Imaging of the Hip

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Imaging of Hip

- Radiographs:
  * Orthograde AP-view pelvis
- Symphysis pubis in line with coccyx
- Coccyx above symphysis by 4 cm
Radiographic Assessment

32 degrees

10 degrees
Center Edge Angle

5 degrees

22 degrees
No anterior coverage on right
Subluxation

Minimal cephalad subluxation
- CEA < 15 (20)
- Tonnis > 15 (20)
Hip Pain in Young

DDH

Anterolatera

Anterior

Lateral

Posterolateral
A patient is presented with hip pain and labral tear. The radiograph of the affected hip is shown. In order to assess the anterior coverage of the femoral head, which special view is needed?

1) Dunn’s view
2) Abduction view
3) Congruity view
4) Lequesne’s view
5) Posterior wall view
Imaging of Hip

• Abduction view
  • 30 degrees abduction
  • Neutral rotation
  • view

• Faux profile view
Imaging of Hip

Dunn’s View
The radiograph of the hip shows which anatomical abnormality?

1) Anterior deficiency of femoral head coverage
2) Anterior over-coverage of the femoral head
3) Posterior wall sign
4) Acetabular anteversion
5) Femoral retroversion
Acetabular Retroversion

Preoperative studies

- CT arthrogram/3D
- MR-arthrogram
- D-GMERIC
Routine Non-contrast Hip MRI

- Indications:
  - Fracture (consider screening pelvis exam)
  - Known AVN (for eval of articular surface)
  - Arthritis
  - Muscle or tendon pathology; bursitis

Hip MR Arthrogram

- Indications:
  - FAI / Labral tear / Intraarticular body
  - **IMPORTANT** Perform coronal STIR of pelvis. Perform all other sequences on only side in question
  - **IMPORTANT** For Femoral-acetabular Impingement, acquire axial oblique T1 fat saturated images as well
**Hip-Axial Imaging Plane**

**Relevant Anatomy**

- Ilium
- Acetabular Roof
- Greater Trochanter
- Lesser Trochanter

**Axial Imaging Plane**

Prescribe plane parallel line bisecting lesser trochanters and/or acetabular roofs. Scan from acetabular roof through lesser trochanter.
Hip-Coronal Imaging Plane

**Relevant Anatomy**

- Superior Pubic Ramus
- Femoral Neck
- Femoral Head
- Ischium
- Greater Trochanter

**Coronal Imaging Plane**

*Prescribe plane parallel femoral heads. Scan from ischium through pubic symphysis.*
Axial Oblique
(For FAI)

Relevant Anatomy

Axial Oblique Plane
Prescribe plane parallel to femoral neck. Scan through entire femoral neck.
Femoral head-neck morphology

Alpha Angle

37°

79°
Measurement of “alpha angle”

1. **Draw a circle at head**
2. **Draw line through neck**
3. **Note where femoral head ‘leaves circle’**
4. **Alpha angle: from here to femoral neck line**
Femoral head-neck morphology

Alpha Angle
OBLIQUE AXIAL PLANE

Plot off Coronal

Axial along plane of femoral neck
FAI: Triad

Abnormal alpha angle

Labral tear  Chondral injury

FAI: Chondral lesion
Labral Tear: Noncontrast

Compare sides – look for dark triangle
LABRAL TEAR: MRI

- Criteria similar to shoulder
  - Cyst = tear (most common sup/lat)
  - Fluid / contrast through
  - Displacement
  - Abnormal morphology
MR Arthrography

Surgically proven labral tear
Recess between capsule and lateral labrum

Fluid around transverse ligament

Size and shape: anterior = posterior
Which of the following is likely to lead to an increase in the signal-noise ratio (SNR) for MRI images

1) Make slices thinner
2) Increase bandwidth
3) Use a smaller coil
4) Increase TE
5) Use STIR images
HIP MRI: Maximizing SNR

- To increase SNR:
  - Make slices thicker
  - Lower bandwidth
  - Use a smaller coil
  - Lower TE
  - Avoid artifact (reduce noise)
    - Bowel / vascular motion (SPF)
- Lowering bandwidth improves SNR
- Raising BW decreases metal artifact
Bursitis

- Greater trochanteric bursitis – lateral
  - Fluid common; often asymptomatic, related to obesity (B/L, more diffuse)
- Iliopsoas bursitis – anterior
  - No fluid normally
  - Snapping hip: “coxa saltans”
  - Friction effect from iliopsoas tendon over anterior ridge of acetabulum
- DDx: labral tear
A patient is complaining of left hip pain that has not responded to administration of NSAID (see image). The next best course of action is:

1) Corticosteriod injection of the joint
2) Corticosteriod injection of the iliopsoas bursa
3) Corticosteriod injection of the abductor bursa
4) Resection of the osteophyte on the femoral neck
5) Acetabular osteoplasty
Greater Trochanteric Bursitis

Whole pelvis FOV useful for symmetry and the “big picture”
Small FOV of hip for characterization of specific pathology

Gluteus medius / minimus tear

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AVULSION FRACTURE

- Due to sudden forceful muscle contraction
- Sartorius, rectus femoris in adolescents “hip pointer”
- Gluteus medius / minimus, obturators in elderly
Anterior Superior Iliac Spine (ASIS)

Sartorius avulsion
AllS - Rectus femoris avulsion
RECTUS FEMORIS

Partial tear (grade 2)
STRESS FRACTURE

MRI
- Edema on T2w / STIR
- +/- Periosteal reaction
- Subcortical line (may be subtle)
  - Low signal on T1, T2
  - Represents trabecular microcallus
  - Look for extent of propagation across bone
- First described 3rd trimester of pregnancy
- Very painful; typically resolves spontaneously
- Xray: asymmetric osteopenia
Early AVN or Transient Osteoporosis?

**DDx:**
- Xray/CT (density)
- Gd MRI (vascularity)
- Follow-up (resolution)

Small FOV to see subchondral fracture line
Avascular Necrosis

Subchondral fx

Early collapse

Sagittal small FOV for anterior articular surface, labrum
A 67-year-old patient is presented with hip pain that has not responded to non-operative measures. The best surgical option available for this patient is:

1) Core decompression
2) Core decompression with bone grafting
3) Labral repair and osteoplasty
4) Acetabular osteotomy
5) Total hip arthroplasty
OA with Subchondral Cyst

Anterosuperior cartilage loss, labral tear
Synovial Osteochondromatosis

Small FOV for erosions, bodies

Synovial proliferation
Numerous bodies
Erosions
Rheumatoid Arthritis

Large FOV for symmetry
A patient is presented with hip pain and loud snapping sounds of the hip when hip is flexed from an extended position. The hip appears to lock on a daily basis. The best next step in management of this patient is:

1) CT Scan of the hip
2) MR-arthrogram of the hip
3) Iliopsoas tendon injection
4) Physical therapy and NSAIDS
5) Hip arthroscopy
**COXA SALTANS**

**SNAPPING HIP**

- **DDX**
  - Labral tear
  - Intraarticular bodies
  - Bursitis (IP)
  - IT band syndrome

*Displaced labral fragment*
Labral Tear with Cyst

Need fluid-sensitive sequences as well
- Marrow
- Periarticular soft tissues
- Paralabral cysts may not fill with contrast
OCCULT FRACTURE

- S/P fall, elderly, osteoporotic
- Delayed Dx leads to complications
- Bone scan findings delayed
- If Xray neg, MRI better option than CT (if available)
Also check the Exam Corner
T1 useful to see fracture line

STIR for detection, soft tissue injury
GLUTEUS AND ADDUCTOR TEARS

INTERTROCHANTERIC FRACTURE
-NOT SEEN ON RADIOGRAPHS
Infection

Osteomyelitis / Abscess

Gd: thick rim enhancement

$T2 / STIR$: ‘dirty’ fluid

Gd: thick rim enhancement
Athletic Pubalgia Exam Selection:

Indications:

Suspected rectus abdominis / adductor strain, osteitis pubis, “sportsman’s hernia”
Baseball catcher with chronic osteitis pubis, now with acute groin injury while fielding a bunt
That's All, Folks!

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