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Sports Hernias in Athletes

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Groin pain is a common presenting complaint for athletes in the surgical outpatient clinic. The differential diagnosis of this condition can be extensive, encompassing: musculoskeletal, nflammatory, infectious, neurological, neoplastic, and congenital causes.[1] Sometimes, despite an extensive workup, the cause of this pain is not evident. Athletic pubalgia or Sportsman's hernia is a poorly understood and often misdiagnosed cause of chronic groin pain in athletes and active individuals.[2]

Many terms have been used over the years to describe this condition. The exact terminology differs widely, based on geography as well as the primary specialty of the treating surgeon. In the United States, most of the publications refer to the condition as "athletic pubalgia" or "sports hernia". A few papers refer to it as "Core muscle injury". In contrast, papers from Europe refer to it as "Inguinal disruption", "Sportsman's hernia", "Sportsmen's groin".[3] The official term adopted by the British hernia society is "Inguinal disruption", coined at the Manchester consensus meeting in 2014.[4] In this paper we use the above-mentioned terms interchangeably.

Core muscle injuries are a common cause of groin pain in athletes who engage in sports that require a twisting motion or a change of direction at high speed. It may also be considered as an "overuse syndrome".[5] In our practice, most patients are soccer or hockey players, but we see patients in all sports.[1] This condition has also been described in the general population who are not athletes but engage in strenuous activity or have injured their core while slipping on ice during the winter, for example.[2]

This condition is poorly understood, and awareness of its existence has been gradually increasing among the medical community. This perception is supported by the number of articles indexed in PubMed with the term "sports hernia". Between 1946-2000, there were

266 articles. From 2000 till 2022, there have been 886 articles, indicating a rising interest in this condition.[6] This condition is important as it can significantly affect the career of an athlete if it is not addressed and treated appropriately.[1]

The onset of pain in the high-performance athlete can be either gradual or acute, and often responds poorly to conservative measures which include rest, physical therapy, and cortisone injections. This review article aims to provide an effective overview of the condition and to highlight the philosophy of treatment developed at our center in athletes over the course of the past two decades.

Clinical Features

The diagnosis is made with the typical history, physical examination and findings on MRI.[1,7] Classically, the onset of pain is related to exercise, is relieved with rest and is localized to the lower abdomen and groin. A typical complaint of patients is that despite the pain, they can play through the sporting event. However, the following morning, the pain in the groin is excruciating and they find it hard to get out of bed or put on their trousers. The pain may radiate to the perineum, inner thigh, and scrotum.[1] More often than not, the onset is insidious in nature, although in approximately one-third of cases, the patient will recount a sudden pop or pull as the inciting event, and may be able to continue playing in that instance, but with pain.[8] Given the wide spectrum of physical findings, it has been our experience that a provocative test to elicit pain at the insertion of rectus abdominis muscle is the most consistent and diagnostic physical finding in these patients. The patient is asked to perform a sit-up while the examiner applies pressure just superior to the pubic symphysis at the rectus insertion, as shown in Figure 1.[9] There may be concomitant adductor insertion pain since the adductor can also be injured.

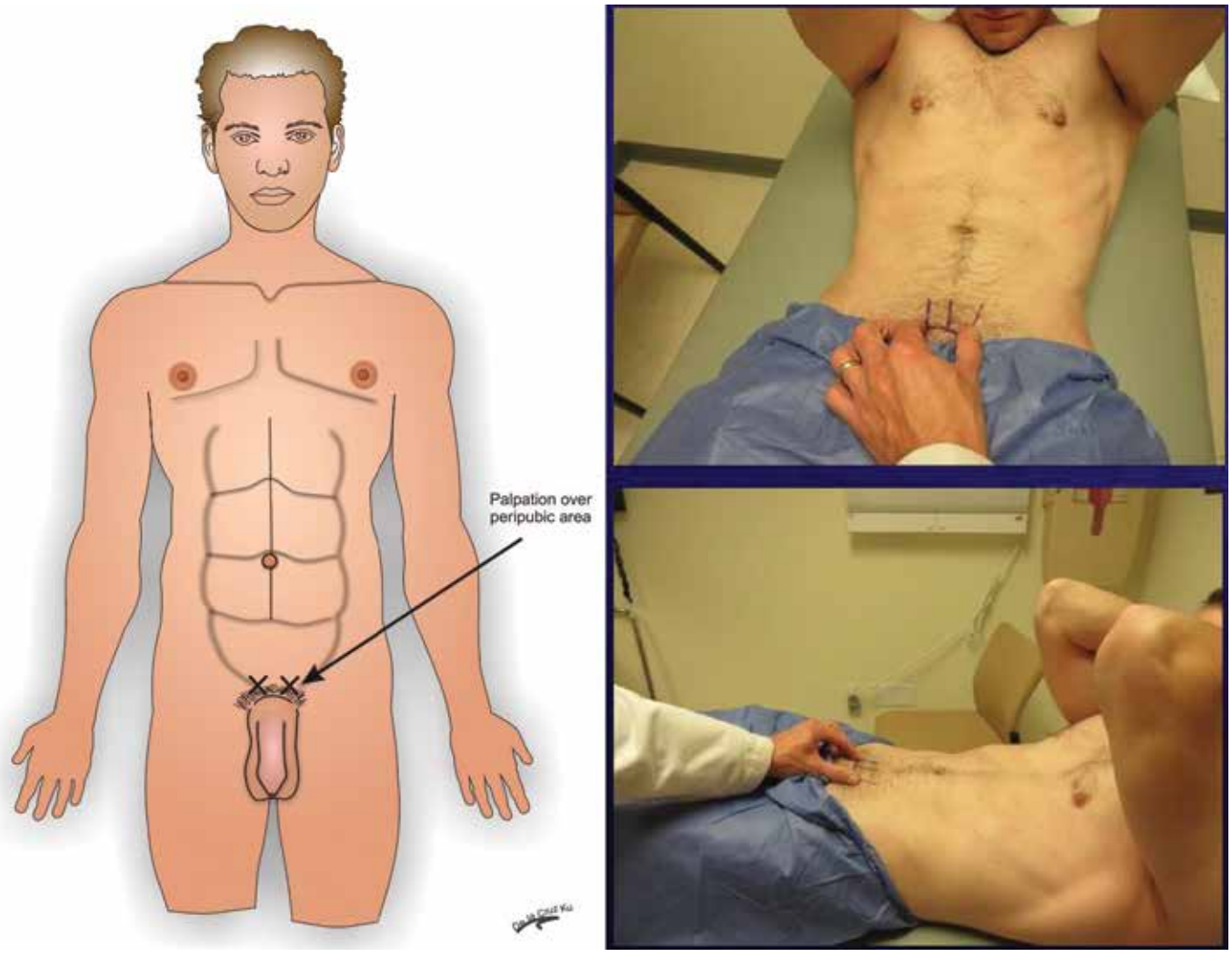

Figure 1: Location of palpation of tenderness in the suprapubic region & provocative maneuvers with flexion of the rectus muscles

Accurate diagnosis rests primarily on a good history and physical exam, supported well by imaging modalities. The most used imaging modalities are an MRI of the pelvis, followed by plain radiographs.[3]

In a patient with sports hernia, MRI frequently demonstrates rectus abdominis / adductor aponeurosis injuries.[9] While MRI findings may lend support, it is not essential to establish the diagnosis. In a minority of patients, it is possible to have an entirely normal MRI. A dynamic US of the groin is also useful in patients with occult hernias,[10-12] but plays little role in diagnosing the muscle injury phenomenon associated with sportsman hernia. It is not uncommon for all imaging investigations to be normal, and the only pathological finding to be point tenderness upon deep palpation over the insertion of the rectus muscle, just medial to the pubic tubercle.[13, 14]

The Manchester Consensus conference of the British Hernia Society established a set of diagnostic criteria for this condition. Any patient with 3 out of 5 clinical signs can be diagnosed to have inguinal disruption, without evidence of any other obvious pathologies:

1. *Pinpoint tenderness over the pubic tubercle at the point of insertion of the conjoined tendon*
2. *Palpable tenderness over the deep inguinal ring*
3. *Pain and/or dilation of the external ring with no obvious hernia evident*
4. *Pain at the origin of the adductor longus tendon*
5. *Dull, diffused pain in the groin, often radiating to the perineum and inner thigh or across the midline*[4]

In this context, we would like to let the readers know that we often use a different set of related criteria to diagnose patients in our practice. These include:

1. A typical history, especially if the patient has a history of a distinct pop / pull sensation
2. Tenderness at the point of insertion of rectus muscle
3. Tenderness at the adductor insertion
4. Perception of the examining physician of attenuation / bulging of the posterior wall of the inguinal canal
5. Corroborative findings on MRI, although not essential to make the diagnosis.

We are reluctant to make a diagnosis of sports hernia unless the patients have continued symptoms after conservative treatment for at least 8 weeks.

Pathophysiology

Several theories have been proposed to explain the nature and causation of this poorly understood injury complex. Broadly, they can be classified into two groups – one which attributes the pain to an injury in the musculotendinous complex in the lower midline of the abdomen around the pubic rami,[15] and the other which aims to explain the symptomatology as an incipient or occult hernia in the transversalis fascia. Others emphasize the idea that both pathologies often exist in these patients. In a subset of these patients, the symptoms occur secondary to reduced range of movement at the hip joint due to femoroacetabular impingement (FAI). This contributes to increased shear forces around the pubic symphysis, extending posteriorly into the spine and sacroiliac joints as well.[16-20]

To understand the musculotendinous injury origin of sports hernias, it is vital to understand an important anatomical construct in the pubic region called the "pubic aponeurosis". This upper part of this complex is formed by merging of the fibers from the rectus abdominis, external oblique aponeurosis and the conjoined tendon. This, column becomes confluent with the origins of the adductor and gracilis muscles to form the rectus abdominis/adductor aponeurosis. These structures act as prime movers of the anterior pelvis with the pubic symphysis acting as the fulcrum (Figure 2).[5, 21]

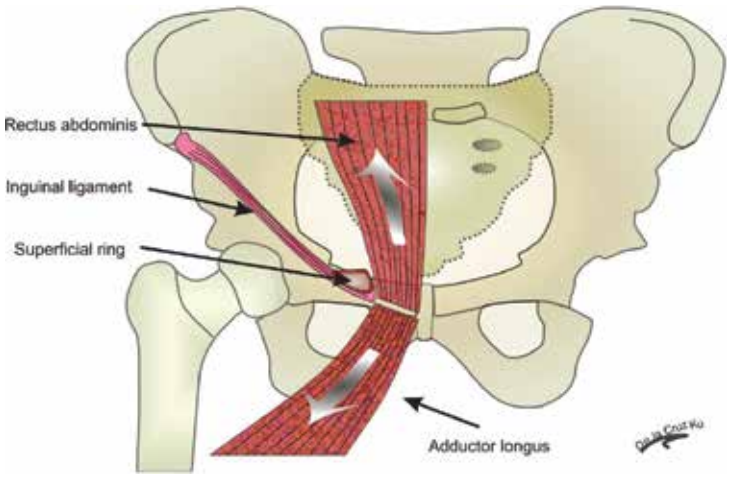

Figure 2. Depiction of various forces acting on the pubic symphysis. The column of the rectus abdominis pulls against the adductor muscle

From our experience in treating these patients, it is our belief that the underlying injuries in inguinal disruption can range from chronic tendinitis of the rectus or

adductor tendons, edema at the insertion of the tendons, a large tear, or multiple small tears in the rectus abdominis / adductor aponeurosis.[1] These findings occur due to shearing forces generated by an imbalance in the muscles acting on the pubic region. The thigh adductor muscles pulling stronger than the relatively weaker lower abdominal musculature may lead to a tear of the rectus abdominis or may lead to weakness and attenuation of local soft tissues. There may be concurrent injury to the internal or external oblique, and there is often attenuation of the transversalis fascia leading to bulging of the posterior wall of the inguinal canal.[22,23] Despite the possibility of an occult hernia, we do not believe that this contributes to the pain experienced by these patients. This view comes from the understanding and clinical observation that most commonplace hernias present merely with a bulge and do not have similar pain upon presentation.[7] Physicians lending support to the idea of an occult hernia believe that the pain is due to compression of the genital branch of the genitofemoral nerve by the hernia.[24] This line of thought has given rise to a "minimal" repair technique which involves making a small opening in the posterior abdominal wall defect, decompression of the nerve and repair of the transversalis fascia.[11] In a small retrospective study of 28 patients, this minimal repair technique showed a greater return to sports at previous level in a significantly shorter period as compared to the traditional Bassini repair technique. The rate of recurrence between the two groups was not statistically different.[25]

Approach to Treatment

Currently, there are very few controlled trials to recommend the best surgical approach for this condition. Most of the existing data is based on observational retrospective studies. The choice of surgical treatment will depend on the exact etiology of the symptoms and can include a traditional hernia repair, adductor longus tenotomy, reinforcement of the insertion of the rectus abdominis muscle, or a combination of the above techniques.[1,3]

At our center, we believe athletic pubalgia to be a muscular injury problem. Hence, the repair of this condition is focused on reinforcing the column of the rectus muscle by broadening its insertion site and reinforcing the posterior wall of the inguinal canal, thereby "tightening" the groin. There may be the need for concomitant adductor release if the adductor is injured. The operation that we perform in the young athlete is a suture repair which is a variation of the McVay/Bassini operation. Our surgical technique and the post-operative recovery protocol has been previously published.[1,7] For the readers of this article, the steps are briefly described in Table 1.

#	Description
1	Local anesthesia of the region with 0.25% Marcaine + Ipsilateral Ilio-inguinal nerve block
2	Groin skin crease incision 3-4 cm in length
3	Deepening the incision & delineation of external oblique aponeurosis
4	Opening of external oblique aponeurosis & dissection of the spermatic cord free from surrounding structures
5	Inspection of posterior wall and findings are noted. (See Table 2)
6	Broadening the insertion of rectus abdominus – lateralization of rectus muscle and its tendinous portion onto the pubic tubercle and medial part of Cooper's ligament with sutures
7	Closure of external oblique aponeurosis, subcutaneous tissues, and skin

Table 1: Steps of Open All-Suture repair technique

#	Findings
1	Thinning or narrowing of the insertion of the rectus abdominus
2	Injury to the tendinous portion of the rectus abdominus
3	Tear to the lateral edge of the rectus abdominus
4	Thinning or disruption of the conjoined tendon
5	Weakness and/or a visible bulge in the posterior wall of the inguinal canal

Table 2: Common intra-operative findings noted in the inguinal canal

A few other key points about our technique[7] –

- We do not routinely divide the nerves in the groin. Our experience does not suggest that the pain is due to nerve compression.
- The reinforcement of the posterior wall does not need to extend all the way to the internal ring, as there is no true hernia through the internal ring.
- Patients with a visible bulge, akin to a conventional hernia, usually undergo a laparoscopic mesh repair via a TAPP approach.
- High performance athletes <40 years of age usually get a sutured repair.

- All individuals >40 years of age get a laparoscopic TAPP procedure with mesh.
- Local injection of cortisone and 0.25% Marcaine is given into the adductor tendon if the patient has pain and tenderness over the adductor longus tendon pre-operatively.
- An adductor tendon release is usually carried out when there are significant adductor related symptoms especially if the MRI indicates injury.

It is important to note the difference between a traditional Bassini repair and our technique. A Bassini repair has sutures primarily directed to close the defect in the posterior wall of the inguinal canal with the sutures nearly parallel to each other and extending until the deep internal inguinal ring. Our technique involves bringing down the lateral edge of the rectus abdominis muscle to the Cooper's ligament (Figure 3). The sutures converge closer together towards the pubic tubercle to reinforce what we term the column of the rectus.

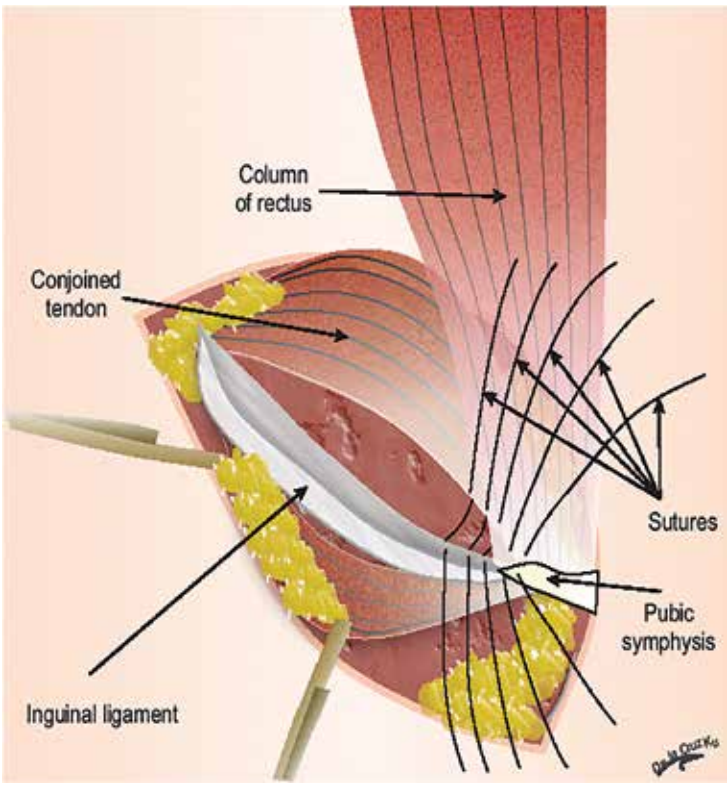

Figure 3: The sutures for repair focus on broadening the rectus insertion. The lateral edge of the column of the rectus muscle is sutured sequentially to the pubic tubercle, Cooper's ligament, and the reflected portion of the inguinal ligament. This is extended along the posterior wall of the inguinal canal as far as the surgeon deems necessary based on the integrity of the posterior wall. Non-absorbable suture material, either #1 or #2 strength, is used.

Other repairs that are reported include variations of the Shouldice repair,[11-26] onlay mesh repairs,[27] and laparoscopic TAPP and TEP repairs.

With our technique, our patients have had significant improvement of symptoms. In the high-performance athletes, we have had a high success rate of getting the athlete back on the field playing at a high level, with a very low recurrence rate.[7]

Age is an important predictor of success, and we choose our technique based on the age of the high performing athletes. In young athletes (<40 years of age), we opt for a suture repair. In an older athlete or in a non-athlete, we usually adopt a laparoscopic TAPP repair. This reinforces the groin from the posterior aspect. The laparoscopic approach is associated with less pain during post-operative recovery.

Despite these differences in our choice of technique, we advise all our patients, both young and old, not to return to full strenuous activity for 6-8 weeks. This would mean high level competition for the athlete, or heavy lifting for the laborer.

Numerous centers and surgical teams have studied the outcomes following repair – both open[28] and laparoscopic techniques. Most of the data about outcomes of these procedures comes from observational studies with few clinical trials. Most of the clinical trials from the last decade and have been done in Europe.[29-33] A randomized multicentric trial from Europe compared open repair with laparoscopic TEP repair in 65 athletes. For their primary end point of symptomatic pain relief at one month, both approaches were found to be similar in effectiveness. However, the laparoscopic repair was less painful than the open technique.[33] A meta-analysis comparing the totally extra-peritoneal (TEP) repair and trans-abdominal pre-peritoneal (TAPP) repair techniques for laparoscopic repair of the hernia failed to find any difference in post-operative pain reduction or in time taken to return to sports. They did, however, note that there was significant heterogeneity in the reporting of the outcomes.[34]

Although many techniques have been used for the repair of sports hernias, direct comparison between these techniques is difficult. There is a lot of variation in patient population, technique, selection criteria, surgical experience, and there is a lack of clear endpoints in terms of post-operative recovery of these patients. As a result, it is imperative for all surgeons treating this condition to adopt a surgical technique with which they are familiar and are comfortable. We have adopted and utilized the technique

described above for more than 25 years and have found excellent success in this subset of patients.[7]

While most of the literature is focused on athletes with groin pain, it is important to remember that this condition can also be seen quite often in the general population as well. A nation-wide retrospective study using the Danish Hernia database found that about 1% of all hernia repairs performed can be attributed to a sportsman's hernia with a predominance in middle aged men.[35]

Conclusion

In conclusion, this distinct syndrome seen predominantly in high-performance athletes remains poorly understood. Most of them require surgical intervention for improvement in symptoms. Our treatment approach to this condition has yielded a high level of success getting the high-performance athletes back on the field. Future directions for research could include a randomized clinical trial comparing a standardized and broadly accepted open approach to a standard laparoscopic approach carried out by experienced surgeons with both techniques.

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