

Referral Patterns for Chronic Groin Pain and Athletic Pubalgia/Sports Hernia: Magnetic Resonance Imaging Findings, Treatment, and Outcomes

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Abstract

Chronic groin pain is a common problem and has been well-described in high-performance athletes. Its presentation in the recreational athlete has been less frequently described. We present the experience of a tertiary group of physicians specializing in groin pain and athletic pubalgia.

Dynamic magnetic resonance imaging (MRI) protocol was employed. Surgery was performed in patients failing non-surgical management. A retrospective review was performed.

Of 117 mostly non-professional athletes, there were 79 MRI-positive cases of athletic pubalgia (68%). Other common findings were acetabular labral tear (57%) and inguinal hernia (35%). Employment of a dynamic

MRI protocol increased sensitivity for certain pathologies. Of positive athletic pubalgia cases, 49% went on to have surgical repair. The satisfaction rate in the surgical group was 90% at follow up.

Advances in MRI have increased our ability to characterize and diagnose specific injuries causing groin pain. We present our diagnostic algorithm, including an MRI protocol that not only evaluates the groin, but has increased sensitivity for additional findings such as inguinal hernia and abdominal wall deficiencies. A targeted work-up and subsequent surgical treatment in the appropriate patient, even in the recreational athletic population, has yielded a 90% satisfaction rate.

The past 3 decades have seen an evolution in the understanding, diagnosis, and treatment of groin pain, both chronic and acute, in athletes and non-athletes alike. Groin pain and groin injury are common. Most cases are transient, with patients returning to their activities within weeks or months. There has also been increasing awareness of a definitive population of patients who do not get better, or who improve and plateau before reaching preinjury level of performance.¹⁻³ Several authors have brought more attention to the injury, introducing vocabulary, theories, diagnostic testing, and diag-

noses, which now constitute a knowledge base.^{1,3-5}

As stated in almost every article on groin pain and diagnosis, lack of cohesive agreement and vocabulary, and consistent protocols and procedures, has abounded, making general understanding and agreement in this area inconsistent.^{1,6-8}

In this article, members of a tertiary-care group specializing in chronic groin pain, athletic pubalgia (sports hernia), and inguinal herniorrhaphy outline their clinical examination, diagnostic algorithm, imaging protocol, treatment strategy, and outcomes for a population of patients referred by physicians

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

and allied health professionals for a suspected diagnosis of athletic pubalgia.

Background

The pubic symphysis acts as a stabilizing central anchor with elaborate involvement of the anterior structures, including the rectus abdominis, adductor longus, and inguinal ligaments.^{3,7,9} Literature from Europe, Australia, and the United States has described groin pain, mostly in professional athletes, involving these pubic structures and attachments. Several publications have been addressing chronic groin pain, and each has its own diagnostic algorithm, imaging protocol, and treatment strategy.^{3,6,9-18}

Terminology specific to groin pain in athletes is not new, and has a varied history dating to the early 20th century. Terms such as *sportsman hernia*¹⁹ and subsequently *sports hernia*²⁰, have recently been embraced by the lay population. In 1999, Gibbon²¹ described shearing of the common adductor–rectus abdominis anatomical and functional unit and referenced a 1902 anatomical text that describes vertical ligamentous fibers contiguous with rectus sheath and adductor muscles, both attaching to the pubis. Injury to this region is the basis of *pubalgia*, a term originally used in 1984 by Brunet to describe a pain syndrome at the pubis.²²

Many authors have proposed replacing *sports hernia* with *athletic pubalgia*.^{1,3,6,7,10,14,18,23} These terms refer to a group of musculoskeletal processes that occur in and around the pubic symphysis and that share similar mechanisms of injury and common clinical manifestations. The condition was originally described in high-performance athletes, and at one point the term *sports hernia* was reserved for this patient population.⁵ According to many authors, presence of an inguinal hernia excludes the diagnosis.^{1,2,5}

Magnetic resonance imaging (MRI) has helped to advance and define our understanding of the injury.¹⁰ As the history of the literature suggests, earlier concepts of chronic pain focused either on the medial aspect of the inguinal canal and its structures or on the pubic attachments. Many specialists in the area have concluded that the chronic groin pain injury can and often does embody both elements.^{3,9} Correlation with MRI findings, injury seen during surgical procedures, and cadaveric studies have directed our understanding to a structure, the pre-pubic aponeurotic complex (P-PAC), or rectus aponeurotic plate.^{12,24,25} Anatomically,

the P-PAC, which has several fascial components, attaches posteriorly to the pubic bone and, to a degree, the pubic symphyseal cartilaginous disc. Major contributions to the P-PAC are fibers from the rectus abdominis tendon, the medial aspect of the transversalis and internal oblique muscles (the conjoint tendon, according to some), the inguinal ligament, and the adductor longus tendon.²⁶

When communicating with referring physicians, we use the term *athletic pubalgia* to indicate a specific injury. The athletic pubalgia injury can be defined as serial microtearing,¹ or complete tearing, of the posterior attachment of the P-PAC off the anterior pubis.^{3,10} Complete tearing or displacement can occur unilaterally or across the midline to the other side. As athletic pubalgia is a specific anatomical injury rather than a broad category of findings, an additional pathologic diagnosis, such as inguinal hernia, does not exclude the diagnosis of athletic pubalgia. Unfortunately, the terms *sports hernia* and *sportsman hernia*, commonly used in the media and in professional communities, have largely confused the broader understanding of nuances and of the differences between the specific injuries and MRI findings.¹⁸

Our Experience

In our practice, we see groin pain patients referred by internists, physiatrists, physical therapists, trainers, general surgeons, urologists, gynecologists, and orthopedic surgeons. In many cases, patients have been through several consultations and work-ups, as their pain syndrome does not fall under a specific category. Patients without inguinal hernia, hip injury, urologic, or gynecologic issues typically are referred to a physiatrist or a physical therapist. Often, there are marginal improvements with physical therapy, but in some cases the injury never completely resolves, and the patient continues to have pain with activity or return to sports.

Most of our patients are nonprofessional athletes, men and women who range widely in age and participate casually or regularly in sporting events. Most lack the rigorous training, conditioning, and close supervision that professional athletes receive. Many other patients are nonprofessional but elite athletes who train 7 days a week for marathons, ultramarathons, triathlons, obstacle course races (“mudders”), and similar events.

Work-Up

A single algorithm is used for all patients initially referred to the surgeon's office for pelvic or groin

pain. The initial interview directs attention to injury onset and mechanism, duration of rest or physical therapy after surgery, pain quality and pain levels, and antagonistic movements and positions. Examination starts with assessment for inguinal, femoral, and umbilical hernias. Resisted sit-up, leg-raise, adduction, and hip assessment tests are performed. The P-PAC is examined with a maneuver similar to the one used for inguinal hernia, as it allows for better assessment of the transversalis fascia (over the direct space) to determine if the inguinal canal floor is attenuated and bulges forward with the Valsalva maneuver. Then, the lateral aspect of the rectus muscle is assessed for pain, usually with the head raised to contract the muscle, to determine tenderness along the lateral border. The rectus edge is traced down to the pubis at its attachment, the superolateral border of the P-PAC. Examination proceeds medially, over the rectus attachment, toward the pubic symphysis, continuing the assessment for tenderness. Laterally, the conjoint tendon and inguinal ligament medial attachments are assessed at the level of the pubic tubercle, which represents the lateral border of the P-PAC. Finally, the examination continues to the inferior border with assessment of the adductor longus attachment, which is best performed with the leg in an adducted position. In the acute or semiacute setting (pain within 1 year of injury onset), tenderness is often elicited. With long-standing injuries, pain is often not elicited, but the patient experiences pain along this axis during activity or afterward.

Patients with positive history and physical examination findings proceed through an MRI protocol designed to detect pathology of the pubic symphysis, hips, and inguinal canals (Figures 1A-1D). Imaging includes use of axial single-shot fast spin-echo with and without the Valsalva maneuver. Use of this maneuver increases sensitivity in detecting abdominal wall deficiencies, such as inguinal hernias (Figures 2A, 2B). We developed this pubalgia protocol (Table) to specifically assess each of the potential areas of concern.

Treatment

Patients who report sustaining an acute groin injury within the previous 6 months are treated nonoperatively. A combination of rest, nonsteroidal anti-inflammatory drugs, and physical therapy is generally recommended.^{2,10} In cases of failed nonoperative management, patients are evaluated for surgery. No single operation is recommended

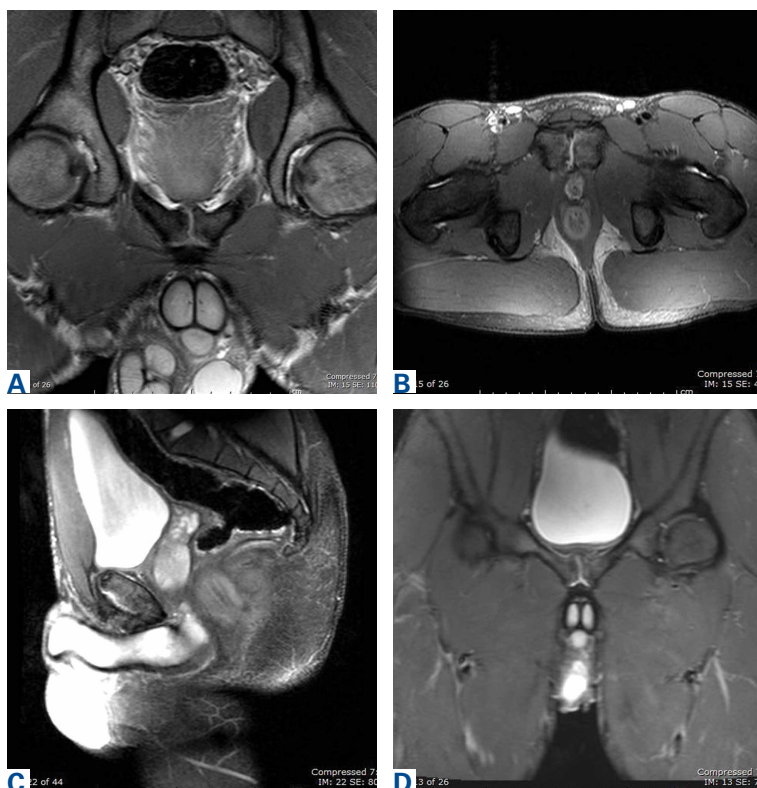


Figure 1. Athletic pubalgia on magnetic resonance imaging. (A) Axial oblique proton density of the pubic symphysis. (B) Axial and (C) sagittal T2-weighted fat suppressed images of the pelvis and (D) coronal STIR demonstrate increased fluid signal within the pubic cleft and extending bilaterally across the pre-pubic aponeurotic plate deep to the enthesis of the rectus abdominis/adductor longus.

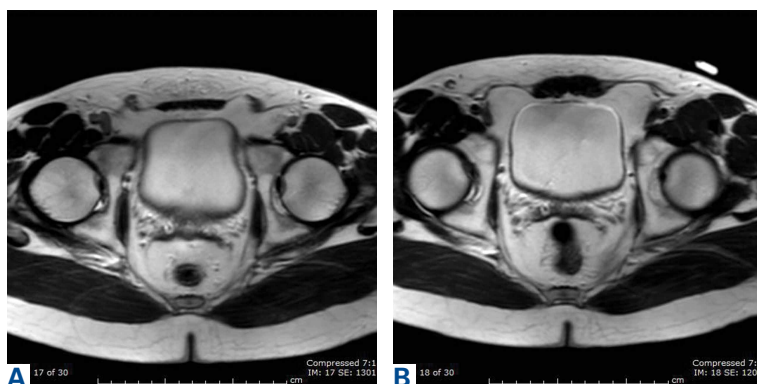


Figure 2. Dynamic axial SSFSE images demonstrate focal bulging of the left transversalis fascia (A) with Valsalva maneuver. This finding is not apparent (B) without Valsalva maneuver.

for all patients.^{1,6,14,27,28} (Larson²⁶ recently reviewed results from several trials involving a variety of surgical repairs and found return-to-sports rates ranging from 80% to 100%.) Findings from the physical examination and from the properly protocolled MRI examination are used in planning surgery to correct any pathology that could be contributing to

Table. Overview of Our Recommended Magnetic Resonance Imaging Protocol for Indication of Groin Pain

Sequence	Planes
T1	Coronal
Proton density	Axial, axial oblique, sagittal
T2 fat-suppressed	Axial, axial oblique, sagittal
Short T1 inversion recovery	Coronal
Single-shot fast spin-echo with and without Valsalva maneuver	Axial

symptoms or destabilization of the structures attaching to the pubis. Disruption of the P-PAC from the pubis would be repaired, for example. Additional injuries, such as partial or complete detachment of the conjoint tendon or inguinal ligament, may be repaired as well. If the transversalis fascia is attenuated and bulging forward, the inguinal floor is closed. Adductor longus tendon pathology is addressed, most commonly with partial tendinolysis. Often, concomitant inguinal hernias are found, and these may be repaired in open fashion while other maneuvers are being performed, or laparoscopically.

Materials and Methods

After receiving study approval from our Institutional Review Board, we retrospectively searched for all MRIs performed by our radiology department between March 1, 2011 and March 31, 2013 on patients referred for an indication of groin pain, sports hernia, or athletic pubalgia. Patients were excluded if they were younger than 18 years any time during their care. Some patients previously or subsequently underwent computed tomography or ultrasonography. MRIs were reviewed and positive findings were compiled in a database. Charts were reviewed to identify which patients in the dataset underwent surgery, after MRI, to address their presenting chief complaint. Surgery date and procedure(s) performed were recorded. Patients were interviewed by telephone as part of the in-office postoperative follow-up.

Results

One hundred nineteen MRIs were performed on 117 patients (97 men, 83%). Mean age was 39.8 years. Seventy-nine patients (68%) had an MRI finding of athletic pubalgia, 67 (57%) had an acetabular labral tear in one or both hip joints, and

41 (35%) had a true inguinal hernia. Concomitant findings were common: 47 cases of athletic pubalgia and labral tear(s), 28 cases of athletic pubalgia and inguinal hernia, and 15 cases of all 3 (athletic pubalgia, labral tear, inguinal hernia).

Use of breath-hold axial single-shot fast spin-echo sequences with and without the Valsalva maneuver increased sensitivity in detecting pathologies—inguinal hernia and Gilmore groin in particular. On 24 of the 119 MRIs, the Valsalva maneuver either revealed the finding or made it significantly more apparent.

Of all patients referred for MRI for chronic groin pain, 48 (41%) subsequently underwent surgery. In 29 surgeries, the rectus abdominis, adductor longus, and/or pre-pubic aponeurotic plate were repaired; in 13 cases, herniorrhaphy was performed as well; in 2 cases, masses involving the spermatic cord were removed.

The most common surgery (30 cases) was herniorrhaphy, which was performed as a single procedure, multiple procedures, or in combination with procedures not related to a true hernia. Eighteen patients underwent surgery only for hernia repair.

Of the 79 patients with MRI-positive athletic pubalgia, 39 subsequently underwent surgery, and 31 (79%) of these were followed up by telephone. Mean duration of rest after surgery was 6.2 weeks. Twelve patients (39%) had physical therapy after surgery, some as early as 4 weeks, and some have continued their therapy since surgery. Of the 31 patients who were followed up after surgery, 23 (74%) resumed previous activity levels. Return to previous activity level took these patients a mean of 17.9 weeks. When asked if outcomes satisfied their expectations, 28 patients (90%) said yes, and 3 said no.

Forty patients with MRI-positive athletic pubalgia were nonoperatively treated, and 28 (70%) of these patients were followed up. In this group, mean duration of rest after surgery was 6.9 weeks. Thirteen patients (46%) participated in physical therapy, for a mean duration of 10.8 weeks. Of the patients followed up, 19 (68%) returned to previous activity level. Twenty-one patients (75%) were satisfied with their outcome.

Discussion

Diagnosis and treatment of chronic groin pain have had a long, confusing, and frustrating history for both patients and the medical professionals who provide them with care.^{3,6,7,10} Historically, the problem has been, in part, the lack of diagnostic

capabilities. Currently, however, pubalgia MRI protocol allows the exact pathology to be demonstrated.³ As already noted, concomitant hip pathology or inguinal hernia is not unusual⁶; any structural abnormality in the area is a potential destabilizer of the structures attached to the pubis.¹⁸ Solving only one of these issues may offer only partial resolution of symptoms and thereby reduce the rate of successful treatment of groin pain.

Diagnostic algorithms are being developed. In addition, nonoperative treatments are being tried for some of the issues. Physicians are giving diagnostic and therapeutic steroid injections in the pubic cleft, along the rectus abdominis/adductor longus complex, or posterior to the P-PAC. Platelet-rich plasma injection therapy has had limited success.²⁹

This article provides a snapshot of what a tertiary-care group of physicians specializing in chronic groin pain sees in an unfiltered setting. We think this is instructive for several reasons.

First, many patients in our population have visited a multitude of specialists without receiving a diagnosis or being referred appropriately. Simply, many specialists do not know the next step in treating groin pain and thus do not make the appropriate referral. Until recently, the literature has not been helpful. It has poorly described the constellation of injuries comprising chronic groin pain. More significantly, groin injuries have been presented as ambiguous injuries lacking effective treatment. Over the past decade, however, abundant literature on the correlation of these injuries with specific MRI findings has made the case otherwise.

Second, a specific MRI pubalgia protocol is needed. Inability to make a correct diagnosis, because of improper MRI, continues to add to the confusion surrounding the injury and undoubtedly prolongs the general medical community's thinking that diagnosis and treatment of chronic groin pain are elusive. Our data support this point in many ways. Although all patients in this study were seen by a medical professional before coming to our office, none had received a diagnosis of occult hernia or attenuated transversalis fascia; nevertheless, we identified inguinal hernia, Gilmore groin, or both in 44% of these patients. These findings are not surprising, as MRI was the crucial link in diagnosis. In addition, the point made by other groin pain specialists—that a hernia precludes a pubalgia diagnosis^{1,2,5}—is not supported by our data. Inguinal hernia can and does exist in conjunction with pubalgia. More than half the patients in our study

had a combined diagnosis. We contend that, much as hip labral pathology occurs concomitantly with pubalgia,²³ inguinal hernia may be a predisposing factor as well. A defect in the direct or indirect space can destabilize the area and place additional strain on the pubic attachments.

In our experience, the dynamic Valsalva sequence improves detection of true hernias and anterior abdominal wall deficiencies and should be included in each protocol for the evaluation of acute or chronic groin pain.

Shear forces and injury at the pubis can occur outside professional athletics. Our patient population is nonprofessional athletes, teenagers to retirees, and all can develop athletic pubalgia. Ninety percent of surveyed patients who received a diagnosis and were treated surgically were satisfied with their outcomes.

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