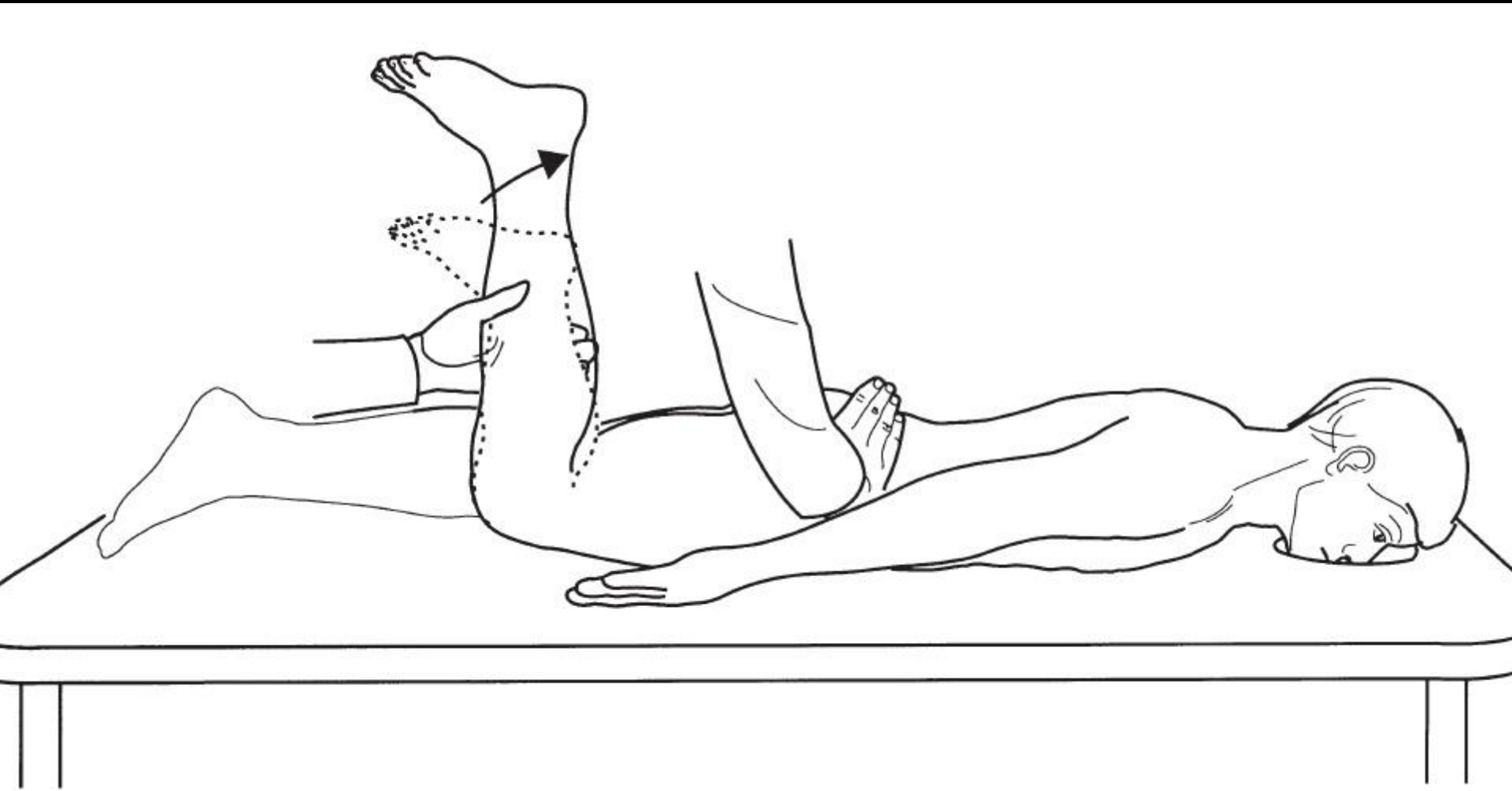
- The normal end feel is **firm (ligamentous)** due to tension from the posterior capsule and the ischiofemoral ligament.
- Normal range of motion is 0-45 degrees.





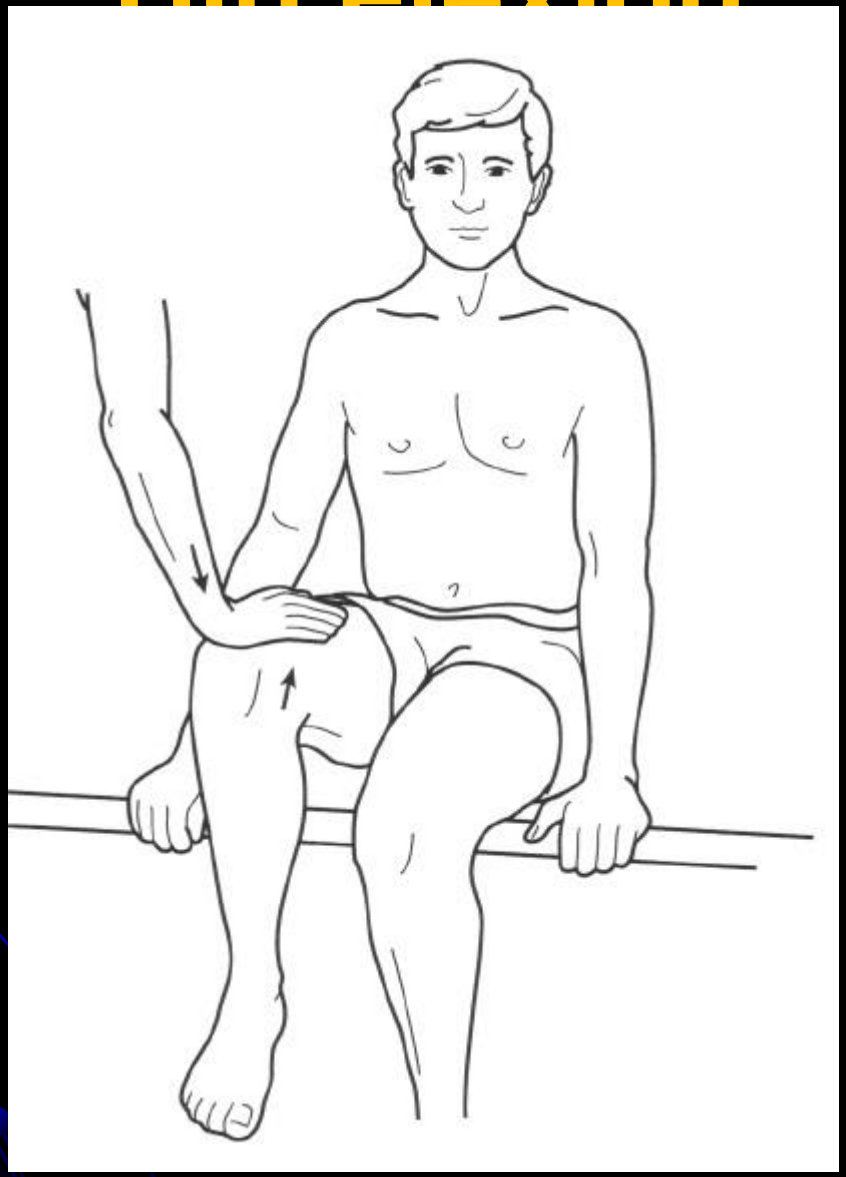
Lateral (External) Rotation

- The normal end feel is firm (ligamentous) due to tension in the anterior capsule and iliofemoral and pubofemoral ligaments.
- Normal range of motion is 0-45 degrees.

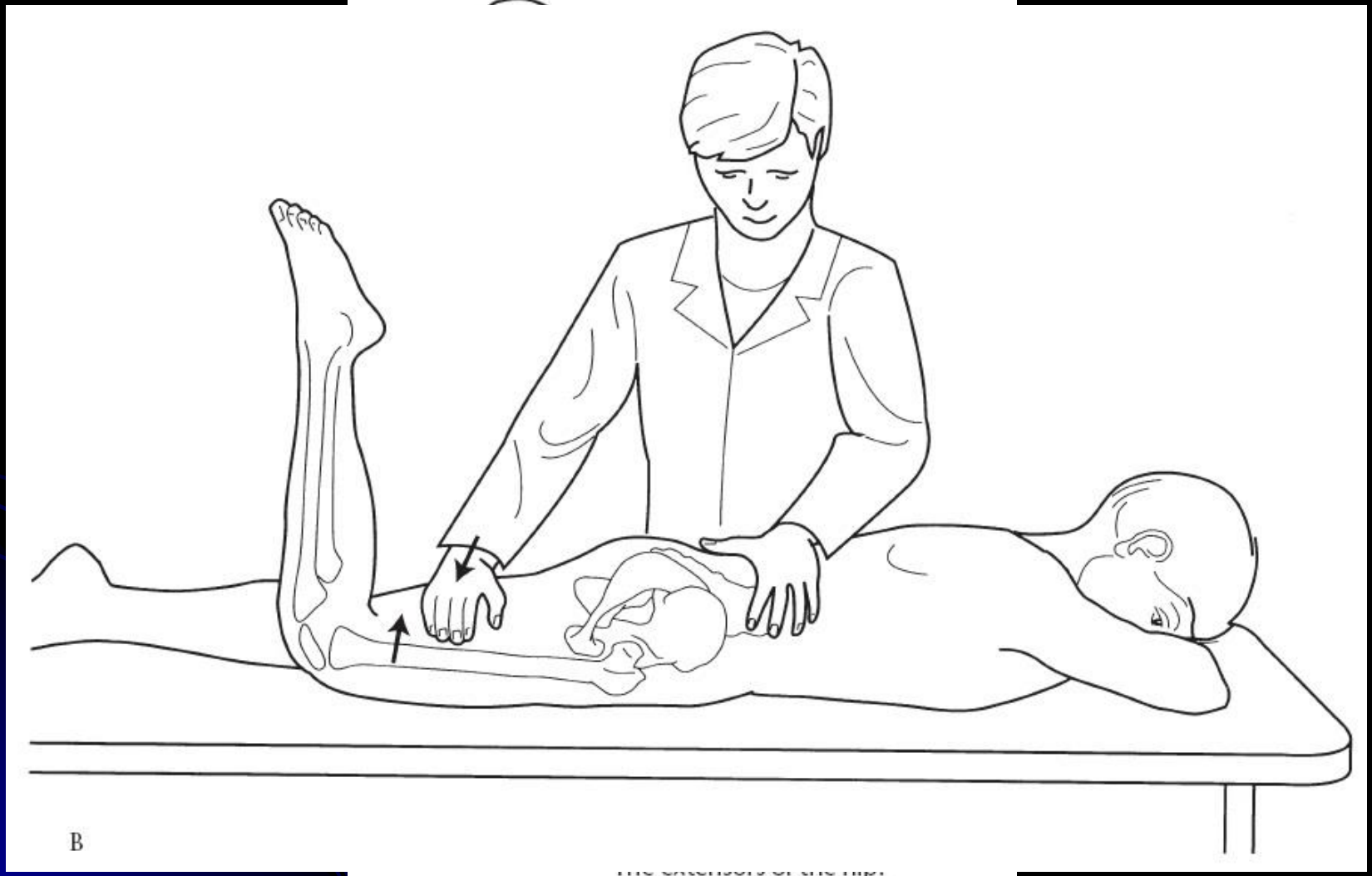


Resisted Isometric Movements

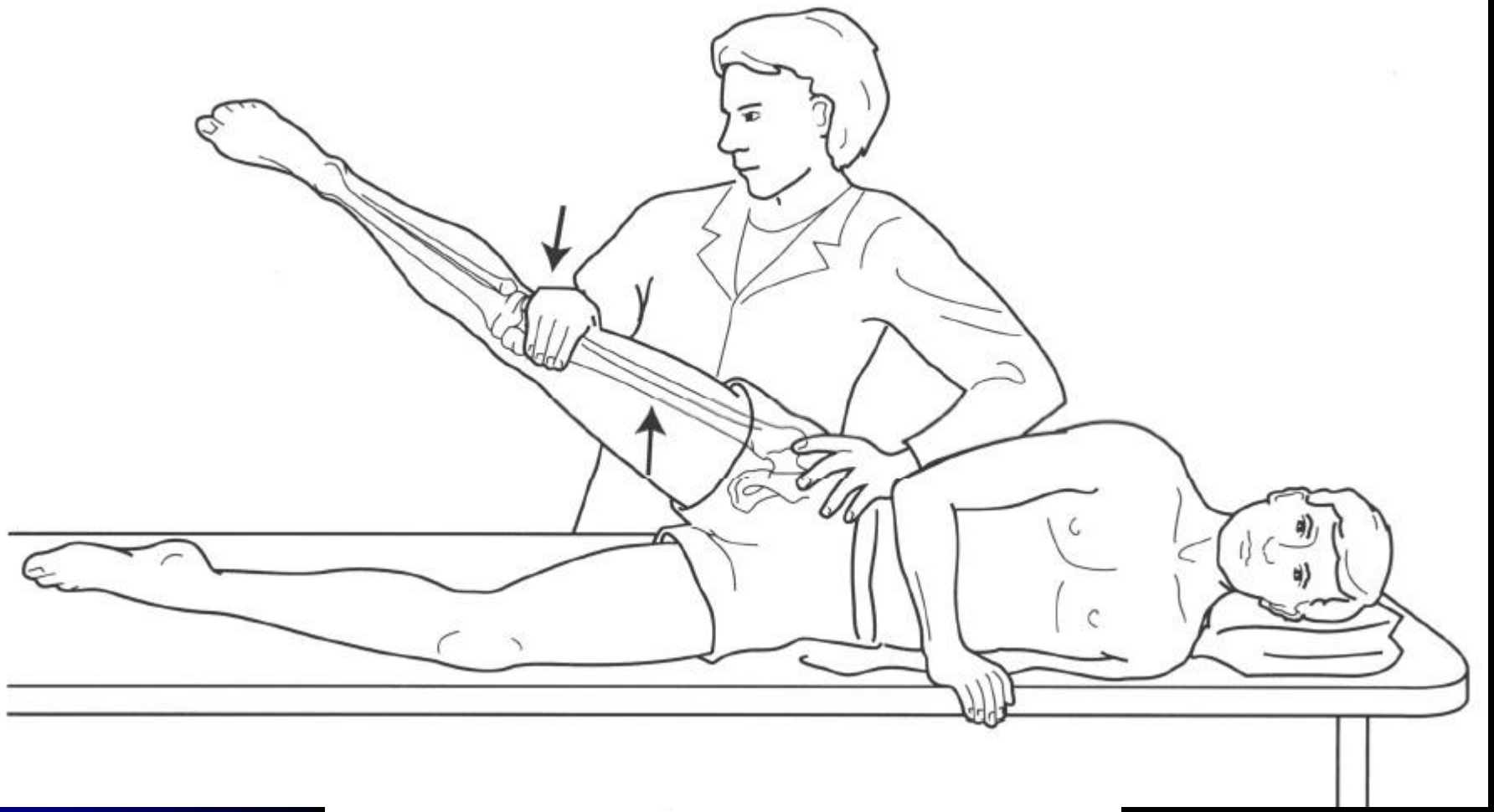
Hip Flexion



Hip Extension

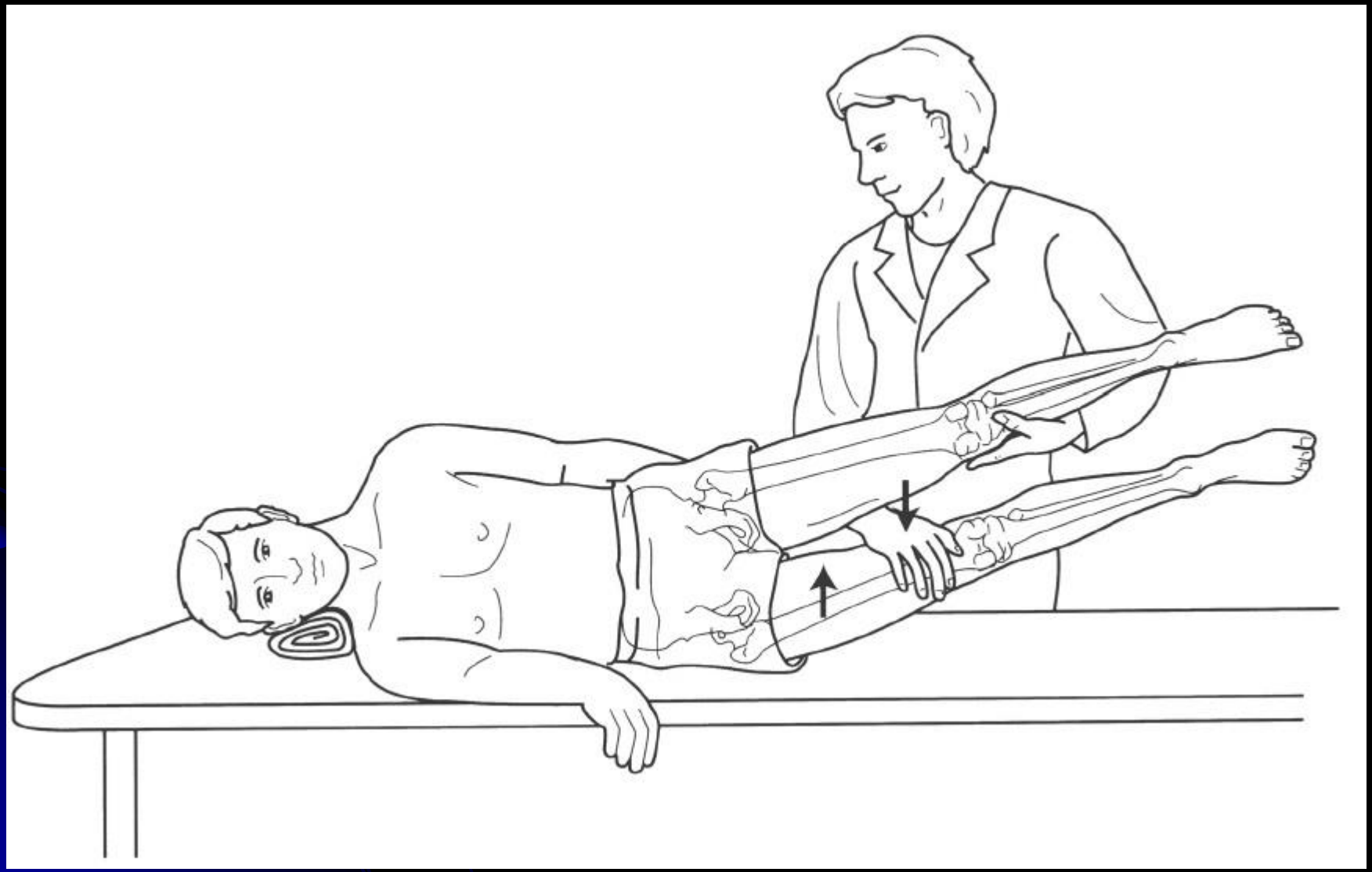


Hip Abduction

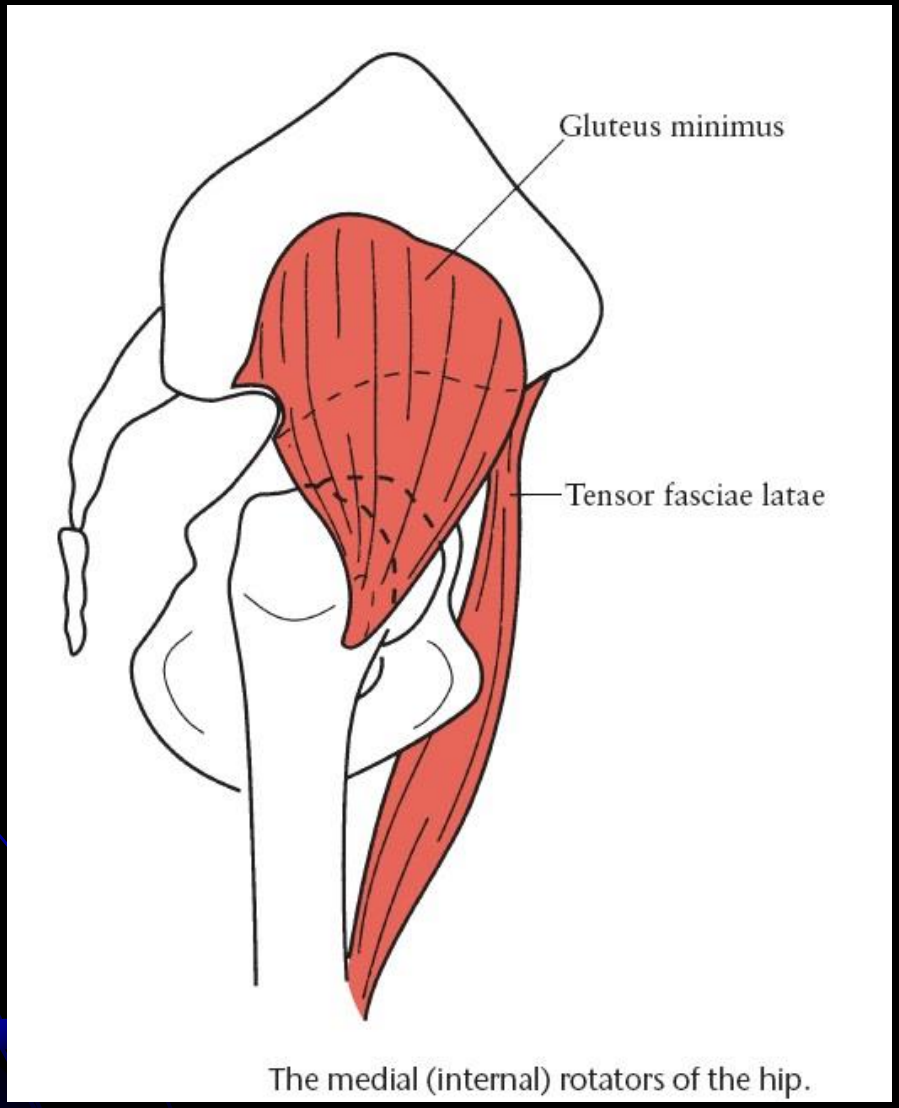


The abductors of the hip.

Hip Adduction

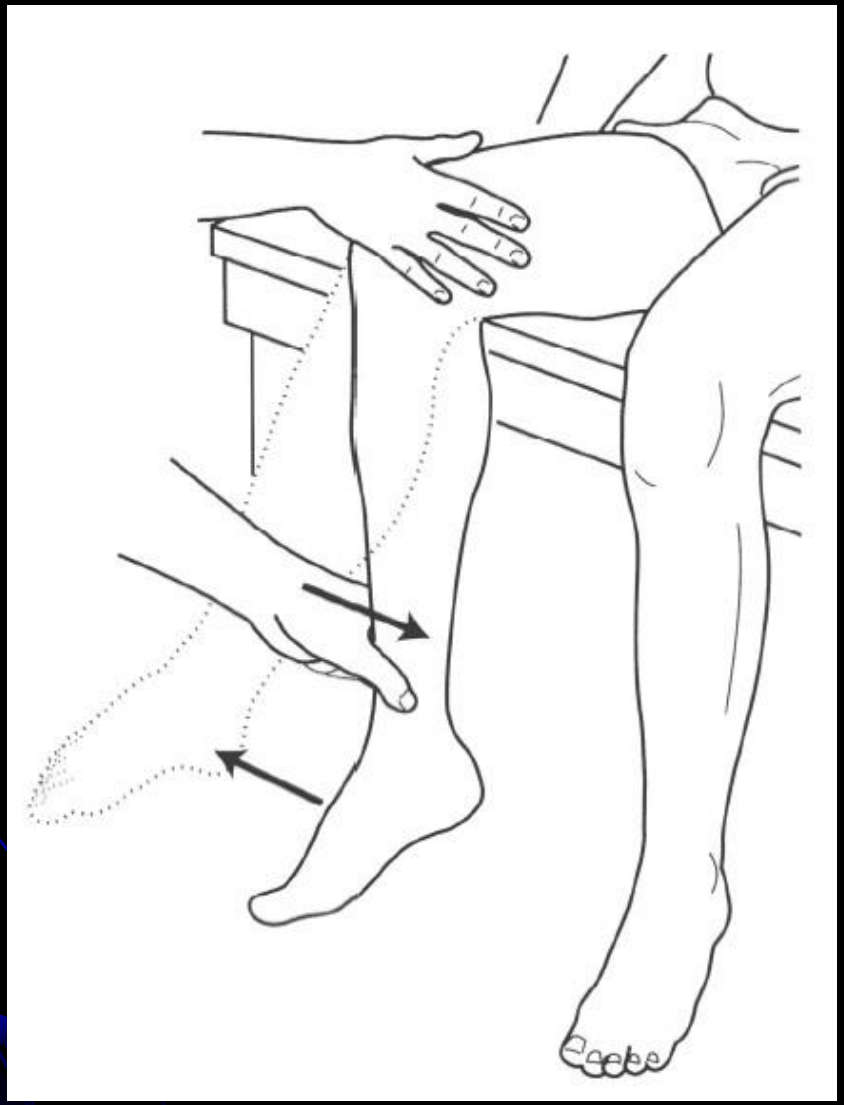


Hip Medial Rotation

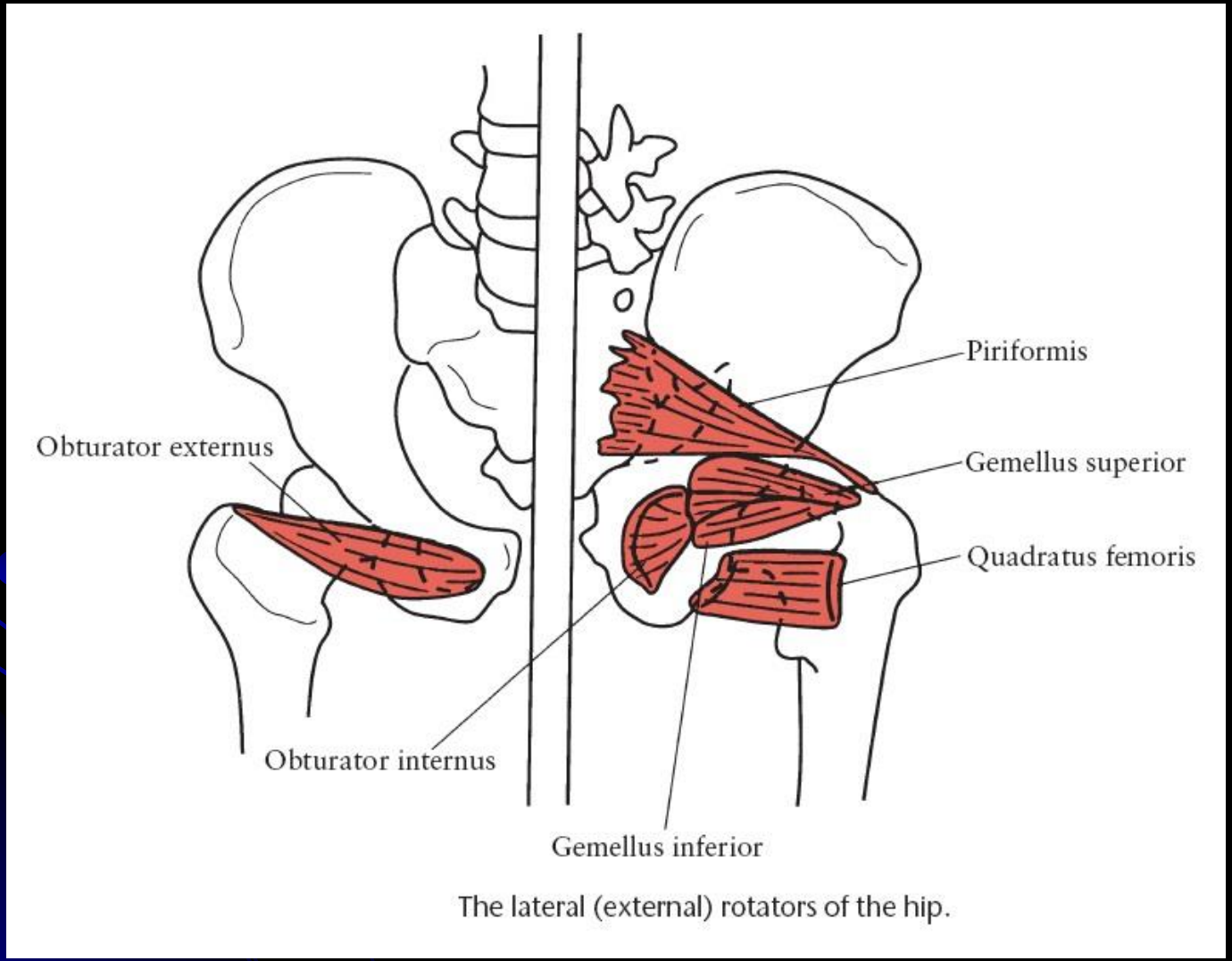


The medial (internal) rotators of the hip.

Hip Medial Rotation



Hip External Rotation



The lateral (external) rotators of the hip.

Hip External Rotation

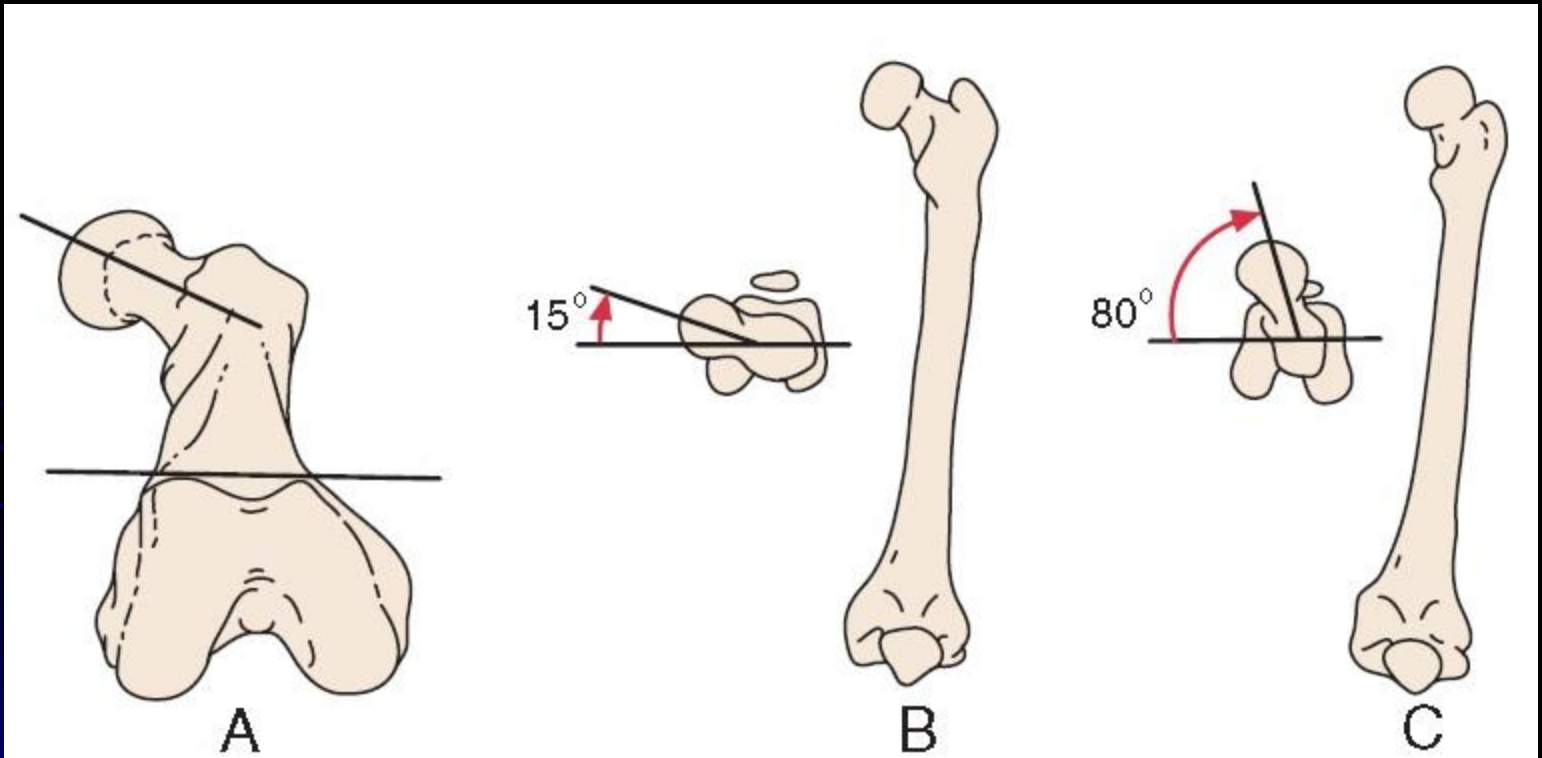
Special Tests

Tests for Hip Pathology

Craig's Test ©

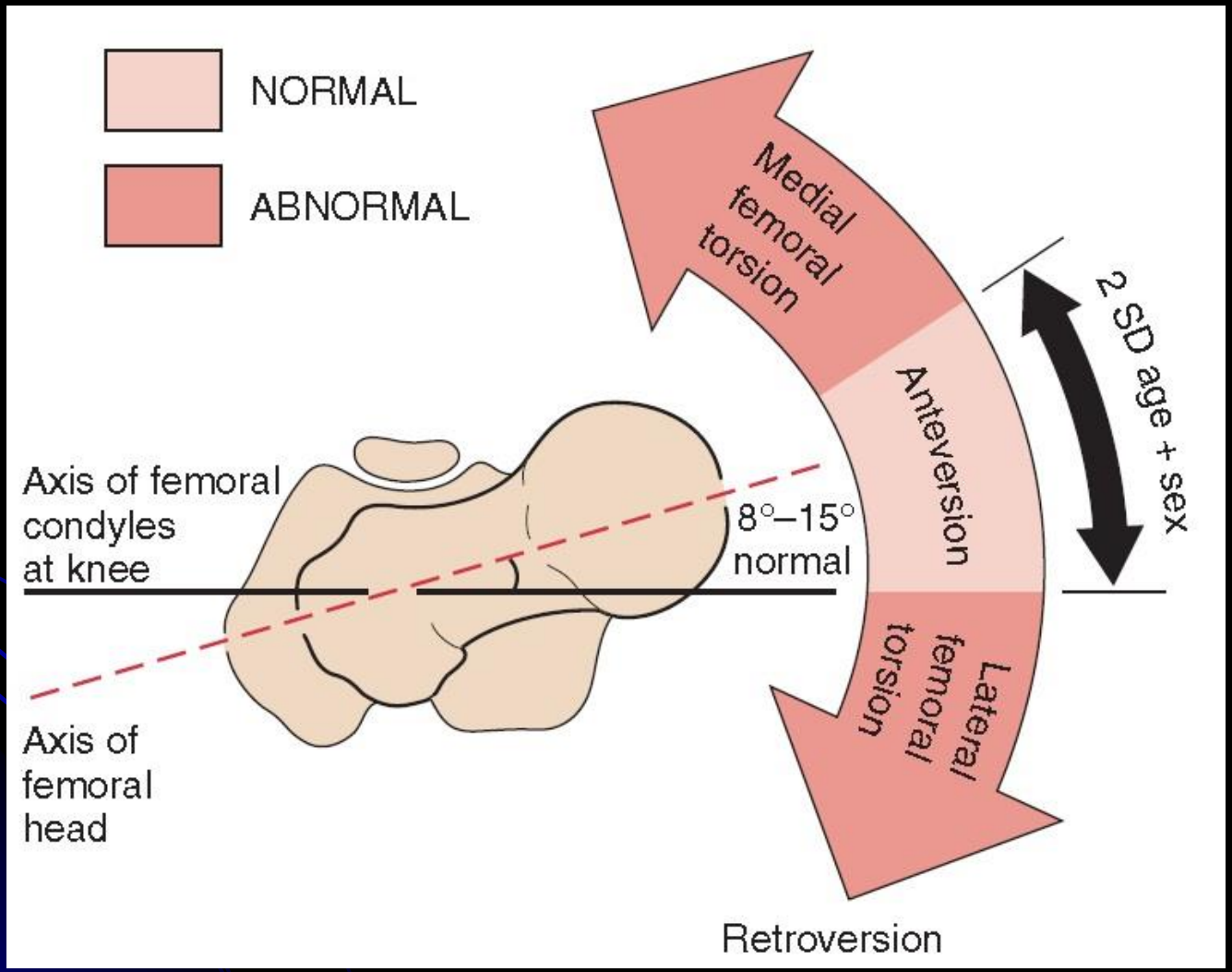
- Craig's test measures femoral **anteversion** or **forward torsion** of the femoral neck.

➢ Anteversion of the hip is measured by the **angle** made by the **femoral neck** with the **femoral condyles**.



Anteversion of the hip. A, Femoral anteversion angle. **B,** Normal angle. **C,** Excessive angle.

✓ It is the degree of forward projection of the femoral neck from the coronal plane of the shaft.

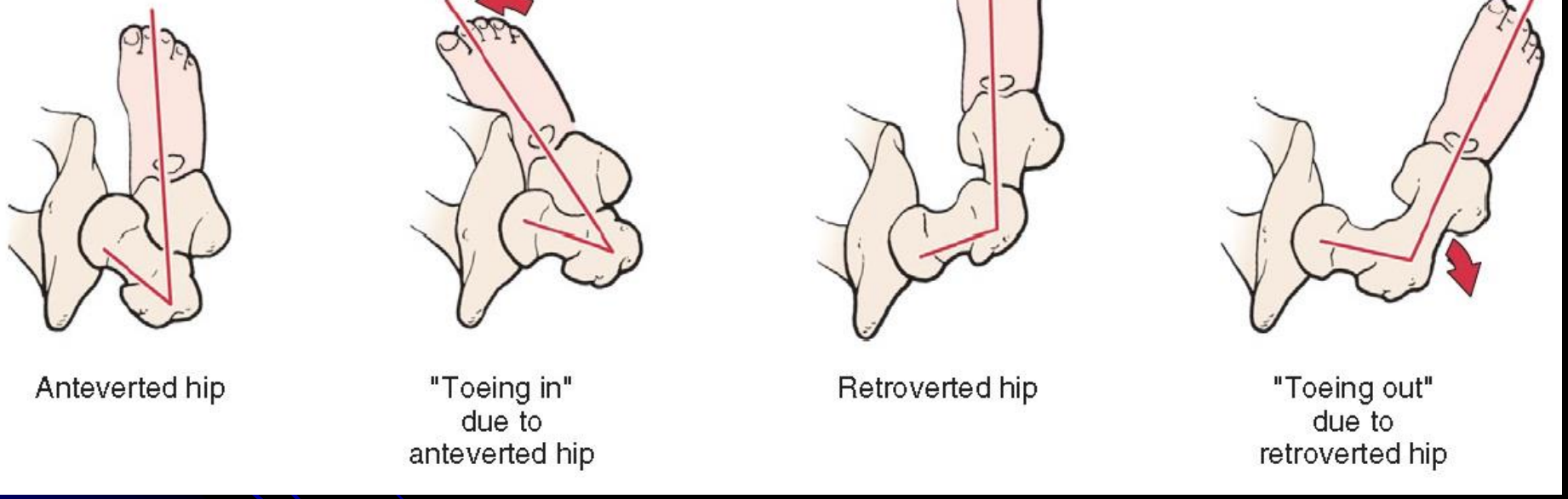


✓ It **decreases** during the growing period.

✓ **At birth**, the mean angle is approximately **30°**; in the **adult**, the mean angle is **8° to 15°.**

✓ Excessive anteversion is **twice** as common in girls as in boys.

✓ A common clinical finding of excessive anteversion is **excessive medial hip rotation** (more than 60°) and **decreased lateral rotation in extension.**

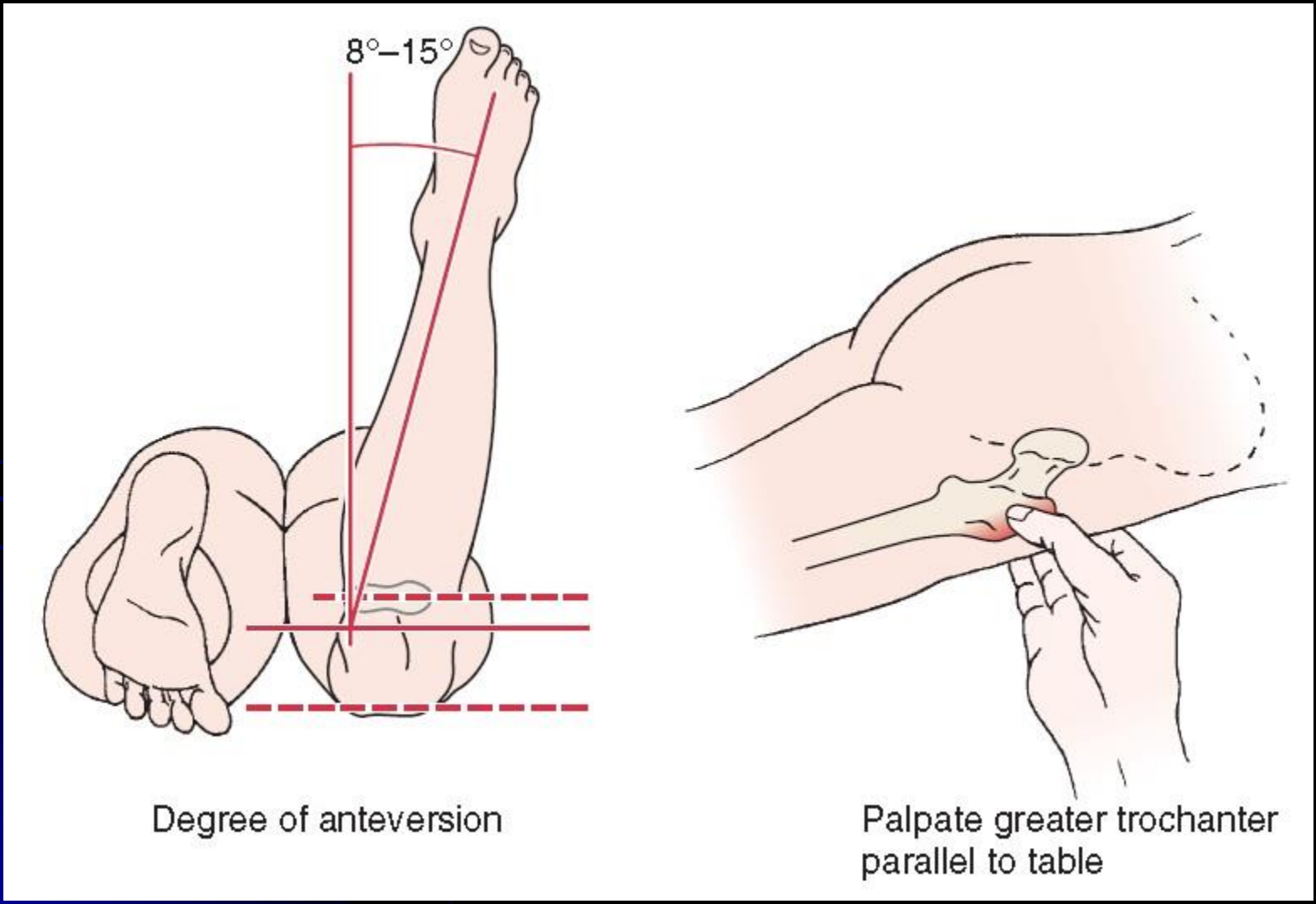

Anteverted hip
"Toeing in"
due to
anteverted hip
Retroverted hip
"Toeing out"
due to
retroverted hip

✓ The patient lies prone with the knee flexed to 90°.

✓ The examiner **palpates** the posterior aspect of the greater trochanter of the femur.

✓ The hip is then passively rotated medially and laterally until the **greater trochanter** is parallel with the examining table.

✓ The degree of anteversion can then be estimated, based on **the angle of the lower leg** with the **vertical line**.



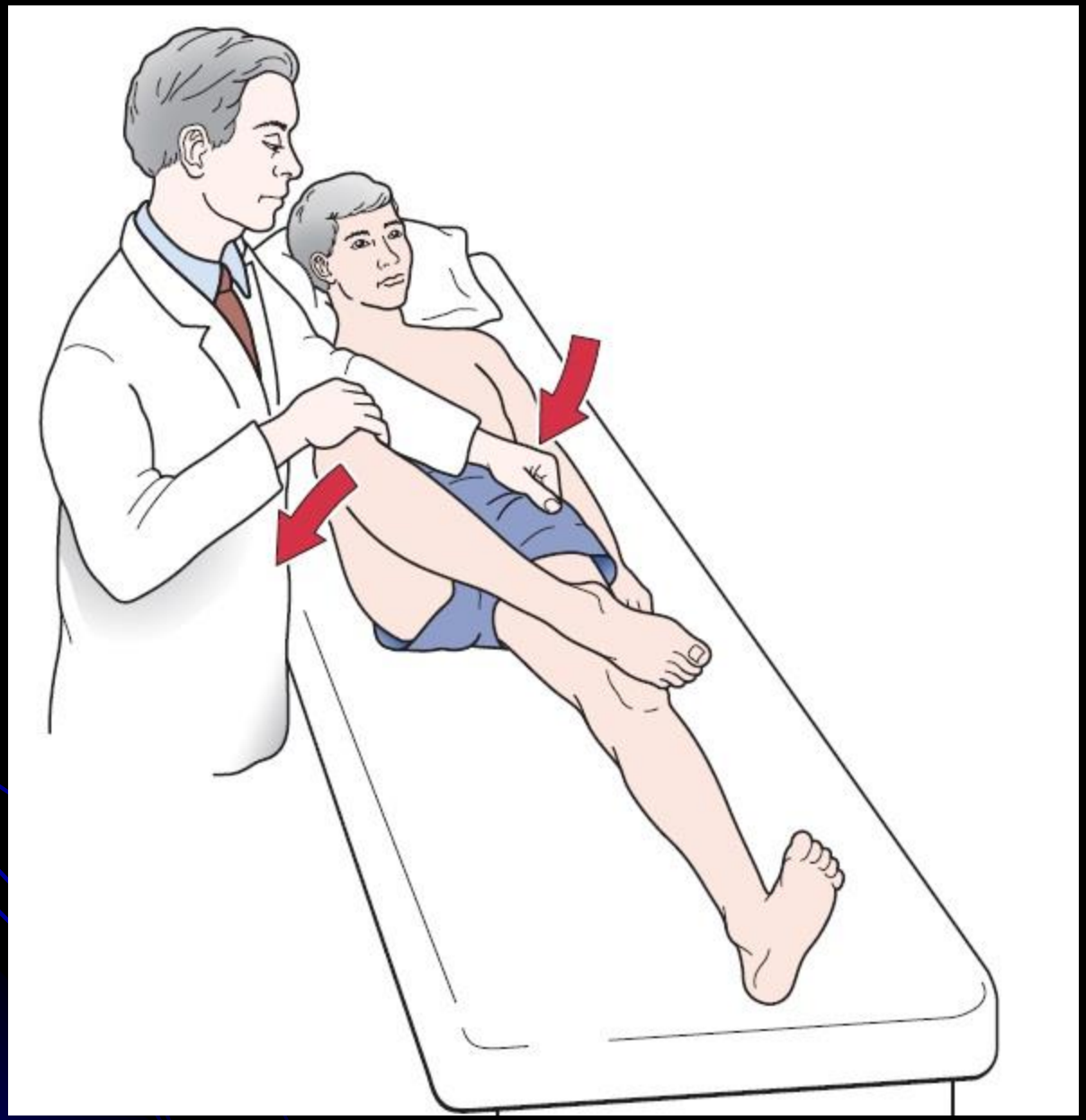
Patrick's Test (FABER or Figure-4 Test) ©

- **Flexion, abduction, and external rotation (FABER)** is the position of the hip at which the patient begins the test.
- The patient lies supine, and the examiner places the patient's test leg so that the **foot** of the test leg is on top of the knee of the opposite leg.
- The examiner then slowly **lowers** the knee of the test leg toward the examining table.

✓ A **negative test** is indicated by the test leg's knee falling to the table or at least being parallel with the opposite leg.

✓ A **positive test** is indicated by the test leg's knee remaining above the opposite straight leg.

✓ If positive, the test indicates that the **hip joint may be affected**, that there may be iliopsoas spasm, or that the **sacroiliac joint may be affected**.



Tests for Impingement

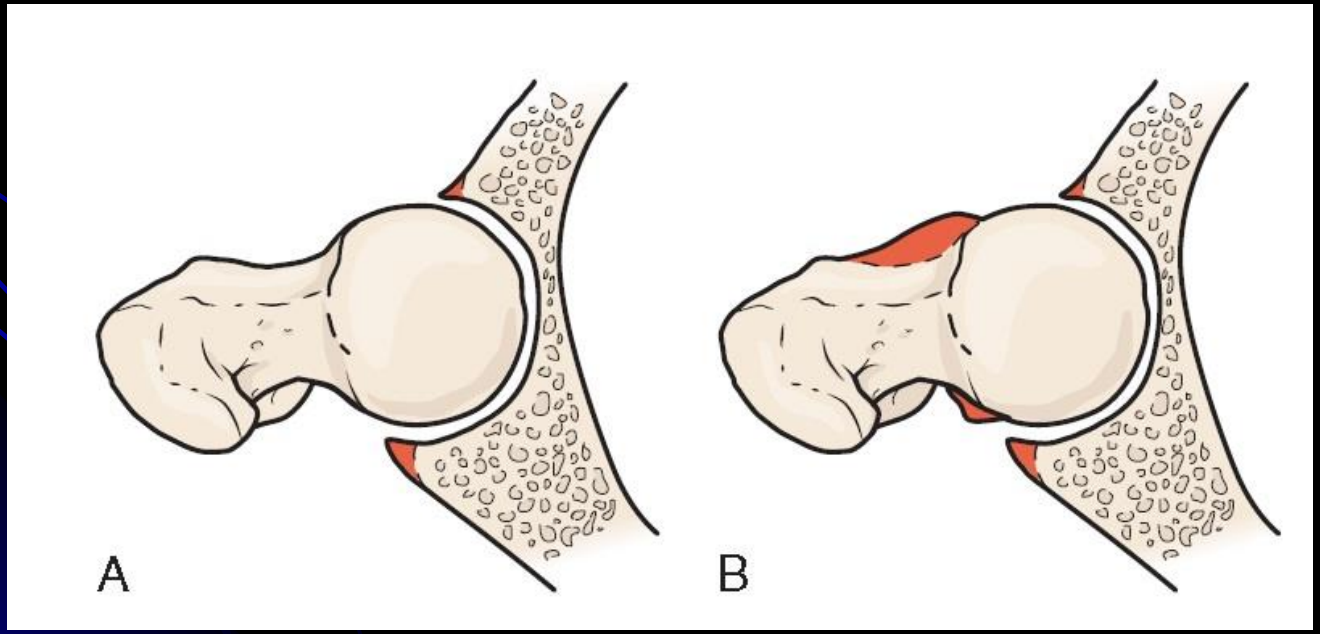
Femoroacetabular impingement (FAI)

- In FAI, **bone spurs** develop around the **femoral head** and/or **along the acetabulum**.
- The bone overgrowth causes the hip bones to hit against each other, rather than to move smoothly.
- Over time, this can result in the **tearing of the labrum** and **breakdown of articular cartilage** (osteoarthritis).

✓ **FAI** may be **cam type** or **pincer type**.

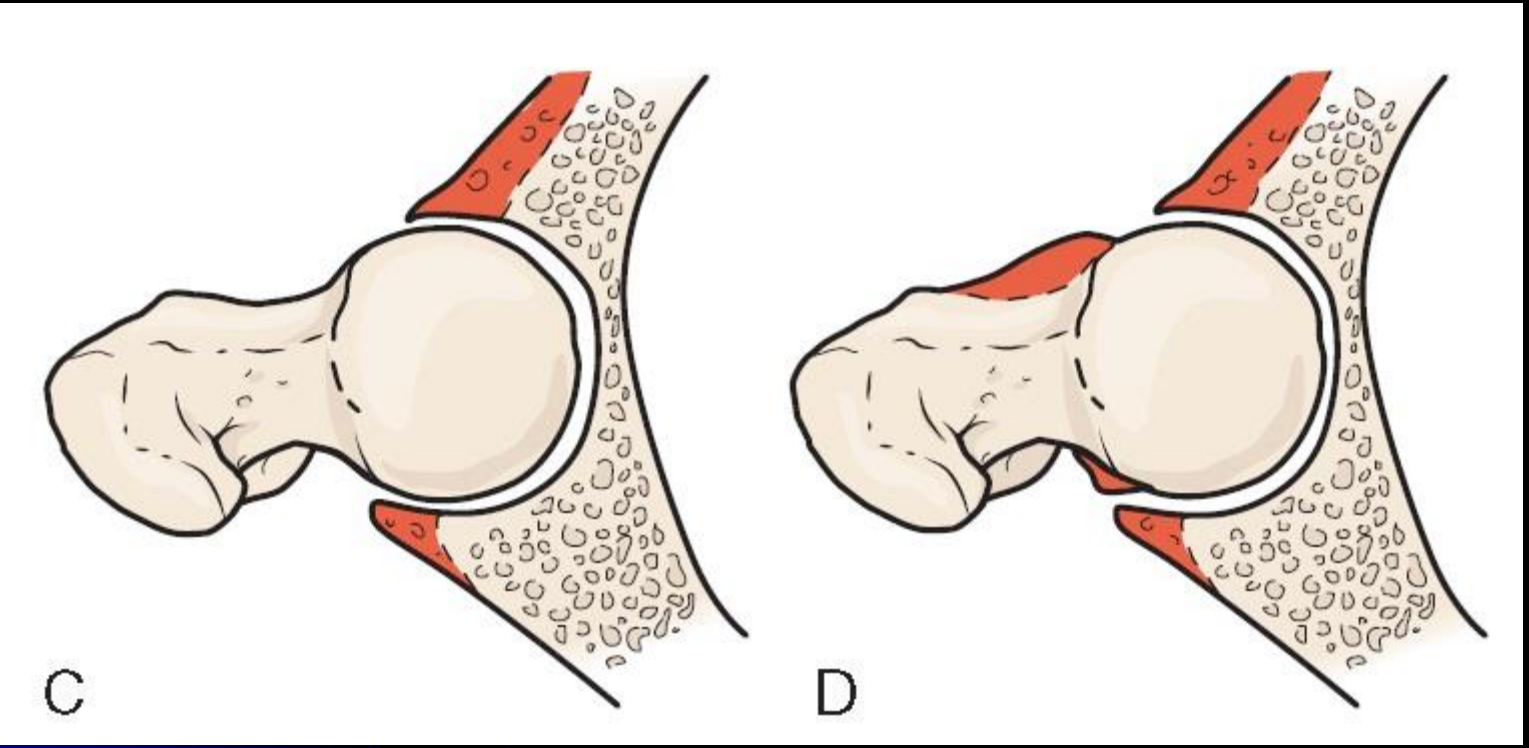
✓ **Cam Type:** the **femoral head** is not round and cannot rotate smoothly inside the acetabulum.

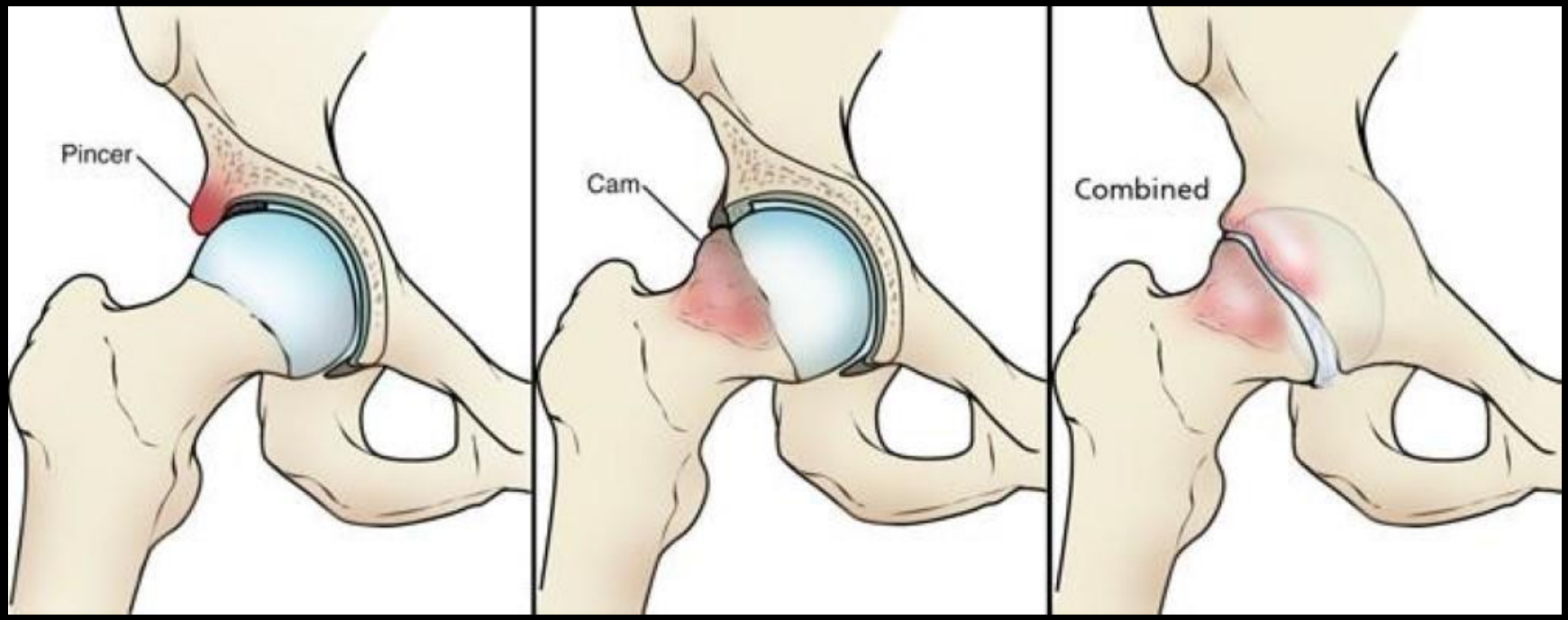
✓ A **bump** forms on the edge of the femoral head that grinds the cartilage inside the acetabulum.

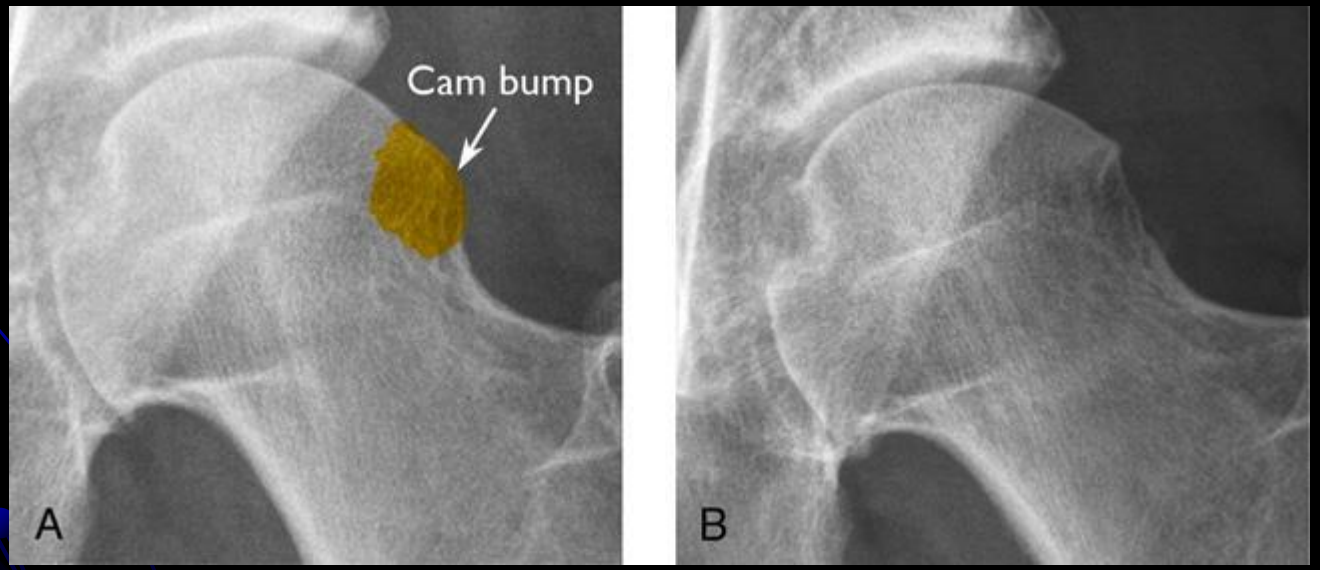


✓ **Pincer type:** This type occurs because **extra bone** extends out over the normal rim of the **acetabulum**.

✓ The **labrum can be crushed** under the prominent rim of the acetabulum.




Pincer
Cam
Combined


Cam bump
A
B

Anteroposterior Impingement Test.

- The patient lies supine with the hip flexed to 90°.
- The examiner then **medially rotates** and **adducts** the hip which leads to impingement of femoral neck against the acetabular rim.
- Forced medial rotation can lead to a labral lesion, chondral lesion, or both.
- **Pain** is a positive.

Posteroinferior Impingement Test.

- The patient lies supine with the legs hanging free over the edge of the bed to ensure maximum hip **extension**.
- The examiner then **laterally rotates** the hip quickly .
- Deep **groin** or **buttock pain** is an indication of posteroinferior impingement.

Tests for Labral Lesions

Anterior Labral Tear Test. (Flexion, Adduction, and Internal Rotation [FADDIR] Test) ©

- This test, also called the **anterior apprehension test,** is used to test for anterior-superior impingement syndrome, **anterior labial tear**, an iliopsoas tendinitis.

✓ The patient is placed in supine position.

✓ The examiner takes the hip into full flexion, lateral rotation, and full abduction as a **starting position**.

✓ The examiner then extends the hip combined with medial rotation and adduction.

✓ positive test is indicated by the production of **pain**.

Anterior labral tear test. A, Starting position. **B,** End position.

Tests for Leg Length

True leg length discrepancy (true shortening)

- This is an **anatomic** or **structural change** in the lower leg resulting from congenital maldevelopment (e.g., adolescent coxavara, congenital hip dysplasia, bony abnormality) or trauma (e.g., fracture).
- Because an anatomic short leg results, the spine and pelvis are often affected, leading to **lateral pelvic tilt** and **scoliosis**.

Functional leg length discrepancy (Functional shortening or Apparent shortening)

- It is the result of **compensation** for a change that may have occurred because of **positioning rather than structure**.
- For example, a functional leg length discrepancy could occur because of **unilateral foot pronation** or **spinal scoliosis**.

True Leg Length

- The legs should be 15 to 20 cm (4 to 8 inches) apart and parallel to each other.
- To obtain the leg length, the examiner measures from the **ASIS to the lateral or medial malleolus**.
- A slight difference (as much as **1 to 1.5 cm**) in leg length is considered **normal**.

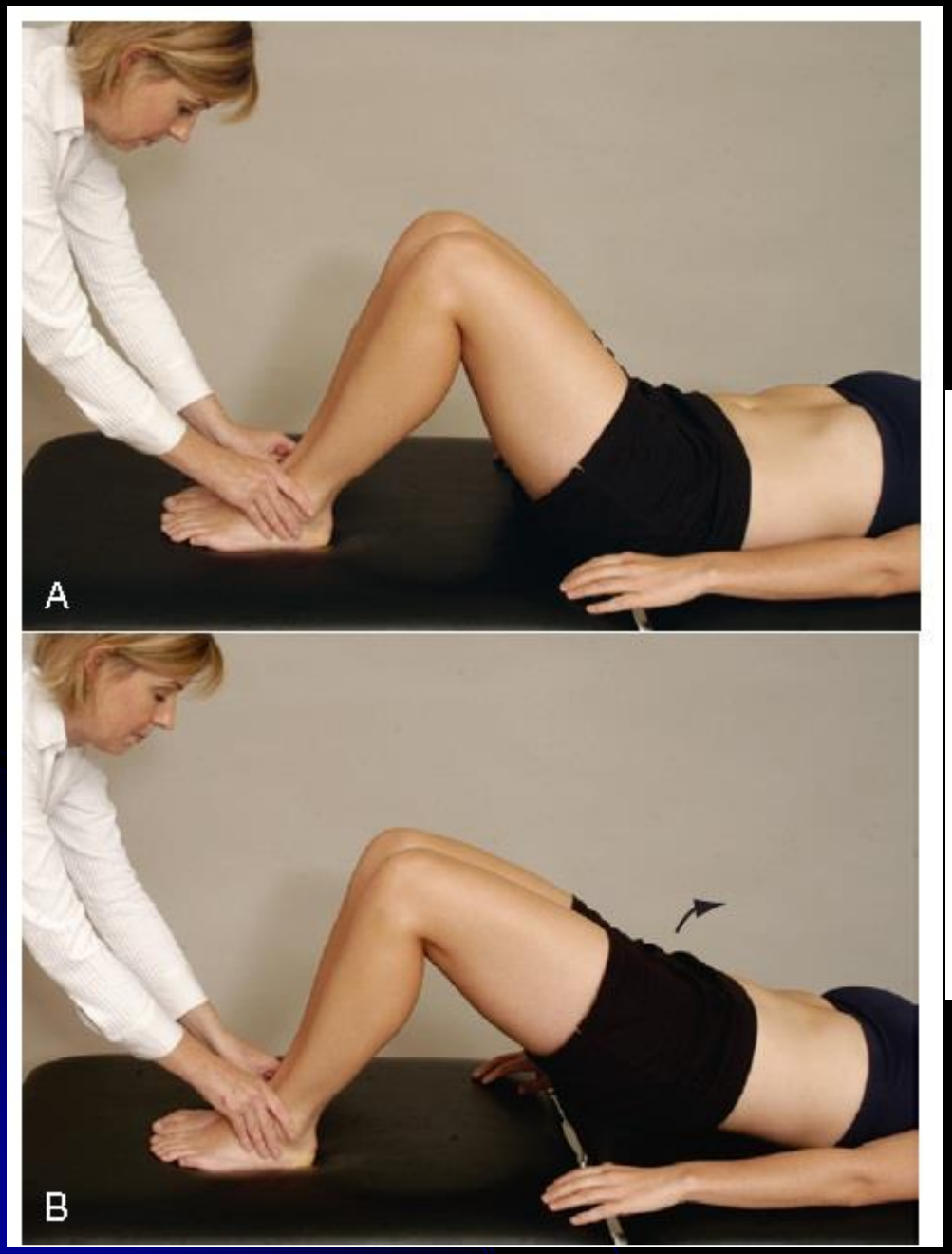
Functional leg length discrepancy (Functional shortening)

- The examiner obtains the distance from the tip of the **xiphisternum** or **umbilicus** to the **medial malleolus**.
- If true leg length is normal but the umbilicus-to-malleolus measurements are different, a functional leg length discrepancy is present.

Weber-Barstow maneuver (visual method)

- The patient lies supine with the hips and knees flexed.
- The examiner stands at the patient's feet and palpates the distal aspect of the medial malleoli with the thumbs.
- The patient then lifts the pelvis from the examining table and returns to the starting position.

✓ Next, the examiner passively extends the patient’s legs and compares the positions of the malleoli using the borders of the thumbs. Different levels indicate asymmetry.

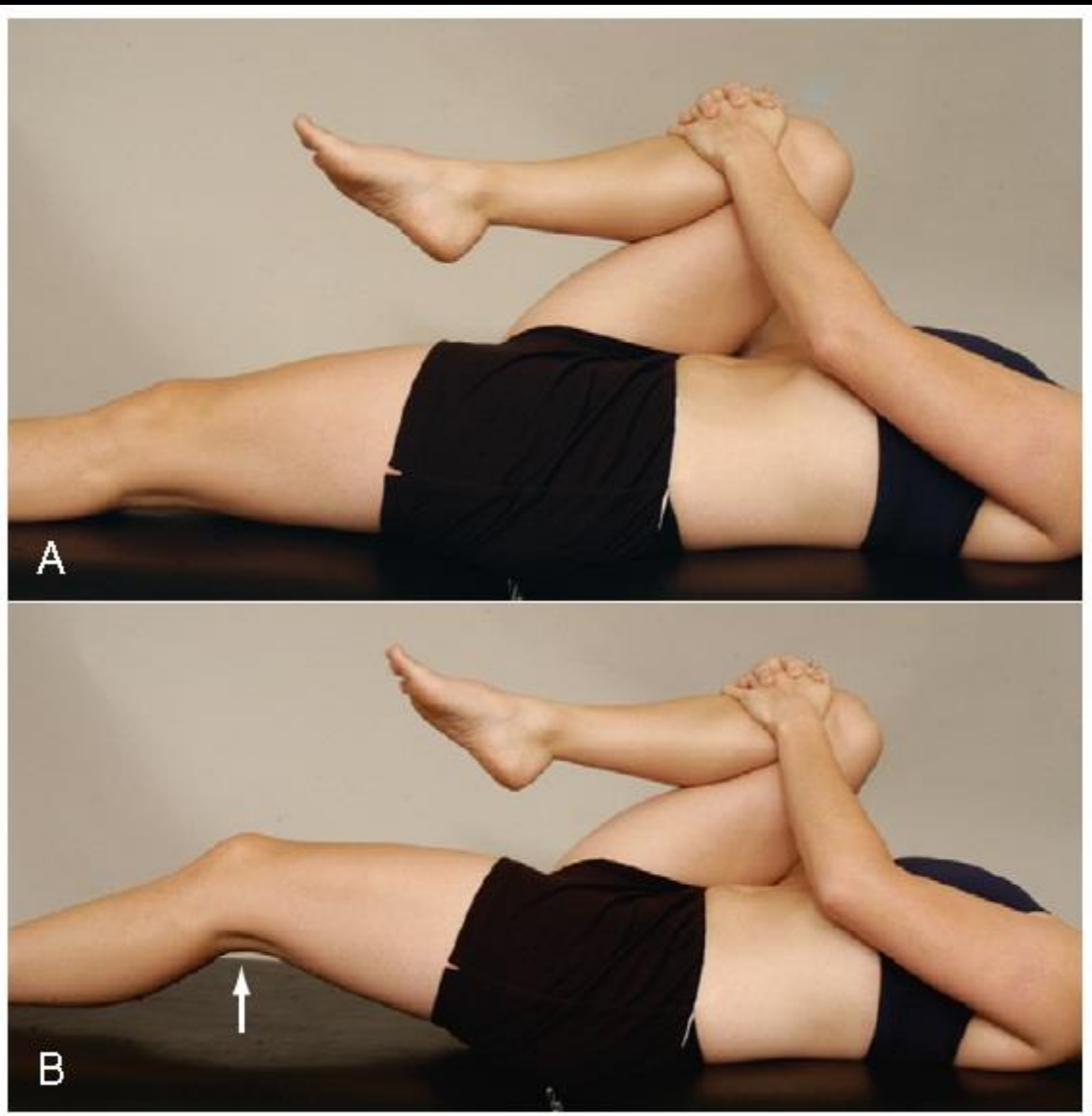

A
B


C

Tests for Muscle Tightness or Pathology

Thomas Test ©

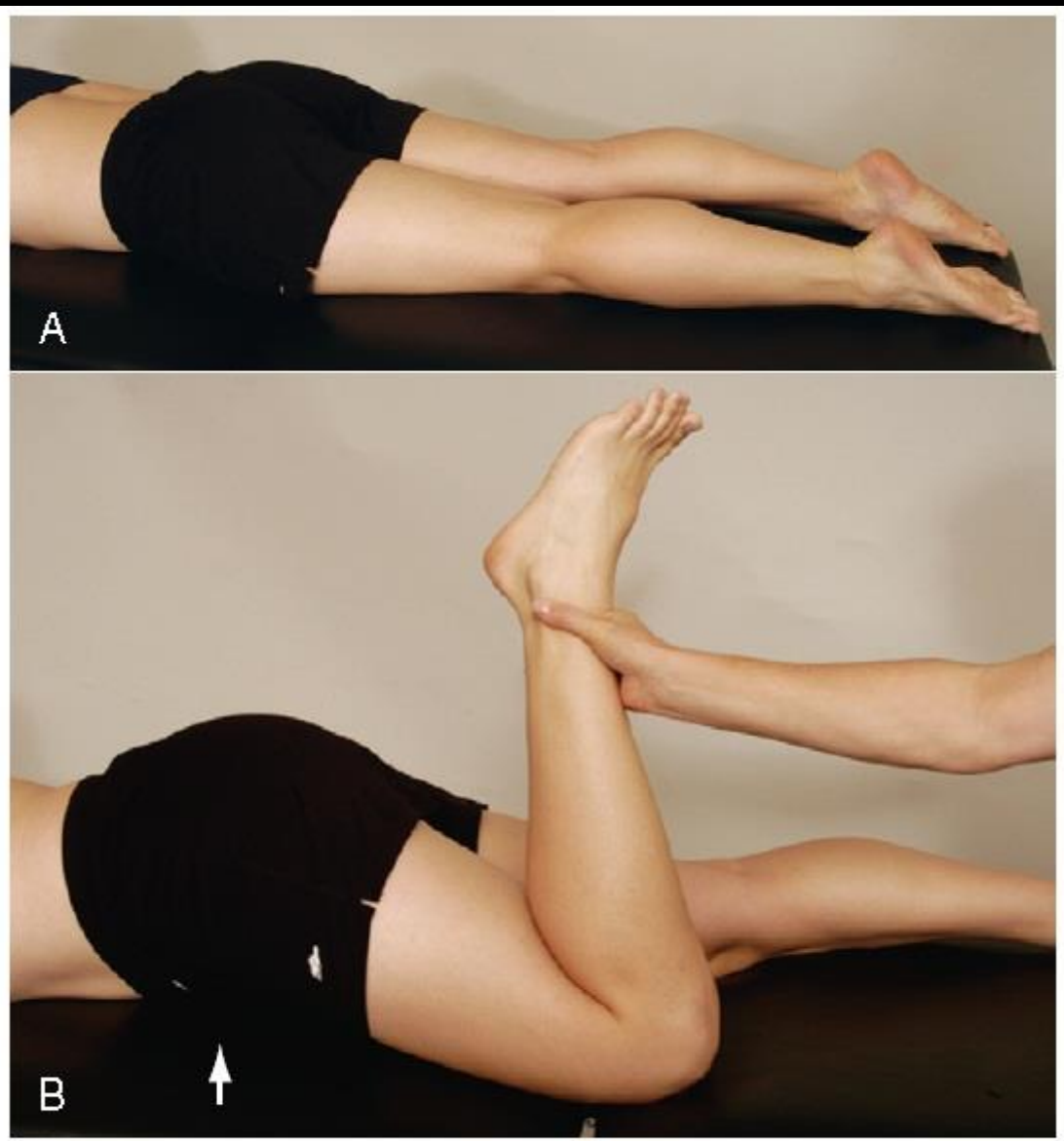
- The Thomas test is used to assess a hip **flexion contracture**, the most common contracture of the hip.



Thomas test. A, Negative test. **B,** Positive test.

Ely's Test (Tight Rectus Femoris) ©

- The patient lies **prone**, and the examiner **passively flexes** the patient's knee.
- On flexion of the knee, the patient's **hip on the same side spontaneously flexes**, indicating that the rectus femoris muscle is **tight** on that side and that the test is positive.
- The two sides should be tested and compared.



Ely's test for a tight rectus femoris. A, Position for the test. **B,** Posture test shown by hip flexion when the knee is flexed.

Rectus Femoris ContractureTest (Kendall Test) ©

Hamstrings Contracture Test

- The patient is instructed to **sit** with **one knee flexed** against the chest to stabilize the pelvis and the **other knee extended**.
- The patient then attempts to **flex the trunk** and **touch the toes** of the extended lower limb (test leg) with the fingers. The test is repeated on the other side.

✓ Normally, the patient should be able to at least **touch the toes** while keeping the knee extended.

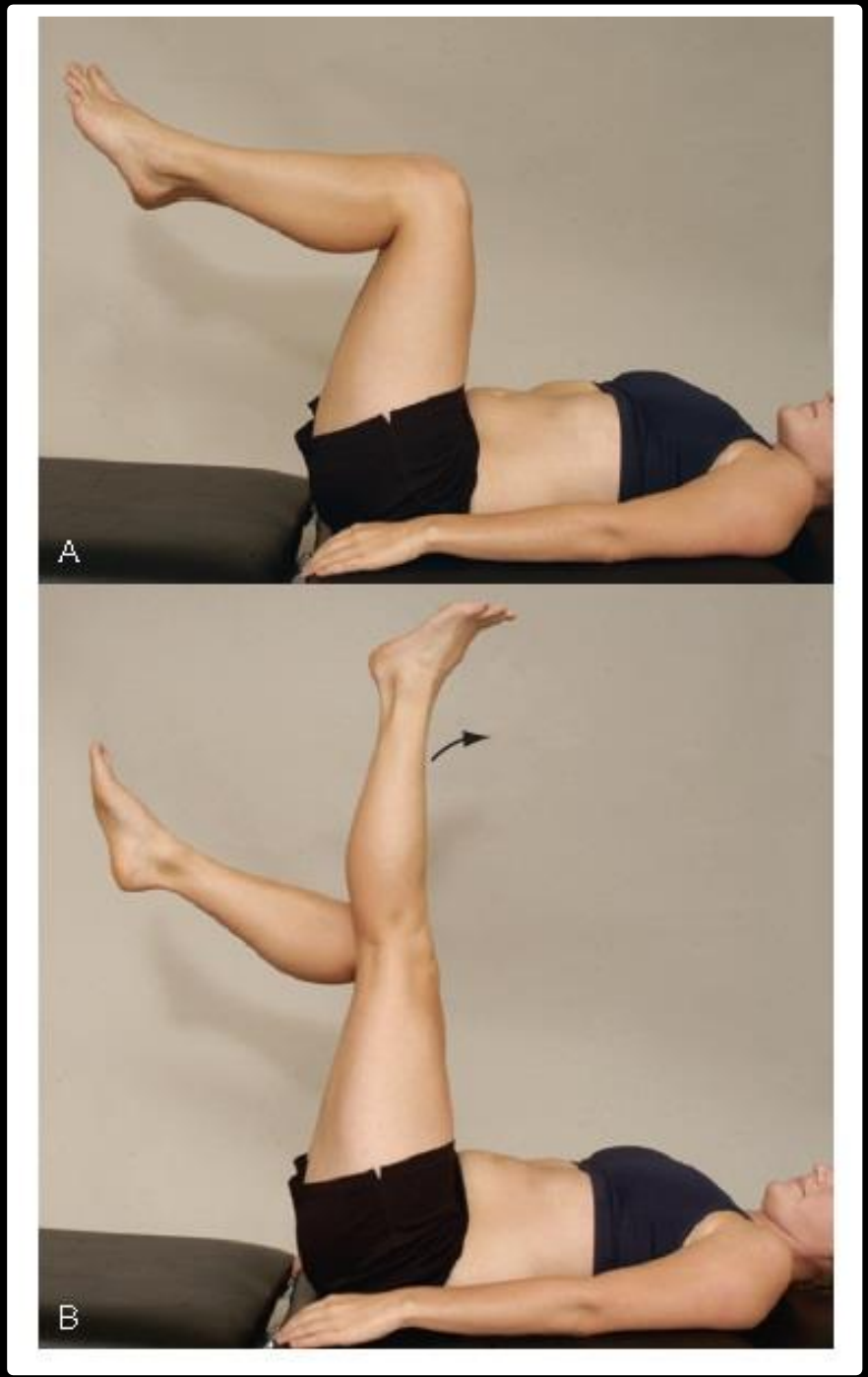
✓ If he or she is **unable to do** so, it is an indication of **tight hamstrings** on the straight leg.

Test for hamstring tightness (method 2). A, Negative test. **B,** Positive test. **C,** Hypermobility of hamstrings.

90–90 Straight Leg Raising Test ©

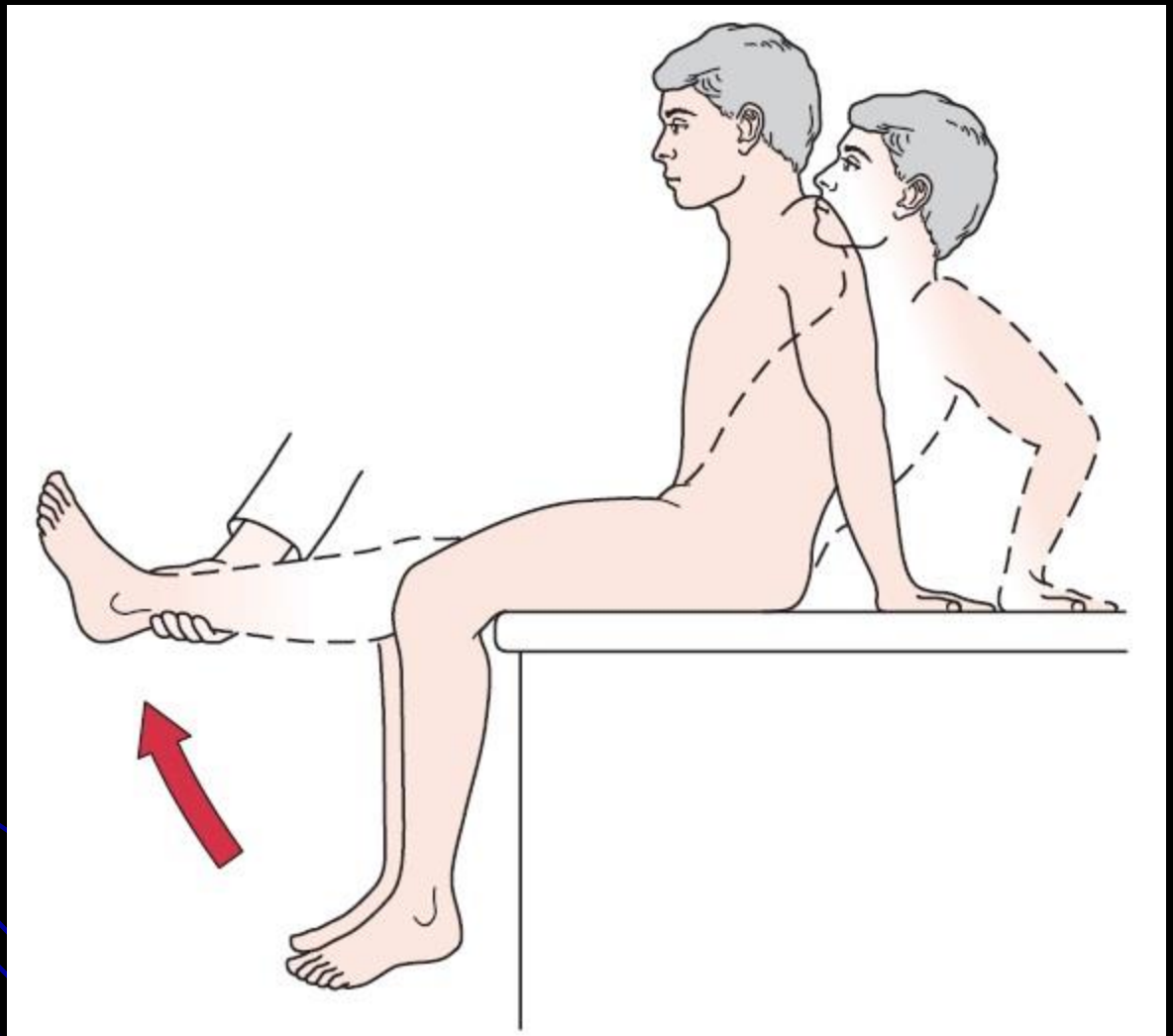
- The supine patient **flexes** both **hips** to 90° while the knees are bent.
- The patient may grasp behind the knees with both hands to stabilize the hips at 90° of flexion.
- The patient **actively extends each knee** in turn as much as possible.

- For normal flexibility in the hamstrings, **knee extension should be within 20° of full extension.**



Tripod Sign (Hamstrings Contracture)

- The patient is seated with **both knees flexed to 90°** over the edge of the examining table.
- The examiner then **passively extends knee**.
- If the hamstring muscles on that side are tight, **the patient extends the trunk** to relieve the tension in the hamstring muscles.

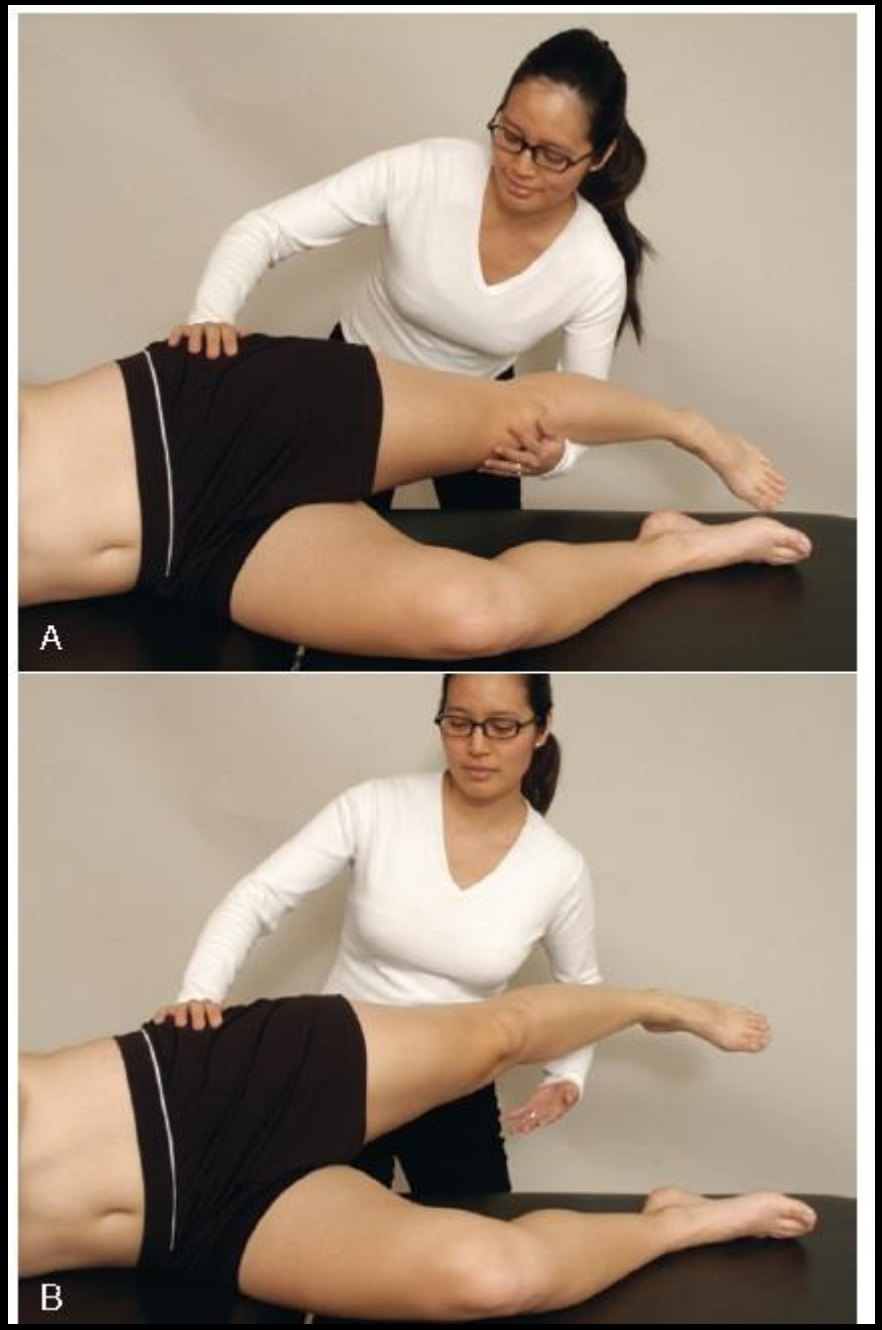


Tripod sign.

Ober's Test ©

- Ober's test assesses the **tensor fasciae latae (iliotibial band)** for contracture.
- The patient is in the side lying position with the **lower leg flexed** at the hip and knee for stability.
- The examiner then **passively abducts** and **extends** the patient's upper leg with the knee straight or flexed to 90°.

✓ The examiner slowly lowers the upper limb; if a contracture is present, the **leg remains abducted and does not fall to the table**.



Piriformis Test ©

- In about **15% of the population**, the sciatic nerve, all or in part, passes through the piriformis muscle rather than below it.
- These people are more likely to suffer from this relatively rare condition, **piriformis syndrome**.

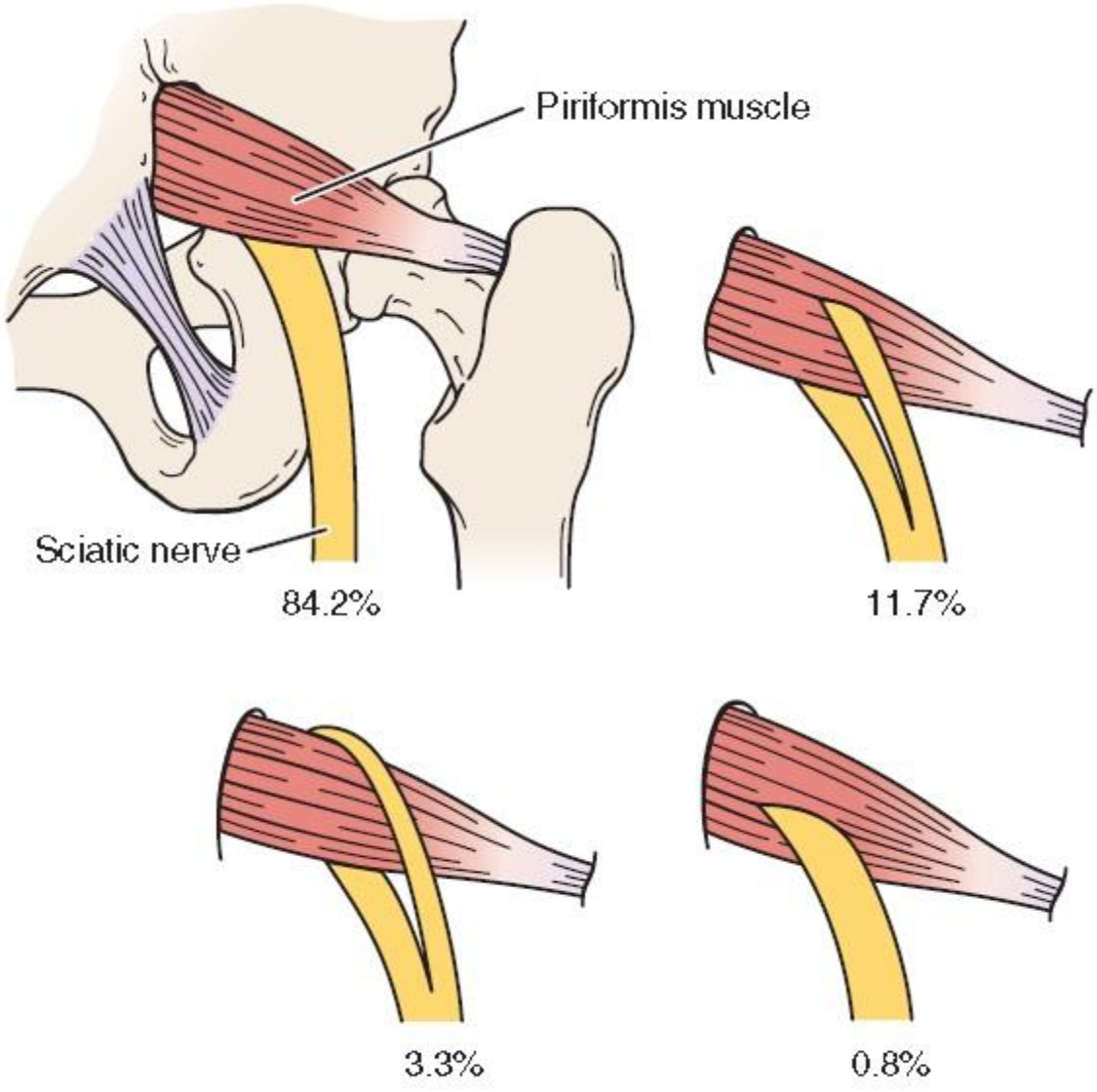


Figure 11-63 Sciatic nerve: Variations in its relationship with the piriformis muscle.

✓ The patient is in the **side lying** position with the test leg uppermost.

✓ The patient **flexes the test hip to 60°** with the knee flexed.

✓ The examiner stabilizes the hip with one hand and **applies a downward pressure to the knee**.

✓ If the piriformis muscle is **tight**, **pain is elicited in the muscle**.

✓ If the piriformis muscle is **pinching the sciatic nerve**, **pain** results in the buttock and sciatica may be experienced by the patient.