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Athletic Pubalgia – A Significant Diagnostic and Therapeutic Challenge in Athletes?

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Abstract

Introduction:

Athletic pubalgia is a clinical syndrome involving overuse injuries of the musculotendinous structures around the pubic symphysis. It primarily affects athletes engaged in sports requiring rapid directional changes, kicking, and high core and lower limb load. This study aims to present the current understanding of the pathophysiology, epidemiology, clinical presentation, and treatment strategies of athletic pubalgia.

Methods:

A review of 25 scientific publications from PubMed and Google Scholar was conducted. The analysis focused on risk factors, clinical symptoms, diagnostic approaches, and both conservative and surgical management strategies in athletes.

Results:

Athletic pubalgia predominantly affects male athletes in soccer, hockey, and American football. Symptoms include exertional groin pain. Diagnosis is based on clinical assessment, functional testing, and imaging—especially MRI. Conservative treatment involving physiotherapy and postural re-education is effective in most cases. Refractory cases may require surgical intervention such as posterior inguinal wall repair or adductor tenotomy.

Conclusions:

Athletic pubalgia presents a significant diagnostic and therapeutic challenge. Effective management requires an interdisciplinary and individualized approach. Further clinical studies are needed to develop standardized diagnostic and therapeutic algorithms.

Key words: *athletic pubalgia, athletes, groin pain, conservative treatment, surgical management, diagnosis, MRI, physiotherapy*

1. Introduction

Athletic pubalgia is a term that is often misinterpreted in sports medicine. It refers to a complex clinical syndrome that lacks a universally accepted definition. This condition involves a broad spectrum of anatomical structures within the pelvic region and frequently necessitates temporary or permanent limitation of physical activity. Due to its multifactorial etiology, athletic pubalgia is classified as a clinical syndrome resulting from overlapping injuries and repetitive overuse. [1]

In the literature, the term "athletic pubalgia" is often used interchangeably with expressions such as "sports hernia," "athlete's hernia," "Gilmore's groin," or "groin disruption." [2]. The fundamental mechanism leading to the development of athletic pubalgia is muscular imbalance and weakening of the musculo-tendinous structures in the pelvic region, which results in abnormal force distribution and overload in the area of the pubic symphysis [1].

From a terminological perspective, the term "athletic pubalgia" appears more appropriate than "sports hernia," as it more accurately reflects the multifactorial etiology of the condition and the diverse pain symptoms localized around the pubic symphysis, without suggesting a single, often incorrectly attributed, cause of the pain [3].

2. Epidemiology and Risk Factors

The epidemiology of athletic pubalgia reflects increasing awareness and more frequent diagnosis of this condition among athletes. Literature reports indicate that approximately 15% (range 5–23%) of all sports-related injuries lead to groin pain [4,5]. Epidemiological studies consistently demonstrate a higher prevalence of athletic pubalgia in males, suggesting a possible sex-based predisposition [6,7]. Although initially believed to primarily affect professional athletes, this condition is now being increasingly diagnosed in recreational athletes as well [6].

Among sports disciplines, soccer players and runners are particularly at high risk for developing athletic pubalgia, likely due to repetitive and dynamic movements involving the core and lower extremity muscles [6,7]. An elevated incidence is also observed in contact sports such as American football and ice hockey, where sudden directional changes and intense

biomechanical loads may contribute to overload and injury of the anatomical structures in the groin region [6].

Major risk factors include repetitive and explosive movements that heavily engage core muscles, as well as limited hip joint mobility, which may predispose individuals to overload and injury in this area [8,9,10,11,12]. Prospective cohort studies have demonstrated a significant association between strength training and the risk of developing athletic pubalgia—college American football athletes undergoing Olympic weightlifting (OWL) training were found to have a 2.86-fold higher risk of developing this condition compared to those not engaged in OWL. Moreover, athletes playing in skill positions in American football were 9.32 times more likely to develop athletic pubalgia compared to players in other positions. Notably, among student-athletes who were not exposed to OWL and who played in less physically demanding positions, no cases of athletic pubalgia were reported [8].

3. Pathophysiology

The pathophysiology of athletic pubalgia, also referred to as sports hernia, is based on an imbalance of biomechanical forces acting within the pelvis, with particular emphasis on the pubic symphysis region [13,14]. This anatomical structure serves as a key support point for the anterior pelvic complex, and its overload can lead to stress-related and traumatic changes. In athletes performing repetitive rotational movements, kicking, or sudden body turns, excessive and asymmetrical shearing forces are generated and concentrated at the pubic symphysis [14,15].

In close anatomical proximity to this structure are the attachments of the rectus abdominis muscle, responsible for trunk flexion and pelvic stabilization, and the adductor muscles, which play a crucial role in stabilizing the anterior segment of the pelvis. Functional weakening of the rectus abdominis leads to compensatory and unbalanced pulling by the adductor longus muscle, resulting in overload and, subsequently, microtrauma or tearing at its insertion site. [14]

An additional risk factor is the disproportion between lower limb muscle strength and insufficient development of the core musculature, which promotes the accumulation of overload forces within the musculotendinous tissues [15]. In males, due to a narrower and less stable pelvic structure, the vectors of force may be transmitted in a less favorable manner, which may explain the significantly higher prevalence of athletic pubalgia in this group [13,14,15].

4. Clinical Presentation

Clinical Symptom	Description
Lower abdominal and/or groin pain	Typically unilateral, exercise-induced pain that intensifies with physical activity (sprinting, kicking, twisting, directional changes) and resolves with rest.
Radiating pain	May radiate to the perineum, inner thigh, suprapubic region, or scrotum.
Focal tenderness on palpation	Localized over the pubic crest, especially at the insertion site of the rectus abdominis and/or adductor longus.
Pain with resisted hip adduction	Notably present at 0°, 45°, and 90° of hip flexion; suggests involvement of adductors or aponeurotic complex.
Pain with resisted abdominal contraction	Reproduction of pain during resisted sit-up or abdominal curl-up.
Valsalva maneuver-induced discomfort	Coughing, sneezing, or straining may provoke symptoms in the absence of a clinically evident hernia.
Positive adductor squeeze test	Pain reproduced during resisted adduction in supine and 90° hip flexion positions.
Sensory disturbances in the groin area	Paresthesias or dysesthesias involving the lower abdomen, inguinal region, inner thigh, or genitals—suggesting possible nerve entrapment.
Decreased hip range of motion	Particularly internal rotation and abduction; may indicate coexisting femoroacetabular impingement (FAI).
Associated conditions	Coexisting pathologies such as adductor tendinopathy, osteitis pubis, and FAI are common and complicate the clinical presentation.

TABLE 1. Clinical symptoms of athletic pubalgia [13,14,15,16]

4. Diagnostic Methods

The diagnosis of athletic pubalgia (AP) is a complex process due to the intricate anatomy and biomechanics of the groin region. Diagnosis is based on a thorough clinical examination combined with advanced imaging techniques, with the primary goal of excluding other potential sources of groin pain. [17,18]

The first and most critical step in the diagnostic process is a detailed patient history [17,18]. It is essential to determine the characteristics of the pain, its precise location (e.g., groin, medial thigh, lower abdomen, pubic symphysis area), the mechanism of onset (sudden or gradual, contact or non-contact injury), as well as aggravating and relieving factors, such as physical activity, coughing, or rest [17,19]. A comprehensive sports history should be obtained, including the type of sport practiced (e.g., soccer, rugby, hockey—sports involving frequent directional changes, sprinting, or kicking), level of athletic performance (often elite athletes), training intensity, previous injuries, and treatment approaches [17,18].

Patients with AP typically report chronic or recurrent groin pain that, in more advanced cases, may radiate to the testicles (in males) and may present bilaterally. The history should also explore any previous episodes of groin pain and whether the patient is a professional athlete [17].

The physical examination should begin with an assessment of body posture, alignment, and gait. The typical profile is a young, athletic male, although this is not always definitive [17]. Palpation is essential and should include the pubic symphysis and pubic tubercles, where tenderness is frequently observed [19]. Pain at the insertion of the adductor longus and rectus abdominis muscles, as well as tenderness of the aponeurotic plate connecting these structures, may suggest AP as the potential source of symptoms [18,20].

During the examination of the inguinal canal, attention should be paid to any widening of the superficial inguinal ring and tenderness in this area. In male patients, the scrotal inversion technique may be useful for palpating the posterior wall of the inguinal canal [19,21].

Assessment of range of motion (ROM) in the hip joints and lumbar spine is also important. Patients with AP often present with limited internal and external hip rotation and abduction, which may suggest reduced flexibility of the hip rotators and adductor group. However, it should be noted that studies on the relationship between ROM and AP yield inconsistent results [17].

When assessing muscle strength, it is crucial to compare the strength of the hip adductors, abductors, and abdominal muscles between the symptomatic and asymptomatic sides. Adductor weakness is commonly observed, and it is generally accepted that adductor strength should be at least 80% of the strength of the abductors. [17]

Several specific clinical tests can aid in the diagnosis of AP and help localize the source of pain in clinical practice [17,18,19].

TABLE 2. Types of Clinical Tests Used in the Diagnosis of Athletic Pubalgia [17,18,19]

Test Name	Procedure	Positive Finding
Resisted Sit-up Test	The patient lies on their back with legs extended, performs a sit-up with arms extended forward, and holds the position for 5 seconds.	Reproduction of pain at the rectus abdominis attachment site.
Resisted Leg Adduction Test	The patient lies supine with hips flexed to ~30°. The examiner places hands on the medial side of the patient's heels, who resists leg abduction.	Pain in the groin region, unilaterally or bilaterally.
Squeeze Test	The patient lies supine with hips flexed to 45° and knees to 90°. The examiner places a fist between the knees and asks the patient to squeeze maximally.	Reproduction of groin pain.
Direct Stress Test	Palpation of the superficial inguinal ring while the patient lies supine, followed by straight leg raise.	Increased pain during simultaneous ring pressure and leg elevation
ASLR (Active Straight Leg Raise)	The patient lies supine and raises one straight leg approximately 20 cm while maintaining pelvic stability.	Pain, difficulty performing the movement, or compensation may indicate impaired pelvic stability.

To exclude hip joint pathology, stress fractures, and spinal pain syndromes, it is equally important to perform screening tests targeting the hip joint and the lumbosacral spine [14,21,22].

Test Name	Procedure	Positive Finding
FADIR (Flexion-Adduction-Internal Rotation)	The patient lies supine. The lower limb is flexed, adducted, and internally rotated at the hip joint.	Pain reproduction may indicate femoroacetabular impingement or labral tear.
Patellar Pubic Percussion Test (PPP)	The examiner taps the patella while auscultating over the pubic symphysis with a stethoscope, comparing both sides.	Diminished sound on one side may suggest a femoral stress fracture.
Fulcrum Test	The patient is seated with the lower limb resting on the examiner's forearm as a lever; downward pressure is applied to the thigh.	Pain during the test may indicate a femoral stress fracture.
Thigh Thrust Test	The patient lies supine with hip and knee flexed. The examiner applies axial pressure through the femur in a posterior-inferior direction.	Pain in the sacroiliac region suggests dysfunction or pathology of the sacroiliac joint.

TABLE 3. Screening Tests for the Hip and Lumbosacral Spine [14,21,22]

As part of imaging studies, the primary diagnostic method is pelvic radiography in anteroposterior (AP) and lateral projections, which allows for the detection of bony abnormalities such as avulsion fractures, signs of osteitis pubis, calcifications at tendon insertions, or features of femoroacetabular impingement (FAI) [14,18]. The imaging modality of choice in suspected cases of athletic pubalgia (AP) is magnetic resonance imaging (MRI), which enables detailed evaluation of soft tissue structures, including the adductor muscles, rectus abdominis, and their attachment sites [14,18]. MRI also allows for the identification of muscle tears, edema, as well as abnormalities involving the pubic symphysis and hip joints, including FAI and labral injuries [14,21]. In certain cases, MR arthrography may be indicated [14]. MRI can also visualize stress fractures and nerve entrapments [18]. According to the study

by Zoga et al., MRI demonstrates a sensitivity of 68% and specificity of 100% for detecting pathology of the rectus abdominis, and a sensitivity of 86% and specificity of 89% for identifying changes in the adductor muscles [14].

Ultrasonography, particularly dynamic ultrasound performed with the Valsalva maneuver, can be helpful in evaluating the posterior wall of the inguinal canal and in diagnosing inguinal hernias. It can also visualize dilation of the external inguinal ring. However, ultrasound is operator-dependent and may have limited reproducibility. Accurate technique during the Valsalva maneuver is essential for reliable results. [21]

In diagnostically challenging cases, image-guided diagnostic injections using local anesthetics may be considered, targeting the hip joint, pubic symphysis, or muscle attachment sites. A significant reduction in pain following injection helps localize the primary source of pain. [18]

Ultimately, the diagnosis of AP is most often a diagnosis of exclusion, requiring a combination of characteristic clinical presentation, physical examination findings, and imaging results. Due to the complex etiology and symptomatology of AP, novel diagnostic and therapeutic approaches are increasingly being proposed, aiming to improve treatment effectiveness and shorten the time required for athletes to return to full activity. [17]

5. Management Strategies

Conservative Treatment

Conservative management is most commonly the first-line therapy for patients with athletic pubalgia (AP). The primary goals of conservative treatment are to reduce pain and inflammation, restore function, and enable a return to sport without the need for surgical intervention. [23]

TABLE 4. Conservative treatment of athletic pubalgia [23,17,24]

Method	Description
Rest and activity modification	Limiting or avoiding activities that exacerbate groin pain, including sports and daily movements.
Physical therapy – core stabilization	Strengthening of deep trunk muscles (transverse abdominis, obliques, pelvic floor muscles, multifidus) to improve control of the lumbopelvic complex.
Postural re-education	Correction of pelvic and lumbar spine alignment to reduce stress on the pubic symphysis and surrounding muscular attachments.
Strengthening exercises	Focus on hip adductors, abductors, flexors, and extensors, as well as abdominal and back muscles; includes both isometric and dynamic exercises with progressive loading.
Balance and coordination training	Improvement of neuromuscular control and stability using unstable surfaces and sport-specific functional drills.
Pain and swelling control	Use of cryotherapy and rest; however, current evidence does not strongly support the effectiveness of physical modalities in managing AP-related pain.
Manual therapy	Soft tissue mobilization (adductors, abdominal muscles, fascia) and joint mobilization (hip, sacroiliac joint, pubic symphysis); may affect both peripheral and central pain mechanisms.
Range of motion (ROM) restoration	Aiming to regain full, pain-free hip mobility, particularly in internal/external rotation and abduction.
Pharmacotherapy	Use of nonsteroidal anti-inflammatory drugs (NSAIDs) for pain and inflammation reduction.

Injections	Corticosteroid injections (limited long-term effect), platelet-rich plasma (PRP – mixed evidence), glyceryl trinitrate patch (effective in other tendinopathies, but not studied in AP).

Most studies report significant improvement after 6–8 weeks of intensive physiotherapy [23]. However, in cases where there is no clinical improvement—particularly in elite athletes—surgical intervention should be considered [17].

Surgical Treatment

Surgical intervention is considered when conservative management fails, particularly in professional athletes aiming for a full return to training. The choice of surgical technique depends on the predominant symptoms and the underlying structural abnormalities. [17,23]

TABLE 5. Surgical treatment of athletic pubalgia [25,20,21,6,3]

Surgical technique	Description
Posterior inguinal wall repair	Commonly used in cases of "sports hernia" (posterior wall weakness without visible hernia); can be performed using open or laparoscopic technique.
Reinforcement of rectus abdominis and adductor origin	Reinforcement or reconstruction of the shared aponeurotic attachment (RA-AL plate), e.g., using an adductor–rectus abdominis flap.
Adductor longus tenotomy	Partial release of the adductor longus tendon, especially when adductor-related pain predominates.
Pubic symphysis debridement	Removal of degenerative or inflamed tissue from the pubic symphysis, especially in cases of osteitis pubis.
Concurrent treatment of FAI	Addressing femoroacetabular impingement (FAI) or labral tears if coexisting – often performed in the same surgical session.

Studies indicate that surgical treatment results in pain reduction and return to sport in the majority of patients. One analysis demonstrated that patients who underwent rectus abdominis–adductor longus (RA-AL) repair were more likely to return to sport at ≥90% of their pre-injury level compared to those who had undergone previous surgical interventions. However, each subsequent procedure was associated with an increased risk of treatment failure. [20]

Postoperative Rehabilitation

Postoperative rehabilitation is a crucial component in restoring full function and enabling return to athletic activity following surgery [23]. The primary goals include pain and swelling reduction, protection of the surgical site, restoration of range of motion, muscular strength, stability, and coordination.

Early Phase (0–2 weeks):

This phase focuses on pain and swelling control (cryotherapy, limb elevation), protection of the operated area (limited weight-bearing), and activation of the deep core muscles, primarily the transversus abdominis. Gentle isometric exercises are introduced within a pain-free range of motion. [23]

Intermediate Phase (2–6 weeks):

Gradual restoration of hip joint mobility is initiated, along with resistance-based strengthening exercises (using bands or light weights) targeting the hip and core muscles. Emphasis is placed on restoring muscular balance between opposing muscle groups. [23,17]

Late Phase (6–12 weeks):

This phase includes strength and endurance training, proprioceptive exercises, and dynamic stabilization drills. Sport-specific functional movements are progressively incorporated. [23,17]

Return to Sport (>3 months):

The return to sport is gradual and closely monitored. Criteria include absence of pain, full range of motion, sufficient muscular strength (comparable to the uninjured side), and successful completion of functional tests (e.g., single-leg hops, agility tests, sprinting). [23,17]

Throughout the entire rehabilitation process, maintaining a neutral spine position and tailoring exercises to the specific demands of the athlete's sport are essential. [15]

Conclusion

Athletic pubalgia remains a complex and multifactorial condition that poses significant diagnostic and therapeutic challenges in sports medicine. Despite an increasing number of publications, a consistent definition and standardized management algorithm are still lacking. Its multifactorial etiology—including pelvic biomechanical imbalances, muscular asymmetries, and coexisting pathologies such as osteitis pubis, femoroacetabular impingement (FAI), and adductor tendinopathy—necessitates an individualized and interdisciplinary approach to each case.

Although clinical and imaging diagnostics are becoming more precise, they still lack tools that can effectively differentiate athletic pubalgia from other causes of groin pain. Magnetic resonance imaging (MRI) remains the gold standard; however, its accuracy is dependent on the experience of the radiological team and their ability to detect subtle changes in soft tissues and at the pubic symphysis. Currently, there is no objective biomarker or functional test that can definitively confirm the diagnosis of athletic pubalgia. Conservative treatment, including physical therapy, postural re-education, core strengthening, and activity modification, is usually the first-line approach. While surgical intervention is gaining popularity, its efficacy remains debated due to the limited number of randomized trials and the lack of long-term outcome studies. Postoperative rehabilitation protocols, though well described, have not yet been clearly validated in terms of their duration and comparative effectiveness. The key takeaway from this literature review is the urgent need for further high-quality research—especially prospective, randomized clinical trials involving athletes from various disciplines. Additionally, the development of a unified classification system and validated diagnostic tools would significantly improve early recognition and differentiation of this syndrome from other groin pathologies.

In clinical practice, it is essential to promote a holistic, interdisciplinary approach that brings together orthopedic surgeons, physiotherapists, radiologists, and sports medicine specialists. Only such a comprehensive model enables optimal treatment planning and improves the likelihood of a full return to sports while minimizing the risk of recurrence.

Given the dynamic evolution of sports medicine, athletic pubalgia deserves continued scientific exploration as a condition with a significant impact on athletic performance, quality of life, and career longevity.

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References:

1) Rabe SB, Oliver GD. Athletic pubalgia: recognition, treatment, and prevention. Athl Train Sports Health Care. 2010;2(1):25-30. doi:10.3928/19425864-20090827-01.
2) Elattar O, Choi HR, Dills VD, Busconi B. Groin injuries (athletic pubalgia) and return to play. Sports Health. 2016 Jul;8(4):313-23. doi: 10.1177/1941738116653711. PMID: 27302153; PMCID: PMC4922526.
3) Meyers WC, Yoo E, Devon ON, Jain N, Horner M, Lauencin C, Zoga A. Understanding "Sports Hernia" (Athletic Pubalgia): The Anatomic and Pathophysiologic Basis for Abdominal and Groin Pain in Athletes. Oper Tech Sports Med. 2007 Oct;15(4):165-177. https://doi.org/10.1053/j.otsm.2012.03.005
4) Litwin D, Sneider E, McEnaney P, Busconi B. Athletic Pubalgia (Sports Hernia). Clin Sports Med. 2011 Apr;30(2):417-34. doi: 10.1016/j.csm.2010.12.010.
5) Zoga AC, Meyers WC. Magnetic Resonance Imaging for Pain After Surgical Treatment for Athletic Pubalgia and the "Sports Hernia". Semin Musculoskelet Radiol. 2011 Oct;15(4):372-82. doi: 10.1055/s-0031-1286017. PMID: 22006623
6) Goes RA, Teles FDC, Figueiredo F, Noronha DR, Coelho ON, Peixoto LP. Epidemiological Analysis of 245 Patients with Athletic Pubalgia. Rev Bras Ortop. 2023;58(4):563-570. doi: 10.1055/s-0042-1749461.
7) Oliveira AL, Andreoli CV, Ejnisman B, Queiroz RD, Pires OGN, Falótico GG. Epidemiological profile of patients diagnosed with athletic pubalgia. Rev Bras Ortop. 2016 Nov-Dec;51(6):692-696. doi: 10.1016/j.rboe.2016.10.011. PMID: 28050542; PMCID: PMC5198137.
8) Neuville AJ, Benge CL, Tjong VK, Lund BS, Baer GS, Walczak BE. Risk Factors for Athletic Pubalgia in Collegiate Football Student-Athletes: A Retrospective Cohort Study. Sports Health. 2023 Sep-Oct;15(5):760-766. doi: 10.1177/194173811121127. Epub 2022 Sep 28. PMID: 36171687; PMCID: PMC10467470.

9) Larson CM, Ross JR, Kuhn AW, Fuller D, Rowley DM, Giveans MR, Stone RM, Bedi A. Radiographic hip anatomy correlates with range of motion and symptoms in National Hockey League players. Am J Sports Med. 2017 Jun;45(7):1633-1639. doi: 10.1177/0363546517692542. Epub 2017 Feb 1. PMID: 28298064.
10) Lyons M, Brunt LM. Sports hernia—anatomy: what is a sports hernia? In: Diduch DR, Brunt LM, eds. Sports Hernia and Athletic Pubalgia: Diagnosis and Treatment. Boston, MA: Springer; 2014:1-11. doi: 10.1007/978-1-4899-7421-1_1.
11) Malycha P, Lovell G. Inguinal surgery in athletes with chronic groin pain: the "sportsman's" hernia. Aust N Z J Surg. 1992 Feb;62(2):123-5. doi: 10.1111/j.1445-2197.1992.tb00009.x. PMID: 1739383.
12) Meyers WC, Foley DP, Garrett WE, Lohnes JH, Mandlebaum BR. Management of severe lower abdominal or inguinal pain in high-performance athletes. Am J Sports Med. 2000 Jan-Feb;28(1):2-8. doi: 10.1177/03635465000280011501. PMID: 10653536.
13) Orchard J, Read JW, Verrall GM, Slavotinek JP. Pathophysiology of chronic groin pain in the athlete. Br J Sports Med. 2000 Jun;34(3):198-203. doi: 10.1136/bjsm.34.3.198. PMID: 10854019; PMCID: PMC1724190.
14) Cohen B, Kleinhens D, Schiller J, Tabaddor R. Understanding Athletic Pubalgia: A Review. R I Med J (2013). 2016 Oct 4;99(10):31-35. PMID: 27706276.
15) Khan JA, Gupta S. Athletic Pubalgia: A Clinical Reform. J Adv Sport Phys Edu. 2022 Jan;5(1):1-6. doi: 10.36348/jaspe.2022.v05i01.001.
16) Hammoud S, Bedi A, Magennis E, Meyers WC, Kelly BT. High incidence of athletic pubalgia symptoms in professional athletes with symptomatic femoroacetabular impingement. *Arthroscopy.* 2012 Oct;28(10):1388-1395. doi: 10.1016/j.arthro.2012.02.024. PMID: 22938898.
17) Hegedus EJ, Stern B, Reiman MP, Tarara D, Wright AA. A suggested model for physical examination and conservative treatment of athletic pubalgia. Phys Ther Sport. 2012 Aug;13(3):123-34. doi: 10.1016/j.ptsp.2012.04.002. Epub 2012 May 29. PMID: 22651940.
18) Koutserimpas C, Ioannidis A, Konstantinidis MK, Makris MC, Antonakopoulos F, Mazarakis A, Papagelopoulos PJ, Vlasis K, Konstantinidis MK. Insights in clinical examination and diagnosis of Athletic Pubalgia. *Cureus.* 2022 Nov 7;14(11):e31204. doi: 10.7759/cureus.31204. PMID: 36407390; PMCID: PMC9726186.

19) Brown A, Abrahams S, Remedios D, Chadwick SJ. Sports hernia: a clinical update. Br J Gen Pract. 2013 Mar;63(608):e235–e237. doi: 10.3399/bjgp13X664432. PMID: 23561792; PMCID: PMC3582984.
20) Emblom BA, Mathis T, Aune K. Athletic pubalgia secondary to rectus abdominis–adductor longus aponeurotic plate injury: diagnosis, management, and operative treatment of 100 competitive athletes. Orthop J Sports Med. 2018 Sep 24;6(9):2325967118798333. doi: 10.1177/2325967118798333. eCollection 2018 Sep. PMID: 30263900; PMCID: PMC6153539.
21) Bisciotti GN, Bisciotti A, Bisciotti A, Auci A. What the Radiologist Needs to Know About Sport Hernias: A Systematic Review of the Current Literature. Diagnostics. 2025 Mar 20;15(6):785. doi: 10.3390/diagnostics15060785. PMID: 39914772; PMCID: PMC6153539.
22) Larson CM. Sports hernia/athletic pubalgia: evaluation and management. Sports Health. 2014 Mar;6(2):139-44. doi: 10.1177/1941738114523557. PMID: 24587864; PMCID: PMC3931344.
23) Ellsworth AA, Zoland MP, Tyler TF. Athletic pubalgia and associated rehabilitation. Int J Sports Phys Ther. 2014 Nov;9(6):774-784. PMID: 25386197; PMCID: PMC4231472.
24) Verrall GM, Hamilton IA, Slavotinek JP, Oakeshott RD, Spriggins AJ, Barnes PG, et al. Hip joint range of motion reduction in sports-related chronic groin injury diagnosed as pubic bone stress injury. J Sci Med Sport. 2005 Mar;8(1):77-84. doi: 10.1016/S1440-2440(05)80044-7. PMID: 15798857
25) Ziprin P, Prabhudesai SG, Abrahams S, Chadwick SJ. Transabdominal preperitoneal laparoscopic approach for the treatment of sportsman's hernia. J Laparoendosc Adv Surg Tech A. 2008 Oct;18(5):669-72. doi: 10.1089/lap.2007.0176. PMID: 18999953.