The Hip Joint

Orthopedics and Neurology
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Goals

1. Discuss specific orthopedic conditions of the hip.
2. Teach specific orthopedic tests and signs
3. Enable differentiation of hip joint conditions and diseases
The Hip Joint

• The hip is a ball-and-socket synovial joint
• The hip is an exceptionally strong and stable joint, with a wide range of multiaxial movements
The Hip Joint
Loading forces acting on the hip

1. Standing transfers one third of the body weight to the hip joint mechanism
2. Standing on one limb transfers 2.4 to 2.6 times the body weight to the hip joint mechanism.
3. Walking transfers 1.3 to 5.8 times the body weight on the hip joint mechanism.
The Hip Joint

Four major components of the proximal femur

1. Greater trochanter
2. Lesser trochanter
3. Femoral neck
4. Femoral head
The Hip Joint

Three most clinically important hip bursae

1. Trochanteric bursa
2. Iliopsoas bursa
3. Ischiogluteal bursa
Iliopsoas Bursitis
Hip Ligaments

Ligaments screws home the femoral head with extension (close-packed)
Iliofemoral Ligament

- Reinforces the fibrous capsule anteriorly
- Y-shaped and attaches to the anterior inferior iliac spine and acetabular rim proximally, and the intertrochanteric line distally.
- With extension, the ligament screws the femoral head into the acetabulum ("close-packed" position).
The Hip Joint
Sciatic nerve distribution

- Sciatic nerve exits the pelvis via the sciatic notch
- It usually passes under the piriformis
- Superior gluteal n, a branch of the sciatic, innervates the gluteus medius, minimus, and the tensor fascia lata. (Occurs prior to piriformis)
The Hip Joint
Sciatic nerve distribution

- Inferior gluteal nerve innervates the gluteus maximus and passes under the piriformis.
- Sciatic nerve is predisposed to injury from hip joint to popliteal fossa.
- Sciatic and peroneal mononeuropathies are second and first most common mononeuropathies in lower extremity.
The Hip Joint

Hip range of motion by patient

- **Supine**
  1. Raises leg above body with knee extended (flexion of hip)
  2. Knee to chest, opposite leg extended (flexion of hip)
  3. Swings leg laterally and medially with knee extended (Abduction and adduction)
  4. Side of foot on opposite knee and moves flexed knee toward table (external rotation)
  5. Flexes knee and rotates leg to move knee inward (internal rotation)
The Hip Joint

Hip range of motion by patient

- Prone or standing
  1. Swings the straightened leg behind the body
     (see page 685)
Hip Flexion
Approximately 135 degrees
Hip Extension
Normally 30 degrees
Hip Abduction
Normal limits 45-50 degrees
Hip Adduction
Normal limits 20-30 degrees
Hip External Rotation
Normal limit 45 Degrees
Hip Internal Rotation
Normal limit 35 degrees
Internal and External Hip Rotation

Flexed position
Basic Hip Radiological Study

1. AP pelvic view
2. AP spot hip view
3. Lateral (frog leg) spot view of affected side
The Hip Joint
Osseous deformities of the proximal femur

1. Coxa vara
2. Coxa valga
3. Femoral anteversion
4. Femoral retroversion
Coxa Vara
Developmental and acquired conditions

1. Intertrochanteric fracture
2. Slipped capital femoral epiphysis
3. Legg-Calve-Perthes disease
4. Congenital hip dislocation
5. Rickets
6. Paget’s disease
Coxa Vara

- Coxa vara, by definition, includes all forms of decrease of the femoral neck shaft angle to less than 120-135°.
  (see page 681 Evans figure 10-4)
- Yochum states 120-130 degrees is normal for the "Femoral angle"
  1. Coxa vara (less than 120 degrees)
  2. Coxa valga (more than 130 degrees)

http://www.emedicine.com/Orthoped/topic474.htm
Coxa Vara
Medical therapy

• Many forms of nonoperative treatment have been proposed in the past, including spica cast immobilization and skeletal pin traction with bed rest, with generally unsatisfactory results.

• It is generally accepted that no place remains for conservative nonoperative measures for individuals requiring treatment for either symptomatic or progressive CCV.
Coxa Vara
Surgical intervention

• Most patients seem to present for evaluation and are considered for treatment when aged 5-10 years.

• Femoral osteotomy procedures are technically easier in the older child, as more bone stock is present.
The Hip Joint
Anteversion and retroversion

• Normal angle of anteversion is 15 degrees (adults)
• Increase in angle = excessive femoral anteversion
• Decreased angle = femoral retroversion
Normal, Anteversion, and Retroversion

Anterior anterior angulation of the neck of the femur
Anteversion of Hip
Toe-in-gait
Retroversion of Hip

Toe-out-gait
Normal Femoral Rotation

Infants
Excessive Anteversion

More common in infants
Excessive Femoral Retroversion

Infants
Motor Testing of Hip
Primary flexor = Iliopsoas
Secondary = Rectus femoris Femoral nerve, L1,2,3
Motor Testing of Hip
Primary extensor = Gluteus Maximus
Inferior Gluteal nerve, S1
Motor Testing of Hip
Primary abductor = Gluteus medius
Superior gluteal nerve, L5
Secondary abductor = Gluteus minimus
Motor Testing of Hip
Alternate motor test for abduction
Motor Testing of Hip

Primary adductor = Adductor Longus, Obturator nerve, L2,3,4
Secondary = Add. Brevis/magnus, pectineus, gracilis
Sensory Distribution
Hip and pelvis
Sensory Distribution
Anus
Palpation
Pelvic obliquity
Bony Anatomy of Hip and Pelvis
Palpation
Iliac crest and tubercle
Palpation
Greater trochanter (posterior aspect)
Palpation
Ischial tuberosity
Sacroiliac Joint
Palpation

L4-5 spinous process
Informed Consent
Palpation

1. Explain procedure to patient
   • Technique
   • Area to be examined
   • Reason for examination
2. Request and gain permission to perform
3. Medical assistant present
Soft Tissue Palpation
Femoral triangle of Scarpa
Sartorius, inguinal ligament, and adductor longus
Soft Tissue Palpation

Inguinal ligament
Soft Tissue Palpation

Femoral artery
Soft Tissue Palpation

Normally, the femoral vein and nerve are not palpable
Soft Tissue Palpation

Sartorius muscle
Soft Tissue Palpation

Adductor longus muscle
Femoral Triangle

Tenderness and swelling in the femoral triangle may indicate enlarged lymph nodes as a result of an ascending infection or local pelvic problems.
Soft Tissue Palpation

Trochanteric bursal pain may be confused with sciatic pain
Soft Tissue Palpation

Sciatic nerve is halfway between ischial tuberosity & greater trochanter
Soft Tissue Palpation

Ischial bursitis might be confused with sciatic pain
Superficial Hip and Pelvic Muscles
Soft Tissue Palpation
Rectus femoris
Soft Tissue Palpation

Quadriceps
Soft Tissue Palpation

Origin of gluteus maximus
Hip Joint Orthopedic Tests

Hip dislocation

• Allis test
• Ortolani’s Click test
• Hip telescoping test
Allis Test
Hip dislocation

• Procedure
1. Supine
2. Knees flexed
3. Feet approximated
Allis Test
Galeazzi’s Sign
Hip dislocation or bone dysplasia

Rationale

• A difference in height of the knees = + test (supine posture)

1. Short knee (affected side) = posterior displacement of femoral head or decreased tibial length

2. Long knee (affected side) = anterior displacement of femoral head or increased tibial length
Ortolani’s Click Test

Procedure
1. Infant supine
2. Grasp both thighs with thumbs at lesser trochanters
3. Flex and abduct thighs bilaterally
Ortolani’s Click Test

Rationale

1. Either a palpable and/or audible click indicate a + test
2. Femoral displacement of femoral head
3. Common use with small children, in order to determine a hip dislocation
Congenital Hip Dislocation

- The condition is more accurately called “dislocatable hips” or “developmental dislocation of the hips” (DDH).
- Waddling, limping, toe-walking, and unequal leg lengths in a toddler or older child may be the sign of a hip problem that went undiagnosed in infancy.
- In babies, parents may notice an unequal number of thigh skin folds, uneven knee position, or legs that appear to be different lengths.

http://www.drgreene.com/21_1056.html
Congenital Hip Dislocation

• Hip dislocation is often associated with congenital torticollis. If a baby has torticollis or turned-in feet, careful attention should be paid to the hips.
• Unless the problem is corrected before the baby begins to bear weight, long-term hip damage can occur.
• Often hip instability cannot be prevented.
• Avoiding excess exposure to estrogens or medicines that relax the hips and avoiding breech delivery may prevent some cases.
Congenital Hip Dislocation

- Treatment depends on the developmental status of the hips.
- Treatment often involves holding the hips in the correct position so that they can continue their development.
- This might be accomplished with harnesses, splints, or other devices.
- Sometimes surgery is needed to correct the problem.
Hip Telescoping Test
Assessment for congenital dislocation of the hip articulation

Procedure
1. Supine posture
2. Hip and knee flexed to 90 degrees
3. Depress femur toward table
4. Lift leg from table
5. Considerable movement with dislocatable hips
Hip Joint Orthopedic Tests

Leg Length

• Actual leg-length test
• Apparent leg-length test
Actual Leg-Length Test

Assessment for true leg-length discrepancy

Procedure

1. Supine posture with feet together and lower extremities extended

2. Measure distance from apex of ASIS to medial malleolus

3. Actual leg length shortening is caused by an abnormality above or below the trochanter
Apparent Leg-Length Test
Assessment for apparent leg length discrepancy

Procedure
1. Measure from umbilicus to apex of medial malleolus
2. Measurement is an index of the functional length of the lower extremity
3. A scanogram is the most accurate confirmatory test.

http://backandneck.about.com/od/conditions/ss/tiltedpelvis_3.htm
Hip Joint Orthopedic Tests
Fracture

- Anvil test
- Chienes’ test
- Ludloff’s sign
Anvil Test

Assessment for fractures of femoral neck or head

Procedure
1. Supine posture
2. Tap with fist the inferior calcaneus.

Rationale
Localized pain indicates area of fracture, such as, femoral, tibial, fibular, or calcaneal
Chienes’ Test

Assessment for fracture of the neck of the femur

Procedure

1. Supine posture with legs extended
2. Measure circumference of thigh at level of greater trochanter of affected limb
3. Measure and record opposite leg
4. Compare to opposite leg
Chienes’ Test
Assessment for fracture of the neck of the femur

Rationale
1. Increased diameter indicates a lateral rolling of trochanter
2. Increased diameter correlates with fracture of the neck of femur
Ludloff’s Sign

Assessment for traumatic separation of the lesser trochanter

Procedure

1. Seated posture
2. Unable to raise affected limb from table
3. Ecchymosis and edema in Scarpa’s triangle
Hip Joint Orthopedic Tests

Intracapsular

- Guavain’s sign
- Jansen’s test
- Patrick’s test
Guavain’s Sign

Assessment for tuberculous arthritis of the hip joint or adult-onset osteonecrosis of the femoral head

Procedure
1. Supine with affected limb up and extended
2. Passively rotates thigh

Rationale
1. Sign is present if contraction of abdominal muscles noted on ipsilateral side of rotation
Jansen’s Test
Assessment for osteoarthritis of hip joint

Procedure
1. Supine posture
2. Active crossing of legs with ankle resting on opposite knee

Rationale
1. Patient unable to perform if significant disease exists
Patrick’s Test
Also known as FABERE Sign
Assessment for intracapsular coxa pathology

Procedure
1. Supine posture
2. Passive flexion, abduction, externally rotated, and extended of thigh

Rationale
1. Hip pain with maneuver is a positive test for a coxa pathologic condition.
Hip Joint Orthopedic Tests

Muscular dysfunction

- Ober’s test
- Phelp’s test
- Thomas test
- Trendelenberg’s test
Ober’s Test
Assessment for iliotibial band contracture

Procedure
1.  Side-lying with affected hip down
2.  Grasps ankle while steadying pelvis
3.  Abducts and extends thigh
Ober’s Test
Assessment for iliotibial band contracture

Rationale
1. Leg remains abducted with contracture
2. Test is positive with contracture with both anesthetized and conscious patients
3. + test may occur with - radiological study
4. May cause lumbosacral spinal disorders with or without sciatica
Phelp’s Test
Assessment for contracture of gracilis with associated pathology of hip joint

Procedure

• Prone posture with knees extended and thighs maximally abducted (pain & resistance)
• Actively flex knees bilaterally to right angle
• Note changes in hip abduction
Phelp’s Test
Assessment for contracture of gracilis with associated pathology of hip joint

Rationale
1. Positive test if knee flexion increases hip abduction
2. Positive test if knee extension decreases hip abduction
3. Test indicates contracture of gracilis muscle
Thomas Test
Assessment for flexion contracture involving the iliopsoas

Procedure
1. Supine posture
2. Thigh is flexed with the knee bent upon the abdomen
3. Patient’s lumbar spine should flatten
Thomas Test
Assessment for flexion contracture involving the iliopsoas

Rationale
1. Lordosis maintained = + test
2. Indicates hip flexion contracture as from a shortened iliopsoas
Trendelenberg’s Test
Assessment for insufficiency of the hip abductor system

Procedure
1. Patient stands on affected side and raises opposite limb into flexion of thigh and knee
2. Normal hip will demonstrate inferior iliac crest ipsilateral to planted foot and opposite iliac crest will present superior
Trendelenberg’s Test
Assessment for insufficiency of the hip abductor system

Rationale

1. Hip-joint involvement and muscle weakness will present an inferior iliac crest on the unaffected side and a superior iliac crest on the affected side (planted foot)

2. Legg-Calve Perthes, poliomyelitis, epiphyseal separation, coxa ankylosis, dislocation, fracture, or subluxation
Hip Joint Orthopedic Tests
Meningeal Irritation

- Guilland’s sign

Procedure
1. Pinch quadriceps with patient supine
2. Usually when sign is present the contralateral hip and knee flex
3. Presence of sign is due to meningeal irritation