American Academy of Physical Medicine and Rehabilitation

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330 North Wabash Avenue, Suite 2500
Chicago, Illinois 60611-7617
www.aapmr.org

phone 312/464.9700
fax 312/464.0227
info@aapmr.org

Musculoskeletal Case No. 9, January 2001

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Presenting Symptom: Groin Pain

Case prepared by: Robert P. Wilder, MD, FACSM, William J. Barrish, MD

Appropriate Audience: Residents and practicing physicians

Learning Objectives: After completing this educational activity, participants will be able to (1) understand the differential diagnosis of groin pain in athletes and (2) establish a systematic approach to diagnosis and treatment of groin pain.

History

A 28-year-old professional soccer player presents to the training room during the second week of practice complaining of the acute onset of groin pain that day while stretching for a ball during practice. Pain is primarily at the proximal adductor tendon and less so at its pelvic insertion. Pain is exacerbated by running and by striking the ball.

This patient is treated with electrical stimulation, massage, anti-inflammatories, flexibility and strengthening of the pelvic, hip, and lower extremities. Exercises are performed in both open and closed chain fashion.

For the first 3 days, his sport activity is limited to running up to three-quarter speed and dribbling drills. Sprinting drills are added on day 4. Patient is progressed through a progressive addition of sports specific soccer drills so that by day 14 post-injury, he is fully released for game participation. On day 16 post-injury he removes himself from a scrimmage, reporting the recurrence of groin pain.

- *Prior to continuing, please develop a differential diagnosis and list each possible diagnosis in order of likelihood.*

Commentary I

In athletes with persistent groin pain for whom initial measures fail, a broad differential diagnosis should be entertained (Table 1).

TABLE 1: Differential Diagnosis of Groin Pain in Athletes
Tendonitis (adductor, flexor, abdominal)
Pelvic or femoral stress fracture
Osteitis pubis
Snapping hip syndrome
Bursitis (iliopsoas)
Nerve entrapment (ilioinguinal, genitofemoral)
Enthesopathy (inguinal ligament)
Sacroiliac joint (SIJ) dysfunction
Pubalgia (sports hernia)
Labral or acetabular injury
Avascular necrosis of the hip (AVN)

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Degenerative joint disease of the hip (DJD)
Lumbar referred pain
Inguinal hernia
Genitourinary disease
Systemic disease (rheumatologic, other)

Tendinitis in the groin region may occur as a result of incomplete healing of an acute groin strain or as an overuse injury. Tenderness is most pronounced at the bony attachment of the hip adductors, and pain can be elicited with passive stretching or resisted adduction. Pain is often present at the onset of activity, with gradual improvement as exercise progresses.

Osteitis pubis represents inflammation of the symphysis pubis. It is thought to be caused by repetitive motion and microtrauma of the symphysis, often as a consequence of running, jumping, or kicking.

Stress fractures may occur in the pelvis or more commonly in the femur. They result from accelerated bone remodeling in response to repeated stress. Several factors contribute to this excessive stress: repetitive microloading from pounding, the transmission of excessive impact forces to bone secondary to surrounding muscle fatigue, and the repetitive action of muscular traction on the bone.

Patients with genitourinary and systemic diseases will most often have associated findings on history and physical examination. Such questions should be included in a review of systems.

Labral and acetabular injuries are often associated with mechanical symptoms, severe pain, and limited function.

The athlete with pubalgia presents with chronic exertional lower abdominal, inguinal pain near the pubic insertion, which is not explainable by a demonstrable hernia or other medical diagnosis. The pain progresses to involve the adductor longus tendon as well as the contralateral inguinal and adductor regions. The location of pain suggests injury to both the rectus abdominus and adductor longus muscles. Paramount to the diagnosis of athletic pubalgia is the exclusion of other causes of groin pain.

Internal snapping hip syndrome is most often caused by friction of the iliopsoas tendon over an osseous ridge on the lesser trochanter or the iliopectineal eminence.

Sacroiliac joint dysfunction is typically caused by biomechanical imbalance and is manifested by pain that is sharp, aching, or dull and generally localized to the involved sacroiliac joint (SIJ) or posterior superior iliac spine (PSIS). Pain is generally unilateral and may be referred to the buttocks, groin, posterior thigh, or distally beyond the knee.

Nerve entrapments may present with radiating pain, the ilioinguinal into the testicular region, the obturator nerve into the medial thigh.

Enthesopathy of the inguinal ligament generally presents with pain medially at the insertion to the pelvis.

Iliopsoas bursitis is characterized by anterior hip pain.

The diagnosis of avascular necrosis of the femoral head should be considered in athletes with a history of trauma or steroid use.

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- *Is there any additional information regarding the clinical history that might be helpful in clarifying your differential list or changing its order of priority?*

Commentary II

Is there any previous history of groin injury or pelvic trauma? What diagnostic testing has been done in the past and what were the results? What were the results of any previous treatments?

Is there any history of back pain or injury? Is there any history of numbness or paresthesias?

Is there any pain with weight bearing? Does pain intensity change with walking or running?

History, continued

This athlete reports two prior "groin pulls" during the last 2 weeks of the previous soccer season. He denies direct trauma to the hip region. Plain film radiographs of the pelvis and hips were unremarkable. There is no history of back pain or previous lumbosacral trauma. He denies numbness or tingling in the groin and lower extremities. He does not have pain with normal weight bearing, but pain intensifies with walking and running. He denies genitourinary and constitutional symptoms.

He was able to fully complete the previous season, however he did feel some limitation in his performance with regards to sprinting and shooting. During the last two weeks of his previous season he received eight phonophoresis treatments, daily soft tissue massage to the thigh musculature, icing after practice, and more extensive flexibility work in the training room.

He declined an offer to play abroad during the off-season, choosing instead to rehabilitate his injury and optimize conditioning for this current season. During the first 6 weeks of the 12-week off-season, he refrained from running and used stationary biking and deep water running for a total of 90 minutes as his conditioning. He also lifted upper body weights and performed daily flexibility exercises. On weeks 7-10 he added an easy running program advancing from six miles total per week to 15 miles total per week of running. He continued to ride the stationary bike and run in the water. The final 2 weeks prior to coming to camp he did some additional running with accelerations as well as some light ball work.

- *If necessary, revise your differential diagnosis based on the additional clinical history.*
- *On which details of the physical examination should you focus at this point?*

Commentary III

Hip adductor and flexor tendinitis remains the most likely diagnosis. Localized tenderness, as well as reproduction of pain with passive stretching and active contraction of the involved muscles will provide further clues. Iliopsoas bursitis also remains in the differential.

Osteitis pubis and athletic pubalgia should still be considered highly in the differential. The history of chronic groin pain in the adductor region of the thigh, along with reproduction of pain with running and kicking, is consistent with these diagnoses.

Given that he had several weeks of non-running rest and subsequently a gradual progression back to impact activity, the likelihood of a stress fracture would be considered much lower.

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Lack of numbness, tingling, and radiating pain make nerve entrapment a less likely cause of chronic groin pain.

Absence of direct trauma and pain-free weight bearing make the diagnoses of AVN, labral injury, acetabular injury, and hip DJD less likely.

The physical examination can be useful in directing the clinician to a more likely choice among the possible diagnoses.

Tendinitis will generally present with tenderness along the involved tendon and exacerbation of pain with resisted muscle activity.

Patients with bone involvement including stress fractures, joint disease, and avascular necrosis will have most specific pain with weight-bearing activities. Hopping on one leg may exacerbate symptoms.

Osteitis pubis generally presents with tenderness at the pubic symphysis.

Snapping hip syndrome will present with a snapping or clicking sensation anteriorly as the iliopsoas snaps over the iliopectineal eminence.

Inguinal ligament enthesopathy generally has tenderness directly at the inguinal ligament insertion at the pelvis.

Patients with lumbar referred pain will often have evidence of lumbar pain or segmental dysfunction, positive neural tension signs, or abnormalities on neurologic testing.

Inguinal hernias can be detected by digital examination.

Athletes with sacroiliac dysfunction will demonstrate pelvic abnormalities on physical examination and provocative testing.

Physical Examination

For definitions of Gillette, Gaenslen and Scouring tests please see glossary at the end of the case

Lumbar range of motion (ROM) is full without reproduction of pain. Iliac crest heights are symmetric. Gillette's test and flexion tests are normal. Gaenslen's test is normal.

Motor, sensation, and reflex examination of the lower extremities and groin is unremarkable.

Examination of the groin region reveals diffuse tenderness throughout the anteromedial groin. There is tenderness at the adductor insertion extending into the medal soft tissues of the thigh. There is tenderness at the pubic symphysis as well as at the superior aspect of the pubic bone. Pain is intensified with sit-ups and resisted hip adduction. Pelvic compression increases pain. Hip range of motion is full, with reproduction of pain upon internal rotation. Scouring test is negative.

There are no deformities or hernias appreciated.

- *At this point, review your differential diagnosis and revise as appropriate.*
- *Are there additional observations on physical examination that might be helpful in narrowing your differential list?*

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Commentary IV

History and physical examination findings are consistent with several diagnoses, including hip adductor and/or flexor tendinitis, osteitis pubis, athletic pubalgia, and iliopsoas bursitis. The critical aspect of the athlete's history is the recurrence of symptoms in the pubic and adductor regions despite aggressive, comprehensive therapy. The findings on physical examination were helpful in localizing the pathology to this region by decreasing the likelihood of primary pathology of the lumbosacral spine, sacroiliac joint (SIJ), hip joint, or isolated nerve entrapment.

Primary muscle involvement in adductor strain and tendinitis can be established by reproducing the symptoms during resisted adduction in three positions of hip rotation: external rotation (adductor magnus), neutral (adductor longus), and internal rotation (pectineus). Acute cases may be accompanied by swelling and ecchymosis. A palpable defect may be present, representing a tear.

A complete functional and biomechanical exam is critical to the proper diagnosis of this athlete. This allows for a more appropriate determination of the seriousness of his current injury. Functional examination should include evaluation of gait with walking, jogging, running, and carioca. Also, sport-specific activities, such as kicking, should be evaluated.

Physical Examination, continued

The patient walks without antalgia. He is able to jog but demonstrates mild antalgia on the left. He is unable to sprint or perform carioca. Single leg hop test produced pain at the adductor insertion at the left pelvis.

Pain is reproduced with resisted hip adduction in general, with no particular change in intensity with the hip internally or externally rotated or in the neutral position.

- *If necessary, revise your differential diagnosis based on the additional physical findings.*

Final Diagnostic Impression

1. Osteitis pubis.
2. Adductor longus tendinitis.

Commentary VII

Osteitis pubis represents a chronic inflammatory and overuse condition of the pubic symphysis and adjacent ischial rami. Most commonly associated with urologic procedures, prostatectomy, and childbirth, osteitis pubis can also occur in athletes and appears to be related to repetitive shear forces transmitted to the pubc symphysis during running and repetitive adductor contractions during kicking sports. The athlete typically complains of the gradual onset of discomfort in the lower abdomen or groin area that is worsened by sport activity and relieved by rest. Physical examination reveals point tenderness at the pubic tubercles, rectus abdominis insertion, adductor origin, and inferior pubic rami. Pain is intensified with sit-ups and resisted hip adduction. Range of motion is maintained. Radiographic studies may reveal a fraying or roughening of the periosteum of the pubic symphysis. However, x-ray signs may be delayed for as long as 4 weeks after the onset of symptoms, therefore a bone scan or MRI may assist diagnosis in early stages.

Adductor or groin strain can result from an acute injury or from chronic angiofibroblastic tendinosis of the hip adductor group, particularly at the adductor longus at the proximal

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musculo-tendonous junction, tendo-osseous insertion to the inferior pubic rami, or the muscle belly itself. Eccentric overload, such as that experienced during quick changes in direction from a stretched out lunge position, is thought to be especially contributive. Ballistic stretching often leads to groin strain. The functional biomechanical deficits include tightness of the ipsilateral adductors and contralateral tensor fascia lata. The ipsilateral gluteus medius and gluteus minimus will then become inhibited or weak as will the lower abdominal muscles. The functional adaptation complex includes an increase in lateral tilt of the pelvis where the contralateral side of the pelvis drops in the swing phase of gait. An ipsilateral inferior pubic ramus dysfunction is often associated. The tissue overload complex is exhibited by excessive strain and inflammation of the lateral pelvic and hip structures, including the gluteus medius and gluteus minimus, as well as the trochanteric bursa. Along the kinetic chain, the tensor fascia lata and iliotibial band as well as lateral knee structures and lumbar spine are susceptible to overload. The knee and, in particular, the patellar femoral joints are overloaded, as well as distal structures such as the ankle, owing to altered pelvic stability. The abdominals are considered overloaded due to the position of the pubic rami inferiorly, which puts the abdominals on stretch, placing them at risk for tears. Finally, the adductors inhibit the contraction of the gluteii after the propulsion phase of running.

- *What treatment would you now initiate for the patient?*

Commentary VIII

Acute cases of adductor strain and osteitis pubis can be treated with ice and non-steroidal anti-inflammatory agents to limit pain and inflammation. Elastic spica wrapping or compression shorts help control swelling and minimize pain during ambulation and sport activity. Rehabilitative exercises emphasize full motion strengthening of the hip adductor group and flexibility. Functional deficits in the gluteii, tensor fascia lata, and pelvis are corrected. Strengthening involves both concentric and eccentric loading. Proprioceptive neuromuscular facilitation (PNF) diagonal motions effectively exercise the muscles to promote balance, strength and flexibility around the joint. Soft tissue mobilization and electrical stimulation are useful adjunctive treatments. In more chronic adductor strains, ultrasound is a useful modality to precede mobilization. Five or six treatments of deep friction massage to break up scar tissue before stretching may also be necessary. Flexibility and strength of the abductor group ensures muscular balance. Sport specific activities should include the slide board for side to side gliding, and lateral sprints.

Any dysfunctions in the pelvis and sacroiliac joint are also corrected.

In refractory cases or severe acute cases of osteitis pubis, a corticosteroid injection into the pubic symphysis can be useful.

In the current case, given the extensive conservative care provided to this athlete with inability to return to his prior level of function, an injection of corticosteroid into the pubic symphysis is performed. The patient reports almost immediate reduction in pain. He is able to walk with no pain. Jogging results in mild discomfort graded no worse than 2/10.

In an effort to protect local structures following a steroid injection, the athlete is not permitted to participate in any impact loading activities for a period of 2 weeks. During this time, he participates in deep water running sessions to maintain aerobic fitness. He continues with his flexibility and strength work on a daily basis. He continues to receive daily electrical stimulation and soft tissue massage treatments. Two weeks post-injury a

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gradual running and cycling program is initiated. Four weeks post-injection the patient initiates sprinting and functional drills. Six weeks post-injection the patient is released for full participation in major league soccer. He completes the remainder of the season without recurrence of pain.

Final Discussion

As previously discussed, most instances of acute groin pain in the athlete will represent adductor tendinopathy. Most will also respond to aggressive conservative care including anti-inflammatories, modalities, soft tissue work, balanced flexibility and strengthening, and functional progression.

Those cases that do not respond to conservative care require further evaluation and consideration of a much broader differential diagnosis as presented in Table 1.

In cases of longer standing or recurrent groin pain, bony and intra-articular injury must be considered.

If x-rays are negative, bone scanning or MRI scanning can be used to assist with diagnosis.

Intra-articular injuries including damage to the hyaline cartilage of the femoral head or acetabulum, and labral injuries, can be potentially career ending injuries. Although some cases may respond to protracted rest and nonoperative treatment, surgical remediation may be necessary. Hip arthroscopy is developing and may provide a greater opportunity to assist with treatment of such injuries.

Although stress fractures of the hip and pelvis are not common, early diagnosis is mandatory to avoid unnecessary complications.

The majority of femoral stress fractures occur at the femoral neck. Femoral shaft stress fractures are less common and generally occur in the subtrochanteric region, but can occur in the mid-shaft and distal regions as well.

The athlete with a pelvic or femoral stress fracture generally complains of non-specific deep thigh or groin pain that is aggravated by activity and relieved by rest. Onset often is associated with a recent change in training (particularly an increase in distance or intensity) or a change in training surface. Physical examination may reveal normal hip motion and strength. Advanced cases will be associated with decreased strength and motion with pain on end rotation. Direct palpation over the involved bony area may elicit pain in patients with femoral shaft fractures, as will stressing the femur over the edge of the examining table, distal to the site of pain. Hopping on one leg may reproduce pain.

Initial x-ray findings are often negative, and as many as one-third of femoral stress fractures never show radiologic changes on plain films. Thus, bone scans or MRIs should be ordered if suspicion is high, particularly if pain has persisted for more than two weeks with appropriate conservative care.

With femoral neck fractures, the type of fracture **must** be differentiated. Compression type injuries occur at the lower border of the femoral neck, and displacement is rare. Distraction type fractures occur in the superior part of the neck, and displacement is more common, thus necessitating internal fixation.

Patients with non-displaced compression type femoral neck fractures are placed on crutches with partial weight bearing status until pain is absent and radiologic follow up indicates sufficient callus formation (3-8 weeks).

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The athlete then commences rehabilitative efforts including deep water running, swimming, biking for conditioning, as well as rehabilitative exercise restoring muscle flexibility, strength, and balance.

Displaced compression type injuries, and distraction type fractures may require internal fixation and thus mandate orthopedic referral. Femoral shaft fractures typically respond to a protracted period of non-weight bearing (2-4 months). Most non-displaced pelvic stress fractures will also respond to weight-bearing rest of 6 weeks duration. Patients may run in the water during this time. After 6 weeks, a progressive weight-bearing exercise program is commenced.

Athletes with a snapping hip syndrome will describe a popping sensation with repetitive flexion-extension caused by the iliopsoas snapping over the iliopectineal prominence. Most cases of the anterior snapping hip syndrome are painless. Balanced flexibility and strengthening will ensure muscular balance. Painful cases may also benefit from anti-inflammatories, modalities, and soft tissue work in addition to the flexibility and strengthening.

Cases of bursitis, nerve entrapment, and enthesopathy of the inguinal ligament will also generally respond to initial conservative measures as described for the adductor tendinopathy.

We have found that cases of the iliopsoas bursitis tend to produce pain in the anterior groin more typically, and the inguinal ligament enthesopathy pain at the pelvic insertion. Entrapment of the iliopectineal nerve will often result in pain, which can radiate into the testicular region. Obturator neuropathy can present with decreased sensation in the obturator distribution as well as weakness of the adductor muscles. Electrodiagnostic testing may demonstrate changes in the adductor musculature. Electrodiagnostic testing is also useful in ruling out lumbar referred pain.

For those cases that do not respond to conservative measures a steroid injection can be considered for treatment of the bursitis, nerve entrapment, or enthesopathy. The injection serves dual purposes, both diagnostic and hopefully therapeutic. Injections should be directed by the physical examination as noted above, although certain refractory cases may require a series of injections to best localize the particular pain generator.

A small subset of athletes will experience long-standing groin pain despite aggressive conservative measures (medications, rest, physical therapy, massage, flexibility, strengthening). The patient with athletic pubalgia presents with chronic exertional lower abdominal/inguinal pain near the pubic insertion, which is not explainable by a demonstrable hernia or other medical diagnosis. The pain progresses to involve the adductor longus tendon as well as the contralateral inguinal and adductor regions. The location of pain suggests injury to both the rectus abdominis and adductor longus muscles. Paramount to the diagnosis of athletic pubalgia is the exclusion of other causes of groin pain. Athletes who fail to respond to conservative management, including flexibility and strengthening of the abdominal and hip musculature, may benefit from surgical remediation, which includes attachment of the abdominal muscle firmly to the anterior pelvis and, in those cases with adductor pain, a partial adductor release also. Other proposed etiologies for chronic groin pain include:

1. Deficiency of the transversalis fascia, with a weakening and bulging of the posterior wall of the inguinal canal (the "sportsman's hernia"), either alone or in combination with splitting of the conjoint tendon and/or dilation of the internal inguinal ring.

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Surgical correction consists of repair of the posterior wall of the inguinal canal by plication of the transversalis fascia as well as repair of the deficit in the conjoint tendon, if present.

2. Attenuation or laddering of the external oblique in conjunction with separation of the conjoint tendon from the inguinal ligament and laxity of the transversalis fascia (Gilmore's groin). Surgical correction involves reinforcement of the weakened transversalis fascia and reattachment of the conjoint tendon to the ilioinguinal ligament.

As with pubalgia, athletes considered for surgical remediation must have failed conservative care including strengthening of the core pelvic and abdominal muscles, and should be referred to surgeons with experience in treating athletes with chronic groin pain.

Glossary

Scouring (quadrant) test - With flexed hip, examiner adducts and abducts the hip while maintaining axial pressure. Apprehension, pain, or irregular movement may indicate hip pathology.

Gaenslen's test - Patient supine over the edge of the table, drop one leg over edge of table and pull opposite knee to the chest. Positive test may indicate ipsilateral SIJ dysfunction, hip pathology, or an L4 nerve root lesion.

Gillet's (sacral fixation) test - While the patient stands, the examiner palpates the PSIS. The patient is then asked to stand on one leg while pulling the opposite knee toward the chest. If the SIJ on the side on which the knee is flexed moves minimally, the joint is hypomobile, indicating a positive test.

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