

## The Sports Hernia

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**Summary:** The sports hernia is a cause of chronic groin pain in athletes. The diagnosis can be made by taking a thorough history and elucidating the appropriate findings on examination. The main feature of the examination is a painful, enlarged cough impulse from a weakness of the posterior wall of the inguinal canal. Treatment is by surgical repair. Success rates in terms of a pain-free return to activity are 80–90%. The condition has been reported in many countries and is gaining world wide acceptance. **Key Words:** Groin pain—Sports hernia—Direct inguinal hernia.

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The groin is not commonly a site of sporting injury: Only 5% of those attending a sports injury clinic (1,2,3) had complaints about the groin. Injuries to the groin are responsible, however, for a much larger proportion of time lost from competition and work (4) than are injuries in other sites. In the game of soccer injury to this area is more common than the figures suggest. In 1965, Vater reported that 28% of players had a positive history of groin pain and also had associated x-ray changes.

The chronic groin pain of athletes is diffuse in its distribution but can become sufficiently severe that it affects activities of daily living. Many etiologies have been proposed and syndromes described (6,7,8). The syndrome of a weakness of the posterior inguinal wall, without a clinically obvious hernia causing chronic groin pain, is increasingly recognized. The symptoms are variable, but the diagnosis can be made from the history and examination. The condition does not respond well to conservative measures, including prolonged rest.

In 1980, Smedberg et al. (9) presented their findings, investigating groin pain in athletes with herniography. They found that a significant number of patients with obscure groin pain had a direct noncongenital hernia. After surgery, there was an 81% incidence of full return to sport.

In 1993, the current author reported experiences with a syndrome of weakness of the posterior inguinal canal that was suspected to be an early direct inguinal hernia (10) and was treated with surgical repair. There were 15 patients,

all were men and women engaged in active, competitive sports or involved in strenuous physical exercise in the armed forces. The average duration of symptoms from onset to surgery was 20 months, with a range of 6 weeks to 5 years. Excellent results were achieved in more than 80% of patients, with full return to competition; all patients reported improvement. Total experience now runs to more than 200 cases.

Smedberg et al. state that they could not reliably determine which of their patients had a hernia from the history and examination, but in the current author's experience, history and examination can accurately determine which patients have a sports hernia.

A wide variety of sports have been associated with this injury. The most prominent of them is soccer, but distance running and rugby have also produced significant numbers of patients.

### HISTORY

The condition frequently has an insidious onset, but because of poor recognition of this condition, time from initial symptoms to consultation with a specialist is prolonged. The groin pain of a sports hernia less frequently results from a sudden tear. Patients will usually receive a variety of modalities of treatment. With gradual onset, the initial sensation is often not sufficiently severe to prevent the player from completing the event but becomes an unpleasant dull, toothache-like pain during the next few hours and during the evening. Runners usually report a prolonged history of gradual onset, although contact athletes have an acute episode more frequently than do runners. It is of note, however, that

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a soccer player will report having had "groin strains" in the past, by which is meant adductor muscle pulls; this new injury is felt more strongly and is "deeper." As the athlete continues the sport, the discomfort appears toward the end of a game or of a run during the game. With time, the player will not train between matches and despite resting, will find that groin pain comes on earlier and is more severe. It becomes impossible to stride out or to turn quickly without a stab of pain. Kicking a ball hard gives rise to sudden, sharp pain. The athlete is often removed from play earlier in the match as the symptoms progress. Professional soccer players will continue with matches but will not be able to train between them. The groin pain becomes progressively more severe to the stage where pain is felt at rest, with a painful limp when walking.

The pain is frequently difficult for the patient to pinpoint, because the pattern is very diffuse. It usually centers on the inguinal region but spreads laterally along the inguinal ligament, proximally into the rectus muscles and even across to the opposite side. Pain is experienced in the adductor muscles, spreading distally into the perineum, and pain levels can be high. In a follow-up assessment, an analogue pain scale from 0 (no pain) to 10 (worst possible pain) was used to describe pain. The range was 3 to 9, but the mean was 6.5: This can be an extremely uncomfortable condition.

Testicular pain is a feature in approximately 30% of cases. The aching from the testes can be sufficiently painful to be referred for urologic opinion. Low back pain is frequently an additional complaint. A history of reproduction of pain while coughing or sneezing is helpful in confirming the diagnosis. One international marathon runner reported having to bend over and to press firmly in the inguinal region with his hand to reduce symptoms if he coughed while running. Sit-up exercises exacerbate symptoms. Some patients report pain during sexual intercourse.

### EXAMINATION

The findings on examination depend on how much rest and treatment the athlete has received. Many patients will have already undergone prolonged periods of rest, with lengthy spells of physiotherapy in the form of stretching, strengthening exercises, and electrotherapy. The pain is significantly reduced with prolonged cessation of activity. It recurs with the same intensity when training is resumed.

In the acute stage, there is adductor spasm with tenderness around the belly and the origin of the adductor muscles. However, the patient will recognize that the tenderness palpated is not the true source of the pain. Attempting to bring the knees together against resistance will cause pain

around the adductors and in the inguinal region. Attempting to lift the legs from the couch while supine reproduces symptoms in some patients. The symphysis pubis and pubic tubercle of the affected side are tender to palpation. The inguinal rings must be palpated through the scrotum, in that external examination fails to detect a sports hernia. In the United Kingdom this necessity has frequently led patients to fail to report pathologic symptoms when referred to a general surgeon (11). The area around the external ring is tender, and the external ring may be enlarged.

The significant part of the examination is when the midinguinal canal is palpated. The patient usually confirms that the pain is worst there and that the pain is aggravated by coughing. In severe cases, this is an extremely painful procedure. The cough impulse is broader and diffuse, causing a significant bulge compared with the normal side. The patient who is pain free after a period of prolonged rest causes some difficulty. The clinician should ask the patient to return to sport and then should repeat the examination. If this is impractical, sending the patient out during the consultation to exercise to the point of pain will confirm the diagnosis. Interestingly, the cough impulse is also greater in patients with only a small preexercise cough impulse. The testes should be formally examined to exclude local pathology. The hip, spine, sacroiliac joints, perineum, and abdomen should be examined to exclude other pathologies.

### Investigations

Pelvic x-ray may show evidence of osteitis pubis. Bone scan yields positive findings earlier than plain x-ray in the progression of osteitis pubis and follows the clinical path more closely. Herniography has been used to attempt to provide an objective diagnostic test (12-15). From the surgeon's point of view, a herniogram may prove useful. A positive herniogram reassures patient and surgeon that there is justification for an operative procedure. The herniogram may show an incipient hernia on the contralateral side. A successful herniographic scan requires considerable experience on the part of the radiologist; reports become much more reliable after the first 100 investigations. Herniography is less sensitive when assessing cases with a relatively short history. The weakness and consequent bulging on performing Valsalva maneuvers shown with an early or mild hernia is not gross enough to show on herniography. Herniography does not appear to be helpful in cases in which the clinical condition is not obvious to a clinician experienced in the diagnosis of the sports hernia.

Reports of findings using ultrasound to detect posterior wall deficiency show some promise using this noninvasive technique (46). Magnetic resonance imaging has not been useful in the diagnosis of sports hernia. Edema across

the pubic symphysis has been demonstrated in acute cases, presumably indicating early instability.

### OPERATIVE FINDINGS

Operative findings are more pronounced the more prolonged the condition. In all cases, there is a weakening and thinning of the transversalis fascia, with separation of the inguinal ligament from the conjoined tendon. The weakness can amount to a direct hernia. The internal ring may be dilated, with the inferior epigastric vessels clearly visible. The shutter mechanism that protects the internal ring has disappeared. On occasion, this author has seen the femoral vessels covered only by a flimsy sheet of fascia. With a short duration of symptoms, the defect seems to be more to the medial end of the inguinal canal. In one heavily built rugby player, there was an obvious defect between a firm inguinal ligament and there was marked hypertrophy in the lower abdominal wall musculature.

The repair, which this author extends to reconstitute the internal ring, is performed with a plication of the transversalis fascia. The plication is then covered by a darn of nonabsorbable suture, opposing the conjoined tendon to the inguinal ligament. The repair is similar to that performed by Malycha and Lovell (16). A Bassini repair or marlex mesh was used by Simonet et al. (17) and a Bassini or Shouldice repair by Urquhart et al. (18). Reported success rates are similar for each method (19).

In the current author's opinion, the plication is the important part of the procedure. When this condition has been treated by laparoscopic repair, there has been variable relief of symptoms. Although early results have been presented with some optimism, there have been some notable failures in English soccer players. According to Smedberg, the sports hernia amounts to a generalized distension of the anterior abdominal wall, with an incompetence of the posterior inguinal wall. The defect develops into a general weakness of the whole posterior inguinal wall that requires tightening through its length to effect a long-term cure. Greg Lovell, in personal correspondence, agrees with this opinion.

### Return to sport

Early return to sport has led to recurrence, with multiple surgical procedures reported in personal communication with doctors caring for professional soccer clubs. This author recommends that patients return to activity gradually, with stretching and non-weight-bearing exercise (swimming or cycling) after 3 to 4 weeks. Running commences at 4 to 5 weeks, with daily training usually possible at 6 weeks. A number of athletes report pulling in the groin during this period, but the sensation gradually set-

les. The author's patients are told to expect this and that it is attributable to the settling down of the plication and darn. Patients are not permitted to return to sit-ups for at least several months, if at all, because such exercise has led to return of symptoms in some patients.

### Follow-up

Excellent and good results are consistently reported in 72% to 100% of patients, respectively, with full return to sport. Most surgeons report better than 90% success in full return to sport.

The diffuse and varied nature of the distribution of pain was illustrated and confirmed by the pain diagrams that were used in the author's follow-up. Patients shaded the area over the inguinal canal and the adductor origin. Some had referred pain into the scrotum, inner thigh, proximally in the midline, or laterally along the inguinal ligament.

### DISCUSSION

Chronic groin pain has the justified reputation of a condition that is difficult to cure. Conservative treatments achieved only a 38% return to sport in the report of Martens et al. (20). The current author's series included patients who had received stretching and strengthening exercises from physical therapists in addition to electrical treatment modalities. Local anesthetic and steroid injections provide no lasting relief, if any at all. Two patients in the original series underwent scrotal procedures, in effect placebo operations, with no relief of their groin pain.

The current author's results show an 85% return to full activity after surgery, despite failure of all previous conservative treatments.

The number of reports in the literature describing chronic groin pain is growing. There have been several reports in the literature (10,16-22) of surgical repair of the posterior inguinal wall for chronic groin pain in athletes. During the 1980s, European literature provided some suggestions for treating chronic groin pain surgically.

Smodlaka (23) reports that Nessovic in Yugoslavia uses a Bassini repair with success. Horsky and Huraj (24) report strengthening of the inguinal ligament and transversalis fascia to be effective. Hess (25,26) states that no conservative measures succeed.

In these earlier reports, surgeons disagree on the site of the pathology. Schneider (27) considers the problem to be an insufficiency of the external ring and aponeurosis. Dr. James Hyde, in personal correspondence from Australia (28), calls the syndrome chronic conjoint tendon syndrome, believing that there is no herniation and that the problem is more medial. He reattaches the insertion of the conjoined tendon, emphasizing the tightening of the tendon. He claims

a 90% success rate after 6 to 8 weeks after surgery with more than 500 procedures performed, but without published results. Martens (20) differentiates the syndrome into three types, depending on the predominant site of pain. He operates on the origins of the adductor group, the insertion of rectus abdominis, or the posterior inguinal canal, but has presented no data comparing results.

Recently published reports are more consistent in attributing the site of the pathology to the posterior inguinal wall, with an early direct inguinal hernia (10,13,16–19,29), and this author agrees that this is indeed the site of weakness. This correlates well with herniographic findings. The success of repair of the posterior inguinal wall supports this concept.

Occasionally, indirect hernias are found during surgery; these are incidental findings (13). Yilmazlar notes a weakness of the transversalis fascia, in addition to indirect hernias, that seems not to have the strength to withstand the repeated high intraabdominal pressure generated by sports activity.

Groin pain is comparatively uncommon in women. In more than 200 cases of sports hernia, less than 5% have been in women. Examination of the posterior inguinal wall and hernial orifices is more difficult, and the history becomes more significant. Repair is as successful when the diagnosis is made.

The cause of the pain and its widespread nature requires further thought and investigation. Lovell found no histologic abnormality with investigation by biopsy (30). As a modification of herniography technique used in the current author's patients, Blease (12) used lignocaine with the radiographic dye before sending patients to exercise in an attempt to reproduce their pain, to determine whether the peritoneum was the possible source of pain. The results are inconclusive. The probable cause of the pain is a stretching of the tissues of the posterior inguinal canal, possibly with a subacute instability of the pubic symphysis in the early stages of the condition. Testicular or adductor pain may be related to irritation of nerves running through the area. Certainly, nerve entrapment in this region has been reported as a cause of chronic groin pain (31,32,45). In the current author's practice, neither osteitis pubis nor adductor tendon pathology has been a significant cause of groin pain. The author's patients are often tertiary (or more) referrals and may not be representative of the whole population experiencing groin pain. Harris and Murray (33) also described changes in the sacroiliac joint in their soccer players with osteitis pubis, which may account for the associated low back pain with this syndrome.

The skeptic may argue that the improvement is related to a "proper" rest after surgery. The pain in the scrotum can be a prominent feature and has led to investigation for tes-

ticular abnormality. In the author's original series of 15 patients, before referral, 4 patients underwent ultrasound examination, with 2 of those undergoing surgery to their testicles in the form of fixation or epididymectomy before the cause of their groin pain was determined. In neither case did the patients note any change in their pain, nor did the enforced rest relieve their symptoms. After surgery to their inguinal canal, both commented that although they had pain at the operative site, they had immediate postoperative relief from the dull ache that had been their initial symptom.

Fredberg et al. (34) attempted to review the literature in a review article entitled, "The Sportsman's Hernia—Fact or Fiction?" and concluded there was no justification for the condition of sports hernia. They claim that chronic groin pain settles in 3 months. They use this to conclude that a long follow-up means that the condition may have settled spontaneously before follow-up occurred—that is, that the patient would have recovered despite surgery. The clinical picture and pathology described in the reports supporting the diagnosis of sports hernia are remarkably similar.

There appears to be a syndrome that includes osteitis pubis and pain around the adductor origin with sports hernia. There is certainly a distinct similarity in the symptoms described by investigators writing about the three conditions (33,35,37). Akemark (36) published an account of the use of tenotomy of adductor longus in the management of chronic groin pain. He states that surgery was performed on those with localized pain, although he notes that osteitis pubis produced a groin pain similar to that found in his patients. Cochrane (37) gives a detailed account of the progression of symptoms in two footballers with osteitis pubis. The history is nearly identical to that given by the current author on sports hernia (10). Gullmo (15) recommends herniography for those with chronic groin pain and osteitis pubis. He notes a correlation between the two but gives no data to support his recommendation. Presumably, the incidence of radiographic changes in those undergoing repair for positive herniographic findings was frequent enough to alert him. Harris and Murray (33) state that the x-ray appearances of osteitis pubis lagged behind the clinical picture and remained after the symptoms settled after treatment with conservative measures. However, Le Jeune (38) investigated 32 cases of pubic pain with scintigraphy, using technetium-99m, and reports a closer relationship with the clinical course when the scan was positive; however, he gives no clinical histories for his cases. Further investigation into the correlation between osteitis pubis, adductor pain, and sports hernia is required.

Several theories of the etiology of the condition of chronic groin pain have been described. Williams (39) implicates a reduction in internal rotation of the hip joint

in the etiology of osteitis pubis. He proposes that a block to internal rotation produces a shearing force across the pubic symphysis from continued adductor pull. Bowerman (40) proposes that it would follow that shearing across the pubic symphysis leads to stress on the inguinal wall perpendicular to the direction of fascia fibers and of muscle fibers. The anatomic defects in the wall—that is, the inguinal rings—may account for the predominance of this condition in men. An alternative theory is that it is simply a chronic stretching of the posterior inguinal wall caused by excess demands and aggravated by the anatomy of the region. Anatomy texts have described variability in the depths of the fossae outlined in herniograms. It may be the case that those who fall victim to this syndrome are predisposed to it by naturally deep fossae. Simonet et al., Taylor et al., and Smodlaka (17,19,23) all state that a congenital defect may predispose to this condition.

The differential diagnosis of groin pain is extensive (22,41–43). Snapping-hip syndrome (44), with psoas bursitis as a cause of chronic, undiagnosed groin pain, is the second most common diagnosis in athletes referred in the current author's practice. Stretching the psoas tendon can reproduce the pain felt by those with this injury, and is used as a diagnostic test. In severe cases of sports hernia, this stretch is also painful, but the patient does not recognize the pain produced as the same pain. The author has found that a program of supervised psoas stretching has a high success rate and that surgery is rarely indicated. During accumulation of patients with chronic groin pain, the author has found cases of pain referred from a spondylolisthesis of L5. One was a fast bowler in the English game of cricket, in which twisting of the lumbar spine is a frequently reported cause of traumatic spondylolysis. He was successfully treated by screw fixation, with the abolition of his groin pain. Other patients have responded to local anesthetic–steroid injection, with successful pain-free return to running. None of these patients reported significant low back pain.

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