MRI Hip and Groin Pain

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Pelvic Overuse Injury

- 5-6% athletic injury in adults
- 10-24% athletic injury in children
- lower limb dominated athletic activity: football, rugby, running, ballet
- MRI global view bone and soft-tissue
  IV gadolinium
- MR arthrography

Bencardino, Palmer RCNA 2002;40:267
Aetiology : Groin pain

- Articular
- Osseous/Tendo-osseous
- Muscular
- Paratendinous/Bursal
Articular injury

- hip ligament tears
- labral tears
- femoroacetabular impingement
- osteochondral injuries
- transient bone marrow oedema
Intrinsic Hip Ligaments

- Acetabular fossa
- Acetabular labrum
- Lunate surface
- Obturator artery
- Pubic tubercle
- Pubis
- Acetabular branch of obturator artery
- Artery of ligament of head
- Ligament of the femoral head
- Obturator membrane
- Ischial tuberosity
- Synovial sleeve around ligament
- Transverse acetabular ligament
- Obturator foramen
Intrinsic Ligament Injury

- isolated ligamentum teres injury rare
- subtle subluxation - rugby fall on flexed knee with hip abducted
- posterior acetabular fracture
- only 5% diagnosed pre-arthroscopy

Ligamentum teres injury
Extrinsic Hip Ligaments
Extrinsic Ligamentous Injury

- iliofemoral ligament injury
  common following dislocation
  subtle hip subluxation - rugby

- early OA

- arthroscopic capsulorrhaphy

Boutin, Newman MRI Clins NA 2003;11:255
Iliofemoral ligament injury
Labral tears

- non-specific symptoms
- predispose to OA
- sport - repetitive direction change
- MR arthrography >> conv MR
  sensitivity 90%; accuracy 91%*
- paralabral cyst - increases specificity

*Czerny et al AJR 1999;173:345
Paralabral cyst
Femoroacetabular impingement

- hip flexion, adduction, internal rotation
- abnormal head-neck morphology
  - pincer, cam, mixed
- subcortical oedema or cyst formation
- ant-sup labral tear
- ant-sup acetabular cartilage abnormality

Kassarjian et al Radiology 2005;236
Siebenrock et al JBJS 2003;85:278
Femoroacetabular impingement

Cam-type

Ito et al JBJS 2001; 83:171
Schmid et al Radiology 2003;226:382
Siebenrock et al JBJS 2003;85:278
Femoroacetabular impingement
Osteochondral injuries

- repetitive microtrauma
- subclinical shearing/impaction injury
- subtle hip instability - contact sports
- often superomedial femoral head

Weaver et al AJR 2002;178:973
Overdeck, Palmer Sem Musculoskeletal Radiol 2004;8:41
Osteochondral injuries
MR arthrography

[Images of MRI scans highlighting osteochondral injuries]
MR arthrography vs hip surgery

- 40 patients: 2 readers
  sens 50-79%: spec 77-84%
  acc 69-78%: poor kappa

- good for high grade cartilage defects
- poor for softening, fibrillation, flaps, small loose osteochondral fragments

Schmid et al Radiology 2003;226:382
Transient Bone Marrow Oedema

- Self limiting bone marrow oedema and synovitis in the hip
- Osteopaenia and insufficiency fractures
  - young males following sports injury
  - Pregnancy, middle age F>M
- May be a continuum to ischaemic necrosis
- Treated with biphosphonates to speed recovery
Osseous/Tendo-Osseous Injury

- osseous injury
- stress response/fracture
- tendo-osseous injury
- apophyseal injury
- enthesopathy
- tendon avulsion
Stress Fracture

- 20% all injuries in sports related trauma
- normal bone subject to abnormal forces
- prox femur, pubic rami, sacrum
- risk factors
  - female > male 1.5-3.5 : 1
  - declining fitness with age

Stress fracture

- 340 - activity related hip/groin pain
  - 40% stress fractures
  - 60% proximal femur: 40% pelvis
  - incidence F > M

- plain films inadequate in early stress injury
  sensitivity 15% at diagnosis, 50% at F/U

- MRI gold standard
  specificity: MRI > bone scintigraphy

*Kiuru et al Eur Radiol 2003;13:605
Stress Injury - MR classification

- grade 1 - periosteal oedema STIR/T2
- grade 2 - bone marrow oedema STIR/T2
- grade 3 – marrow oedema on T1 and STIR/T2
- grade 4 - low signal fracture line
  - correlates with symptoms
  - useful prognosticator for rehab

Yao et al Acad Radiol 1998;5:34*
Tendo-osseous injury

- developing skeleton - physis/apophysis
  stress response
  apophyseal avulsion

- mature skeleton - enthesis
  enthesopathy
  tendon avulsion
  tendon and bony avulsion
203 avulsion injuries in adolescent athletes

Osteitis pubis - Athletic pubalgia

- chronic athletic groin pain
- insidious onset 6-12 weeks
- common in football
  - incidence 14-28% in soccer players
  - 10% acute :18% chronic injuries
  - parasymphysisal stress response
  - cleft effusion
  - adductor tendinopathy

Kavanagh et al Semin Muscoloskeletal Radiol 2006;10:197;23:472
Robinson, English Semin Muscoloskeletal Radiol 2011;15:14
Muscle injury

- common in football
- iliopsoas, gluteus, pectineus, hip rotators
- frequently present with hip/groin pain
- tend to rehabilitate quickly <2/52wks
- occasionally develop chronic symptoms

heterotopic ossification
Iliopsoas
Pectineus
Quadratus femoris
Tendon/Bursal Overuse Injury

- overuse/impingement injury
- bursitis/paratendinitis/tendinopathy
  - iliopsoas
  - iliotibial tract/gluteus
  - common hamstring
- audible/palpable snapping +/- pain

Overdeck, Palmer Sem Musculoskeletal Radiol 2004;8:41
Iliopsoas bursitis
Iliopsoas paratendinitis
common hamstring enthesisopathy
Hip and groin pain

Summary

- Articular injury
- Osseous/Tendo-osseous injury
- Muscular injury
- Paratendinious/bursal injury
Summary
MR Imaging - Technique

• non-specific groin pain
• extra-articular abnormality
• cor/ax T1 and STIR/VEfs
• cor/ax T1 fat sat post gad
Summary
MR Imaging - Technique

• internal hip derangement
• effusion

SFOV cor/ax oblique VE fat sat
• no effusion

MR Arthrography
cor/ax oblique/sag oblique T1 fat sat