MLTJ
Muscles, Ligaments and Tendons Journal

REVIEW

THE CONSERVATIVE TREATMENT OF SPORTS HERNIA IN ATHLETES: THE STORY OF AN ANATOMICAL PREDICTED FAILURE. A NARRATIVE REVIEW

Gian Nicola Bisciotti[1], Andrea Bisciotti[1,2,3], Piero Volpi[2,3]

[1] Kinemove Rehabilitation Centers, Pontremoli, Italy
[2] Orthopaedics of the Knee and Sport Traumatology Unit, IRCSS Humanitas Research Hospital, Milano, Italy
[3] FC Internazionale Medical Staff, Milano, Italy

Corresponding author's e-mail: bisciotti@libero.it

Received: 18/02/2026
Accepted: 15/04/2026
Published: 22/05/2026

Conflict of interests: The Authors declare that there are no competing interests.
Fundings: This research received no external funding.
Data availability: Not applicable.
Contributions: GNB conceived and wrote the study, AB provided the radiological images, PV revised the text.
This article is licensed under a CC Attribution-NonCommercial-NoDerivatives 4.0 License

LEVEL OF EVIDENCE: 4

ABSTRACT

Sports hernias (SH), more correctly defined as weakness of the posterior wall of the inguinal canal, play a major role in the etiopathogenesis of groin pain syndrome (GPS). Important and indisputable anatomical reasons do not justify the application of conservative treatments, which are, nonetheless, still often recommended. This study analyzes both the anatomy of the inguinal canal and the imaging examination that allows a correct definition of SH and clarifies why, SH necessarily requires surgical treatment at least in professional athletes.

KEYWORDS

Sport hernia, weakness of the posterior wall of the inguinal canal, conservative treatment, surgery

INTRODUCTION

Sports hernias (SH), more precisely referred to as a weakness of the posterior wall of the inguinal canal[1], are recognized as a primary contributor to groin pain syndrome (GPS)[2,3]. For clarity and consistency, this text will treat the terms "sports hernia" and "posterior inguinal wall weakness" as interchangeable. Although SH was first introduced by Nesovic nearly four decades ago[4], it remains one of the most ambiguous and poorly defined clinical conditions in the field of sports medicine[1]. This ongoing lack of clarity can be attributed to two main factors, one related to terminology (taxonomy) and the other to anatomical interpretation. From the perspective of terminology, SH has been described in various ways, ranging from "chronic groin pain syndrome" to "groin disruption associated with pelvic instability"[5]. Such broad and non-specific descriptions have led to considerable conceptual and classificatory ambiguity[6,7]. Anatomically, the term "sports hernia" initially referred specifically to a weakening of the posterior wall of the inguinal canal, particularly involving the transversalis fascia[8-10]. However, as debate over the exact anatomical site of injury grew, the term began to be used more loosely by various authors to describe any type of groin pain[11], further mitigating its diagnostic precision. Therefore, for a correct understanding of the clinical situation generated by an SH, it is necessary to clarify two

Publisher smc media srl

main points: the first concerning the anatomy of the inguinal canal and the second inherent to the radiological definition of SH.

ANATOMY OF THE INGUINAL CANAL

The inguinal canal is a key anatomical feature of the pelvic region. In males, it serves as a passageway for the spermatic cord, while in females, it contains the round ligament. Structurally, the canal is composed of four walls—anterior, posterior, superior, and inferior—and has two openings: a superficial (external) ring and a deep (internal) ring[12]. The aponeurosis of the external oblique muscle represents the main anatomical element of the anterior wall. The inguinal ligament (or Poupart's ligament) forms the inferior wall. The superior border of the internal oblique muscle and the transversus muscle form the superior wall of the IC. The posterior wall is formed by the transversalis fascia, which is strengthened laterally by the interfoveolar ligament of Hesselbach and medially by the ligament of Henle, the ligament of Colles and the conjoint tendon[13].

The external (or superficial) inguinal ring is defined by fibers of the external oblique muscle aponeurosis, which originates at the anterior superior iliac spine[14]. These fibers either extend towards the pubic tubercle form the inferior crus forming the inferolateral or external pillar, or head towards the pubic symphysis form the superior crus, to form the superomedial or internal pillar[13]. Furthermore, the internal (deep) inguinal ring opens into the abdominal cavity and lies perpendicular and approximately 15–20 mm above the midpoint of the inguinal ligament and roughly 50 mm from the pubic tubercle[12,14]. A schematic view illustrating the structure of the inguinal canal is presented in *Figure 1*. Within the transversalis fascia it is important to remember that Hessert's triangle *(Fig. 2)* and Hesselbach's triangle *(Fig. 3)*, although with some negligible difference, identify an area of relative and intrinsic weakness of the abdominal wall, unsupported by the broad abdominal muscles, where both direct hernias and SH originate.

THE RADIOLOGICAL DEFINITION OF SPORTS HERNIA

It is essential to clarify that the term 'sports hernia' (SH) is anatomically misleading, as this condition does not involve an actual herniation[15]. Unlike a direct inguinal hernia, where the posterior wall of the inguinal canal is disrupted, SH does not result in a true anatomical loss of tissue continuity[16,17]. Moreover, describing this condition as 'sports'-related can be inaccurate, since it may also be found in individuals engaged in physically demanding activities who are not necessarily athletes[18]. A more precise anatomical description of this condition is "weakness of the posterior wall of the inguinal canal"[6], a term more consistent with the recommendations made by the Italian Consensus Conference on groin pain terminology, clinical assessment, and imaging in athletes[19]. As far as anatomical nomenclature is concerned, replacing the term 'sports hernia' with "posterior inguinal wall weakness" is more appropriate[1,19]. Nevertheless, for ease of reading and continuity, this manuscript will use both terms interchangeably. Dynamic ultrasonography (USD) is considered the diagnostic gold standard for evaluating suspected SH[1,8,19-22]. Under

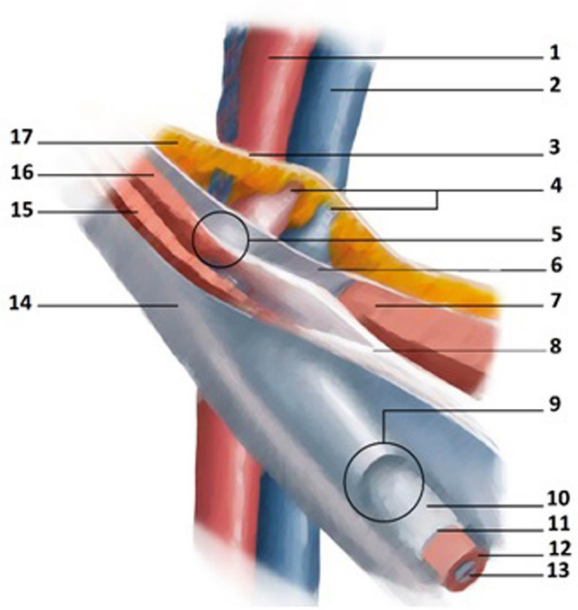


Figure 1. *A schematic view of the inguinal canal.*
Legend: 1) External iliac artery; 2) External iliac vein; 3) Parietal peritenonium; 4) Inferior epigastric vessels; 5) Internal inguinal ring; 6) Transversalis fascia; 7) Rectus abdominis muscle; 8) Conjoint tendon; 9) External inguinal ring; 10) Spermatic cord; 11) External spermatic fascia; 12) Cremasteric muscle and fascia; 13) Internal spermatic fascia; 14) External oblique muscle aponeurosis; 15) Internal oblique muscle; 16) Transversus oblique muscle; 17) Extraperitoneal tissue.

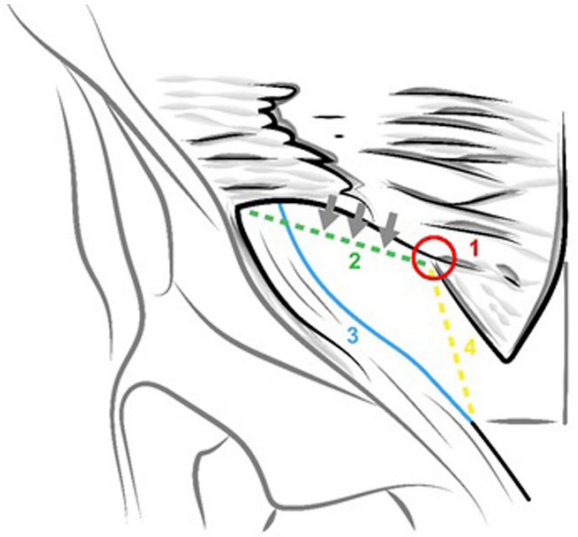


Figure 2. *The Hessert's triangle is an anatomical area delimited by the internal ring at the apex (1), the internal oblique and the transversus abdominis muscles (2) and the inguinal ligament (3) laterally, and, at its base, by the rim of the rectus abdominis muscle (4).*

© 2026 The Author(s) - Doi: 10.32098/mltj_2026_6381

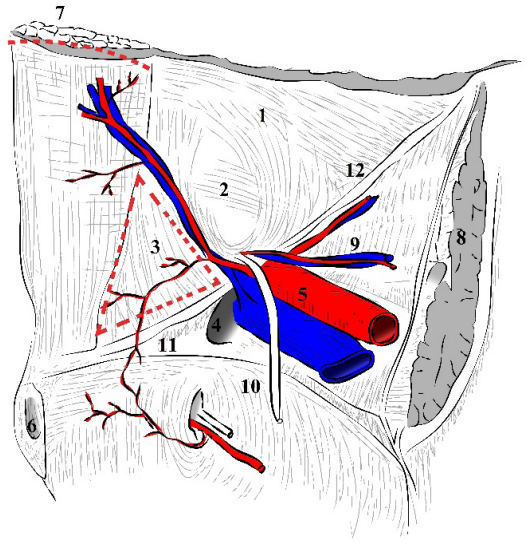


Figure 3. *Hesselbach's triangle is an anatomical area in the lower abdominal wall, delimited medially by the lateral border of the rectus abdominis, inferiorly by the inguinal ligament, and laterally by the inferior epigastric vessels which lie medial to the internal inguinal ring.*
Legend: 1) Transversalis fascia; 2) Internal inguinal ring; 3) Hesselbach's triangle; 4) External inguinal ring; 5) External iliac vessels; 6) Pubic symphysis; 7) Rectus abdominis muscle; 8) Iliopsoas muscle; 9) Testicular vessels; 10) Vas deferens; 11) Conjoined tendon; 12) Inguinal ligament.

normal conditions, the posterior wall of the inguinal canal presents a slight concavity when assessed at rest via ultrasound[1,19]. This concavity is maintained as the intra-abdominal pressure increases during a correctly performed Valsalva maneuver[1,19,22-24] *(Fig. 4)*. However, in cases of posterior wall insufficiency, ultrasound imaging reveals that this physiological concavity becomes convex during the Valsalva maneuver. This bulging effect—an outward displacement of the posterior wall—is considered a trait of SH[1,8,19,21-23] *(Fig. 5)*. Notably, this represents a functional weakness, not a true hernia, as no anatomical defect or tissue breach is present[1,2,19,22-24]. In contrast, direct inguinal hernias exhibit, upon ultrasound examination, a clear discontinuity in the transversalis fascia during the Valsalva maneuver as defined by the European Hernia Society[25]. Preperitoneal fat and/or intra-abdominal contents protrude, medially to the inferior epigastric vessels, into the inguinal canal[25] through this hernia breach *(Fig. 6)*. Similarly, EHS guidelines describe indirect (or oblique external) hernias as herniations that protrude through the deep inguinal ring and progress into the inguinal canal itself, occurring laterally to the inferior epigastric vessels[25]. It is also critical to verify the effectiveness of the Valsalva maneuver during ultrasonographic evaluation. This is typically done by observing the temporary distension of the femoral and iliac veins *(Fig. 7)*, which confirms adequate intra-abdominal pressure[26]. Repeating the Valsalva maneuver while monitoring tissue movement in relation to the inferior epigastric vessels provides valuable diagnostic clues. Depending on whether this movement is medial, lateral, or involves posterior wall deformation, a trained radiologist can differentiate between SH, direct hernias, and indirect hernias. Conversely, a poorly executed or uncontrolled Valsalva maneuver may result in diagnostic errors, particularly false negatives[26].

The SH typically appears similar to a direct inguinal hernia, located medially to the inferior epigastric vessels and at the level of the transversalis fascia. However, in the case of an SH, the transversalis fascia remains intact and only bulges during the Valsalva maneuver but does not rupture to allow the protrusion of preperitoneal fat or intra-abdominal contents as seen in direct hernias[1,19,22-24]. Thus, SH could be seen as an early manifestation of a

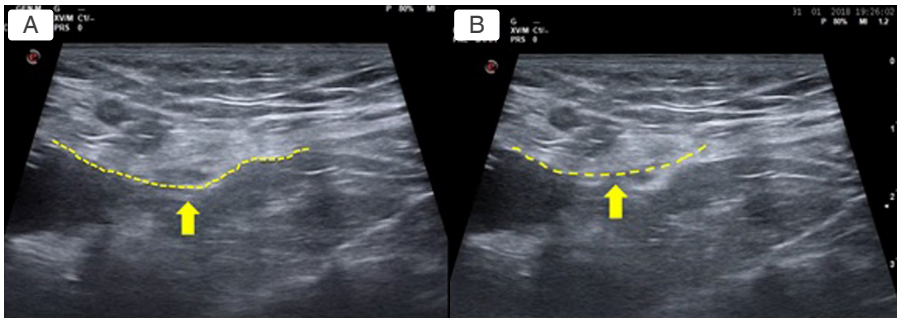


Figure 4. *Ultrasound imaging of the posterior wall of the inguinal canal. A) In the resting state, the posterior wall displays a mild inward curvature (indicated by the arrow); B) Under normal conditions during the Valsalva maneuver, this concave shape remains unchanged (arrow).*

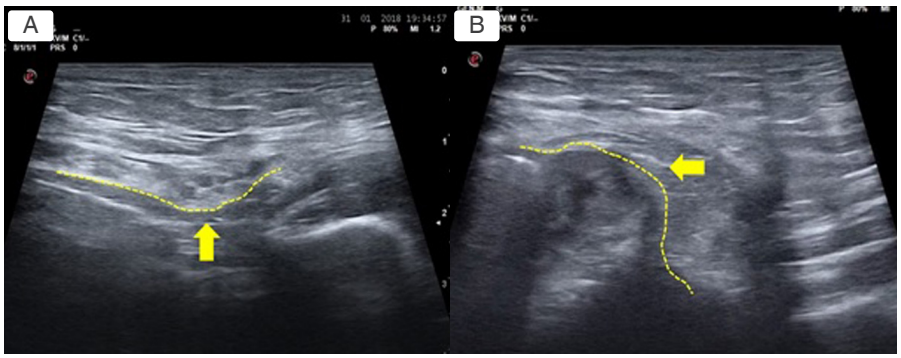


Figure 5. *A) Ultrasound scan showing the posterior wall of the inguinal canal at rest (arrow); B) During the Valsalva maneuver, the normal concave shape of the posterior wall is reversed, revealing a noticeable bulge (arrow). This finding is characteristic of posterior wall weakness, occurring without an actual inguinal hernia.*

© 2026 The Author(s) - Doi: 10.32098/mltj_2026_6381

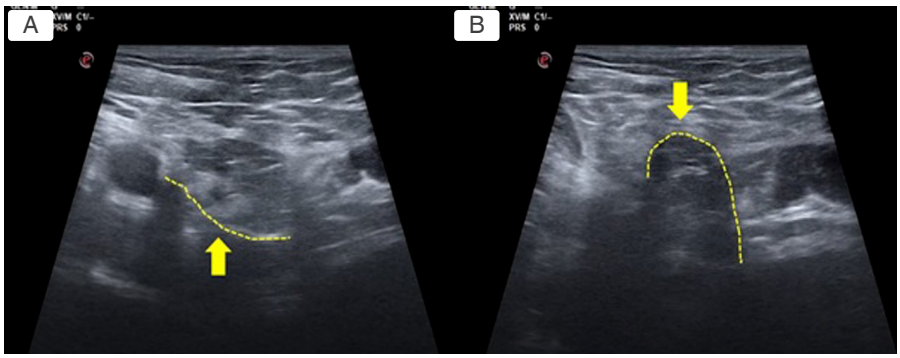


Figure 6. *A) Ultrasound image of the posterior wall of the inguinal canal in a resting state (arrow); B) During the Valsalva maneuver, preperitoneal fat is seen protruding into the inguinal canal (arrow). This sonographic appearance is consistent with a direct inguinal hernia, as defined by the European Hernia Society classification[25].*

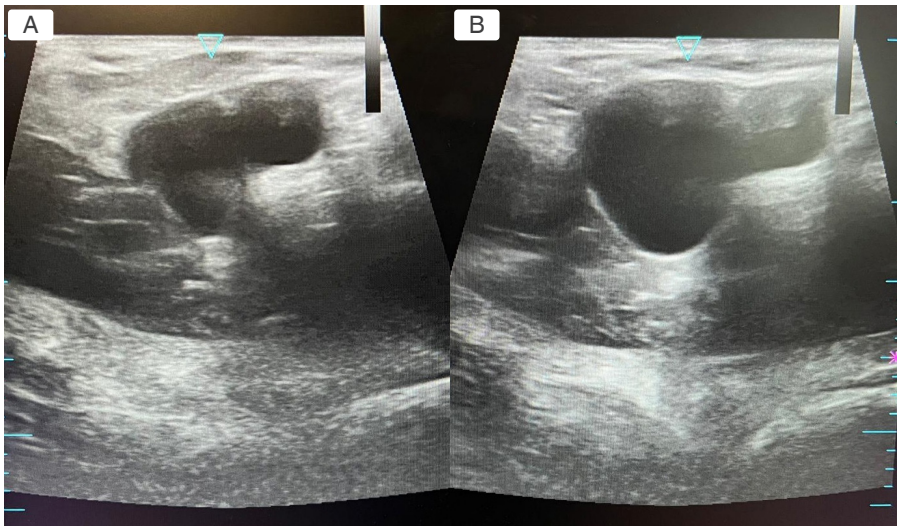


Figure 7. *Ultrasound imaging gauges and monitors the distension of the femoral and iliac veins to check whether or not the Valsalva maneuver is performed properly. In panel A, these veins are shown in a relaxed (resting) state, while in panel B, they appear dilated during the Valsalva maneuver. A substantial dilation of these vessels confirms that intra-abdominal pressure has effectively increased, validating the maneuver.*

direct inguinal hernia in evolution, essentially, a "hernia in the making" (hernia in fieri)[1,19,27]. Consequently, the notion of "weakness of the inguinal canal posterior wall" ought not to be confused with either "inguinal hernia" or "occult/hidden inguinal hernia". According to the HerniaSurge Group's definition, an occult inguinal hernia refers to an asymptomatic hernia that cannot be identified through physical examination and is typically only discovered via USD or during inspection of the contralateral side during laparoscopic surgery on the hernia[14]. Despite this clear definition, inconsistencies remain in the literature. Several authors interpret "occult hernia" as an early-stage hernia, a visible bulge of intra-abdominal contents, or even a "patent processus vaginalis without herniation"[28,29]. This terminological inconsistency contributes to ongoing conceptual confusion. To reduce this ambiguity, it is crucial to adopt a precise and widely accepted radiological definition during USD evaluations of posterior inguinal wall weakness. Based on current evidence, the following appears to be the most appropriate: "Posterior wall weakness of the inguinal canal can be diagnosed via USD when, during a properly performed Valsalva maneuver, a clear reversal of the normal concavity of the transversalis fascia is observed—medial to the inferior epigastric vessels—without interruption of its anatomical continuity (i.e., bulging occurs without a hernial sac)."

DISCUSSION

SH is therefore identifiable as a weakness of the posterior inguinal wall that occurs in the same region as a direct inguinal hernia. The bulging that occurs during increased intra-abdominal pressure compresses the nerve endings that pass through the inguinal canal (i.e., the ilioinguinal nerve, the genital branch of the genitofemoral nerve, and the ilioepigastric nerve), causing the painful symptoms[1,19,22-24]. Unfortunately, to date, there are still numerous studies in literature that recommend conservative treatment as the initial management of GPS caused by SH[30-33]. The type of conservative treatments recommended essentially involve rest, anti-inflammatory drugs, physical therapy and strengthening of the abdominal wall. Given that GPS caused by SH is a functional pathology[3] that is, a pathology that is triggered by the physical demands typical of sporting activities, it is clear that rest can only offer short-term symptom relief. However, reducing or abstaining from physical activity, in addition to being merely a symptomatic therapy, is difficult to reconcile with the needs of athletes, particularly professional athletes. Similarly, pharmacological and physical treatments also target symptom management and are therefore unlikely to provide a lasting solution[1,19]. As for abdominal wall strengthening, its ineffectiveness is essentially based on anatomical considerations. The anterior abdominal wall is composed of three primary layers; the superficial layer of skin and subcutaneous adipose tissues; the myofascial layer, consisting of muscles and fasciae, and the deep layer, comprising the transversalis fascia, preperitoneal fat, and the parietal

© 2026 The Author(s) - Doi: 10.32098/mltj_2026_6381

peritoneum[34]. The myofascial layer includes 5 muscles: the rectus abdominis, the pyramidalis, the external and internal oblique and the transversus abdominis muscle. The transversalis fascia, which is part of the deep layer and forms the posterior wall of the inguinal canal, is a diaphanous fibrous membrane that lines the inner surface of the transversus abdominis muscle and separates it from the parietal peritoneum. The transversalis fascia is reinforced only by the interfoveolar ligament of Hesselbach and medially by the ligament of Henle, the ligament of Colles, and the conjoint tendon and as such represents a locus minoris resistentiae, a region of minor resistance, through which both direct hernias and SH can protrude[3,13,35]. Based on this anatomical evidence, it is evident that strengthening of the myofascial muscles does not reinforce the transversalis fascia and consequently, muscle strengthening does not constitute a preventive or a therapeutic strategy against the onset of direct inguinal hernia and/or SH. This clear and indisputable anatomical concept appears clear to numerous authors who affirm the ineffectiveness of conservative treatments in such cases[1,36-38]. Reflecting this consensus, the expert panel from the 2023 update of the Groin Pain Syndrome Italian Consensus Conference[1] advised against conservative treatment for inguinal hernia and SH and instead recommended early surgical intervention particularly for professional athletes. On the other hand, amateur athletes may often benefit from refraining from sports or drastically limiting physical activity to alleviate or resolve symptoms, especially for cases of SH[1]. Nonetheless, it is equally clear that such a strategy is not feasible for elite professional athletes due to their unique performance obligations.

CONCLUSION

Anatomical data clearly show us that attempting to treat SH conservatively while maintaining the same level of athletic performance is essentially impossible. Professional athletes should be directly referred to surgical solutions. Amateur athletes, on the other hand, should be clearly informed that a reduction in physical activity can alleviate pain symptoms.

REFERENCES

1. Bisciotti GN, Zini R, Aluigi M, Aprato A, Auci A, Bellinzona E, et al. Groin Pain Syndrome Italian Consensus Conference update 2023. J Sports Med Phys Fitness. 2024;64(4):402-414. doi: 10.23736/S0022-4707.23.15517-4.
2. Brown A, Abrahams S, Remedios D, Chadwick SJ. Sports hernia: a clinical update. Br J Gen Pract. 2013;63(608):e235-7. doi: 10.3399/bjgp13X664432.
3. 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 (Basel). 2025;15(6):785. doi: 10.3390/diagnostics15060785.
4. Nesovic B. Bolni sindrom simfeze kod sportista i mogucnosti njegovog lecenja. In: Povrede u sportu i njihovo lecenje. In: Zdravstvena Kimosija SFKJ; Nacionalna i Univerzitetski Biblioteka: Bosna i Hercegovina, Sarajevo, 1987.
5. Kraeutler MJ, Mei-Dan O, Belk JW, Larson CM, Talishinskiy T, Scillia AJ. A Systematic Review Shows High Variation in Terminology, Surgical Techniques, Preoperative Diagnostic Measures, and Geographic Differences in the Treatment of Athletic Pubalgia/Sports Hernia/Core Muscle Injury/Inguinal Disruption. Arthroscopy. 2021;37(7):2377-2390.e2. doi: 10.1016/j.arthro.2021.03.049.
6. Strosberg DS, Ellis TJ, Renton DB. The Role of Femoroacetabular Impingement in Core Muscle Injury/Athletic Pubalgia: Diagnosis and Management. Front Surg. 2016;3:6. doi: 10.3389/fsurg.2016.00006.
7. Mitrousias V, Chytas D, Banios K, Fyllos A, Raoulis V, Chalatsis G, et al. Anatomy and terminology of groin pain: Current concepts. J ISAKOS. 2023;8(5):381-386. doi: 10.1016/j.jisako.2023.05.006.
8. Orchard JW, Read JW, Neophyton J, Garlick D. Groin pain associated with ultrasound finding of inguinal canal posterior wall deficiency in Australian Rules footballers. Br J Sports Med. 1998;32(2):134-9. doi: 10.1136/bjsm.32.2.134.
9. Kavanagh EC, Koulouris G, Ford S, McMahon P, Johnson C, Eustace SJ. MR imaging of groin pain in the athlete. Semin Musculoskelet Radiol. 2006;10(3):197-207. doi: 10.1055/s-2006-957173.
10. Koulouris G. Imaging review of groin pain in elite athletes: an anatomic approach to imaging findings. AJR Am J Roentgenol. 2008;191(4):962-72. doi: 10.2214/AJR.07.3410.
11. Lee SC, Endo Y, Potter HG. Imaging of Groin Pain: Magnetic Resonance and Ultrasound Imaging Features. Sports Health. 2017;9(5):428-435. doi: 10.1177/1941738117694841.
12. Tuma F, Lopez RA, Varacallo M. Anatomy, Abdomen and Pelvis: Inguinal Region (Inguinal Canal). 2023 Jul 24. In: StatPearls (Internet). Treasure Island (FL): StatPearls Publishing; 2023 Jan–.
13. Lytle WJ. Inguinal anatomy. J Anat. 1979;128(Pt 3):581-94.
14. Hernia Surge Group. International guidelines for groin hernia management. Hernia. 2018;22(1):1-165. doi: 10.1007/s10029-017-1668-x.
15. Zuckerbraun BS, Cyr AR, Mauro CS. Groin Pain Syndrome Known as Sports Hernia: A Review. JAMA Surg. 2020;155(4):340-348. doi: 10.1001/jamasurg.2019.5863.
16. Bou Antoun M, Reboul G, Ronot M, Crombe A, Poussange N, Pesquer L. Imaging of inguinal-related groin pain in athletes. Br J Radiol. 2018;91(1092):20170856. doi: 10.1259/bjr.20170856.
17. Palumbo P, Massimi F, Lucchese S, Grimaldi S, Vernaccini N, Cirocchi R, et al. Open Surgery for Sportsman's Hernia a Retrospective Study. Front Surg. 2022;9:893390. doi: 10.3389/fsurg.2022.893390.
18. Gamborg S, Öberg S, Hölmich P, Skjoldby B, Rosenberg J. [Sports hernia is not a hernia]. Ugeskr Laeger. 2019;181(29):V01190018.
19. Bisciotti GN, Volpi P, Zini R, Auci A, Aprato A, Belli A, et al. Groin Pain Syndrome Italian Consensus Conference on terminology, clinical evaluation and imaging assessment in groin pain in athlete. BMJ Open Sport Exerc Med. 2016;2(1):e000142. doi: 10.1136/bmjsem-2016-000142. Erratum in: BMJ Open Sport Exerc Med. 2017;2(1):e000142corr1. doi: 10.1136/bmjsem-2016-000142corr1.
20. Robinson P, Hensor E, Lansdown MJ, Ambrose NS, Chapman AH. Inguinofemoral hernia: accuracy of sonography in patients with indeterminate clinical features. AJR Am J Roentgenol. 2006;187(5):1168-78. doi: 10.2214/AJR.05.1251.
21. Balconi G. US in pubalgia. J Ultrasound. 2011;14(3):157-66. doi: 10.1016/j.jus.2011.06.005.
22. Rambani R, Hackney R. Loss of range of motion of the hip joint: a hypothesis for etiology of sports hernia. Muscles Ligaments Tendons J. 2015;5(1):29-32.
23. Dimitrakopoulou A, Schilders E. Sportsman's hernia? An ambiguous term. J Hip Preserv Surg. 2016;3(1):16-22. doi: 10.1093/jhps/hnv083.
24. Valent A, Frizziero A, Bressan S, Zanella E, Giannotti E, Masiero S. Insertional tendinopathy of the adductors and rectus abdominis in athletes: a review. Muscles Ligaments Tendons J. 2012;2(2):142-8.

© 2026 The Author(s) - Doi: 10.32098/mltj_2026_6381

25. Sheen AJ, Stephenson BM, Lloyd DM, Robinson P, Fevre D, Paajanen H, et al. 'Treatment of the sportsman's groin': British Hernia Society's 2014 position statement based on the Manchester Consensus Conference. Br J Sports Med. 2014;48(14):1079-87. doi: 10.1136/bjsports-2013-092872.
26. Vasileff WK, Nekhline M, Kolowich PA, Talpos GB, Eyler WR, van Holsbeeck M. Inguinal Hernia in Athletes: Role of Dynamic Ultrasound. Sports Health. 2017;9(5):414-421. doi: 10.1177/1941738117717009.
27. Malycha P, Lovell G. Inguinal surgery in athletes with chronic groin pain: the 'sportsman's' hernia. Aust N Z J Surg. 1992;62(2):123-5. doi: 10.1111/j.1445-2197.1992.tb00009.x.
28. van Wessem KJ, Simons MP, Plaisier PW, Lange JF. The etiology of indirect inguinal hernias: congenital and/or acquired? Hernia. 2003;7(2):76-9. doi: 10.1007/s10029-002-0108-7.
29. van Veen RN, van Wessem KJ, Halm JA, Simons MP, Plaisier PW, Jeekel J, Lange JF. Patent processus vaginalis in the adult as a risk factor for the occurrence of indirect inguinal hernia. Surg Endosc. 2007;21(2):202-5. doi: 10.1007/s00464-006-0012-9.
30. Machotka Z, Kumar S, Perraton LG. A systematic review of the literature on the effectiveness of exercise therapy for groin pain in athletes. Sports Med Arthrosc Rehabil Ther Technol. 2009;1(1):5. doi: 10.1186/1758-2555-1-5.
31. Ramazzina I, Bernazzoli B, Braghieri V, Costantino C. Groin pain in athletes and non-interventional rehabilitative treatment: a systematic review. J Sports Med Phys Fitness. 2019;59(6):1001-1010. doi: 10.23736/S0022-4707.18.08879-5.
32. Brito R, Cruz P, Costa D, Afonso S, Barros P. Nonsurgical Interventions for the Management of Long-Standing Groin Pain in Athletes: A Systematic Review of Randomized Controlled Trials. Cureus. 2023;15(6):e40149. doi: 10.7759/cureus.40149.
33. Santilli O, Santilli H. Narrative review of long-standing groin pain in athletes. Retrospective analysis of over 12 000 patients. Hernia. 2025;29(1):81. doi: 10.1007/s10029-024-03229-z.
34. Draghi F, Cocco G, Richelmi FM, Schiavone C. Abdominal wall sonography: a pictorial review. J Ultrasound. 2020;23(3):265-278. doi: 10.1007/s40477-020-00435-0.
35. Bendavid R, Howarth D. Transversalis fascia rediscovered. Surg Clin North Am. 2000;80(1):25-33. doi: 10.1016/s0039-6109(05)70395-9.
36. Dojčinović B, Sebečić B, Starešinić M, Janković S, Japjec M, Čuljak V. Surgical treatment of chronic groin pain in athletes. Int Orthop. 2012;36(11):2361-5. doi: 10.1007/s00264-012-1632-4.
37. Jørgensen SG, Öberg S, Rosenberg J. Treatment of longstanding groin pain: a systematic review. Hernia. 2019;23(6):1035-1044. doi: 10.1007/s10029-019-01919-7.
38. Vicenty T, Sérénon V, Aubert M, Omouri A, Le Huu Nho R, et al. Sportsman's Hernia repair using Nesovic procedure, a 13-year single-center experience. Updates Surg. 2025;77(1):231-236. doi: 10.1007/s13304-024-02047-3.