# Diagnostic Approach to Hip Pain

Zoë J. Foster, MD

October 3, 2018

# Disclosures

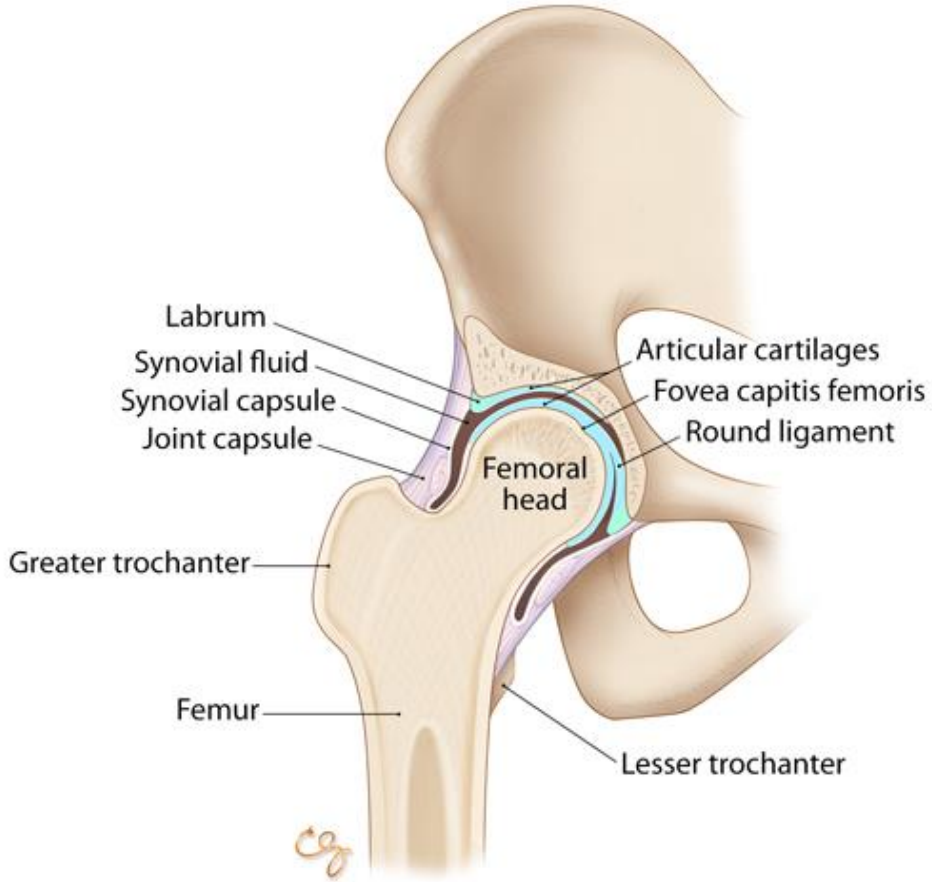
I have nothing to disclose.

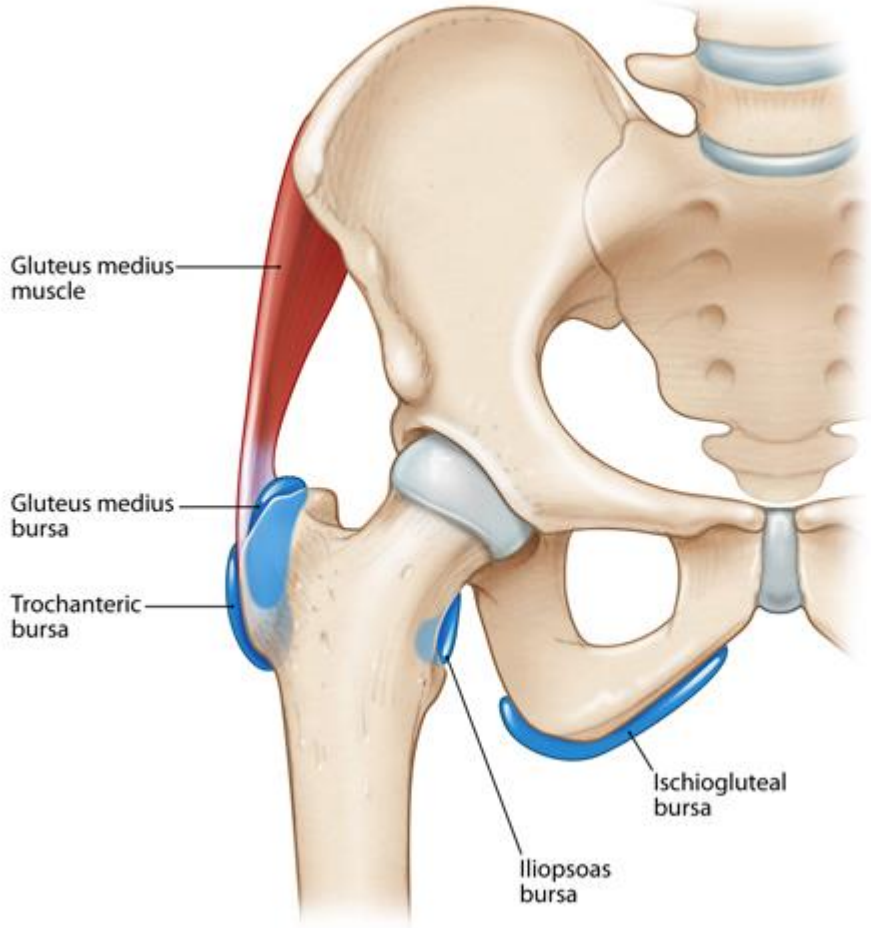

"I already diagnosed myself on the Internet.
I'm only here for a second opinion."

# Objectives

- Review examination of the hip, including special tests
- Discuss differential diagnosis for hip pain
- Consider special diagnoses not to be missed

# Anatomy




Images from: Sonosim

# Case 1: Anterior hip pain

15yo track athlete with worsening R groin pain

- tripped and fell in her yard a year ago, now with pain x 6 months
- dull constant achy pain, 4-5/10
- radiation to anterior thigh
- hard to get comfortable at night
- hard to go up and down stairs one at a time
- can’t run due to pain
- better with ibuprofen
- no history of hip problems prior

# Differential Diagnosis for Hip Pain

| INTRA-ARTICULAR CAUSES | EXTRA-ARTICULAR CAUSES |
|---|---|
| Labral tear | Adhesive capsulitis |
| Loose bodies (including OCD lesions) | Snapping hip (internal or external) |
| Femoroacetabular impingement (FAI) | Greater trochanteric pain syndrome |
| Synovitis | Piriformis syndrome |
| Tears of ligamentum teres | Ostetis pubis |
| Chondral injury | Sports hernia |
| Avascular necrosis | Myotendinous injuries |
| | Avulsion injuries (ASIS, etc) |
| | Stress fractures |
| | Nerve compression syndromes |

From: Poultsides, L. A., Bedi, A., & Kelly, B. T. (2012). An Algorithmic Approach to Mechanical Hip Pain. *HSS Journal*, *8*(3), 213–224. http://doi.org/10.1007/s11420-012-9304-x

# Locations of “Hip Pain”


From: Wilson JJ, Furukawa M. Evaluation of the patient with hip pain. American Family Physician. 2014; 89(1): 27-34

# Differential Diagnosis for Hip Pain

| ANTERIOR | LATERAL | POSTERIOR |
|---|---|---|
| Osteoarthritis | Greater trochanteric pain syndrome | Piriformis syndrome |
| Femoroacetabular impingement (FAI) | External snapping hip (IT band) | Ischiofemoral impingement |
| Hip labral tear | Greater trochanteric bursitis | Sacroiliac joint dysfunction |
| Iliopsoas bursitis (internal snapping hip) | Gluteal muscle tear or avulsion | Lumbar radiculopathy |
| Femoral neck stress fracture | Iliac crest apophysis avulsion | Vascular claudication |
| Osteonecrosis | IT band syndrome | Ischial apophysis avulsion |
| Meralgia paresthetica | Femoroacetabular impingement (FAI) | Hamstring muscle strain/avulsion |
| Athletic pubalgia (sports hernia) | | |
| Loose bodies/chondral lesions | | |
| Legg-Calve-Perthes disease | | |
| Slipped capital femoral epiphysis | | |
| Transient synovitis | | |
| Septic arthritis | | |
| Hip pointer | | |
| Apophyseal avulsion injuries (ASIS; AIIS) | | |

# Functional Tests of the Hip

Squatting

Going up and down stairs one at a time

Crossing the legs so that the ankle of one foot rests on the knee of the opposite leg

Going up and down stairs two or more at a time

Running straight ahead

Running and decelerating

Running and twisting

One-legged hop

Jumping

Image from: http://www.executivestyle.com.au/sock-and-awe-2v7o2

# Case 1: Exam

- Inspection
  - Gait
  - Muscular atrophy
  - Pelvic symmetry
- Palpation
- Range of motion
- Special tests

# Types of Abnormal Gait

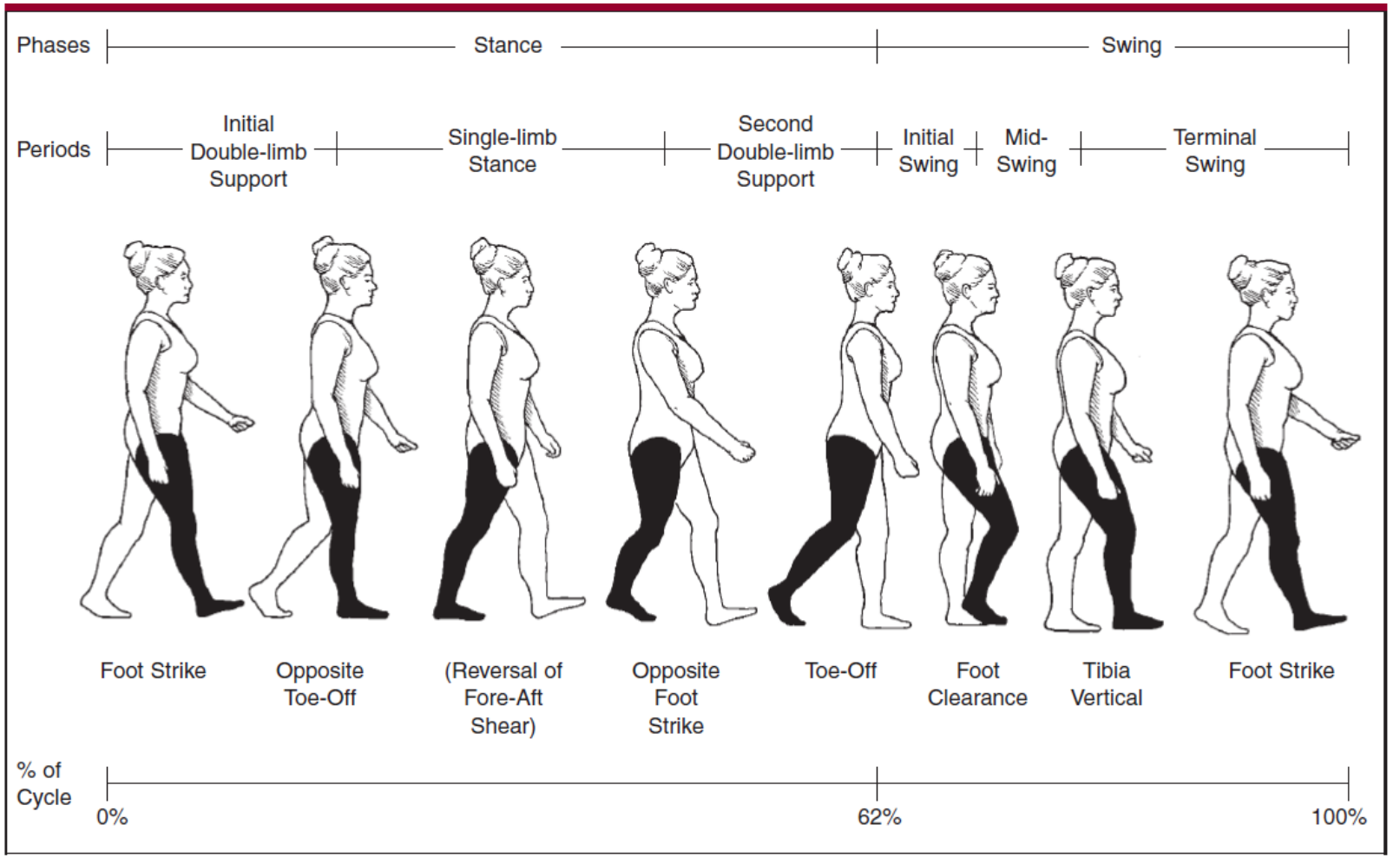
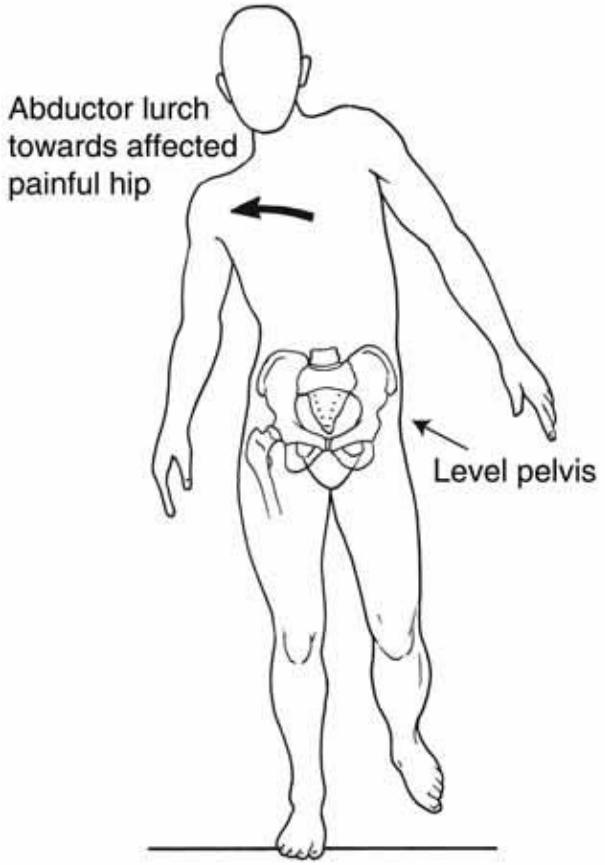
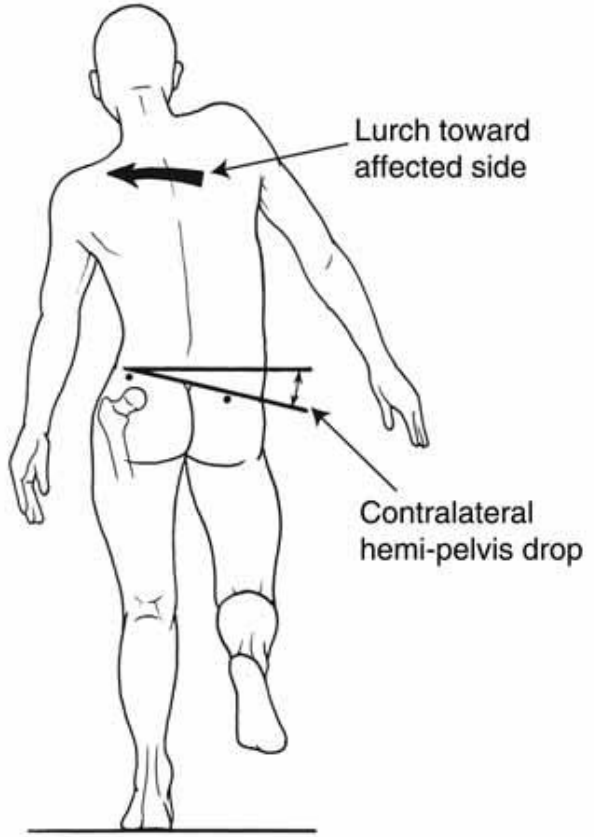



Image from: Lim MR, Huang RC, et. Al. Evaluation of the Elderly Patient with an Abnormal Gait. *J Am Acad Orthop Surg* 2007;15:107-117

# Coxalgic Gait

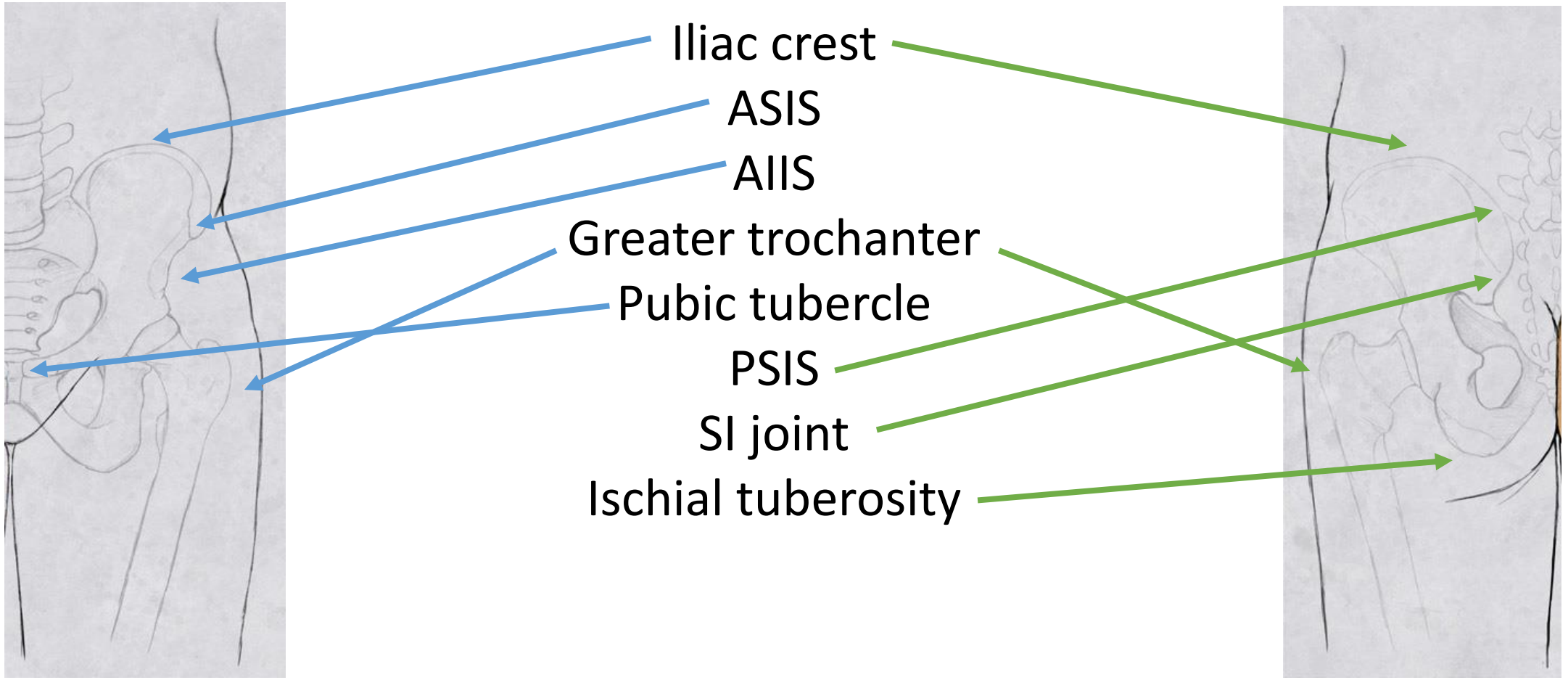



# Trendelenburg Gait




Images from: Lim MR, Huang RC, et. Al. Evaluation of the Elderly Patient with an Abnormal Gait. *J Am Acad Orthop Surg* 2007;15:107-117

# Exam: Palpation of Bony Landmarks



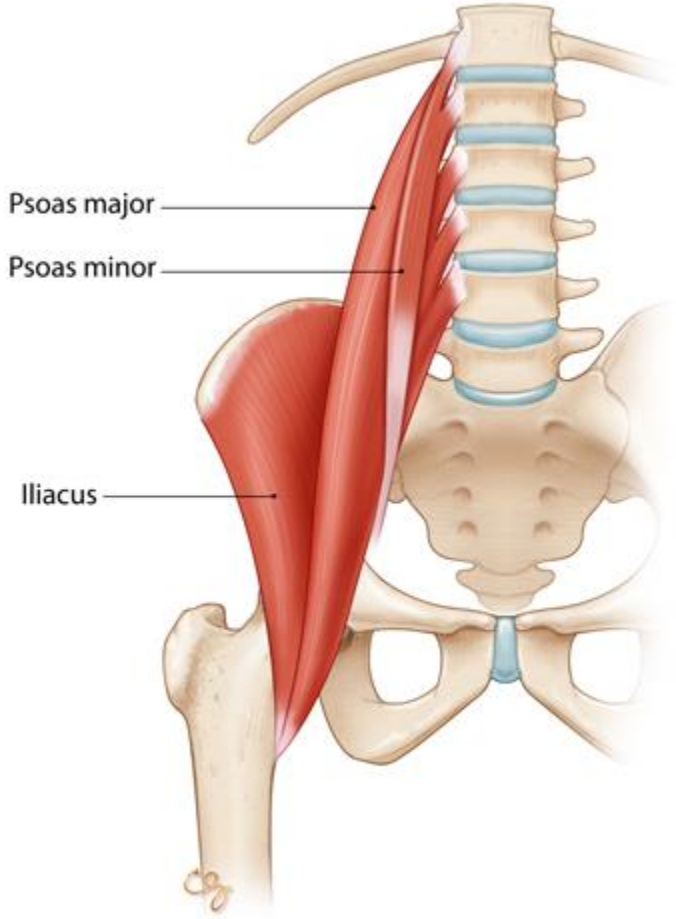
# Exam: Range of Motion






Images from: Sallis R. Examination Skills of the Musculoskeletal System. AAFP Clinical Procedures CME

# Exam: Strength Testing - Flexor Muscles




**Iliopsoas** –

- psoas
- iliacus

Rectus femoris

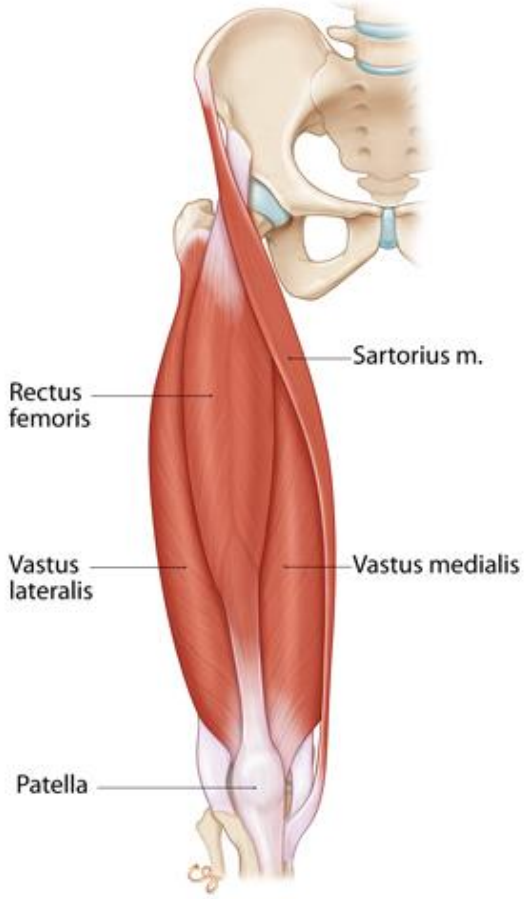
Pectineus

Sartorius

Adductor longus

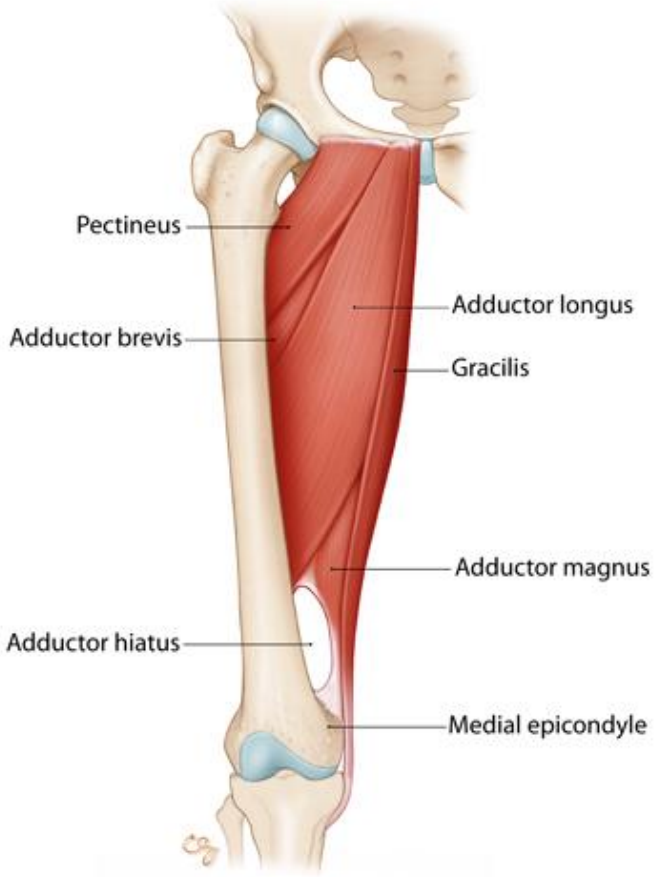
Adductor brevis

Gracilis




Images from Sonosim

# Exam: Strength Testing -Extensor Muscles



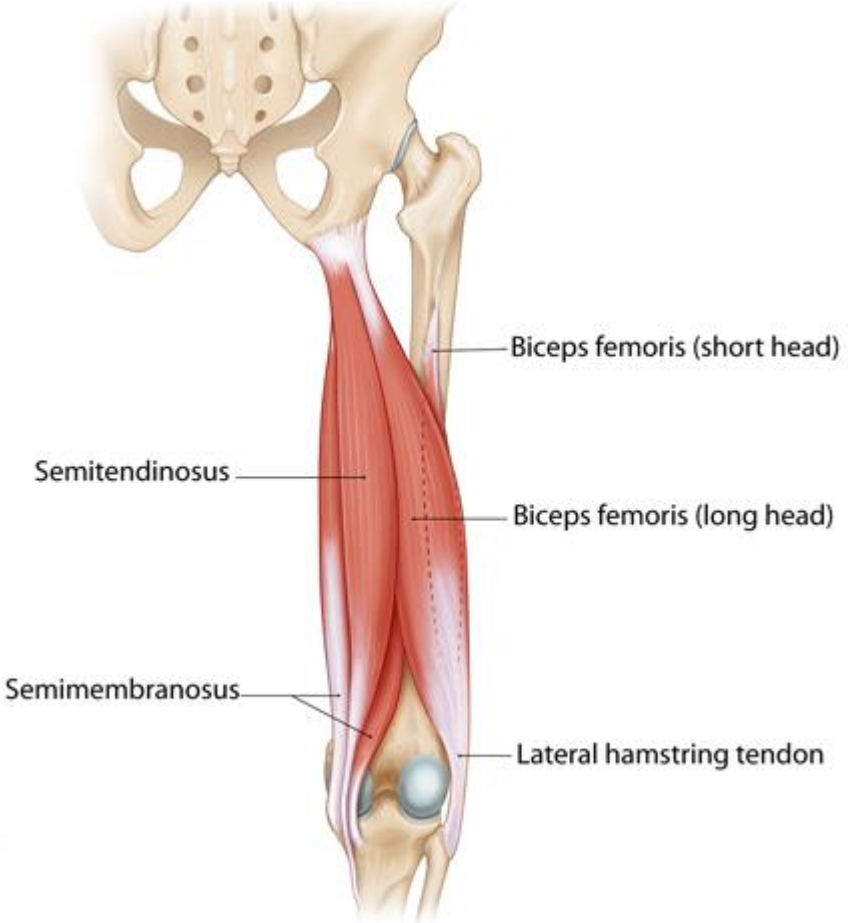

**Gluteus maximus**

Hamstrings

- Biceps femoris
- Semimembranosus
- Semiteninosus

Gluteus medius

Adductor magnus




Images from: Sonosim

# Exam: Strength Testing – Adductor Muscles

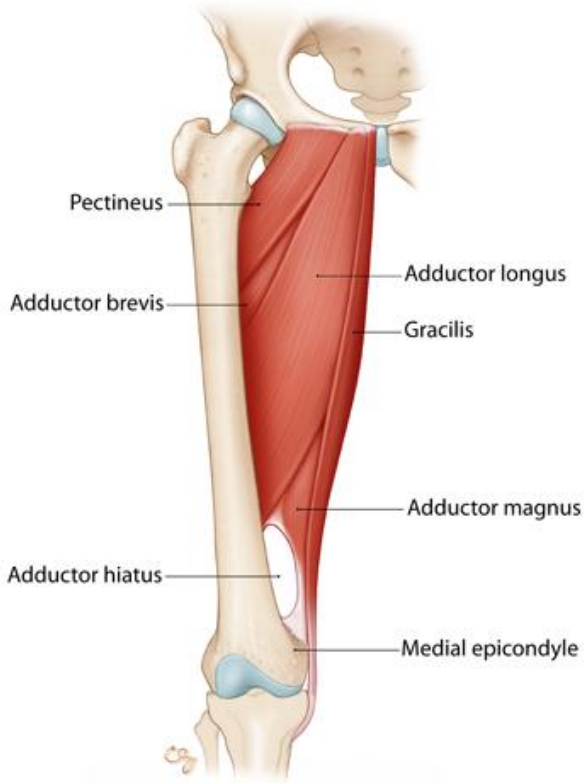



Image from: Sonosim

Adductor longus

Adductor brevis

Adductor magnus

Gracilis

Pectineus

# Exam: Strength Testing – Abductor Muscles

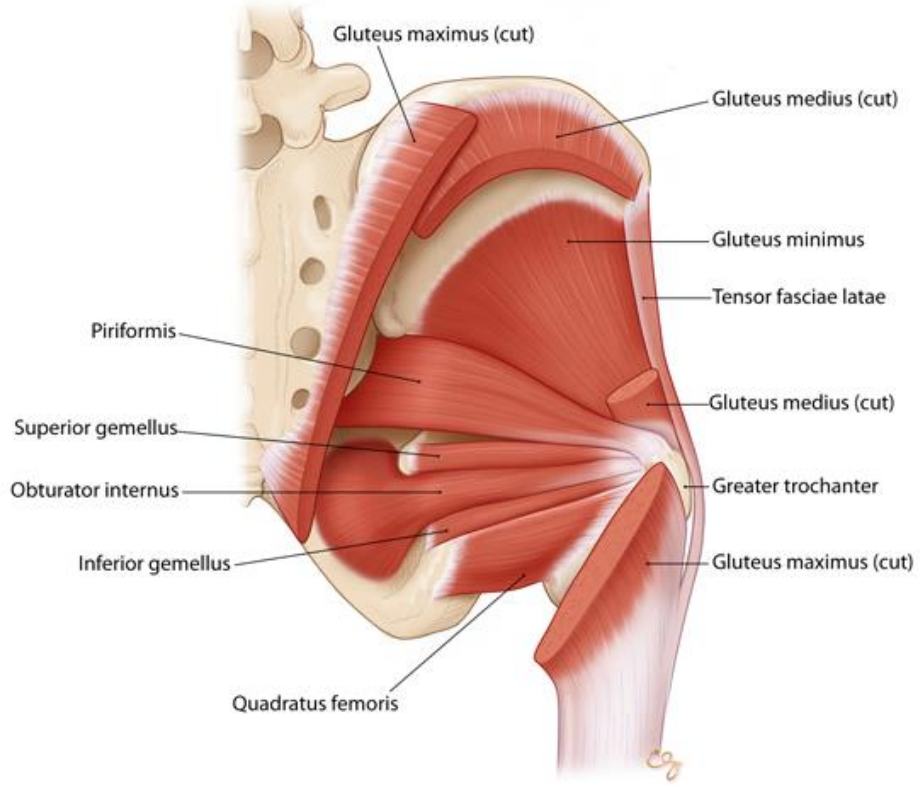



Image from: Sonosim

Tensor fasciae latae

Gluteus medius

Gluteus minimus

Gluteus maximus

Sartorius

# Exam: Strength Testing – Internal Rotation

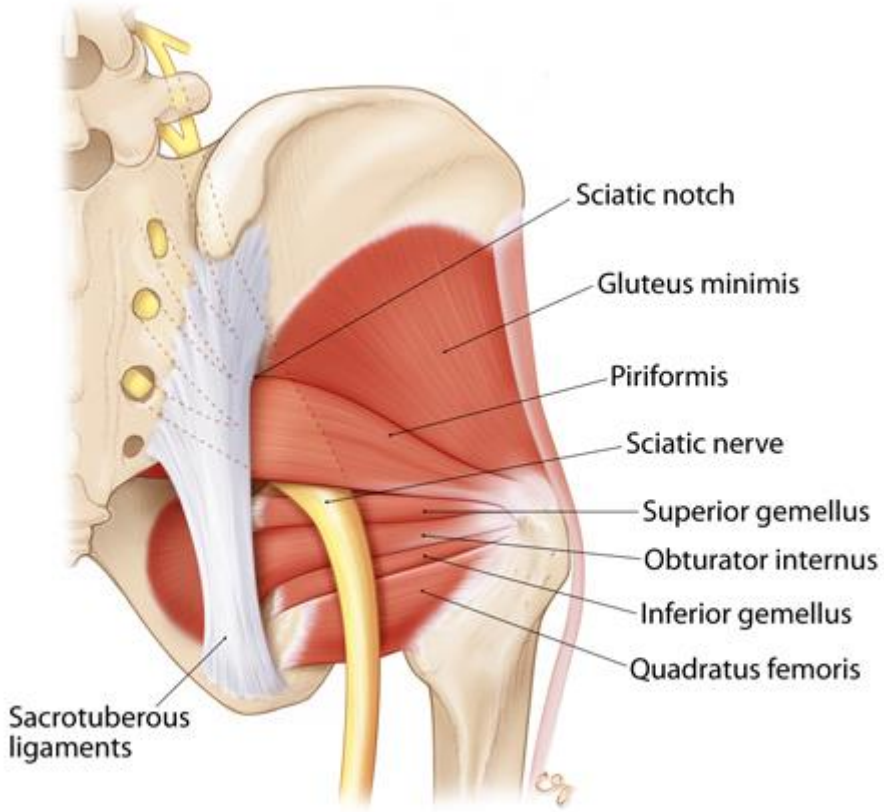



Image from Sonosim

Adductor longus

Adductor magnus

Adductor brevis

Gluteus medius

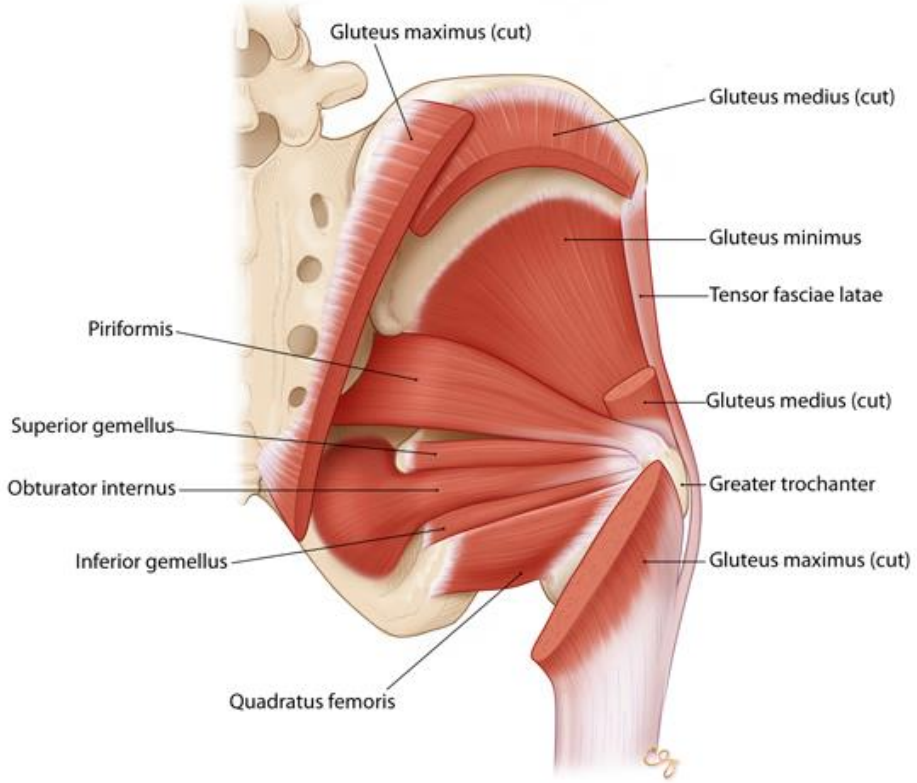
Gluteus minimus

Tensor fasciae latae

Pectineus

Gracilis

# Exam: Strength Testing – External Rotation




Images from: Sonosim

Gluteus maximus
Obturator internus
Obturator externus
Quadratus femoris
Piriformis
Gemellus superior
Gemellus inferior
Sartorius
Gluteus medius

# Exam: Special Tests

**Log Roll**

- Passive assessment of internal and external rotation at the hip
- Positive test is pain or decreased range of motion
- Helpful for diagnosis of:
  - Osteoarthritis
  - Osteonecrosis
  - Femoroacetabular impingement
  - Stress fracture

Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

# Exam: Special Tests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**FABER (Patrick's)Test**

- Passive Flexion, ABduction, External Rotation of the hip joint
- Ipsilateral pain suggests an intra-articular problem or iliopsoas strain; contralateral pain suggests sacroiliac pathology; posterior pain suggests hip impingement (FAI)

# Exam: Special Tests

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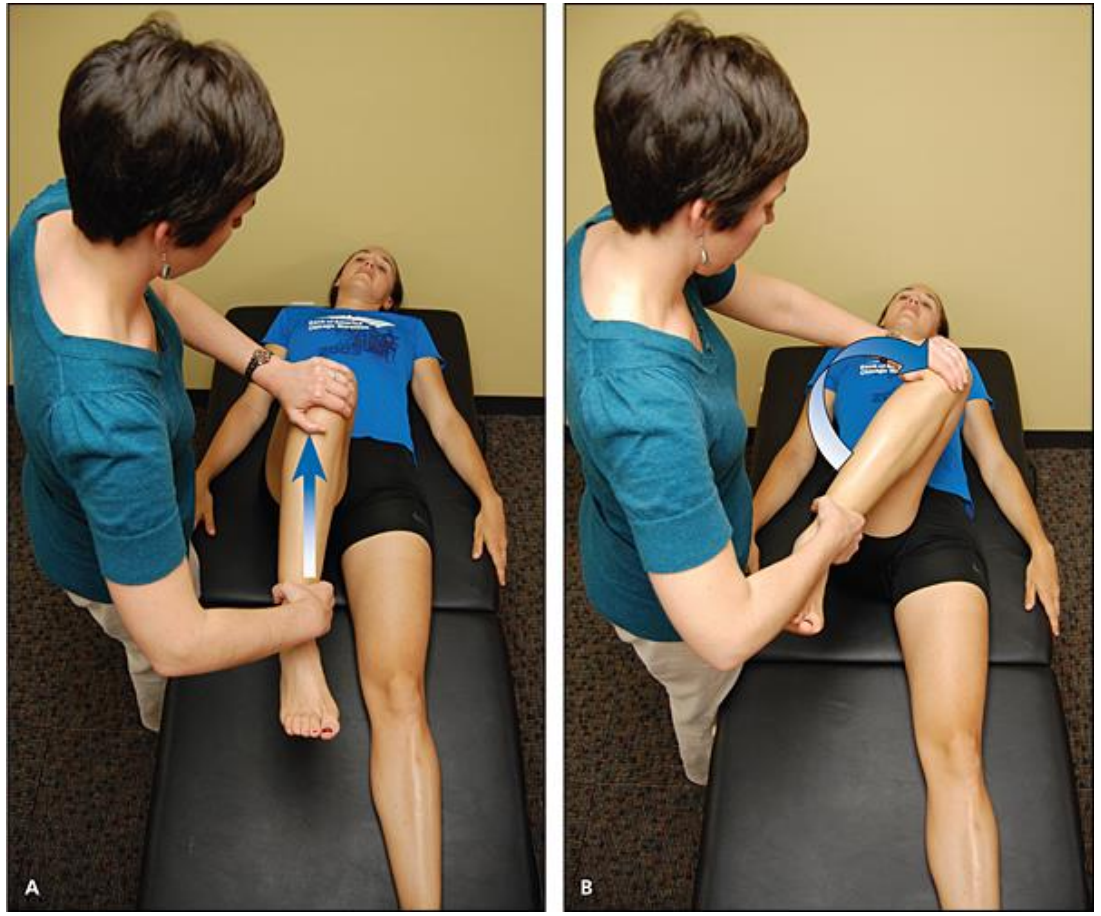
- Passive Flexion, ADduction, Internal Rotation of the hip joint
- Positive for FAI if it reproduces the patient's hip pain

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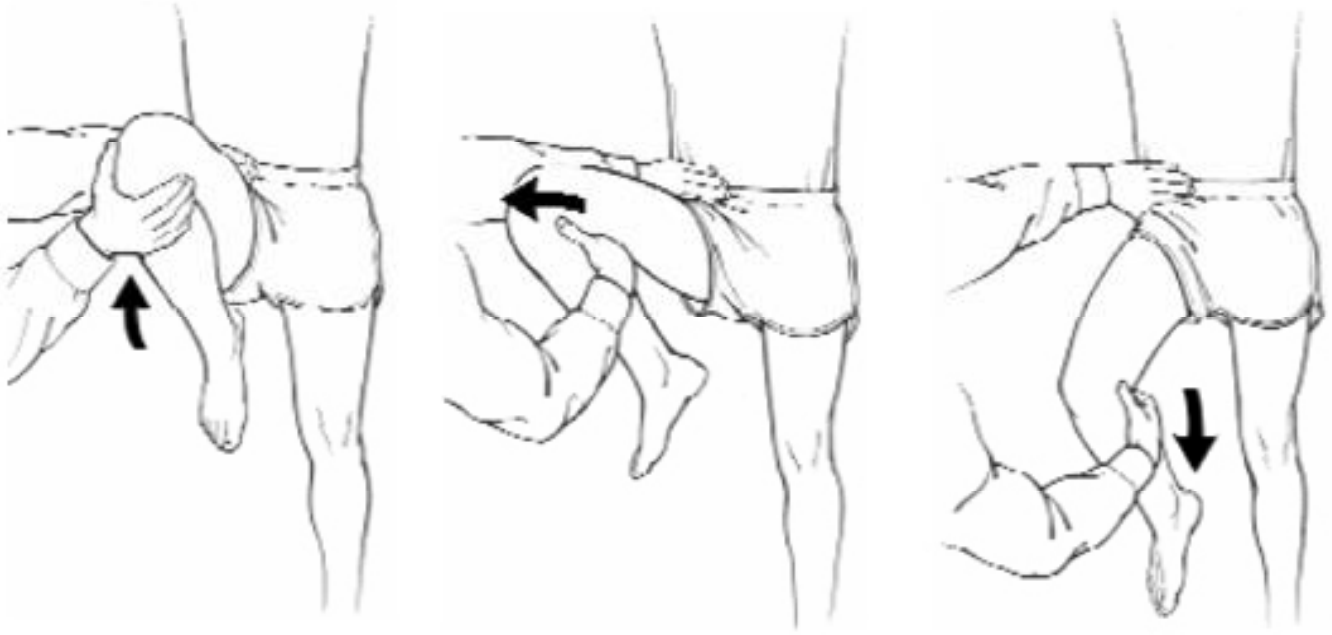


**Snapping Hip Maneuver**

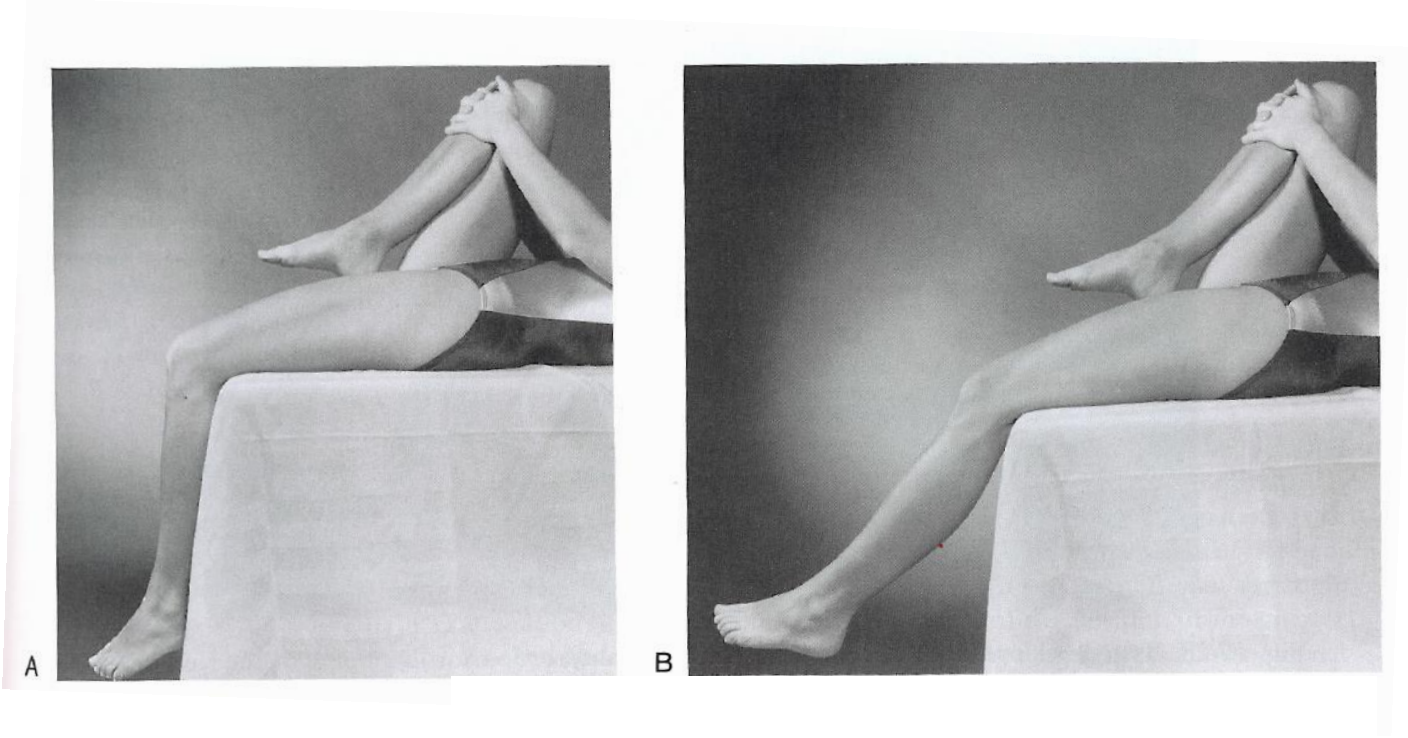
- Passive flexion, external rotation and then extension of the hip
- Positive test is a palpable snap/click and reproduction of the patient's symptoms
- Can suggest iliopsoas bursitis

Image from: Margo K, Drezner j, Motzkin D. Evaluation and Management of Hip Pain: An Algorithmic Approach. Journal of Family Practice. 2003; 52(8): 607-617.

# Exam: Special Tests

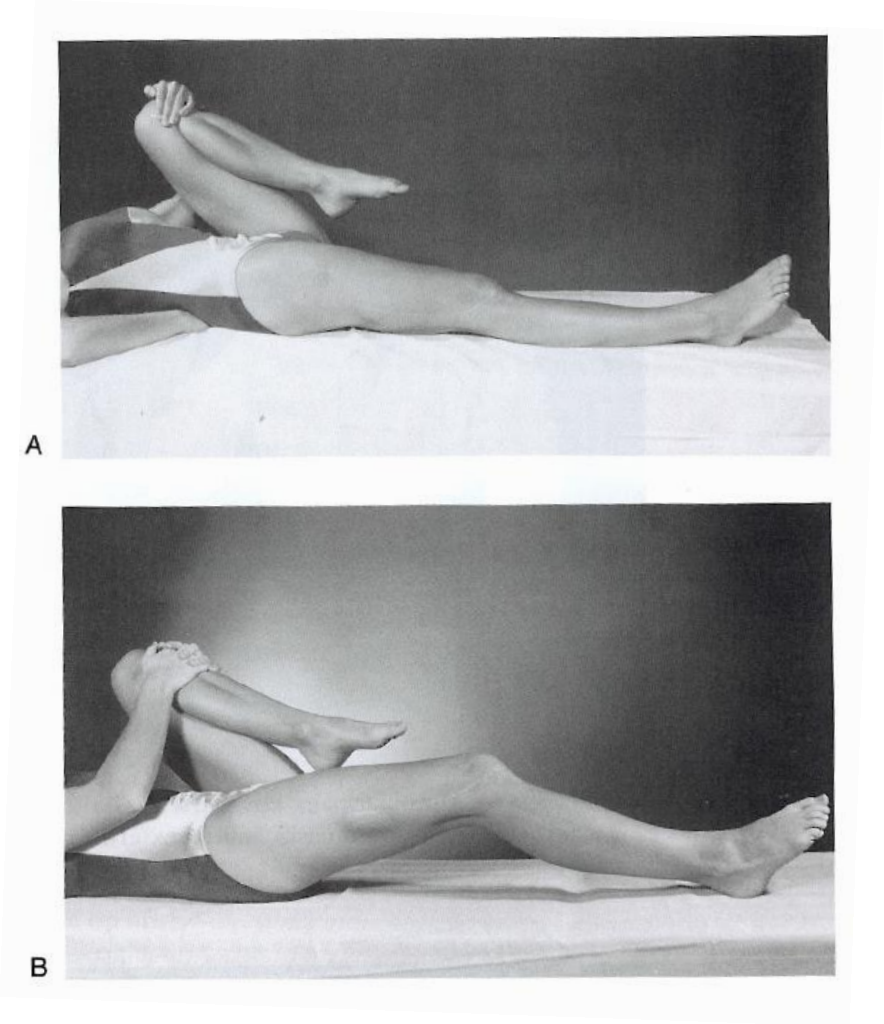
**Rectus Femoris Stretch Test**

- Patient actively flexes the opposite hip to the chest while the leg behind examined is flexed at the knee over the edge of the exam table
- Positive test is extension of the resting leg at the knee
- Suggests tightness in the rectus femoris muscle




Images from: Reid DC. Sports Injury Assessment and Rehabilitation. Philadelphia: Churchill Livingstone, 1992.

# Exam: Special Tests




**Thomas Test**

- Patient actively flexes the opposite hip toward the chest
- Positive test is knee flexion in the extended leg
- Suggests tightness in the hip flexors and psoas

Images from: Reid DC. Sports Injury Assessment and Rehabilitation. Philadelphia: Churchill Livingstone, 1992.

# Exam: Special Tests

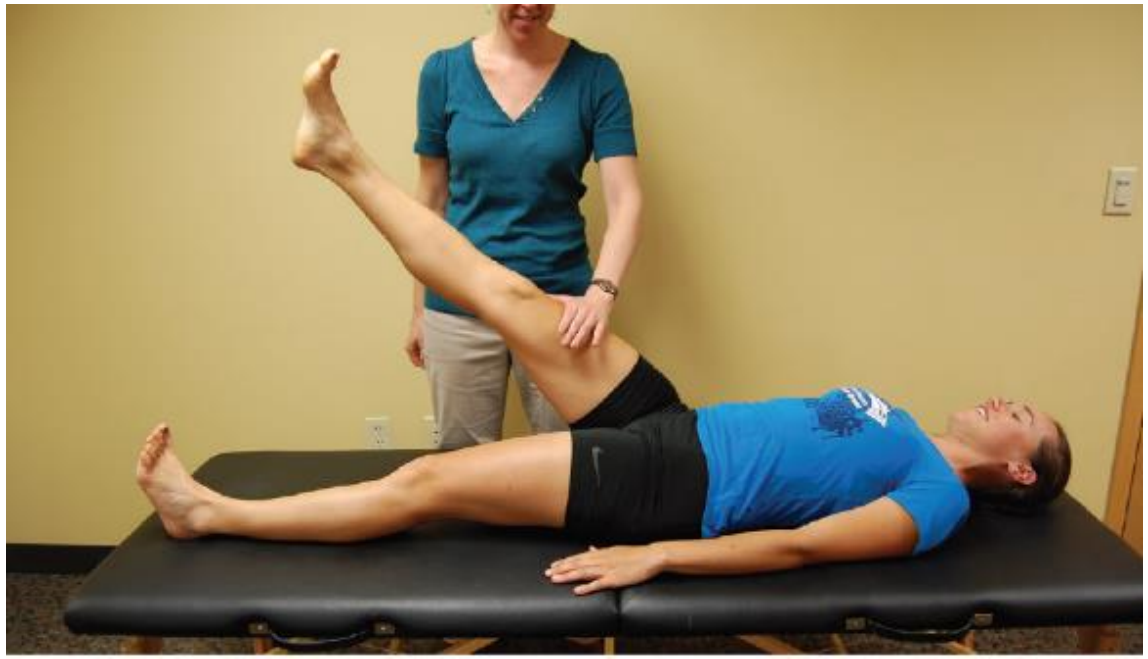


Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

**Stinchfield Test**

- Straight leg raise against resistance (pt lifts leg to 45 while examiner applies downward force on the thigh)
- Positive test is reproduction of the patient's symtoms
- Helpful for diagnosis of:
  - FAI
  - SCFE

# Case 1: Imaging


Case courtesy of Mark Baumeier, DO

# Case 1: Diagnosis

**Slipped Capital Femoral Epiphysis (SCFE)**

- One of the most commonly missed diagnoses in children
- Most common in 8-15yo
- Most common hip disorder in adolescents (10.8/100,000)
- Associated with obesity, growth spurts and sometimes endocrine abnormalities
- Usually present with limping and poorly localized pain in the hip, groin, thigh or knee

# Case 2: Anterior Hip Pain

- 22yo collegiate field hockey player with “tight hip flexor” x 3 wks
  - Anterior pain that she attributes to her hip flexor
  - Exacerbated by long training runs
  - Not better with 4 days rest when team was traveling
  - Dull, achy pain that is becoming more constant
- History of prior stress fracture in tibia
- Suspected eating disorder though BMI is in normal range

# Case 2: Diagnosis


https://jkoa.org/ViewImage.php?Type=F&aid=507940&id=F15&afn=43_JKOA_50_3_178&fn=jkoa-50-178-g015_0043JKOA

**Femoral Neck Stress Fracture**

- Most common location for stress fracture in the femur
- Relatively rare; account for only 1-7% of all stress fractures
- Are high risk on the lateral aspect of the femoral neck
- Should be on the differential for exercise induced pain that is relieved by rest

# Case 3: Lateral hip pain

- 33yo RN with “tightness” in his L hip
  - Gestures in a “c” shape to the lateral hip
  - Symptoms have been present for months
  - Stretching helps
  - Tight sensation, not painful; no radiation
  - No trauma and no h/o same prior
- Exercising daily for 1-2 hours, "sometimes more".
- No rest days.  "I feel like if I stop to rest I'll lose it."

# Differential Diagnosis for Hip Pain

| ANTERIOR | LATERAL | POSTERIOR |
|---|---|---|
| Osteoarthritis | Greater trochanteric pain syndrome | Piriformis syndrome |
| Femoroacetabular impingement (FAI) | External snapping hip (IT band) | Ischiofemoral impingement |
| Hip labral tear | Greater trochanteric bursitis | Sacroiliac joint dysfunction |
| Iliopsoas bursitis (internal snapping hip) | Gluteal muscle tear or avulsion | Lumbar radiculopathy |
| Femoral neck stress fracture | Iliac crest apophysis avulsion | Vascular claudication |
| Osteonecrosis | IT band syndrome | Ischial apophysis avulsion |
| Meralgia paresthetica | Femoroacetabular impingement (FAI) | Hamstring muscle strain/avulsion |
| Athletic pubalgia (sports hernia) | | |
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| Legg-Calve-Perthes disease | | |
| Slipped capital femoral epiphysis | | |
| Transient synovitis | | |
| Septic arthritis | | |
| Hip pointer | | |
| Apophyseal avulsion injuries (ASIS; AIIS) | | |

# Case 3: Exam

- Inspection
  - Gait
  - Muscular atrophy
  - Pelvic symmetry
- Palpation
- Range of motion
- Special tests

# Exam: Special Tests


Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

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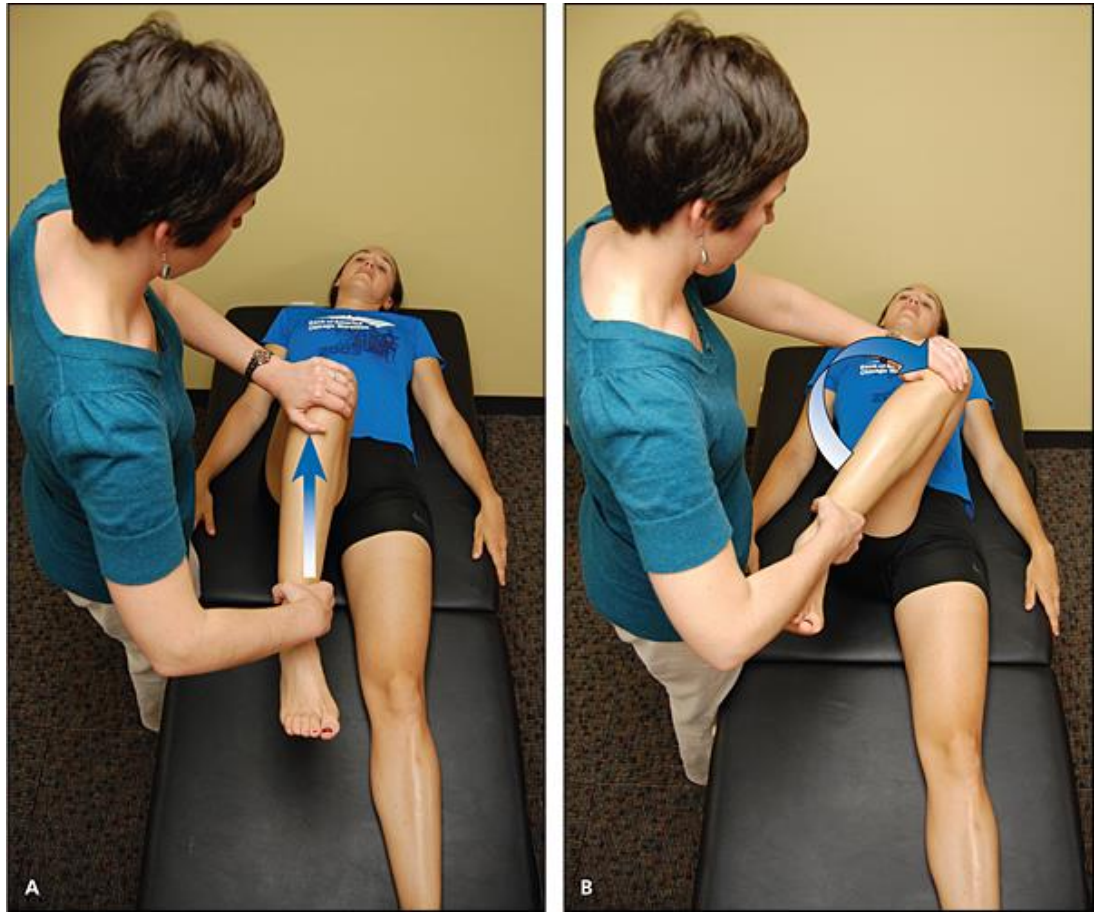



Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

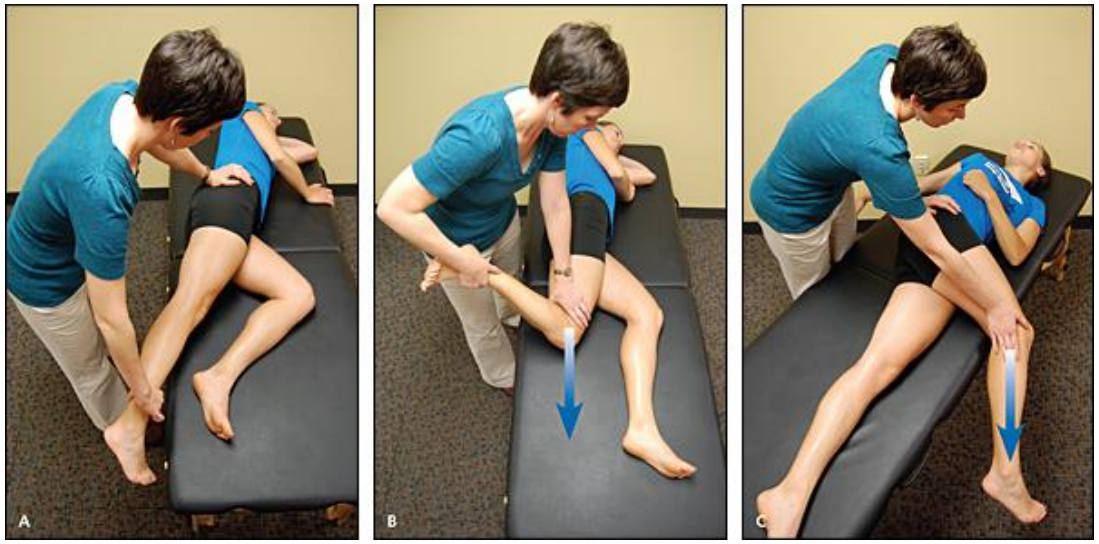
# Exam: Special Tests

**Ober's Test**

- Side lying patient with affected hip up, examiner passively abducts and extends the upper leg, watching the knee
- Positive test is when the knee does not drop toward the exam table
- Suggests tightness in the IT band

Image from: Adkins SB, Figler RA. Hip Pain in Athletes. *Am Fam Physician.* 2000 Apr 1;61(7):2109-2118

# Exam: Special Tests




(A) To evaluate the tensor fasciae latae: The hip and knee are held at 0 degrees of extension and allowed to passively adduct with gravity.

(B) The gluteus medius: The hip is held at 0 degrees of extension and 45 to 90 degrees of knee flexion.

(C) The gluteus maximus: The shoulders are rotated back toward the table, with the hip in flexion and knee in extension.

Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

# Case 3: Imaging

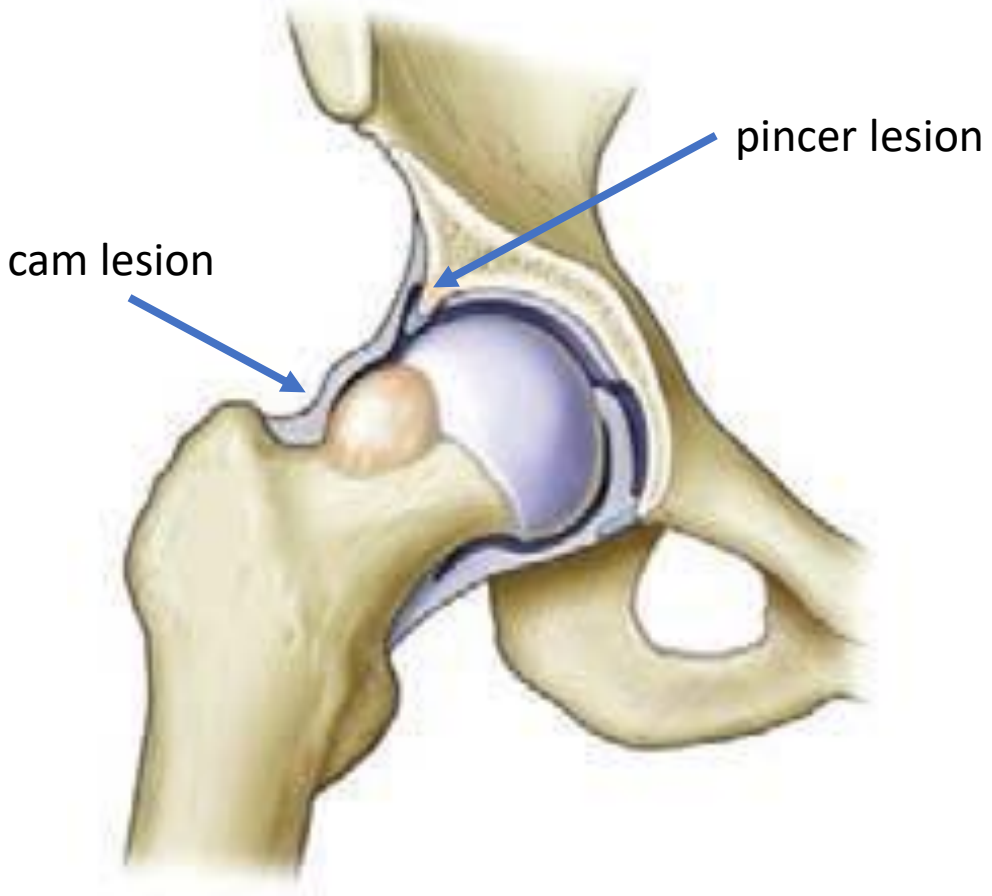


https://radiopaedia.org/cases/femoro-acetabular-impingement-fai-cam-type-with-alpha-angle-measurements

# Case 3: Diagnosis

**Femoroacetabular Impingement (FAI)**

- Common etiology of pain in athletes, adolescents and adults
- Abutment of the acetabular rim and the proximal femur
  - Causing injury to labrum and articular cartilage
  - Can lead to osteoarthritis of the hip if left untreated
- Worse with pivoting, prolonged sitting, getting in/out of a car, leaning forward
- Treated with arthroscopic surgery



# Case 4: Posterior hip pain

- 13yo male sprinter with sudden onset of R buttock pain
  - Started as he came out of the blocks in practice
  - Soreness posteriorly with radiation into hamstrings
  - Better somewhat with taking days off to rest
  - Stretching doesn’t seem to help
  - No h/o problems like this before

# Differential Diagnosis for Hip Pain

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| Slipped capital femoral epiphysis | | |
| Transient synovitis | | |
| Septic arthritis | | |
| Hip pointer | | |
| Apophyseal avulsion injuries (ASIS; AIIS) | | |

# Case 4: Exam

- Inspection
  - Gait
  - Muscular atrophy
  - Pelvic symmetry
- Palpation
- Range of motion
- Special tests

# Exam: Special Tests

**Leg Length Assessment**

- Direct assessment – ASIS to medial or lateral malleolus
  - Lateral malleolus is
- Apparent leg length: umbilicus to medial malleolus

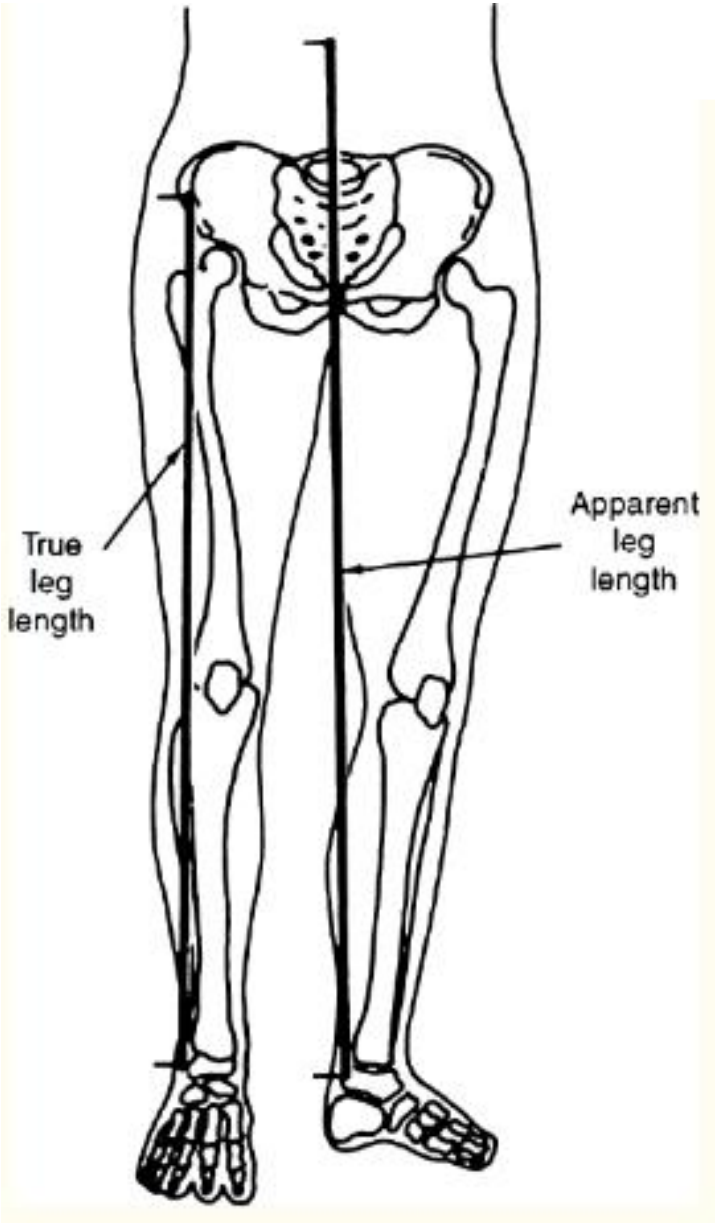


Image from: Sabharwal S, Kumar A. Methods for Assessing Leg Length Discrepancy. *Clinical Orthopaedics and Related Research*. 2008;466(12):2910-2922. doi:10.1007/s11999-008-0524-9.

# Exam: Special Tests

**Piriformis Muscle Testing**

- Piriformis syndrome is a debated diagnosis in sports medicine
- Numerous tests purported to diagnose it

| Name of test | Date first described | Description | Attributed to |
|---|---|---|---|
| Freiberg | 1934 | The patient lies prone with knees flexed and then rotates the hip | Freiberg and Vinke [1] |
| Pace | 1976 | The clinician provides resistance to hip abduction by holding the sitting patient's knee | Pace and Nagle [2] |
| Tonic external rotation of hip | 1981 | Visible sign, hip externally rotated while patient at rest in supine position | Solheim [3] |
| FAIR = flexion abduction internal rotation of hip | 1981 | Maintaining the hip in flexion abduction and internal rotation. | Solheim [3] |
| Beatty | 1994 | The patient holds the flexed hip in abduction against gravity while lying on the unaffected side | Beatty [4] |
| Heel-contralateral knee maneuver (HCLK) | 2013 | The patient externally rotates, flexes the hip, and places the heel on the contralateral knee, and then, the examiner flexes the contralateral hip | Michel et al. [5] |
| Active piriformis | 2013 | The patients actively abducts and externally rotates the hip in the lateral position against resistance by the examiner | Martin et al. [6] |
| Seated piriformis | 2013 | The examiner internally rotates the hip and palpates the sciatic notch with the patient seated | Martin et al. [6] |

Table from: Hopayian, K. & Danielyan, A. Eur J Orthop Surg Traumatol (2018) 28: 155. ttps://doi.org/10.1007/s00590-017-2031-8

# Exam: Special Tests

**Trendelenburg Test**

- Assessment of the hip abductors
- Positive test is when the pelvis drops on the unsupported side
- Helpful for diagnosis of:
  - Contusion of abductor mass
  - Impending stress fracture of the femoral neck

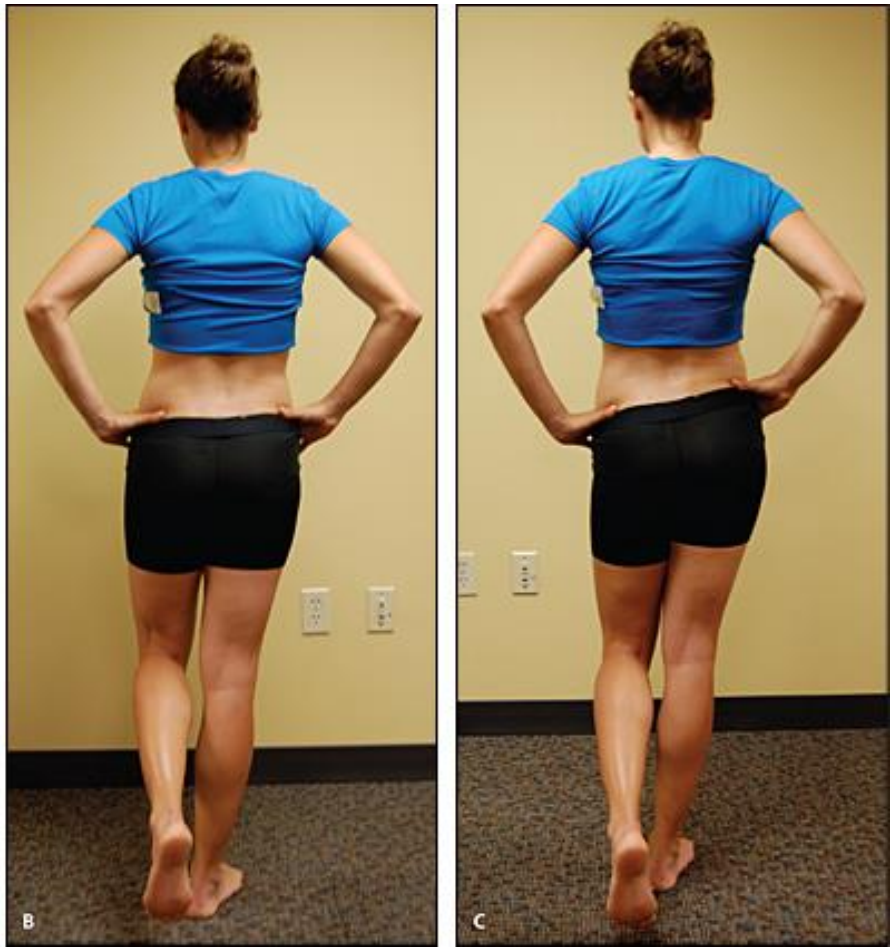


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Image from: Wilson JJ, Furukawa M. Evaluation of the Patient with Hip Pain. *Am Fam Physician.* 2014 Jan 1;89(1):27-34.

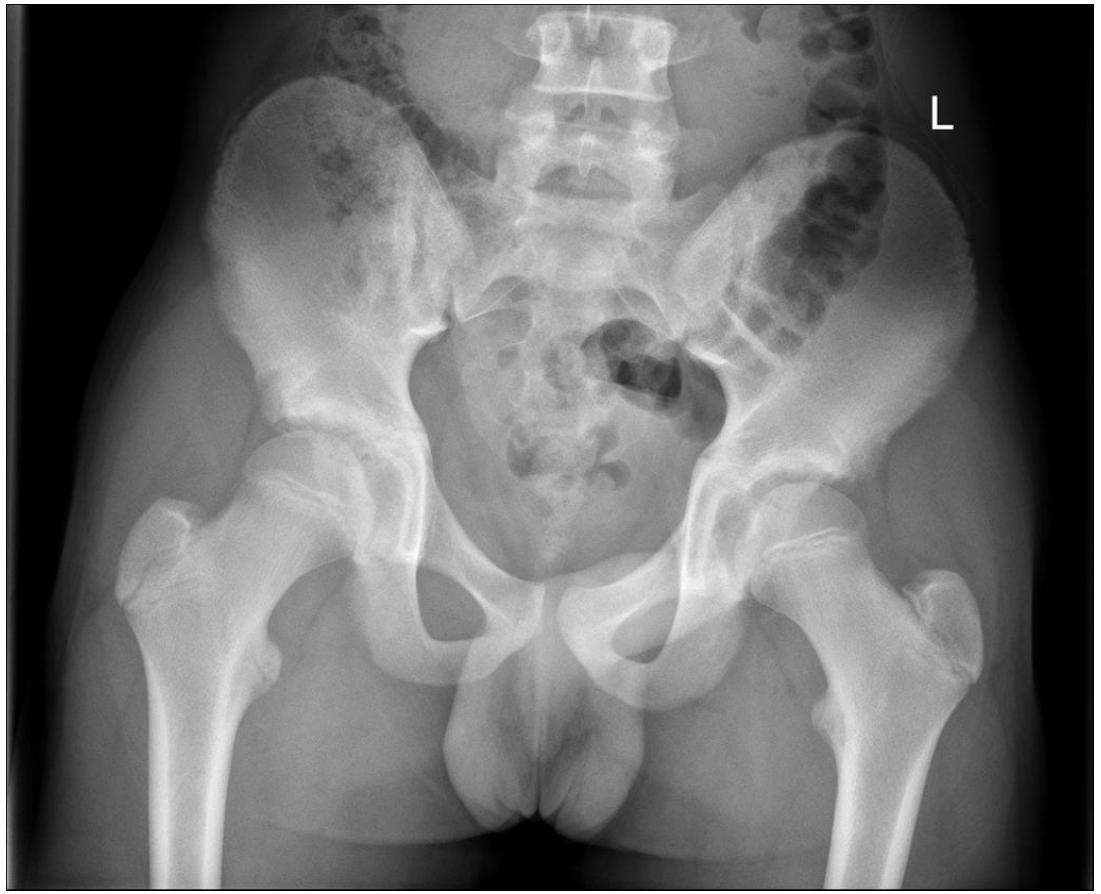
**FABER (Patrick's)Test**

- Passive Flexion, ABduction, External Rotation of the hip joint
- Ipsilateral pain suggests an intra-articular problem or iliopsoas strain; contralateral pain suggests sacroiliac pathology; posterior pain suggests hip impingement (FAI)

# Case 4: Diagnosis

**Ischial apophysis avulsion**

- Apophysis avulsion is not uncommon in adolescents prior to closure of growth plates
- Usually seen in 14 – 25yo age group
- Sudden forceful muscular contraction causes avulsion of the apophysis to which the tendon attaches.




https://radiopaedia.org/cases/ischial-tuberosity-avulsion-1

# Apophyses of the Pelvis

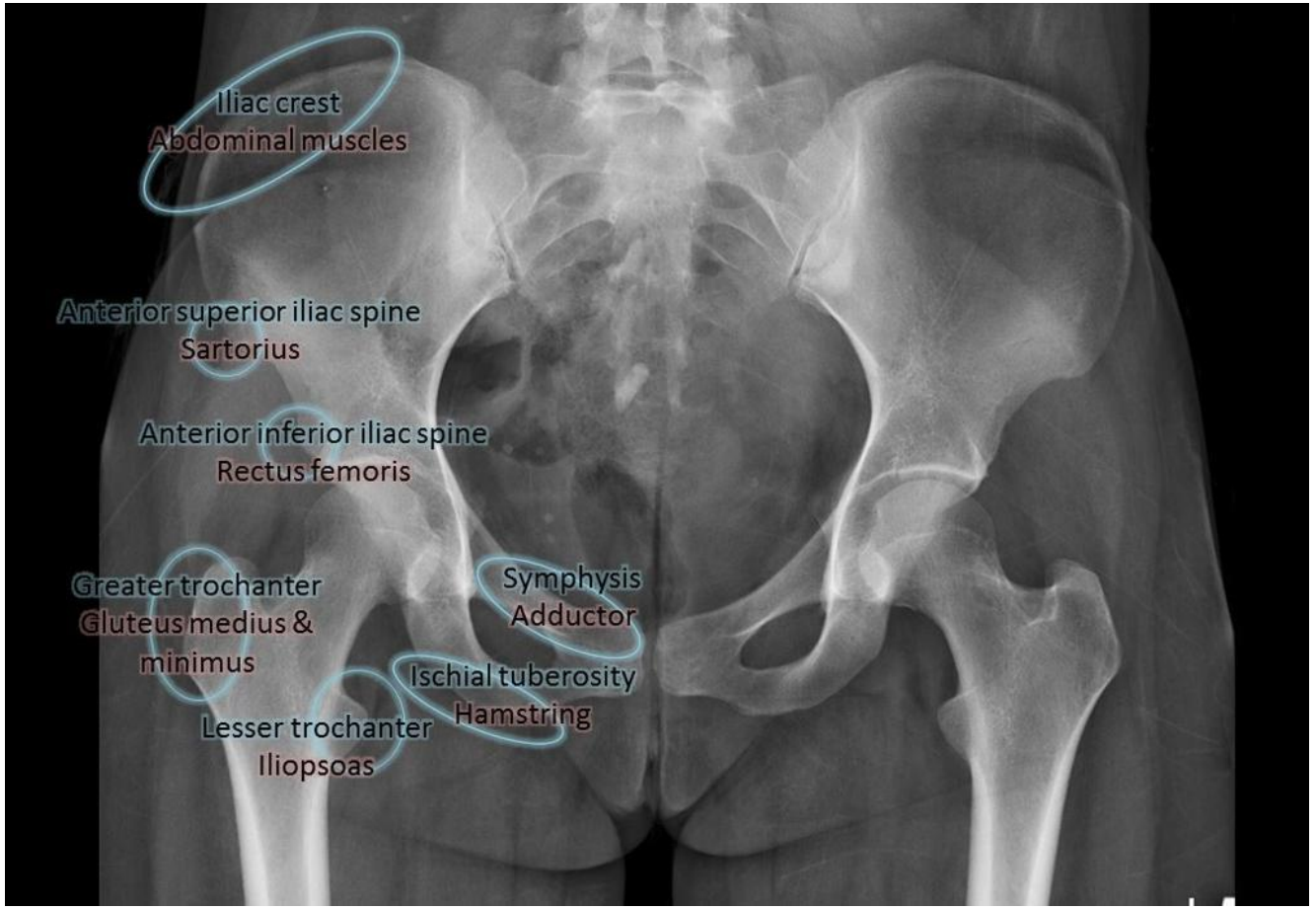



Image courtesy of Dr Andrew Ho, Radiopaedia.org, rID: 28884

# References


- Adkins SB, Figler RA. Hip Pain in Athletes. American Family Physician. 2000; 61(7): 2109-2118.
- Braly BA, Beall DP, Martin HD. Clinical Examination of the Athletic Hip. Clin Sports Med. 2006; 25: 199-210
- Kuhlman GS, Domb BG. Hip Impingement: Identifying and Treating a Common Cause of Hip Pain. American Family Physician. 2009; 80(12): 1429-1434.
- Peck DM, Voss LM, Voss TT. Slipped Capital Femoral Epiphysis: Diagnosis and Management. American Family Physician. 2017; 95(12): 779-784.
- Poultsides, L. A., Bedi, A., & Kelly, B. T. (2012). An Algorithmic Approach to Mechanical Hip Pain. *HSS Journal*, *8*(3), 213–224. http://doi.org/10.1007/s11420-012-9304-x
- Scopp JM, Moorman CT. Assessment of the Athletic Hip Injury. Clinics in Sports Medicine. 2001; 20(4): 647-659
- Verrill MM, Hall MN, Loven B. Evaluation of Hip Pain in Older Adults. American Family Physician. 2012; 86(4)
- Wilson JJ, Furukawa M. Evaluation of the patient with hip pain. American Family Physician. 2014; 89(1): 27-34