Sources of hip and groin pain

Articular:
- Osteoarthritis
- Femoro-acetabular impingement (FAI)
- Labral
- Hip dysplasia
- Ligamentum teres tears
- Chondral lesions

Extra articular:
- Adductor related groin pain
- Hip flexor related groin pain
- Gluteus medius tendinopathy
- Rectus abdominis strain
- Pubic groin pain (osteoitis pubis)
- Snapping hip syndrome
- Athletic pubalgia (sports hernia)

Referred:
- Lumbar spine and SIJ
- Lower abdominal (gastrointestinal)
- Pelvis (genitourinary)
- Abdominal muscle strains

Rare:
- Stress fracture neck of femur
- Avascular necrosis head of femur
- Metastasis / tumour
Hip & groin pain part 1

History - aspects & questions that help guide diagnosis

- Childhood diseases e.g. Perthes (age 4-8), dysplasia – 20-25 years later more likely to develop hip osteoarthritis. Patients often forget about these problems so ask about hip braces when a child.
- Family history of early osteoarthritis
- Fracture – long bone fractures from skiing accidents likely to develop post traumatic osteoarthritis
- Training load – high impact activities such as football/hockey or excessive stretching such as martial arts/ballet
- Location of pain – groin, buttock. Patients may present with both
- Limping when in pain
- Mechanical symptoms – clicking, clunking, catching associated with pain
- Early morning stiffness in patient over 45

Special questions

- How are symptoms after long periods of sitting?
- How are symptoms when putting on socks?
- How are symptoms when squatting or bending forwards?
- Have they stopped sports activities?
- What are the aggravating activities? Deep flexion based or loaded rotation?

Red Flags

- History of cancer
- Trauma – twisting, overstretching
- Night pain – may be present in labral pathology, glute medius tendinopathy or end stage osteoarthritis
- Weight loss
- Systemic symptoms – fatigue, low energy levels
The acronym SAM can be used to remember specific red flags for the hip:

- **Stress fractures** – common in young white females with BMI less than 19. Present with acute onset ache in anterior aspect of thigh and unable to run. Should be wary of runners who have stopped running due to pain or have pain with weight bearing activities.

- **Avascular necrosis** – risk factors include long term oral steroids, drug abuse, sickle cell anaemia, alcoholism. Present as severe night pain. Often missed on x-ray in the first 4-5 months, MRI is the investigation of choice. In initial stages symptoms may present as mechanical however if it does not respond to treatment in 2-3 months then consider MRI.

- **Metastasis** – previous history of cancer even 20-30 years ago. The hip is the 2nd common site for metastasis after the thoracic spine. Imaging should be routinely performed in patients with a history of cancer, especially if they present with new onset of hip pain for no reason. May initially present with mechanical osteoarthritis type symptoms.

### Outcome Measures

The Copenhagen hip and groin outcome score (HAGOS) can be used monthly to monitor patient progress.

### Articular causes

#### Osteoarthritis

Patients with OA present with low irritability. Morning stiffness should last less than 10 minutes, and if it persists longer than 30 minutes it may suggest Ankylosing Spondylitis or other Rheumatological conditions. Patients with hip osteoarthritis often have groin pain however anterior thigh pain and knee pain may also be present.

Restriction of internal rotation range of movement may affect the SIJ and lumbar spine mechanics, creating a mixed symptom presentation. A mild osteoarthritic hip may respond well to anti-inflammatory medications.
Example: Patient in late 30’s early 40’s who has previously been very active however has returned to activity following a long break. They start crossfit/Zumba and complain of niggling pain in the hip.

Hip impingement

Patients with hip impingement often have highly levels of pain, especially with sitting, and may be unable to sit longer than 20-30 minutes. This condition does not respond to anti-inflammatory medications. Hip impingement often affects the functional ability of the patient and may occur in younger patients. Hip impingement is more common in females in the general population however is more common in young males in the sporting population.

Hip dysplasia may present similarly to hip impingement however the patient will not have restriction in range of movement and pain is not aggravated with sitting. Hip dysplasia may be aggravated with walking, standing and running. Often present in a dance population or martial arts complaining in pain at end of range abduction and external rotation. In a normal hip the labrum is a non-weight bearing structure taking 1% of weight. In a dysplasic hip the labrum takes 10-11% of the weight. In patient who do lots of end of range loading activities such as yoga the labrum becomes irritable and degenerative changes occur.

Example of hip impingement: White female in late 20’s with normal BMI. Complaining of on/off hip and groin pain for at least 1-2 years. This is mainly aggravated by sitting and flexion based activities.

Labral pathology

Acute labral tears or pathology is higher irritable, often causing patients to stop sporting activities. Patients may report limping, holding onto the bannister when ascending or descending? stairs, painful clicking/catching, sharp and dull pain and night pain. Patients may become angry and frustrated due to their lack of functional ability and may be taking high level pain killers. These patients are easy to flare up with treatment and take longer to rehabilitate.
Example: 21 year old rugby/football player who has had on/off groin pain since age of 18. Previously diagnosed with adductor pathology. Reports severe limitation in function and restriction in range of movement.

**X-ray**

Hip dysplasia is easy to diagnose with an x-ray as it presents as a lack of coverage of the acetabulum on the femoral head. This can be measured using the lateral centre edge angle, with a normal hip measuring 25-39°. Less than 20° is dysplasia and too much coverage may be diagnosed as a pincer. The alpha angle can be used to assess if a cam is present. An alpha angle of more than 55° then a cam is present, over 78° is a large cam.

The joint space is important to consider on an x-ray. A joint space less than 2mm is a poor marker for hip arthroscopy and these patients have a high conversion rate to total hip replacements within 3-4 years.

**Surgical referral**

If bone morphology limits the range of movement then this will limit function and cause pain. A minimum of 15° of internal rotation is required for rotational sports. Patients with longstanding hip impingement symptoms which limits function and have failed 6 months of conservative treatment may be appropriate for surgical referral. Patients with cam lesions may be fast tracked to surgical referral if not improving and lack range of movement. Patients with a symptomatic cam lesion are 4 times more likely to develop osteoarthritis.

Patients with jobs that do not allow activity modification such as yoga/ballet teachers and personal trainers may benefit from early surgical referral. Poor outcomes are associated with low pre-operative function therefore there is an argument to not delay surgical referral until a patient has stopped all activities.

Prior to arthroscopy surgeons may perform a diagnostic intra articular hip joint injection and a CT scan to further assess the bone morphology.
Extra articular

Patients with muscular pathologies are often able to be more specific about location of pain. To diagnose muscle pathology there should be localised pain, pain with resisted muscle testing and pain with muscle stretch. However, patients may present with a combination of extra articular and articular pathologies. A patient may present with hip impingement and longstanding adductor pathology. When rehabilitating a muscle pathology if it does not improve within a month then it may be in combination with an articular pathology. If both are present, then start with the extra articular pathology first.

Iliopsoas

Iliopsoas pathology has a higher incidence in females. Iliopsoas syndrome comprises of tendinopathy, snapping hip and iliopsoas impingement. When testing resisted hip flexion position the hip into 90° hip flexion with slight abduction and external rotation to avoid an impingement position. Pain will also be present during a Thomas test. Palpation is difficult due to the deep position of the iliopsoas muscle.

Webinar

As mentioned in this episode Benoy will be presenting a webinar with clinical edge. The webinar will discuss:

- Rehabilitation of adductor and iliopsoas
- Risk factors
- Practical tips
- Common presentations
- Osteitis pubis, sports hernia, hip impingement
- Rehabilitation from initial stages to plyometrics
The Adult Hip patient
(The Diagnostic Challenge)

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Introduction
The hip joint is a weight-bearing joint which allows a wide range of motion yet remains stable due to its ball and socket anatomy. Anterior Hip and groin pain are common in both sports medicine and primary care setting. Conditions like hip impingement syndromes, labral tears, chondral lesions and ligament teres injuries are being increasingly identified as cause of hip and groin pain in the physically active population between the ages of 18-45. Surgery for the non-arthritic hip patient has increased by nearly 442% over the last decade in the UK and by 1800% in the US.

Hip and Groin pain can originate from the hip joint, groin, surrounding musculature, sacroiliac joints, lumbar spine, abdomen, or pelvis. Diagnosing the cause of hip pain in the active population can be difficult, but it can be accomplished with an understanding of local anatomy combined with a thorough history and physical examination. Use of a systematic physical examination will assist the clinician in demystifying this region of the body and narrowing the differential diagnosis.

Biomechanics
During gait, the maximum pressure occurs in the antero-superior femoral surface and superior acetabular dome. Standing on one leg generates a force of approximately 2.5 times the body weight across the loaded hip. Running increases femoral head forces to roughly 5 times the body weight, whereas simply performing a supine straight-leg raise generates 1.5 times the body weight across the hip joint.

Femoral Anteversion
The normal child is born with 40 degrees of femoral anteversion. This gradually decreases to 10 to 15 degrees at adolescence and generally improves with further growth. Femoral anteversion is a condition in which the neck of the femur leans forward. Excessive anteversion can overload the anterior structures of the hip joint, including the labrum and capsule, and can cause groin pain in certain individuals.
Common Sources of Hip & Groin Pain

Hip and Groin pain is a common presentation in the active population. There are numerous causes, which can cause hip and groin pain. They can be divided into two categories – Articular Pathologies and Extra-articular pathologies.

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<thead>
<tr>
<th></th>
<th>Articular Causes</th>
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<tbody>
<tr>
<td>1</td>
<td>• Femoro-acetabular Impingement (FAI)</td>
</tr>
<tr>
<td></td>
<td>• Acetabular Labral tears (ALT)</td>
</tr>
<tr>
<td></td>
<td>• Chondral lesions</td>
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<tr>
<td></td>
<td>• Osteoarthritis</td>
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<td></td>
<td>• Hip Dysplasia (HD)</td>
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<tr>
<td></td>
<td>• Ligamentum Teres tears</td>
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<td></td>
<td>• Hip Joint Instability / Capsular Laxity</td>
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<tr>
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<th>Extra Articular Causes</th>
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<tr>
<td>2</td>
<td>• Adductor related Groin Pain</td>
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<tr>
<td></td>
<td>• Hip Flexor related Groin Pain</td>
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<tr>
<td></td>
<td>• Gluteus Medius tendinopathy &amp; tears</td>
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<tr>
<td></td>
<td>• Rectus Abdominis Strain</td>
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<tr>
<td></td>
<td>• Pubic Groin Pain (Osteitis Pubis)</td>
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<tr>
<td></td>
<td>• Snapping Hip Syndrome (External &amp; Internal)</td>
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<td></td>
<td>• Athletic Pubalgia (Sports Hernia)</td>
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<tr>
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<th>Referred Pain</th>
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<tr>
<td>3</td>
<td>• Lumbar Spine (Disc, Pars Injuries, Facet arthropathy) &amp; SIJ</td>
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<td></td>
<td>• Lower abdominal (Gastrointestinal)</td>
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<td></td>
<td>• Pelvis (Genitourinary)</td>
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<td></td>
<td>• Abdominal Muscle Strains / Side Strain</td>
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<th>Rare (Not to miss)</th>
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<tr>
<td>4</td>
<td>• Stress Fractures of neck of femur</td>
</tr>
<tr>
<td></td>
<td>• Avascular Necrosis of head of femur</td>
</tr>
<tr>
<td></td>
<td>• Metastasis / Tumour</td>
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Hip Impingement Syndromes

Femoro-acetabular impingement (FAI) is a recently recognised condition as a cause of hip and groin pain in the active population and has gained increasing attention over the past decade. In the past, this pathological process simply went undiagnosed.

It is defined by abnormal contact between the femoral neck and the acetabular labrum, which is subdivided into three main subtypes – Cam, Pincer and Mixed. The most frequent location for FAI is the antero-superior rim area and the most critical motion is internal rotation of the hip in 90 degrees flexion. The abnormal bone at the head neck junction is called CAM and the process is called cam impingement. Pincer deformity is caused by an overgrowth of bone at the acetabular margin. In majority of symptomatic FAI cases, a combination of cam and pincer may exist.

A recent definition of FAI was provided by Agricola (2014)

“A clinical entity in which a pathologic mechanical process causes hip pain when morphologic abnormalities of the acetabulum and / or femur, combined with vigorous hip motion (especially at the extremes) lead to repetitive collisions that damage the soft-tissue structures within the joint itself.”

The most common movement that brings on pain is end-range hip flexion and internal rotation. Patients will experience pain, usually in the groin, but sometimes further down the anterior thigh, lateral hip or buttock pain. There may be episodes of clicking in the hip, or the sensation that it is coming out of joint. Patients often find that sitting for a prolonged period of time, e.g. long car journey, will bring on groin pain and they often struggle to move into a more comfortable position. It is usual for FAI patients to have difficulty in squatting or their symptoms to be aggravated by flexion based exercises such as cycling or rowing at the gym.
**01 Cam Impingement**

A cam deformity is an extra bone formation, most often found at the anterolateral head-neck junction. The cam deformity may be forced into the acetabulum during flexion and internal rotation of the hip, which is known as cam impingement. It has been proposed that a cam deformity is acquired during growth since radiological cam deformity is not present before the age of 12 years. Cam-type FAI is more prevalent in young male patients who engage in sports which involve combined axial loading and rotation such as football and basketball.

A cam deformity is usually quantified by the alpha angle, which measures the extent to which the femoral head deviates from sphericity. A recent epidemiological study proposed an optimal cut-off value of 60° to best define the presence of a cam deformity. It was reported that for every degree increase in alpha angle equated to a 5% increase in the risk for receiving total hip replacement at 19 years follow-up.

**02 Pincer Impingement**

A variety of morphological and orientation abnormalities can cause a global or focal overcoverage of the femoral head which may subsequently lead to pincer impingement. Due to the acetabular overcoverage, the femoral neck may impact upon the the labrum and acetabular rim, especially during hip flexion. Other variations which are commonly seen are acetabular retroversion in which there is a prominent front of the acetabular socket or a femoral head that is positioned deeply in the acetabulum (also referred as coxa profunda).
Pincer type FAI presentation is more prevalent in middle aged women who are involved in activities which involve end range hip movements such as yoga or dance based training.

**03 Mixed Cam and Pincher FAI**

This is the most common type of FAI, whereby there is an overlap in the bony features of both cam and pincer. Standard radiographs are useful as primary imaging tests. MRI examination is able to detect changes such as cartilage damage, paralabral cyst, synovitis, bone marrow oedema and to rule out red flag pathologies such as avascular necrosis.

There are other types of impingement such as iliopectineus impingement, ischiofemoral impingement and sub-spine impingement. Their detailed descriptions are beyond the scope of this chapter, however they are briefly mentioned.

**04 Ilio-psoas Impingement**

The iliopectineus tendon is located directly anterior to the antero-superior capsulolabral complex. In Iliopectineus impingement, the iliopectineus tendon may impinge on the underlying acetabular anterior wall, joint capsule or acetabular labrum. Possible contributing factors are tightness, adherence or hypertrophy of the iliopectineus or iliocapsularis tendon.

This pathology can be complicated by co-existing iliopectineus bursitis or chronic iliopectineus tendinopathy. It should not be confused with snapping hip syndrome, which is common in young athletes such as ballet dancers. Audible hip snapping is normally absent in iliopectineus impingement, which distinguishes it from the snapping hip syndrome.
05 Ischio-femoral Impingement

This mechanical disorder occurs due to an abnormal contact between the ischium and the lesser trochanter, most commonly following total hip replacement or proximal femoral intertrochanteric osteotomy. This condition is more common in females than males with age range of 30 to 71 years (mean age of 53 years).

Patients with ischiofemoral impingement present with groin and gluteal pain which may radiate to the lower leg due to sciatic nerve irritation. The diagnosis of ischiofemoral impingement can be challenging, as there is no specific clinical test, and therefore imaging is crucial. The treatment of this condition varies from conservative measures such as CT guided cortisone injection to surgical excision of the quadratus femoris or lesser trochanter.

06 Subspine Impingement

This condition is normally a sequela to avulsion injury of the rectus femoris muscle at the anterior inferior iliac spine. It is otherwise called iliac spine impingement or AIIS impingement and can occur in sports which involves repeated sprinting action. The bony protrusion of the AIIS may come into contact with anterior aspect of the femoral neck leading to mechanical impingement. Usually, symptomatic patients will need surgery since they don’t usually respond to conservative management.

Ligamentum Teres Tears

The awareness of ligamentum teres (LT) tears as a cause of hip pain has increased with advancements in hip arthroscopy over recent years. It is a common finding, seen in patients undergoing hip arthroscopy for chronic groin pain. The LT ligament is as strong as the anterior cruciate ligament and has an important role in maintaining hip stability and preventing excessive motion that can occur in sporting activities. It has been shown that patients with LT tears have increased ROM, especially in flexion and internal rotation. The LT test as described by O’Donnell et al (2014) is a reliable clinical test to assess the presence of a torn LT with a sensitivity and specificity of 90% and 85%.
LT tears have been classified into three groups by Gray & Villar (1997)

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
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<tr>
<td>Full thickness Tear</td>
<td>Partial Thickness Tear</td>
<td>Degenerate Tear</td>
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**Ostetis Pubis**
It is a non-infective inflammatory response of the pubic symphysis secondary to overload and commonly seen in team sports such as football and rugby. Clinically, there is marked tenderness in pubic symphysis region on palpation. It is normally seen as an associated finding in chronic adductor related groin pain in the athletic population.

**Stress Fractures**
These tend to occur mostly in the female runners and the military population and the common location is the proximal femur and inferior pubic ramus. MRI is the investigation of choice for stress fractures since plain radiographs have low sensitivity and may not reveal the fractures in the initial stages.
Acetabular Labral Tears

Acetabular labral tears are becoming diagnosed with increasing frequency because of improvements in MRI and arthroscopic techniques. The prevalence of labral tears in young and active patients with mechanical hip or groin pain has been reported to be around 22 – 55%.

Anatomy

The acetabular labrum is a fibrocartilaginous structure that outlines the acetabular socket. It is a continuous, usually triangular structure that attaches to the boney rim of the acetabulum and is completed at the inferior portion by the transverse acetabular ligament over the acetabular notch. The thickness of the labrum may slightly vary, but it is from 2 to 3 mm thick. The labrum is wider and thinner in the anterior region and thicker in the posterior region.

Function

The hip labrum has many functions, including shock absorption, joint lubrication, pressure distribution and aiding in stability. The labrum resists lateral and vertical motion of the femoral head within the acetabulum. It deepens the acetabulum by 21% and increases the joint surface area by 28%. Without the labrum, the articular cartilage must withstand significantly increased pressure, leading to increased contact stress by as much as 92%. Several studies have found an association between acetabular labral tears and early onset of osteoarthritis.

Causes of Labral Tear

The common cause of labral tears is secondary to abnormal hip morphology such as femoracetabular impingement or dysplasia. The presence of acetabular labral tears in the presence of normal radiographs is very uncommon. Repetitive activities that involve twisting or pivoting motions on a loaded femur have been associated with labral damage. Specific sporting activities such as soccer, hockey, golf and ballet, have been linked to labral abnormalities because they require frequent external rotation. It is thought that the labrum takes on a weight-bearing role at the extreme of motion with excessive forces leading to tearing. The majority of tears (86-94%) are found in the anterior quadrant.
Clinical Presentation

The typical presentation is pain in the groin region with mechanical symptoms (clicking, catching and locking). Pain can also be present in the lateral hip region, anterior thigh and buttock region. The symptoms are commonly aggravated with prolonged sitting, impact and pivoting activities. Night pain and pain with walking is a common finding. The diagnosis of labral tears must be considered for active patients who present predominantly with groin pain that is worsened with activity with minimal changes in hip radiograph.

The most consistent physical examination finding is a positive anterior hip impingement test. Physical exam findings remain inconsistent, because of the variable locations of labral tears. Thomas test has been shown to be sensitive and specific for labral tears. Magnetic resonance arthrography (MRA) is the diagnostic test of choice, with arthroscopy being the gold standard.

Management

Small tears could be managed conservatively with appropriate rehabilitation programme. However, large tears in the active individual would need surgical management to reduce pain and improve function. Arthroscopic treatment of labral tears has been shown to be effective with patients returning to pre-injury activity levels.

Online Presentation:

Overview of Hip Labral Tears at:

http://youtu.be/rdgqtzfgTtc

Hip Special Tests at:

http://youtu.be/oCnXsZFHPEA
Adult Hip dysplasia

Dysplasia of the hip refers to a wide variety of pathologies where the bones of the hip are not aligned properly, leading to improper orientation of the acetabulum to the femoral head. In the case of acetabular dysplasia, the acetabulum is typically shallow with antero-superior deficiency. This could lead to increase in increase in joint reactive forces, acetabular rim damage and eventually articular cartilage destruction. The labrum is typically thickened and the sometimes, the femoral head can be small.

The condition is more common in women (nearly 80% of patients) and is often the cause of premature arthritis in women below the age of 50. One Large Danish study found that nearly 4 per cent of adults have it. Around 40 per cent of the 75,000 people who have total hip replacements each year in the UK have underlying signs of dysplasia.

Clinical Presentation

The typical onset is between the ages of 20 and 40. Pain is most commonly localised to the groin and/or the lateral aspect of the hip. Activity related hip pain is common and majority of patients report limp associated with their symptoms. It is usually aggravated with walking and activities like getting in & out of car. While there is no specific test to diagnose hip dysplasia on physical examination, pain is typically reproduced with end-range external rotation of the hip.

The mean time from the onset of symptoms to the diagnosis of hip dysplasia is around 5 years (Nunley, 2011). It is not unusual for women with a dysplastic hip to encounter problems following pregnancy or a year afterwards. Sometimes, symptoms can often go undetected in certain patients until osteoarthritis has set in, and a full hip replacement is needed.

Surgery

There are two main forms of surgery used in adult hip dysplasia - Pelvic osteotomy (before the onset of OA) and Total hip replacement (after OA has set in).
# Hip OA Vs Greater Trochanteric Pain Syndrome

<table>
<thead>
<tr>
<th>Primary Hip Osteoarthritis</th>
<th>Greater Trochanteric Pain Syndrome</th>
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<tbody>
<tr>
<td><strong>Typical Presentation</strong></td>
<td><strong>Typical Presentation</strong></td>
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<tr>
<td>• Normal onset is over the age of 50</td>
<td>• Chronic lateral hip pain which may spread down lateral thigh to the knee</td>
</tr>
<tr>
<td>• Early onset can occur if associated with family history of Hip OA</td>
<td>• Common age group is 40-60 years and more in females</td>
</tr>
<tr>
<td>• Persistent pain localised to the groin +/- buttock or may radiate down the anterior thigh (no lower than the knee)</td>
<td>• Usually unilateral but can be bilateral</td>
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<tr>
<td>• Early morning stiffness not usually lasting for longer than 30 minutes and stiffness after prolonged rest</td>
<td>• May have co-existing low back pain</td>
</tr>
<tr>
<td>• Worse with prolonged use e.g. weight bearing activities such as walking, standing and squatting. Also prolonged sitting with hip in flexion.</td>
<td>• Aggravated by lying on the affected side, prolonged standing, getting up from sitting, sitting crossed legged, climbing stairs, running and high impact activity</td>
</tr>
<tr>
<td>• Eased with rest and NSAIDs</td>
<td>• Eased with ice packs or NSAIDs.</td>
</tr>
<tr>
<td>• Night pain and hip flexion contracture can be present with progression of OA.</td>
<td>• Can affect sleep if the patients lies on the affected side.</td>
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<tr>
<th>Key Clinical Findings</th>
<th>Key Clinical Findings</th>
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<tbody>
<tr>
<td>• Antalgic gait or walk with limp in advanced OA</td>
<td>• Single leg standing for 20-30 secs reproduces lateral hip pain</td>
</tr>
<tr>
<td>• Positive Trendelenberg</td>
<td>• Positive Trendelenberg if associated with Gluteus Medius weakness</td>
</tr>
<tr>
<td>• Loss of medial rotation (MR) with end-range pain</td>
<td>• Localised tenderness on palpation of greater trochanter</td>
</tr>
<tr>
<td>• Pain reproduced on combined flexion, adduction and MR of hip</td>
<td>• External de-rotation test reproduces pain and has high specificity for Gluteus Medius tendinopathy</td>
</tr>
<tr>
<td>• FABER distance is reduced on affected side with groin pain on overpressure</td>
<td>• Pain can be reproduced on resisted hip abduction in side-lying</td>
</tr>
<tr>
<td>• Stiff passive accessory glides</td>
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</tbody>
</table>
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