# Labral tears: understanding the significance of acetabular rim lesions

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**Labral tears often occur in association with articular cartilage damage and are being increasingly identified in patients presenting with groin and lateral hip pain. Arthroscopy has become the new tool for the diagnosis and treatment of this condition.**

The expanded use of arthroscopic hip procedures in the late 1990s has led to an increased understanding of the pathophysiology of arthritic hip disorders. The management of early hip disease has become one of the new frontiers of sports medicine and early intervention in arthritis surgery. However, some misconceptions have arisen – for example, that labral tears commonly occur in isolation. The purpose of this paper is to shed light on some of these misconceptions.

The pathology causing symptoms of early arthritis of the hip joint most often begins at the labral-acetabular articular cartilage junction, specifically at the antero-superior aspect of the acetabulum. Untreated, this pathology can progress to osteoarthritis of the hip joint.

## Anatomy

The acetabular labrum is a rim of fibrocartilage (similar in structure to the knee meniscus) that attaches to the rim of the acetabulum, further deepening the socket. While there are significant variations in the size of the socket between individuals, shallow sockets or hips with acetabular dysplasia are usually associated with a large hypertrophied labrum. As with the knee menisci, the labrum is thought to be important for the protection and nutrition of the articular cartilage and increasing the stability of the hip joint.

## Labral pathology

The six main causes of labral pathology are:

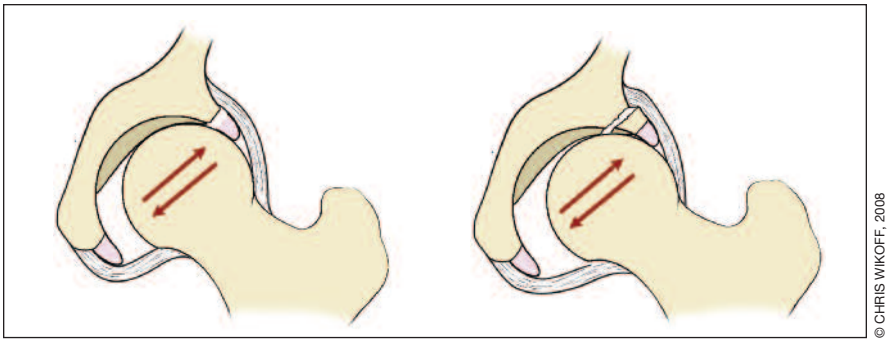
- instability of the femoral head from acetabular dysplasia (Figure 1)
- impingement due to deformities of the femoral head (asphericity) – cam impingement (Figure 2)
- impingement from a deep or retroverted acetabulum hitting the femoral neck in hip flexion – pincer impingement
- recurrent impingement and/or 'banging' of the femoral neck against the acetabular rim from certain sports or other activities
- mixed impingement from a combination of the above factors
- degenerative labral pathology due to ageing.

The ensuing damage and/or degeneration of the labral-acetabular articular cartilage junction arising from any of the insults described above is referred to as an acetabular rim lesion. These lesions are of varying levels of severity, identifiable on MRI scans and clearly visualised and staged at hip arthroscopy.

## Acetabular rim pathology

The earliest stage of an acetabular rim lesion involves simple softening and then fissuring at the labral-acetabular articular cartilage junction. Correction of the cause of the lesion at this early stage leads to symptom relief and improved longevity of the hip. One option for correcting acetabular dysplasia is by periacetabular osteotomy (i.e. turning the acetabulum over the top of the femoral head for better coverage and hence increasing the weight bearing surface).

As the rim lesion pathology worsens





Figures 1a and b. Schematic representation of acetabular dysplasia leading to rim overload with acetabular labral tearing (a, left) and an associated stress fracture of the bony rim (b, right). Arrows indicate sliding movement.

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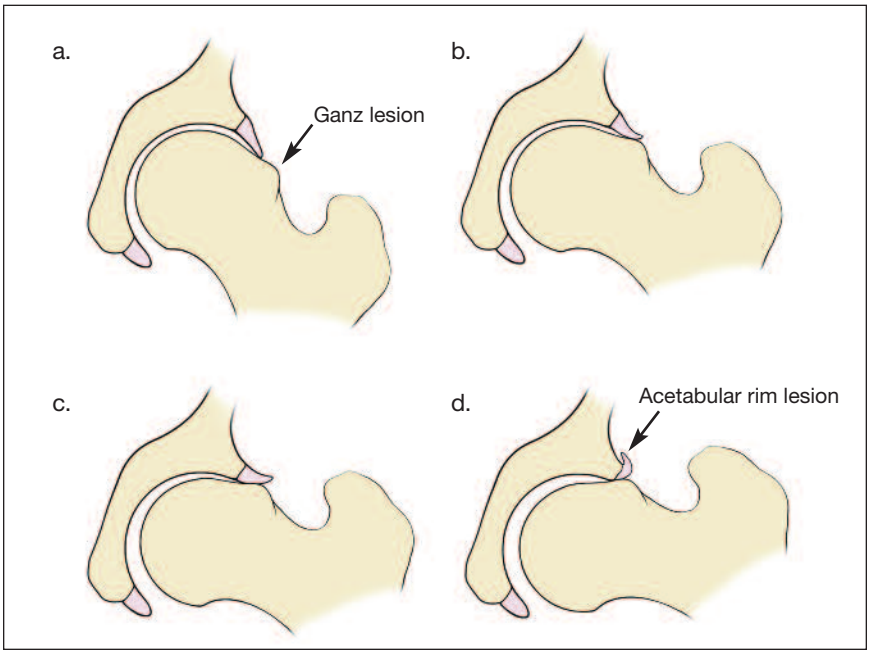




Figures 2a to d. Cam impingement. The aspherical femoral head due to a Ganz lesion is impinging on the acetabular rim with abduction of the leg. This causes buckling and damage to the labral-acetabular articular cartilage junction, producing an 'acetabular rim lesion'.

intralabral and paralabral cysts develop. These changes can be visualised on MRI scans. The acetabular articular cartilage at the rim begins to separate from the underlying subchondral bone plate (Figure 3). This can lead to synovial fluid becoming trapped under the articular cartilage and being driven under pressure into the subchondral bone, forming intra-osseous cysts called geodes.

Identified easily on MRI scans, geodes are the hallmark of early osteoarthritis of the hip. Larger geodes can also appear as subchondral bone cysts on plain x-rays. Joint space narrowing, which is seen in the late stages of osteoarthritis of the hip, does not become apparent until the flaking articular cartilage separates or lyses.

Labral tears rarely occur as a traumatic single event and are more often part of a complex pathology called the acetabular rim lesion. A rigorous search for the cause of this lesion in young people, which most likely arises from a particular childhood hip disorder or from certain excessive movements in sports, provides an opportunity to arrest development of premature osteoarthritis of the hip.

## History

The symptoms of labral tears and rim lesions are classic. While there may be a specific episode of trauma or activity sparking the presentation (such as subluxation of the hip joint), it is more likely that the patient has an insidious onset of symptoms, particularly an ache after exercise. This is often experienced at night and can be a cause of sleep disturbance. As the symptoms progress, patients lose their exercise tolerance and develop a deep groin ache that classically radiates to the greater trochanteric region and occasionally to the buttock.

Mechanical symptoms may occur, with a catching or grabbing sensation being the most likely symptom; locking sensations occur rarely. Large flap tears and bucket handle tears of the labrum can occur after severe hip trauma but are less common.

Several sports are associated with acetabular rim lesions, especially those involving repetitive kicking, stretching of the hip, ligamentous laxity and hip flexion and rotation movements (see the box on page 73).

## Examination

### The grasp or 'C' sign

When asked to demonstrate where the

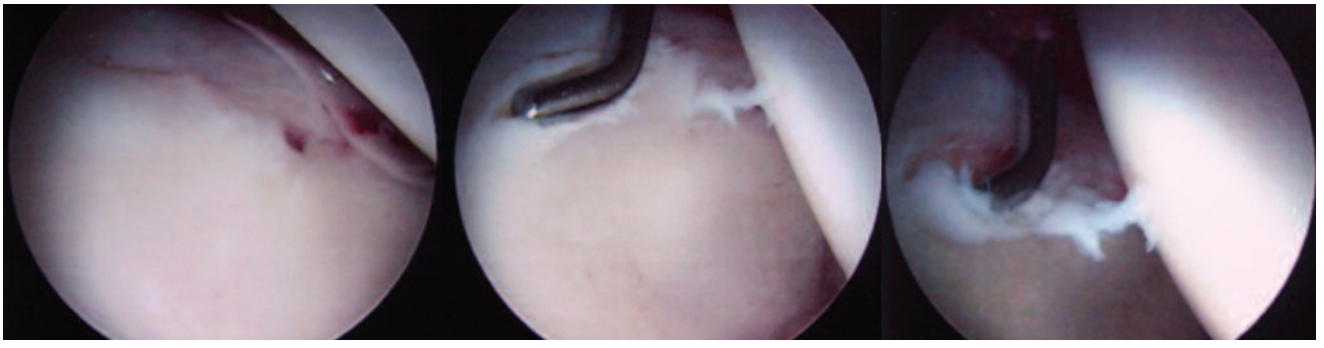

Figure 3. Grade 2 rim lesion as seen on arthroscopy.

pain occurs, patients will typically grip their hip with a thumb in the groin and the fingers wrapped around the trochanter. This action is referred to as the grasp or 'C' sign (Figure 4) and is considered pathognomonic of acetabular pathology. Thigh pain is uncommon in acetabular rim lesions and more often occurs in femoral head pathology, such as avascular necrosis or a slipped upper femoral epiphysis. Femoral head pathology typically causes groin and anterior thigh pain, which may radiate to the knee.

### Hip impingement test

The classic sign of acetabular rim pathology is demonstrated in the hip impingement test (Figure 5). The patient lies supine, the affected hip is flexed to 90° (with the knee held in 90° flexion), and the hip is passively adducted and internally rotated. The test is considered positive if it reproduces the patient's typical groin pain. A reduction in the range of hip internal rotation compared with that in the other side is also often found.

A positive hip impingement test in association with the grasp sign is highly sensitive for labral and acetabular rim pathology.

## Differential diagnosis

The differential diagnoses listed below should be considered in the assessment of patients with hip and groin pain.

- **Osteitis pubis.** This is diagnosed by a positive squeeze test. In this test, while supine on a couch with the hips flexed 45° and the knees 90°, the patient places his or her clenched fist between the knees. In a positive test pain is provoked in the groin region.
- **Trochanteric bursitis.** This usually occurs secondary to gluteal muscle tendinopathy. It is analogous to rotator cuff disease of the shoulder and often referred to as 'rotator cuff disease of the hip'. Local tenderness over the greater trochanter in association with classic night-time pain when lying on the affected side suggests this diagnosis. MRI scans or ultrasound scans can confirm the underlying pathology.
- **Psoas tendinopathy.** This occurs most often after hip replacement surgery and is due to impingement of the psoas tendon against the underlying prosthesis. The diagnosis is suspected with a resisted hip flexion test, which is most easily performed with the patient sitting on the side of a couch.
- **Lumbar spine or intrapelvic pathology.** Such pathology causing referred pain to the hip and groin area should always be considered in patients presenting with unusual pain problems.

## Investigations

### Plain x-rays

When scrutinised together with recent knowledge about hip disorders, the plain x-ray remains the most important investigation for acetabular rim lesions. Most symptomatic hips will reveal their underlying pathology on plain x-ray alone.

Figure 4. The classic grasp or 'C' sign.

### Sports associated with acetabular rim lesions

- Football involving kicking, especially around corners
- Martial arts, especially those involving repetitive kicking
- Water polo where a 'high' eggbeater kick is used for treading water
- Hurdling, especially if the athlete spends long periods stretching the hip into internal rotation and flexion
- Ballet/gymnastics where stretching (as above) and ligamentous laxity lead to hip instability, causing acetabular rim overload
- Squash, which has long been recognised as a cause of premature osteoarthritis of the hip due to the flexion and rotation movements associated with low shots causing repetitive impingement

Figure 5. Patient undergoing the hip impingement test.
Reproduced with the patient's permission.

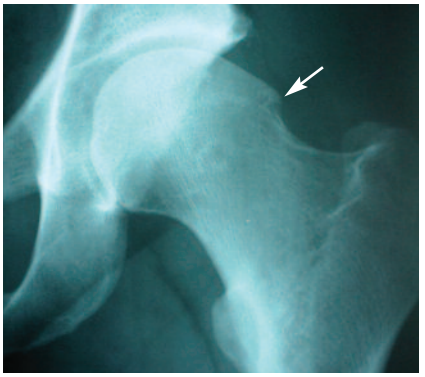

Figure 6. Plain x-ray showing a Ganz lesion (arrow) at the junction of the superior femoral neck and head.

Acetabular dysplasia can be diagnosed by measuring specific angles, such as Weiberg's angle. Os acetabulare are considered stress fractures of the lip of the acetabulum and rarely anatomical variants, as they will often be referred to in radiology reports.

Geodes in the lateral edge of the acetabulum (Egger's cysts) are highly significant for severe underlying rim pathology. The 'bump' often seen superiorly at the head-neck junction (Figure 6) is now referred to as the 'Ganz lesion'. This bump, mostly due to a developmental abnormality or secondary to a previous mild slipped upper femoral epiphysis, can lead to acetabular labral pathology.

Perthes disease, old slipped capital femoral epiphyses, coxa magna, protrusio acetabulare and retroverted acetabulare are all causes of acetabular rim pathology and premature osteoarthritis of the hip joint. These pathologies should be very apparent on initial x-ray investigation.

### MRI scans

Modern high resolution MRI scanning is considered the next line of investigation. Compared with 10 years ago, MRI now has improved sensitivity for rim and labral pathology. Despite this improvement, clinical suspicion and examination findings often dictate the need for arthroscopic intervention to confirm the diagnosis of rim lesions. Gadolinium MRI arthrography can improve the sensitivity of scans but is now used less often due to the availability of higher resolution MRI scanners and increasing radiologists' expertise in reporting hip MRIs .

### Technetium bone scans

The use of technetium bone scans for bone and joint pathology remains useful in unusual cases, particularly in the setting of stress fractures or tumours. An arthritic hip will often show increased uptake of the technetium around the joint.

### CT scans

CT scans are particularly useful for detailing pathology and planning surgical intervention. The exact extent of a Ganz lesion or the severity of acetabular dysplasia observed on 3D reconstruction CT scans is very useful to the orthopaedic surgeon. Subluxations of the hip in acute sporting trauma usually have an associated posterior acetabular fracture, which is often only apparent on a CT scan.

### Ultrasound

Ultrasound is a very useful first line investigation for trochanteric bursitis and underlying gluteal tendon pathology. Psoas tendon pathology, even after total hip prostheses surgery, is best investigated with ultrasound, looking particularly for fluid collections.

### Intra-articular local anaesthetic blocks

Local anaesthetic injected into the hip joint can be a very important diagnostic tool in cases where doubt exists about the exact origin of problematic pain. As this investigation requires fluoroscopy and a rigid sterile technique, it has to be ordered through a radiology department. Leakage of anaesthetic outside the hip joint may cause a femoral nerve block, resulting in the patient stumbling after the block due to quadriceps inhibition. Re-examination of the patient half an hour after the block is particularly useful to determine whether the groin pain has been abolished by the anaesthetic. If it has, it confirms that the hip is the source of the pain. The addition of intra-articular cortisone to the hip block should be used if an inflammatory hip disorder is suspected.

## Management of acetabular rim lesions

### Conservative management

Small labral tears and rim lesions that are not producing disabling symptoms may be best treated conservatively with low resistance exercises and avoidance of impinging activities. Anti-inflammatory medication or an intra-articular cortisone injection is indicated in patients with inflammatory hip disease. Physiotherapy to improve muscle control, particularly pelvic, low back and abdominal muscle tone (core stabilising exercises), can be very beneficial. Similarly, breaking muscle spasm around a painful hip joint can help to alleviate symptoms. Modification of sports activity is essential to halt the progression of hip joint disease in patients with the more abnormal hip joint conditions.

### Surgical management

#### Hip arthroscopy

Hip arthroscopy remains a highly specialised area but one that is gaining acceptance in the general orthopaedic community. It is becoming a routine day-case procedure in many orthopaedic hospitals and has an important role in the early intervention of labral and acetabular rim lesions. It allows for quantification of disease severity and early intervention by debriding the torn labrum, removing damaged articular cartilage and resecting os acetabulare and/or rim osteophytes, which should prevent disease progression.

Arthroscopic resection of the Ganz lesion is the new frontier of orthopaedic sports surgery. Many of the original

concerns about the side effects of hip arthroscopy have been allayed by the use of modern equipment and improved arthroscopic techniques.

Arthroscopic repairs of the labrum and hip joint capsule may improve outcomes in the management of rim lesions, and large series are now being evaluated.

### Periacetabular osteotomy

In cases of acetabular dysplasia in patients aged under 45 years a corrective osteotomy for long-term benefit should be considered. Usually, such patients should be referred to a centre with significant experience in this procedure for evaluation of suitability for further intervention (which may be best determined by hip arthroscopy).

### Resurfacing hip arthroplasty

The advantages of hip resurfacing are the preservation of bone stock (particularly on the femoral side) and a reduction in the rate of postoperative dislocation. In the past, initial attempts at hip resurfacing failed rapidly due to the excessive wear of the materials used (principally the thin polyethylene acetabular components). However, a second generation of hip resurfacing implants has been introduced in the last decade. More than 12 resurfacing hips are now available on the Australian market. According to data from the latest Australian Orthopaedic Association Australian Joint Registry (2006 registry figures), one type of resurfacing hip replacement had a failure rate of 2.9% at one to seven years follow-up.

Resurfacing hip arthroplasty now offers younger patients the chance of symptom relief and the ability to perform a wider range of sporting activities than previously possible with traditional total hip arthroplasty. Older age (women over 60 years and men over 65 years) and osteoporosis are the two most important contraindications for this technique.

Fractures, principally stress fractures, in the early postoperative period account for 60% of the failures and can be avoided by careful patient selection. Metal ion sensitivity leading to tense joint effusions and local tissue necrosis (about 12 to 18 months after implantation) is a potential problem, although the incidence is low.

### Total hip arthroplasty

When the proximal femur is inadequate to support a resurfacing head (due to bony erosion, deformity or osteoporosis) a total hip arthroplasty using modern hard-on-hard bearings or highly cross-linked polyethylene allows larger head diameters and hence lower dislocation rates compared with older prostheses. This also increases life expectancy, and higher functional loads are achievable. However, the intensity of sporting involvement after the procedure needs to be tempered due to fear of sudden failure from periprosthetic fracture or osteolysis from excessive wear products.

Despite these concerns, hip arthroplasty surgery is being performed in younger and younger patients with improved outcomes and a return to physical activities.

## Summary

Labral tears occur in association with articular cartilage damage (known as the rim lesion) and are becoming increasingly recognised in both sporting and non-sporting individuals presenting with groin and lateral hip pain. The practitioner will recognise the probable cause of this pain when the patient is asked to show the region of the pain and demonstrates a classic grasp sign.

Hip arthroscopy has become the new tool for diagnosis and treatment of labral tears and rim lesions, and the next generation of orthopaedic surgeons will become more familiar and technically competent with this procedure. More importantly, they will have a good working knowledge of the problems of hip pathology and its causes in the athlete.

As most rim lesions are due to abnormal hip joint morphology (shape), many will be correctable. Overuse hip injuries and subsequent rim damage are currently a major cause of premature hip degenerative arthritis. MT

## Further reading


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**DECLARATION OF INTEREST: None.**