Hip pain

A focus on the sporting population

BACKGROUND
Patients complaining of 'hip' or 'groin' pain can present a diagnostic and therapeutic challenge for practitioners not only in primary care, but also those in specialist practice.

OBJECTIVE
This article outlines common patterns of groin and lateral hip pain, and provides a targeted clinical approach to treatment or referral.

DISCUSSION
Common causes of chronic groin pain include osteitis pubis, incipient hernia, adductor tendinopathy and intrinsic hip pathology. Tendinopathy of the hip abductor muscles is a common cause of lateral hip pain. While a careful history and targeted examination is essential, the frequently nonspecific findings add to the challenge of managing this group of patients. Treatment remains focused on relative rest, although other, more active modalities are discussed. Advances in hip arthroscopy have lead to further improvement in our understanding, diagnosis and treatment of intrinsic hip pathology.

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The hips and pelvis are well adapted to withstand the transmission of tremendous forces during physical activity. Level walking produces forces up to six times body weight and loads of up to eight times body weight have been demonstrated in the hip joint during jogging.[1]

These forces increase further during vigorous athletic activity, particularly sports involving hard rotational and lateral motion, physical contact and kicking.[2] There is a correspondingly high incidence of groin pain (up to 25%) in players of the various football codes, particularly soccer and Australian Football League (AFL).[3]

The maintenance of pelvic and spinal stability in the face of these forces is dependant on muscular strength, endurance and balance between opposing muscle groups. Whether or not weakness precedes the onset of pain, the presence of pain produces muscular inhibition[4] which further compromises the efficiency of force transfer, perpetuating a spiral of increasing pain and weakness potentially leading to the development of pathology and chronic pain.[5]

As is often the case with clinical practice, a careful patient history, and a specifically targeted clinical examination incorporating specific provocation tests and careful correlation of palpatory findings with normal surface anatomy, can give a clue to the diagnosis and ensure no serious pathology is overlooked. Nonetheless, in the real world of the consulting room, examination findings are often nonspecific, adding to the diagnostic dilemma in this group of patients.

Diagnostic imaging findings such as ultrasound and magnetic resonance imaging (MRI) can be useful if they correlate with the clinical findings. However, they need careful interpretation as structural changes are commonly visualised in asymptomatic patients or on the patient's asymptomatic side, and so may not be a true indication of the symptomatic pathology in any one individual.

Accurate targeted injection of a small volume of local anaesthetic under diagnostic imaging control, whereby the patient's index pain is obliterated for a period of time concordant with the duration of the local anaesthetic used, can assist in differentiating the specific anatomical source of pain in some of these conditions.

The cornerstone of treatment is relative rest from aggravating activities and a physical rehabilitation program incorporating strengthening and stabilising exercises.

Although often used in clinical practice, anti-inflammatory drugs have no theoretical basis for their use in this group of conditions, and so, not surprisingly, are rarely effective.

Injection of corticosteroids provides short to medium term relief in some conditions, such as the tendinopathies,

but if available, should be performed under imaging guidance to ensure accurate needle placement.

Chronic groin pain

Multiple pathologies may co-exist in patients with chronic groin pain,[6] adding complexity to the diagnosis and management of these patients.[3,5] Excluding referred pain to the groin from lumbar spine and sacroiliac joint, the causes of chronic groin pain are outlined in *Table 1* and illustrated in *Figure 1*.

Osteitis pubis

There are no agreed clinical criteria[7] for a diagnosis of osteitis pubis, but the findings commonly include adductor or pubic groin pain during exercise (unilateral or bilateral), local tenderness over the pubic symphysis or pubic bone, and pain with weakness on provocation tests. These include the squeeze test (*Figure 2*) and bilateral hip adduction test (*Figure 3*).

The traditional approach to investigation involves bone scan, proceeding if positive to a limited fine slice computerised tomography (CT) scan of the pubic symphysis. Computerised tomography remains the modality of choice to demonstrate the degenerative changes in cortical bone, including erosions, cysts, osteophytic spurs and spicules of heterotopic calcification at the symphysis.

The emergence of MRI as a helpful tool has followed its utility in clinical research. The ability of MRI to demonstrate pubic bone marrow oedema, indicating stress injury to the trabecular bone, is very appealing, particularly in view of bone biopsy results from athletes with chronic groin pain showing a bone stress response[8] and a possible relationship between bone marrow oedema on MRI and training load.[3]

There are mixed reports on the clinical usefulness of MRI. One study with a small sample size demonstrated both sensitivity and specificity of MRI for chronic groin pain.[9] However, more recent work has found that bone marrow oedema alone,[3] and even in conjunction with pubic tenderness,[10] are often present in asymptomatic athletes and are not predictive of training restriction or missed games. The MRI finding of linear parasymphyseal T2 hyperintensity is potentially of greater clinical relevance than that of bone marrow oedema,[7] although even this finding is less predictive of performance impairment than the presence of preseason pain (*Figure 4*).

Although we can demonstrate bone stress injury histologically, radiologically and clinically, the specific factors that precipitate the development of pain and impaired sports performance remain unknown.

Table 1. Common causes of chronic groin pain

Common causes
- Osteitis pubis
- Incipient inguinal hernia
- Adductor tendinopathy
- Hip pathology

Look out for:
- malignancy
- sepsis
- stress fractures
- scrotal/testicular pathology
- nerve entrapments

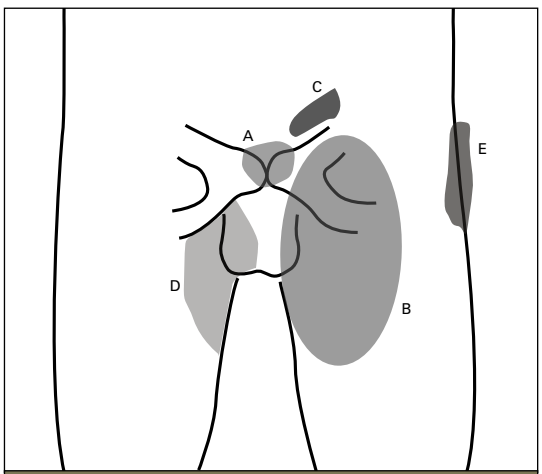

Figure 1. Common causes of chronic groin and hip pain
A. Pubic groin pain
B. Hip pain
C. Inguinal groin pain
D. Adductor pain
E. Lateral hip pain

Known risk factors include limited hip range of motion, particularly internal rotation, weakness of hip adduction or abduction strength, and training errors. A sudden escalation in training frequency, duration or intensity increases the risk of osteitis pubis, while preseason training is protective.[3] Skeletal immaturity, particularly with high training loads, also presents significant risk.

A conservative and supervised exercise program incorporating core stabilisation, adductor strengthening, abductor, abdominal and lumbar extensor strengthening, as well as balance exercise, constitutes the basis of rehabilitation techniques for adductor related pain as it represents the only evidence based randomised clinical intervention to date.[11] The addition of transversus abdominis and pelvic floor exercise is also scientifically justifiable.[4] A graduated return to sport is necessary to help prevent

recurrence. A recent uncontrolled case series of AFL players with pubic bone stress injury[12] treated conservatively with 12 weeks rest from weight bearing exercise (in addition to muscle strengthening and core stabilisation) yielded comparable results to other studies using prolotherapy injections, corticosteroid injection[13] and surgery.

Incipient hernia

The range of names appearing in the literature in an attempt to define incipient hernia, including incipient direct inguinal hernia,[3] posterior inguinal wall deficiency,[14] symphysis syndrome, weak groin,[5] athletic pubalgia[15] and others, suggest that the condition is poorly understood.

The range of surgical approaches consistently producing excellent results merely adds to the confusion. Endoscopic hernia repair,[16] even on the asymptomatic contralateral side,[14] anterior pelvic floor/lower abdominal wall reconstruction,[5,15] and adductor fascial release[5] or tenotomy,[17] all demonstrate utility in published studies.

Figure 2. Squeeze test. The clenched fist of the examiner is placed between the patient's knees with approximately 45 degrees of hip flexion and 90 degrees of knee flexion (heels flat on bed surface). The patient is asked to maximally contract both adductor muscles to effectively 'squeeze the fist'. Reproduction of groin pain constitutes a positive test

Reproduced with permission: Verrall GM, Slavotinek JP, Fon GT, et al. Outcome of conservative management of athletic groin injury diagnosed as pubic bone stress injury. Am J Sports Med 2007;35:467–74

Figure 3. Bilateral isometric resisted hip adduction. Reproduction of groin pain constitutes a positive test

Reproduced with permission: Holmich P, Holmich LR, Bjerg AM. Clinical examination of athletes with groin pain: an intraobserver and interobserver reliability study. Br J Sports Med 2004;38:446–51

The theory advanced to explain these observations is that of an imbalance between the powerful adductors and the opposing anterior abdominal wall musculature, leading to attenuation of the anterior pelvic floor and functional impairment of its role in lumbo-pelvic stabilisation,[5] which could be further compromised by pain inhibition. The recent finding of delayed transversus abdominis contraction in patients with chronic groin pain[4] indirectly supports this hypothesis.

The parallels between this population and the compromised lumbo-pelvic stabilising function in patients with postpartum posterior pelvic pain have led to the evaluation of a pelvic compression belt in the assessment and rehabilitation of these patients. Use of the belt resulted in reduced pain and increased power on resisted adduction (squeeze test) and the active straight leg raise test.[18]

In such patients, facilitation of load transfer from the spine to the lower limb via the pelvic ring using a pelvic compression belt could be a useful adjunct in rehabilitation of transversus abdominis by reducing pain inhibition (*Figure 5*). Normalisation of transversus abdominis and anterior pelvic floor muscle function restores compressive forces across the pubic symphysis[4] so that once rehabilitation is complete, stability can be maintained internally without the need for extrinsic belt compression.

Clinical features suggestive of this syndrome include inguinal groin pain during exercise, positive squeeze test, positive active straight leg raise test, widening of the superficial inguinal ring, tenderness superolateral to the pubic tubercle, and pain reproduction with positive cough impulse.

The similarities between these patients and those with osteitis pubis are manifold: the presence of inguinal groin pain and pain on resisted adduction in both groups, and the common finding in both groups of tenderness over the adductor origins. It is interesting that anterior pelvic floor reconstruction achieved excellent results even in patients with documented osteitis pubis.[13] There may be considerable overlap between these two groups of patients, and it is possible that they represent the same condition.

Adductor tendinopathy

As shown by the clinical features of both osteitis pubis and incipient hernia, adduction related pain (ie. pain on isometric hip adduction or squeeze test) does not specifically indicate adductor tendon pathology.[18] Nevertheless, this assumption does appear in the literature.[19]

Adductor tendinopathy should be suspected in cases of unilateral pain, localised tenderness and weakness. Radiologic confirmation may require X-ray to exclude avulsion or heterotopic calcification, ultrasound or MRI.[20]

Conservative management may include local anaesthetic/corticosteroid injection in addition to graduated strengthening, with tenotomy reserved only for chronic refractory cases.

Figure 4. Fat suppressed T2 weighted image oriented coronal to the body of the pubis in a 29 year old athlete demonstrating linear T2 hyperintensity paralleling the subchondral bone plate on the right side (white arrow). Relatively little bone marrow oedema is apparent on this image

Reproduced with permission: Slavotinek JP, Verrall GM, Fon GT, et al. Groin pain in footballers: the association between preseason clinical and pubic bone magnetic resonance imaging findings and athlete outcome. Am J Sports Med 2005;33:894–9

Table 2. Differential diagnosis for hip pathology

Common causes
- Rim lesion
- Labral tear
- Chondral path
- Loose bodies
- Impingement
- Osteoarthritis

Look out for:
- fractures and avulsions
- septic arthritis
- malignancy
- slipped upper femoral epiphysis
- Perthes disease
- synovitis

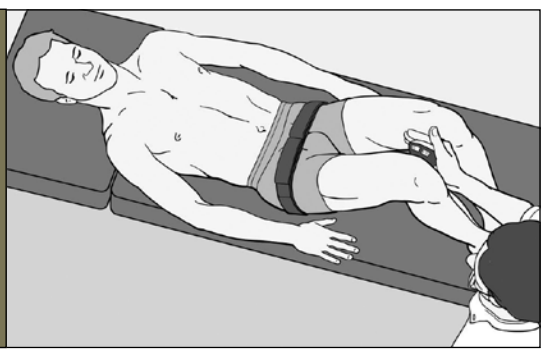

Figure 5. Squeeze test, quantified with hand held dynamometer on patient wearing a pelvic belt

Reproduced with permission: Mens J, Inklaar H, Koes BW, et al. A new view on adduction related groin pain. Clin J Sport Med 2006;16:15–9

Hip joint pathology

Clinical features suggesting hip joint pathology include deep anterior hip or mid inguinal pain, which may refer to the medial or anterior thigh (*Table 2*). Mechanical features consistent with mobile loose bodies, chondral or labral flaps include unpredictable sharper pains, catching or locking. Pain on quadrant positioning (combined flexion, adduction, and internal rotation) such as getting in and out of a high car seat is a feature of femoroacetabular impingement.

Hip joint arthroscopy has a well documented role in the treatment of acetabular rim lesions, which include labral tears and associated chondral defects, as well as loose bodies and ligamentum terres tears.[21–23]

Labral tears most commonly involve the anterosuperior labrum and can be treated with debridement (*Figure 6a, b*) or arthroscopic reconstruction. Chondral defects may require chondroplasty, and microfracture techniques provide good results for full thickness lesions up to 1cm in diameter.[21]

Femoroacetabular impingement can be understood by considering two types: cam and pincer impingement. Cam impingement is the result of a nonspherical femoral head abutting the anterosuperior acetabular rim in the quadrant position (*Figure 7*). X-ray and CT scans demonstrate a 'bump' on the superior femoral neck adjacent to the articular margin. Conservative management is often successful and involves strengthening exercises and educating the patient to avoid loaded quadrant positioning in their activities. If surgery is required, the bump can be burred away arthroscopically (*Figure 8a, b, Figure 9a, b*).

Pincer impingement occurs when a normal femoral head-neck junction contacts a retroverted acetabulum with excessive anterosuperior coverage of the femoral head. Arthroscopic management in these cases is intricate; involving labral debridement, detachment, excision of the anterior acetabular margin and reattachment of the labrum with bone anchored sutures.

Arthroscopic hip surgery is progressing at a rapid rate, and there have been case reports of arthroscopic autologous chondrocyte implantation being performed.

Lateral hip pain

Chronic lateral hip pain is commonly due to pathology in the tendons of gluteus medius (G-med) gluteus minimus (G-min), or tensor fascia lata (TFL). The term 'greater trochanter pain syndrome' (GTPS) has been coined for this condition. Labels such as 'bursitis' or 'tendonitis' are now considered misnomers, as inflammation is rarely involved in the disease process.[24] Rather, these conditions are more commonly degenerative in nature and are more correctly termed 'tendinosis'. The major function of these

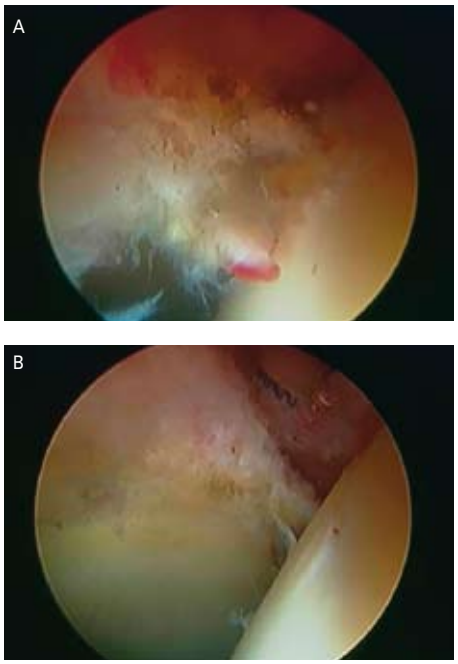

Figure 6. Labral tear: A) before and B) after arthroscopic debridement
Photos courtesy Mr John O'Donnell, Melbourne

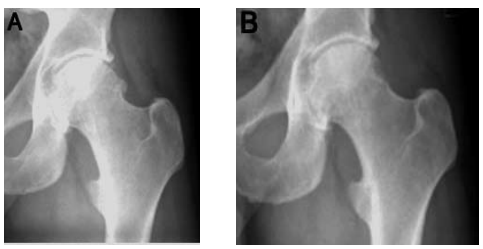

Figure 8. Cam impingement: A) impinging osteophyte at femoral head-neck junction B) following arthroscopic excision

muscles is to dynamically stabilise the pelvis and hip in a way similar to the rotator cuff muscles at the shoulder.[25] Hence, this condition is now considered analogous to rotator cuff pathology of the shoulder.

Greater trochanter pain syndrome presents most commonly in middle aged women, as pain occurring spontaneously over the posterolateral aspect of the hip, and often radiates down the lateral aspect of the lower limb, sometimes below the knee and thus may be confused with lumbar radicular pain. The patient typically has difficulty sleeping on the affected side, and the pain is aggravated by weight bearing, especially walking up stairs or inclines.[26] The cardinal clinical sign is concordant pain reproduction on palpation over the greater trochanter, but there may also be pain and weakness on resisted abduction of the hip (*Figure 10*) and a Trendelenberg gait.

This condition is common and often overlooked and/or misdiagnosed in clinical practice, and can often be recalcitrant to treatment. A tertiary orthopaedic referral centre for the assessment of low back pain found a previously unrecognised incidence of GTPS of 20%.[27] A British primary care retrospective cohort study found an incidence of this condition of 1.8 patients per 1000 per year, with symptoms persisting in 36% at 1 year and 29% at 5 years.[28]

As with any patient presenting with musculoskeletal pain, a check for red flag conditions is imperative, as cases of secondary malignant deposits and tuberculosis have been reported as presenting in a similar way.[29,30]

Differential diagnosis includes primary hip joint pathology and referred pain from the lumbosacral spine, but failure of clinical signs pertaining to the hip and lumbosacral spine to reproduce the patient's symptoms are important negatives in the clinical assessment. However, it has been suggested that lumbosacral spine conditions are a common associate of GTPS, and if present convey a poorer prognosis.[31]

Ultrasound and MRI can identify underlying pathology.[32,33] The incidence of pathology demonstrated on these imaging studies in asymptomatic patients has not been reported, as it has in the shoulder, where changes in middle aged asymptomatic patients are common; although ultrasound changes of tendinopathy on the asymptomatic side in patients with GTPS has been observed.[32] Therefore positive imaging findings alone do not confirm the diagnosis. The definitive test to confirm the source of musculoskeletal pain is by targeted injection of a small volume of local anaesthetic into the offending anatomical structure, under guidance from ultrasound or fluoroscopy to confirm correct needle placement.[34]

The patient's index pain should then be reduced to 0 or near 0, for a time concordant with the duration of action of the local anaesthetic used. Pre- and post-injection pain charts are useful as a means of documenting the effect of such diagnostic injections.[35]

None of the therapeutic interventions used in GTPS have been validly assessed. In the authors' experience NSAIDs are often trialled first, usually without success, as their use has no theoretical basis.[24] Physical therapies incorporating manual therapy techniques, identification and correction of abnormal biomechanics, and core stabilising exercise programs are empirically attractive. It has been suggested that for tendinopathies in general, a program of eccentric strengthening exercises are an essential part of any rehabilitation program.[36] For many conditions, core stability exercises are gaining favour as an important component of management.[37]

Injection of corticosteroids seems to help, at least in the short to medium term in some patients,[38] and

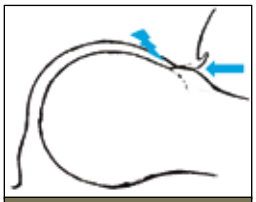

Figure 7. Cam impingement: diagrammatic representation
Image courtesy Mr John O'Donnell, Melbourne

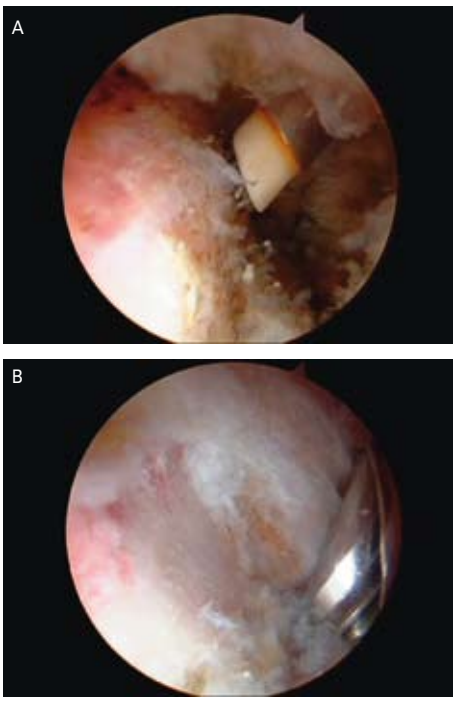

Figure 9. Cam impingement: A) arthroscopic view before and B) after femoral osteectomy
Photos courtesy Mr John O'Donnell, Melbourne

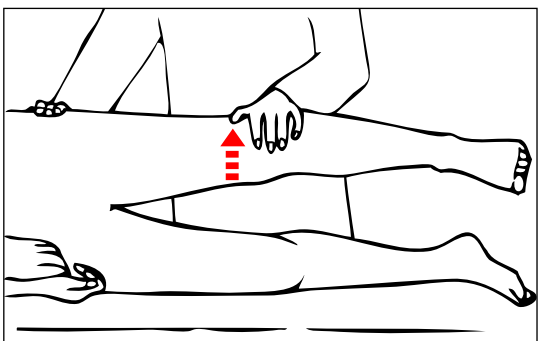

Figure 10. Testing for resisted abduction of the hip. Patient is lying with the side to be tested uppermost; knee should be extended and hip neutral in terms of flexion/extension and internal/external rotation. Pelvis should also be in neutral position. The patient is asked to push up against the examiner's hand placed just below the knee; the opposite hand gently steadies the pelvis

should be performed under guidance from ultrasound or fluoroscopy to ensure accuracy of the injection.[39]

Recalcitrant tendinopathies in other anatomical regions are now being treated with injection of other substances such as polidocanol[40] and concentrated glucose.[41] Surgery is now gaining favour in patients who do not respond to conservative management.[42]

Conclusion

After recognising the common patterns of groin and lateral hip pain, a targeted clinical examination will direct appropriate investigation, treatment or referral in this interesting and challenging interface of sports and musculoskeletal medicine.

Conflict of interest: none declared.

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