0008-3194/2010/264–270/$2.00/©JCCA 2010

Adductor tendinopathy in a hockey player with persistent groin pain: a case report

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Groin pain may stem from a variety of different causes. Adductor tendinopathy is a common but infrequently recognised cause of chronic groin pain especially in athletes. This case report describes a case of clinically suspected adductor tendinopathy in an amateur athlete confirmed by MRI (Magnetic Resonance Imaging). Relevant literature on musculotendinous injuries of the groin along with differential diagnosis for groin pain is discussed. There are several differential diagnoses for athletes that present with groin pain. Therefore, it is important to accurately diagnose the origin of groin pain as the plan of management is dependent of the specificity of the diagnosis. The diagnosis of adductor tendinopathy is made with a history of chronic groin pain along with pain/weakness during isometric adduction of the hip muscles. It is confirmed by MR imaging.
(JCCA 2010; 54(4):264–270)

KEY WORDS: adductor muscle, tendinopathy, MRI, groin pain, tenoperiosteal disease, enthesopathy, adductor strain

La douleur à l'aine peut être causée par différents facteurs. La tendinopathie adductrice est une cause courante mais rarement reconnue de douleur chronique à l'aine, particulièrement chez les athlètes. Cette étude de cas décrit une tendinopathie adductrice cliniquement soupçonnée chez un athlète amateur, puis confirmée par une imagerie par résonance magnétique (IRM). La documentation pertinente sur les blessures musculotendineuses de l'aine ainsi que le diagnostic différentiel des blessures de l'aine fait l'objet d'une discussion. Il existe plusieurs diagnostics différentiels pour les athlètes qui ont des douleurs à l'aine. Il est donc important de diagnostiquer avec exactitude l'origine des douleurs à l'aine, car le plan de gestion dépend de la spécificité du diagnostic. Le diagnostic de tendinopathie adductrice est prononcé lorsqu'il y a antécédents de douleur chronique à l'aine ainsi qu'une douleur/faiblesse durant l'adduction isométrique des muscles de la hanche. Le tout est confirmé par une imagerie RM.
(JCCA 2010; 54(4):264–270)

MOTS CLÉS : muscle adducteur, tendinopathie, IRM, douleur à l'aine, maladie ténopériostéale, enthésopathie, fouleur de l'adducteur

Introduction

Groin pain is a common problem found in many athletes.[1] Many athletes will present to clinicians with a history of groin pain that may be acute or chronic in nature, and may stem from a single traumatic event or repeated microtrauma to the region.[2] However, multiple pathologies may exist in individuals with chronic groin pain,[3] adding complexity to the diagnosis and management of these patients.[4] There are several common causes of groin pain. The groin pain may stem from the lumbar spine,

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sacroiliac joint, symphysis pubis stress, rectus abdominis tear, sports hernia, iliopsoas pathology or adductor musculotendinous pathology.[1,3,5]

The cases of groin pain in athletes that actually involve adductor muscle pathology can present in various forms. Adductor related groin pain can be due to muscle strain, tendinosis, tendinitis, paratenonitis, enthesopathy or a combination of the aforementioned (Table 1).[6] Therefore the specific diagnosis is crucial for the plan of management. Since the list of differential diagnoses for groin pain is large, MRI (Magnetic Resonance Imaging) is necessary to localize pathology and define its type.

There are several review articles examining groin and hip pain with associated adductor pathology.[2,3,7,8] There are articles examining adductor tears[9] and calcific tendinitis of the adductor magnus.[10] However, the case report literature is sparse in examining groin pain in athletes with a proven diagnosis of adductor tendinopathy through radiological evidence.[5,11,12]

Due to the complexity of groin pain in athletes and the difficulty to specifically diagnose the accurate pathological structure, it is important to have radiological evidence in combination with physical examination outcomes to appropriately manage these problematic patients. Delay in diagnosis and treatment may result in undesired complications and lost time from sport participation. The diagnosis of adductor tendinopathy through clinical history of chronic groin pain along with pain/weakness during isometric adduction of the hip muscles needs to be confirmed by advanced imaging to definitively exclude the many other possible anatomical structures that have been implicated in groin pain. This report reviews the relevant literature on adductor musculotendinous pathology, examines the common differential diagnosis for athletes with groin pain and adds one more case report to the literature where the diagnosis has been made clinically and was confirmed by MRI.

Case report

A 21 year old male previously competitive hockey player with persistent groin pain was referred for an MRI at our hospital. This athlete was competing recreationally and had symptoms of chronic pain in the region of the groin. The patient described his pain as localized to one specific region in the proximal portion of his left groin. Palpatory pin point tenderness was elicited at the proximal portion of the left groin at the tendinous insertion. A physical examination revealed pain and weakness of isometric adduction of the hip muscles. A clinical diagnosis of an adductor tendinopathy from repeated microtrauma and overuse was suspected and MR imaging was taken to confirm the diagnosis.

The MRI was performed on a Siemens 1.5 tesla scanner. Coronal T1 and coronal STIR in the plane of the body of the pubis, axial T1 and T2 fat saturation and sagittal gradient sequences were obtained.

The Axial T2 MRI, located at the level of the inferior body of the pubis at the adductor longus tendons, demonstrated an intense bright marrow signal within the body of the pubis bilaterally (Figure 1). This finding is suggestive of focal intense marrow edema at the attachment of the adductor longus tendons.

The Serial coronal T2 MRI, located at the level of the body of the pubis and the attachment of the adductor tendons, demonstrated an intense bright signal within the bone marrow of the body of the pubis bilaterally and the adductor longus tendon at its attachment to the body of the pubis (Figure 2). This finding is indicative of intense focal marrow edema and suggestive of adductor tendinopathy. The bright signal within the tendon is more obvious on the left side than the right.

Discussion

This case report demonstrates the diagnosis of adductor tendinopathy through a history of chronic groin pain, physical findings of pain/weakness during isometric adduction of the hip muscles, palpatory pin point tenderness and confirmed by MRI**.**

Chronic groin pain can develop from muscle strain, tendinosis, tendinitis, paratenonitis, enthesopathy or a combination of the aforementioned (Table 1).[6] Treatment for these conditions varies and therefore necessitates an aggressive early diagnosis to prevent undesired complications such as chronic groin pain and lost time from sport participation. Muscle strain, musculotendinous strain and tendinopathy disorders responds well to conservative rehabilitation therapy whereas enthesopathy, micro-tears at the tendon-periosteal junction, often progresses to prolonged, chronic groin pain.[13]

Pathology

The scientific literature for the sprain/strain injury process,

Table 1 *Classification of tendon and muscle injuries*[32,33]

Pathological Diagnosis	**Concept (Macroscopic Pathology)**	**Histological Appearance**
Tendinosis	Intratendinous degeneration (commonly caused by ageing, microtrauma and vascular compromise)	Collagen disorientation, disorganisation and fibre separation with an increase in mucoid ground substance, increased prominence of cells and vascular spaces with or without neovascularisation, and focal necrosis or calcification
Tendinitis/partial rupture	Symptomatic degeneration of the tendon with vascular disruption and inflammatory repair response	Degenerative changes as noted above with superimposed evidence of tear, including fibroblastic and myofibroblastic proliferation, haemorrhage and organising granulation tissue
Paratenonitis	"Inflammation" of the outer layer of the tendon (paratenon) alone, regardless of whether the paratenon is lined by synovium	Mucoid degeneration in the areolar tissue is seen. A scattered mild mononuclear infiltrate with or without focal fibrin deposition and fibrinous exudate is also seen
Paratenonitis with tendinosis	Paratenonitis associated with intratendinous degeneration	Degenerative changes as noted for tendinosis with mucoid degeneration with or without fibrosis and scattered inflammatory cells in the paratenon alveolar tissue
Enthesopathy	An inflammation or disease of an enthesis (the point at which a tendon joins to a bone)	Similar to tendinitis
Muscle Strain	An injury to a muscle in which the muscle fibers tear as a result of overstretching	*Destruction phase* – Rupture and ensuing necrosis of the myofibers, the formation of a hematoma between the ruptured muscle stumps, and the inflammatory cell reaction *Repair phase* – Phagocytosis of the necrotized tissue, the regeneration of the myofibers, the concomitant production of a connective tissue scar and capillary ingrowth *Remodeling phase* – Maturation of the regenerated myofibers, the contraction and reorganization of the scar tissue

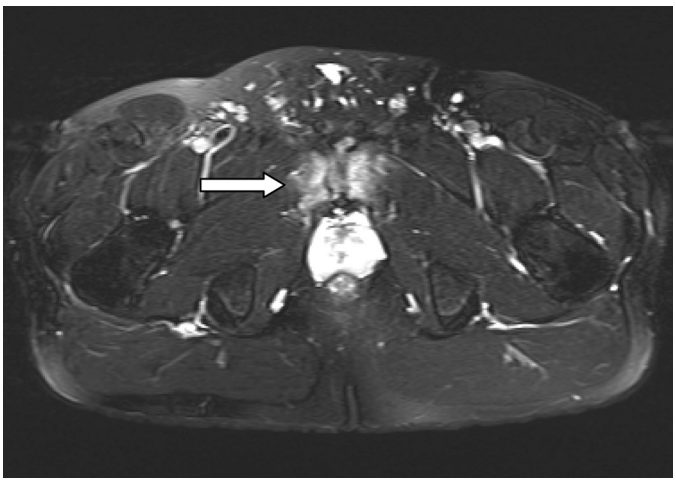

Figure 1 *Axial T2 fat suppressed images at the level of the inferior body of the pubis at the attachment of the adductor longus tendons; Note the intense bright marrow signal within the body of the pubis bilaterally suggestive of focal intense marrow edema at the attachment of the adductor longus tendons (arrow).*

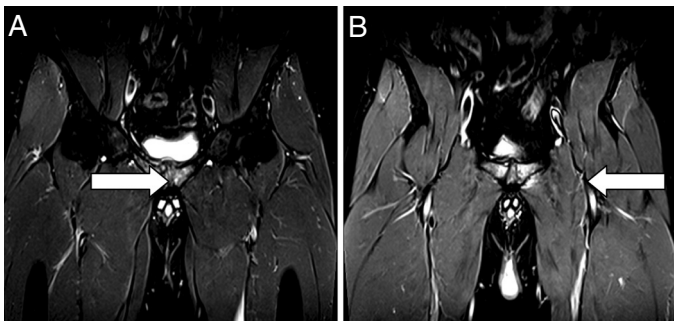

Figure 2 *A and B. Serial coronal T2 fat suppressed images at the level of the body of the pubis and the attachment of the adductor tendons; Note the intense bright signal within the bone marrow of the body of the pubis bilaterally (arrow). This is indicative of intense focal marrow edema. Also seen is high signal within the adductor longus tendon at its attachment to the body of the pubis suggestive of adductor tendinopathy. The bright signal within the tendon is more on the left side than the right (B).*

for a large proportion of groin injuries, has progressed from an inflammatory injury ("-itis") to a degenerative process ("-osis") with connective tissue degenerative change in the presence of a paucity of leukocytes.[14] C*onnective tissue insufficiency* is a term to describe the loss of tissue strength related to degenerative change, which results in loading and stimulation of relatively fixed-length pain mechanoreceptors.[15]

Enthopathy injuries stem from damage to the fibrocartilage enthesis between the tendon and periosteum as being the potential source of the problem.[13] Repair results in symphyseal sclerosis and irregularity, which is a secondary process rather than an active process, and that is why conventional radiographs and isotope bone scans can be inaccurate.

Mechanism of Injury

Groin injuries are common in sports that involve repeated kicking and rapid change of direction.[16] Some of the most prevalent sports include soccer, rugby, Australian Rules football, hockey and American football.[13,16] These conditions tend to relate to pathology with the symphysis pubis and/or surrounding soft tissues. However, these injuries are thought to develop secondary to mechanical stress forces through the anterior pelvis.[13] The combination of these forces along with inadequate abdominal strength or lack of flexibility can result in chronic damage to the pubic symphysis, enthesis, tendon, myotendinous junction and adductor muscles.

Clinical Symptoms and Examination

These athletes will present with chronic groin pain, hip stiffness and pain with active leg adduction. Enthesis disease tends to stem from the adductor longus and gracilis as they are positioned together at the symphysis.[13] The adductor brevis and magnus muscles arise more posterolaterally and are rarely implicated in chronic groin pain.[2]

Muscle strains tend to occur at the myotendinous junction. These injuries typically occur after a single traumatic event. However, tendinopathy injuries do not occur due to a single bout of trauma. They are simply an insidious onset of groin pain that is generally a result of overuse, progressive in nature and aggravated with sporting activity. Adductor tendinopathy should be suspected in cases of groin pain with localised tenderness, weakness and unilateral pain.[3] The patient may complain of groin, inner

leg or lower abdomen pain with quick bursts of activity such as cutting, pivoting and skating.[2] In addition, compensatory mechanisms may result in symptoms extending to the rectus abdominis insertion and/or to the opposite groin.[2] There is increasing pain after activity and soreness the following day.

Intense physical activity, overloading the tendons and tendinous insertions, is needed to tease out the clinical symptoms and reproduce the patients' groin pain.[2] Pain can also be reproduced with adduction of the thigh against resistance and with passive stretching of the adductors.

Differential Diagnosis for Groin Pain

Some classify groin pain as adductor tendinopathy when isometric adduction is painful, pain caused by isometric contraction of hip muscles is not necessarily caused by an injury of adductor muscles or tendons.[17] However, athletes with groin pain can be extremely difficult to diagnose due to the several anatomical structures that have been implicated in exhibiting groin pain. The symptoms of groin pain in many patients have been found to stem from the sacro-iliac joint. For example, patients with pelvic girdle pain feel groin pain during isometric hip adduction.[18] Furthermore, studies have shown that these patients with groin pain can alleviate their pain wearing a pelvic belt.[1]

Patients with symphysis pubis stress injury (Commonly known as osteitis pubis. Osteitis pubis is frequently associated with infection, a finding notably absent among athletes with symphyseal stress injury[19]) tend to present with a history of increasing groin, pubic, or lower abdominal pain. These patients may have tenderness to palpation focally to the proximal adductor muscles, the symphysis pubis or the superior pubic ramus.[20] Both adductor originating injuries and symphysis pubis stress injuries have similarities in inciting mechanisms. Osteitis pubis often coexists with adductor related conditions and may be seen concurrently. Traction on the pubic ramus by the adductor muscles may lead directly to disruption of the fibrocartilaginous symphyseal disc.[21]

The osseous ring of the pelvis may be interrupted at the symphysis pubis and/or the left and/or right sacro-iliac joints. Abnormal motion at one of these joints causes altered biomechanics with increased stress at the other two.[20] Clinicians that examine athletes that complain of groin pain should entertain the possibility of sacro-iliac joint dysfunction or symphysis pubis stress injuries.

Lumbar disc or facet joint abnormalities may result in radicular symptoms referred to the pelvis or groin. The ilioinguinal nerve originates from the T12 and L1 roots and the genitofemoral nerve originates from the L1 and L2 roots. Symptoms from these nerve roots may be provoked with slide or femoral nerve stretch tests.[17] In addition, research has shown that provocation of lumbar facet joints can have a distribution of pain provoked from L2 to L5.[22]

Bursitis, after direct blunt trauma or as the result of chronic irritation secondary to friction syndromes, can cause groin pain in many athlete. The groin pain can result from irritation to the bursa between the iliotibial tract and the greater trochanter, subgluteus minimus, medius and maximus bursae along with the sub-iliopsoas bursa.[23,24]

The iliopsoas can also be implicated in athletes with groin pain. Iliopsoas tendinosis or iliopsoas spasm can produce symptoms of groin pain and these pathologies are commonly seen in repetitive hip flexion sports or total hip replacement that has been caused by impingement of a malpositioned acetabular cup.[6]

Tears within the rectus abdominis and sports hernia are common causes of groin pain in many athletes.[25–27] Sports hernia is due to a posterior inguinal wall deficiency or Gilmore's groin. Posterior inguinal wall deficiency can result from tearing of the conjoint tendon and transversalis fascia which forms the posterior wall of the inguinal canal.[26] Gilmore's groin involves tears in the medial aspect of the external oblique aponeurosis which forms the anterior wall of the canal.[27]

Imaging

Radiological confirmation may require plain radiographs to exclude avulsion injury or heterotopic calcification.[28] Normal MRI of tendons show low signal intensity on all pulse sequences. Myxoid degeneration of tendons occurs with aging or from chronic overuse. On MR imaging, a degenerate tendon is normal or enlarged and has high signal intensity within the substance of the tendon on both T1W and any type of T2W sequences. The abnormal tendon is compatible with degeneration and micro tears, as they generally coexist.

MRI is also the imaging of choice for myotendinous strains. First-degree strains show hemorrhage at the myotendinous junction. There is also a feathery pattern of edema that runs from the myotendinous junction along the

muscle fascicles. Second-degree strains will show a hematoma at the myotendinous junction along with increased fluid adjacent to the fascicles. Third-degree strains demonstrate complete disruption of the myotendinous unit.[29]

MRI for enthesopathy will show periostitis and adjacent marrow edema. The surrounding muscles will also demonstrate edema with thickening of the tendinous insertion of the adductor muscle.[13] Gadolinium enhancement of the adductor enthesis has been demonstrated to correlate with the symptomatic side.[13]

Treatment

Historically, conservative management may include cessation of physical activity, local anaesthetic/corticosteroid injection in addition to graduated strengthening of the core muscles, passive physical therapy modalities, anti-inflammatory drug medication, stretching exercises and prolotherapy.[2,7,30,31] Enthesopathy disorders of the adductor muscle group will sometimes require surgical repair.[20]

Treatment for muscle strains generally includes rest, ice, and compression. The goal of the treatment is to limit haemorrhaging and soft tissue swelling. Once the patient is pain free, progressive range-of-motion and strengthening exercises will begin.[17]

Conclusion

Groin pain in athletes may be acute or chronic in nature, may stem from a single traumatic event or repeated microtrauma and may arise from a variety of structures including muscle, tendon, ligament or joint. One of the most common causes of persistent groin pain in the athlete is adductor tendinopathy. The diagnosis of adductor tendinopathy through clinical history and physical examination can be confirmed by MR imaging. This case report demonstrates the importance of MR imaging in the accurate diagnosis of a patient with chronic groin pain.

References

1 Mens J, Inklaar H, Koes BW, Stam HJ. A new view on adduction-related groin pain. Clin J Sport Med. 2006; 16:15–19.
2 Martens MA, Hansen L, Mulier JC. Adductor tendinitis and musculus rectus abdominis tendopathy. Am J Sports Med. 1987; 15:353–356.
3 Braun P, Jensen S. Hip pain – a focus on the sporting population. Aust Fam Physician. 2007; 36:406–3.
4 Biedert RM, Warnke K, Meyer S. Symphysis syndrome in athletes: surgical treatment for chronic lower abdominal, groin, and adductor pain in athletes. Clin J Sport Med. 2003; 13:278–284.
5 Baeyens L. An unusual clinical variant of pubic pain in females: the case of an athlete. J Gynecol Obstet Biol Reprod (Paris). 1987; 16:339–341.
6 Davies AG, Clarke AW, Gilmore J, Wotherspoon M, Connell DA. Review: imaging of groin pain in the athlete. Skeletal Radiol. 2009.
7 Topol GA, Reeves KD. Regenerative injection of elite athletes with career-altering chronic groin pain who fail conservative treatment: a consecutive case series. Am J Phys Med Rehabil. 2008; 87:890–902.
8 Ashby EC. Chronic obscure groin pain is commonly caused by enthesopathy: "tennis elbow" of the groin. Br J Surg. 1994; 81:1632–1634.
9 Lohrer H, Nauck T. Proximal adductor longus tendon tear in high level athletes. A report of three cases. Sportverletz Sportschaden. 2007; 21:190–194.
10 Hayes CW, Rosenthal DI, Plata MJ, Hudson TM. Calcific tendinitis in unusual sites associated with cortical bone erosion. AJR Am J Roentgenol. 1987; 149:967–970.
11 Tonsoline PA. Chronic adductor tendinitis in a female swimmer. J Orthop Sports Phys Ther. 1993; 18:629–633.
12 Weinstein RN, Kraushaar BS, Fulkerson JP. Adductor tendinosis in a professional hockey player. Orthopedics. 1998; 21:809–810.
13 Robinson P, Barron DA, Parsons W, Grainger AJ, Schilders EM, O'Connor PJ. Adductor-related groin pain in athletes: correlation of MR imaging with clinical findings. Skeletal Radiol. 2004; 33:451–457.
14 Edwards SG, Calandruccio JH. Autologous blood injections for refractory lateral epicondylitis. J Hand Surg Am. 2003; 28:272–278.
15 Leadbetter WB. Soft tissue athletic injury. In: Fu FH, editor. Sports injuries: mechanisms, prevention, treatment. Baltimore: Williams & Wilkins, 1994.
16 Fricker PA. Management of groin pain in athletes. Br J Sports Med. 1997; 31:97–101.
17 Anderson K, Strickland SM, Warren R. Hip and groin injuries in athletes. Am J Sports Med. 2001; 29:521–533.
18 Mens JM, Vleeming A, Snijders CJ, Koes BW, Stam HJ. Reliability and validity of the active straight leg raise test in posterior pelvic pain since pregnancy. Spine. 2001; 26:1167–1171.
19 Major NM, Helms CA. Pelvic stress injuries: the relationship between osteitis pubis (symphysis pubis stress injury) and sacroiliac abnormalities in athletes. Skeletal Radiol. 1997; 26:711–717.
20 Nelson EN, Kassarjian A, Palmer WE. MR imaging of sports-related groin pain. Magn Reson Imaging Clin N Am. 2005; 13:727–742.
21 Brennan D, O'Connell MJ, Ryan M et al. Secondary cleft

sign as a marker of injury in athletes with groin pain: MR image appearance and interpretation. Radiology. 2005; 235:162–167.
22 Marks R. Distribution of pain provoked from lumbar facet joints and related structures during diagnostic spinal infiltration. Pain. 1989; 39:37–40.
23 Nunley RM, Wilson JM, Gilula L, Clohisy JC, Barrack RL, Maloney WJ. Iliopsoas bursa injections can be beneficial for pain after total hip arthroplasty. Clin Orthop Relat Res. 2010; 468:519–526.
24 Kingzett-Taylor A, Tirman PF, Feller J et al. Tendinosis and tears of gluteus medius and minimus muscles as a cause of hip pain: MR imaging findings. AJR Am J Roentgenol. 1999; 173:1123–1126.
25 Connell D, Ali K, Javid M, Bell P, Batt M, Kemp S. Sonography and MRI of rectus abdominis muscle strain in elite tennis players. AJR Am J Roentgenol. 2006; 187:1457–1461.
26 Koulouris G. Imaging review of groin pain in elite athletes: an anatomic approach to imaging findings. AJR Am J Roentgenol. 2008; 191:962–972.
27 Kumar A, Doran J, Batt ME, Nguyen-Van-Tam JS, Beckingham IJ. Results of inguinal canal repair in athletes with sports hernia. J R Coll Surg Edinb. 2002; 47:561–565.
28 Kalebo P, Karlsson J, Sward L, Peterson L. Ultrasonography of chronic tendon injuries in the groin. Am J Sports Med. 1992; 20:634–639.
29 Kaplan P et al. Musculoskeletal MRI. Philadelphia: 2001.
30 Topol GA, Reeves KD, Hassanein KM. Efficacy of dextrose prolotherapy in elite male kicking-sport athletes with chronic groin pain. Arch Phys Med Rehabil. 2005; 86:697–702.
31 Schilders E, Bismil Q, Robinson P, O'Connor PJ, Gibbon WW, Talbot JC. Adductor-related groin pain in competitive athletes. Role of adductor enthesis, magnetic resonance imaging, and entheseal pubic cleft injections. J Bone Joint Surg Am. 2007; 89:2173–2178.
32 Khan KM, Cook JL, Bonar F, Harcourt P, Astrom M. Histopathology of common tendinopathies. Update and implications for clinical management. Sports Med. 1999; 27:393–408.
33 Jarvinen TA, Jarvinen TL, Kaariainen M, Kalimo H, Jarvinen M. Muscle injuries: biology and treatment. Am J Sports Med. 2005; 33:745–764.