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Abstract

Background. Hernias and sports-related groin pain can be difficult to distinguish in athletes. The effects of physical activity on hernia risk and recovery remain unclear.

Aim. To review evidence on the epidemiology, risk factors, diagnosis, physical activity, and management of inguinal and abdominal wall hernias, particularly in athletes.

Material and methods. A narrative review was based on publications identified through PubMed, the MDPI platform, and Quality in Sport, addressing hernia risk, diagnosis, exercise, and treatment.

Results. Inguinal hernias are the most common groin hernias and occur predominantly in men. In athletes, clinical assessment and appropriate imaging help distinguish true hernias from athletic pubalgia and other musculoskeletal causes of groin pain. Exercise programmes may improve selected outcomes, including quality of life, in patients with abdominal wall hernias.

Conclusions. Accurate diagnosis is essential for appropriate treatment and return to sport. Further research is needed to clarify the role of exercise and improve evidence-based treatment and rehabilitation strategies for athletes.

Key words: inguinal hernia, abdominal wall hernia, athletic pubalgia, physical activity, rehabilitation.

1. Introduction

Abdominal wall and inguinal hernias are common clinical conditions that may affect physical functioning and quality of life. Their development is associated with multiple factors, including age, sex, anatomical predisposition, previous surgical procedures, and increased intra-abdominal pressure (Ma et al., 2023; Saiding et al., 2023; Yu et al., 2026). Although hernias occur in the general population, their diagnosis and management may present particular challenges in physically active individuals and professional athletes (Alqahtani et al., 2023; Kopscik et al., 2023).

Groin pain is a common problem in athletes participating in sports involving sprinting, kicking, rapid changes of direction, and rotational movements (Kopscik et al., 2023; Pedrinelli et al., 2024; Serafim et al., 2022). However, groin pain does not necessarily indicate the presence of a true inguinal hernia. The term sports hernia, also known as athletic pubalgia, describes a condition associated with activity-related groin pain in the absence of a demonstrable true hernia (Mitrousias et al., 2023; Pedrinelli et al., 2024; Picasso et al., 2021). Distinguishing an inguinal hernia from athletic pubalgia and other musculoskeletal causes of groin pain is essential for establishing an accurate diagnosis and selecting appropriate treatment (Forlizzi et al., 2023; Mitrousias et al., 2023).

The relationship between physical activity and hernia development is complex. Increased intra-abdominal pressure associated with physical exertion has been identified as a potential factor contributing to hernia development (Yu et al., 2026). Studies involving athletes have also reported an association between sports participation and inguinal hernias, although the available evidence does not establish a uniform relationship between exercise intensity and hernia risk (Alqahtani et al., 2023; Kopscik et al., 2023). Conversely, appropriately selected exercise programmes may improve quality of life in patients with abdominal wall hernias, particularly during the perioperative period, although their effect on pain reduction remains uncertain (Gil Delgado et al., 2025).

The management of hernias may involve conservative treatment, rehabilitation, and surgical repair, depending on the underlying condition and individual clinical circumstances. In athletes, treatment decisions are particularly important because groin pain and inguinal hernias may interrupt sports participation and delay return to training (Serafim et al., 2022). An individualized approach to treatment and rehabilitation is therefore important when aiming to restore physical function and facilitate a safe return to sport.

Despite growing interest in the relationship between physical activity, hernia development, and recovery, differences in terminology and study populations complicate the interpretation of existing evidence (Mitrousias et al., 2023; Pedrinelli et al., 2024). A comprehensive review of hernia characteristics, diagnostic approaches, exercise-related factors, and treatment options may help clarify current knowledge and identify areas requiring further investigation.

Research Objective:

The primary objective of this review is to summarize current evidence concerning the epidemiology, risk factors, diagnosis, and management of inguinal and abdominal wall hernias, with particular emphasis on physically active individuals and athletes.

The specific objectives are:

1. To describe the most common types of inguinal and abdominal wall hernias and their principal risk factors.
2. To examine the relationship between physical activity, sports participation, and hernia development.
3. To discuss the diagnostic challenges associated with differentiating true inguinal hernias from athletic pubalgia and other causes of groin pain.
4. To review available evidence concerning conservative treatment, exercise-based rehabilitation, and surgical management.
5. To identify gaps in current knowledge regarding treatment outcomes, rehabilitation, and return to sport in athletes.

Research Problems:

The review addresses the following research questions:

1. What are the principal risk factors associated with inguinal and abdominal wall hernias?
2. What is currently known about the relationship between physical activity and hernia development?
3. Which diagnostic approaches help differentiate true inguinal hernias from athletic pubalgia and other musculoskeletal causes of groin pain?
4. What evidence supports conservative treatment, rehabilitation, and surgical intervention in patients with hernias, particularly athletes?
5. What factors influence functional recovery and return to sport following treatment?

Research Hypotheses:

As this study is a narrative literature review, the following hypotheses are formulated as propositions to be examined against the available evidence rather than as hypotheses tested using original patient data.

1. The relationship between physical activity and hernia development is multifactorial and depends on individual risk factors and the type and intensity of physical exertion.
2. Differentiating true inguinal hernias from athletic pubalgia and other causes of groin pain is essential for selecting appropriate treatment in athletes.
3. Individualized treatment and rehabilitation may support functional recovery, although outcomes depend on the underlying condition and the treatment approach..

2. Research materials and methods

2.1. Review design

A narrative literature review was conducted to examine current evidence on sports hernia, its epidemiology, risk factors, diagnostic approaches, and treatment options, with particular emphasis on physically active individuals and athletes. The review also addressed the distinction between sports hernia, inguinal hernia, and other causes of activity-related groin pain.

2.2. Evidence identification

Relevant literature published between 2020 and 2026 was identified using PubMed, the MDPI publishing platform, and the journal Quality in Sport. The search focused on publications concerning the epidemiology, diagnosis, management, and treatment of sports hernia and related conditions. Search terms included “sports hernia,” “treatment of sports hernia,” and “hernia epidemiology,” among other topic-related terms.

2.3. Study selection

Publications were selected according to their relevance to the objectives and scope of the review. Priority was given to studies addressing epidemiological characteristics, potential risk factors, diagnostic methods, conservative management, surgical treatment, and rehabilitation. Studies providing information relevant to athletes and physically active individuals were considered particularly pertinent.

2.4. Evidence synthesis

The selected publications were reviewed and synthesized descriptively. The findings were organized into thematic categories covering epidemiology, risk factors, diagnosis, physical activity, treatment, and rehabilitation. The synthesis aimed to identify key findings, compare available evidence, and highlight areas of uncertainty relevant to the clinical management of athletes with sports-related groin pain and hernia- related conditions.

3. Research results

3.1. Definition and characteristics of hernias

A hernia refers to the displacement or protrusion of an organ, or a portion thereof, through the anatomical wall that normally encloses it (Tung & Heyns, 2022).

3.2. Anatomy of the abdominal wall and the inguinal and femoral canals, with particular emphasis on Areas of least resistance

The human abdominal wall is an anatomically organized, multilayered structure composed of tissues that perform distinct functions while collectively fulfilling several essential physiological roles. Its principal components include the skin, subcutaneous adipose tissue, muscles, preperitoneal fascia, and peritoneum. These layers are interconnected with one another and with the underlying skeletal structures, forming a protective barrier that supports and encloses the contents of the abdominal cavity. The abdominal wall is essential for protecting the abdominal organs, maintaining proper body posture, and contributing to the regulation and stabilization of intra-abdominal pressure (Saiding et al., 2023).

The inguinal canal extends from the deep (internal) inguinal ring to the superficial (external) ring and is bounded by the aponeuroses of the abdominal oblique musculature. The internal ring represents an opening within the transversalis fascia, whereas the superficial ring is formed by a defect in the external oblique aponeurosis. Anatomical structures traversing the canal include the ilioinguinal nerve, the spermatic cord in males, and the round ligament in females (Tung & Heyns, 2022). The most common cause of inguinal hernia development is weakness of the posterior wall of the inguinal canal, accompanied by damage to the distal portion of the rectus abdominis muscle (Forlizzi et al., 2023).

The femoral canal is situated medial to the femoral vein and lies within the femoral vascular sheath. Its anatomical boundaries are defined anteriorly by the inguinal ligament, medially by the lacunar ligament (Gimbernat's ligament), laterally by the femoral vein, and posteriorly by the superior pubic ramus, which is covered by Cooper's ligament and the pectineus muscle.

The femoral canal communicates with the abdominal cavity through the femoral ring, which serves as the anatomical opening through which the contents of a femoral hernia may protrude. This communication provides a pathway for the displacement of abdominal contents into the femoral canal, resulting in the development of a femoral hernia (Garcia et al., 2022).

3.3. The most common types of hernias, their prevalence, and risk factors

The development of a hernia is associated with increased intra-abdominal pressure, which may result from various factors, including physically demanding work, recurrent sports-related injuries in professional athletes, obesity, chronic coughing associated with certain diseases, and prolonged constipation (Yu et al., 2026).

Heavy physical work performed in a standing position has been identified as a potential risk factor associated with increased intra-abdominal pressure, particularly within the lower abdominal region (Yu et al., 2026). The physical demands associated with this type of occupational activity may result in repeated episodes of elevated intra-abdominal pressure, especially during tasks involving substantial physical exertion. Prolonged exposure to such conditions may therefore be relevant when considering factors associated with the development of hernias.

Groin hernias comprise both inguinal and femoral hernias and affect approximately 5–10% of the population in the United States. Of these cases, inguinal hernias account for approximately 96%, whereas femoral hernias constitute the remaining 4% (Tung & Heyns, 2022). A study published in PubMed included a total of 277 patients diagnosed with hernias, with the study population comprising not only athletes but also individuals from the general population. Among the hernias identified in this group, inguinal hernias were the most frequently reported, accounting for 66.1% of all cases. Umbilical hernias represented 10.8% of the cases, while paraumbilical hernias accounted for 6.9%. Epigastric hernias were identified in 10.5% of patients, whereas incisional hernias constituted 3.2% of the total cases. Femoral hernias were the least frequently observed type, representing 1.4% of all hernias reported in the study population (Boruah et al., 2024).

A comprehensive study was conducted to evaluate changes in the incidence and prevalence of inguinal, femoral, and abdominal hernias over the period from 1990 to 2019 worldwide. The analysis encompassed 204 countries and was designed to assess the frequency and distribution of these hernias across different populations during the investigated period.

In 2019, the global number of individuals affected by inguinal, femoral, and abdominal hernias was estimated at 32.53 million prevalent cases, with a 95% uncertainty interval (UI) ranging from 27.71 to 37.79 million. During the same year, the number of incident cases was estimated at 13.02 million, with a 95% UI of 10.68–15.49 million. When compared with the corresponding figures reported for 1990, the number of prevalent cases increased by 36.00%, while the number of incident cases showed a substantially greater increase of 63.67%.

Males represented the predominant proportion of newly diagnosed cases, accounting for 86% of all incident cases. This distribution corresponded to a male-to-female ratio of 6:1. In terms of age distribution, the majority of patients affected by inguinal, femoral, and abdominal hernias were within the 50–69-year age group (Ma et al., 2023).

In another study, the authors reported that inguinal hernias occur predominantly among males, indicating a substantially higher frequency of this condition in the male population compared with females (Yu et al., 2026). During the process of testicular descent into the scrotum, the *processus vaginalis* develops as an evagination of the peritoneum. Under normal circumstances, the *processus vaginalis* subsequently undergoes obliteration. However, when it remains patent, it represents a significant risk factor for the development of an inguinal hernia. The right testis descends later than the left testis, which is directly associated with a greater likelihood of failure of *processus vaginalis* obliteration and, consequently, with an increased risk of developing a right-sided inguinal hernia.

An asymptomatic patent *processus vaginalis* has been reported in approximately 20% of patients at 5 months of age, decreasing to 9% among individuals aged 12 years and remaining detectable in approximately 6–19% of adults. Although the persistence of a patent *processus vaginalis* is associated with a markedly increased risk of developing an inguinal hernia, its presence alone does not fully explain the pathogenesis of the condition, as other risk factors also contribute to the development of inguinal hernias (Öberg et al., 2017).

3.4. Pain resulting from a sports-related injury or an early manifestation of a hernia?

The complex and multifactorial nature of inguinal hernia pathogenesis, combined with the broad spectrum of clinical symptoms that may accompany these conditions and are not always specific, has resulted in considerable inconsistency and uncertainty regarding the terminology used to describe them (Mitrousias et al., 2023).

As opportunities for high-level sports participation have become increasingly widespread and competitive seasons in both amateur and professional leagues have become longer, groin pain related to physical activity is being reported by a growing number of individuals. In this context, the term “sport hernia,” also known as athletic pubalgia, should not be interpreted as referring to an actual hernia. Instead, it denotes a condition in which unilateral groin pain is present despite the absence of a demonstrable hernia (Picasso et al., 2021).

The condition referred to as Sports hernia has acquired an exceptionally broad range of terminology and has been described using as many as 33 synonyms. The terminology historically used in the literature includes “sports hernia”, “sportsman's groin”, “Gilmore's groin”, “athletic pubalgia” and “core muscle injury”. Although these expressions are no longer recommended, their continued presence in published articles allows them to remain in circulation, thereby contributing to the persistence of terminological ambiguity surrounding this condition (Mitrousias et al., 2023; Pedrinelli et al., 2024).

From a clinical perspective, it is particularly important to distinguish an inguinal hernia occurring in an athlete from groin pain that results from an injury involving the core muscles (Forlizzi et al., 2023).

Consequently, familiarity with the diagnostic methods that are currently available and recommended is essential for physicians. Appropriate knowledge of these diagnostic approaches can help prevent diagnostic inaccuracies and subsequently enable the selection and implementation of appropriate treatment. The diagnostic evaluation of hernias is based on a combination of clinical examination and imaging techniques, with the selection of an appropriate imaging modality determined primarily by the suspected anatomical location of the hernia and the patient's presenting symptoms. Physical examination, including palpation of the abdominal wall and other body surface structures, may reveal a visible protrusion or a palpable defect within the tissues. However, clinical assessment alone does not always provide sufficient information to establish a definitive diagnosis.

According to the guidelines of the American College of Radiology (ACR), ultrasonography (US) and computed tomography (CT) play an important role in the diagnostic assessment of abdominal and pelvic hernias, allowing both the hernia defect and its contents to be evaluated. When an abdominal wall hernia, including an umbilical or ventral hernia, is suspected, abdominal ultrasonography and CT of the abdomen and pelvis, performed with or without contrast enhancement, are considered appropriate initial imaging examinations.

In patients with suspected inguinal or femoral hernias, the recommended diagnostic modalities include pelvic ultrasonography, CT, and magnetic resonance imaging (MRI) of the pelvis. MRI may also provide valuable diagnostic information in selected clinical situations, including cases involving patients with orthopaedic metallic implants. Consequently, the choice of imaging modality should be based on the suspected type and anatomical location of the hernia, as no single imaging technique can be regarded as optimal for all hernia locations.

The ACR guidelines emphasize that the appropriate application of imaging techniques is important for establishing the diagnosis promptly and for facilitating the subsequent selection of an appropriate therapeutic approach (Garcia et al., 2022).

3.5. Active vs sedentary lifestyle: comparing the risk of disease development, with a particular focus on hernias

The potential relationship between a sedentary lifestyle and the occurrence of hernias remains insufficiently understood and requires further investigation. Previous studies have demonstrated associations between physical inactivity and several health conditions, including depression, schizophrenia, anorexia, gastroesophageal reflux disease, and gastric and duodenal ulcers (Iob et al., 2023; Yu et al., 2026). However, research examining the association between prolonged television viewing and the occurrence of umbilical and diaphragmatic hernias has not yet yielded consistent or conclusive results (Yu et al., 2026).

Consequently, the available evidence is currently insufficient to establish a definitive association between the amount of time spent watching television and an increased risk of developing hernias. In contrast to these inconclusive findings, a study investigating moderate-to-vigorous physical activity (MVPA) reported an association between this level of physical activity and an almost 27% reduction in the prevalence of migraines compared with sedentary behaviour (Gan et al., 2024).

Several studies have further indicated that regular engagement in physical activity may contribute to strengthening the muscles of the abdominal wall. These findings suggest that individuals who maintain higher levels of physical activity may have a reduced risk of developing hernias compared with those who lead less physically active lifestyles.

Performing approximately 20 minutes of moderate-to-vigorous physical activity (MVPA) each day may represent a potentially effective strategy for reducing the risk of hernia development (Yu et al., 2026).

3.6. Physical exercise in patients with existing hernias and during the perioperative period

Although physical activity is recommended for healthy individuals, it is frequently restricted by physicians or patients themselves following the diagnosis of a hernia, even when the condition was previously asymptomatic. A study was conducted to assess the validity of such recommendations by comparing the effects of physical activity in patients before and after hernia repair surgery.

An analysis of the findings from a study involving 2,994 patients who underwent surgical repair of abdominal wall hernias indicates an association between preoperative physical activity and outcomes during the early postoperative period. Patients who reported engaging in physical exercise, regardless of its frequency, experienced lower rates of postoperative complications than those who did not participate in physical activity. This association remained evident after adjustment for selected demographic, clinical, and operative variables. Furthermore, higher levels of preoperative physical activity were associated with a reduced likelihood of hospital readmission within 30 days of surgery.

The highest reoperation rate was observed among patients who did not engage in physical exercise, with 36 individuals (2.7%) requiring a subsequent surgical procedure. This proportion was higher than that reported in patients who participated in physical activity. Specifically, reoperation was required in only 2 patients (0.7%) in the group reporting intense physical activity (more than once per week). However, no statistically significant differences were observed between the groups with respect to changes in pain intensity or quality of life during this period. Preoperative physical activity may represent an important component of patient preparation for abdominal wall hernia surgery. Nevertheless, the retrospective nature of the study and the reliance on self-reported physical activity levels limit the ability to establish a definitive causal relationship between preoperative exercise and postoperative outcomes (Renshaw et al., 2021).

Additional studies have highlighted the potential role of physical exercise both in individuals with an established diagnosis of hernia and in patients who have undergone surgical hernia repair involving reinforcement of the hernia defect. The available evidence suggests that physical activity and appropriately structured exercise programmes may represent a beneficial component of the management of patients with abdominal wall hernias. In the systematic review analysed, all included studies reported positive effects of physical activity on selected patient health outcomes.

One particularly noteworthy finding was the improvement in quality of life following the implementation of an exercise programme, as assessed in both the preoperative and postoperative periods. However, the authors did not observe a significant reduction in pain intensity following the exercise intervention when comparing preoperative and postoperative outcomes (Gil Delgado et al., 2025).

3.7. Physical activity in professional athletes: protective effects or increased risk of hernia development?

Considering studies suggesting potential benefits of physical activity during both the preoperative and postoperative periods in physically active patients, it may be worthwhile to examine findings from studies involving professional athletes to explore whether high-intensity physical exertion is associated with a reduced risk of hernia development or, alternatively, with an increased likelihood of hernia occurrence.

A study involving 594 athletes from Saudi Arabia demonstrated that the prevalence of inguinal hernia among the study participants was 12.3% and was associated with both age and sex. Male sex was identified as an independent factor associated with an increased risk of developing an inguinal hernia (Alqahtani et al., 2023). In comparison, in another study conducted in the United States involving the general population, groin hernias, including both inguinal and femoral hernias, were estimated to affect approximately 5–10% of individuals (Watts et al., 2023). Previous studies have consistently indicated an increased likelihood of groin hernias among athletes engaged in intensive training. However, over the past several years, these conditions have also been increasingly observed in individuals participating in recreational physical activity (Kopscik et al., 2023).

Symptoms that may indicate an inguinal hernia include pain in the lower abdomen, groin, and adductor regions, as well as discomfort experienced during sports participation (Pedrinelli et al., 2024). However, particular caution is warranted when establishing a diagnosis in professional athletes, as groin pain frequently results from significant sports-related injuries and accounts for 5–18% of all injuries sustained by elite athletes (Mitrousias et al., 2023). Groin pain may adversely affect athletic performance and contribute to poorer sporting outcomes. Among athletes, this type of pain is frequently associated with so-called sports hernias (Kopscik et al., 2023).

The development of a sports hernia may be associated with several contributing factors, including inadequate trunk stability, structural abnormalities of the pelvis, and disturbances in muscular balance (Kopscik et al., 2023). The specific demands of a given sport, particularly the types of movements involved, may also play an important role. The aetiology of sports hernia is multifactorial and may be associated with the specific biomechanical demands imposed on the body during different types of physical activity. These conditions are particularly common in sports involving explosive movements, kicking, jumping, and sudden changes in direction, which place considerable demands on the muscles and other structures responsible for stabilising the trunk and pelvis (Kopscik et al., 2023; Pedrinelli et al., 2024; Serafim et al., 2022).

Football is the sport in which sports hernias are reported most frequently (Kopscik et al., 2023). Among football players, these hernias occur in 2–14% of women and 4–19% of men (Mitrousias et al., 2023; Neuville et al., 2023). Other sports associated with a high risk of hernia development include baseball, hockey, American football, and rugby. This increased risk is related to the performance of sudden twisting movements, kicking, and sprinting (Kopscik et al., 2023; Pedrinelli et al., 2024).

3.8. Recommendations for treatment approaches in patients with existing hernias and athletes with groin pain

The treatment of abdominal wall hernias should be tailored to the type of hernia, the size and anatomical location of the abdominal wall defect, and the patient's overall health status. The selection of an appropriate surgical technique also depends on the presence of recurrent hernias, the existence of a stoma, and factors associated with an increased risk of complications, such as obesity, *diabetes mellitus*, smoking, and nutritional disorders.

An important component of contemporary surgical management is the use of surgical mesh, which reduces the risk of hernia recurrence by approximately 20–50% compared with repair without mesh, in which the defect is closed using sutures alone.

The choice between open surgery and a minimally invasive approach should take into account both the characteristics of the hernia and the patient's individual risk factors. Minimally invasive techniques are associated with a lower risk of surgical wound complications and in selected cases, may also be associated with a reduced risk of recurrence.

Adequate preoperative preparation is an important factor influencing the success of treatment. This primarily involves weight reduction, with a target BMI below 30 kg/m², improved glycaemic control in patients with diabetes, and smoking cessation. These measures may reduce the risk of impaired wound healing and surgical site infections, which are among the most common complications following abdominal wall hernia repair (Christoffersen & Henriksen, 2023).

In contrast, the initial management of groin pain in athletes generally involves conservative treatment, including restriction of sporting activities, anti-inflammatory medication, and physiotherapy. Particular emphasis is placed on active rehabilitation programmes designed to improve the strength and coordination of the muscles responsible for pelvic stabilisation, especially the adductor muscles.

These approaches include active rehabilitation, which has been associated with better outcomes than passive rehabilitation, as well as therapeutic exercise (kinesiotherapy) (Serafim et al., 2022).

If adequate improvement is not achieved despite an appropriately conducted course of conservative treatment, surgical intervention may be considered (Christoffersen & Henriksen, 2023). The persistence of an inguinal hernia for more than 3 months despite treatment indicates the need for surgical repair using mesh (Forlizzi et al., 2023).

In the study analysed, endoscopic totally extraperitoneal (TEP) hernia repair using lightweight polypropylene mesh was associated with favourable outcomes in athletes experiencing persistent groin symptoms. Following treatment, a reduction in pain intensity and an improvement in physical function were observed, and most patients were able to return to sporting activities within a elatively short period. It is worth emphasising that, before being considered for surgical treatment, the patients had completed at least 10 weeks of active physiotherapy aimed at improving the strength and coordination of the muscles acting on the pelvis. This indicates that, in the study population, surgery was primarily performed in individuals for whom appropriately structured rehabilitation had failed to provide sufficient improvement. The findings also suggest that the endoscopic TEP technique may facilitate a relatively rapid return to sporting activities. Significant improvements in pain and physical functioning were already observed within 6 weeks after surgery.

Nevertheless, the study included a relatively small sample of 31 patients and was designed as a prospective cohort study. The findings indicate a favourable association between TEP repair and improvements in physical functioning and return to sport. However, given the limited sample size and the absence of a control group, the results do not allow the superiority of this technique over all other treatment approaches to be established conclusively (Garcia et al., 2022).

4. Discussion

The present narrative review aimed to examine the relationship between physical activity and the development of inguinal and abdominal wall hernias, with particular emphasis on risk factors, diagnostic challenges, treatment strategies, and rehabilitation in athletes. The findings indicate that hernia development is a multifactorial process influenced by individual characteristics, anatomical predisposition, previous surgical procedures, and external factors that may affect the structural integrity of the abdominal wall (Ma et al., 2023; Saiding et al., 2023; Yu et al., 2026). Therefore, the relationship between physical activity and hernia development should not be interpreted solely in terms of exercise intensity or the amount of physical exertion.

The increasing incidence of hernias in the general population may be associated with demographic changes, particularly population ageing, as well as lifestyle-related factors (Yu et al., 2026). Nevertheless, the contribution of individual risk factors should be considered carefully, as the available evidence does not establish a direct causal relationship between a sedentary lifestyle and hernia development. Previous surgical procedures, surgical site infections, traumatic injuries, and anatomical weaknesses may contribute to reduced resistance of the abdominal wall, facilitating the protrusion of abdominal contents beyond their normal anatomical position (Saiding et al., 2023). Furthermore, increased intra-abdominal pressure associated with heavy physical work, chronic coughing, constipation, and strenuous physical exertion may represent an additional contributing factor (Yu et al., 2026). These findings support the hypothesis that hernia development results from the interaction of several predisposing and external factors rather than from a single cause.

An important finding of this review concerns the predominance of inguinal hernias among groin hernias and their higher occurrence in men (Yu et al., 2026). This observation is particularly relevant in sports medicine, where groin pain is a common clinical complaint. Reports indicating that as many as 90% of patients diagnosed with sports hernia are male further demonstrate the importance of considering sex-related differences when assessing athletes with groin symptoms (Kopscik et al., 2023). However, the term sports hernia requires careful interpretation because it is frequently used to describe athletic pubalgia, a condition associated with activity-related groin pain without a demonstrable true inguinal hernia (Mitrousias et al., 2023; Pedrinelli et al., 2024; Picasso et al., 2021). Consequently, the symptoms and terminology associated with these conditions should not be considered interchangeable.

The diagnostic process is particularly challenging in athletes because groin pain may arise from several musculoskeletal and anatomical conditions. Groin injuries account for approximately 5–18% of all injuries sustained by elite athletes, highlighting the clinical significance of accurate differential diagnosis (Mitrousias et al., 2023). Symptoms may include pain in the lower abdomen, groin, and adductor region, with discomfort becoming more pronounced during sporting activities (Pedrinelli et al., 2024). Nevertheless, these symptoms alone are insufficient to confirm the presence of an inguinal hernia. A comprehensive clinical examination, supplemented by appropriate imaging when indicated, is essential to distinguish true hernias from athletic pubalgia and other causes of sports-related groin pain (Forlizzi et al., 2023; Mitrousias et al., 2023). This distinction directly influences treatment selection and may help prevent the implementation of inappropriate or ineffective therapeutic strategies.

The relationship between physical activity and hernia development remains complex. Although strenuous exertion and repeated increases in intra-abdominal pressure may contribute to hernia formation in susceptible individuals, the available evidence does not establish a uniform relationship between exercise intensity and hernia risk (Alqahtani et al., 2023; Kopscik et al., 2023; Yu et al., 2026). Moreover, the biomechanical demands of particular sports, including sprinting, kicking, rapid changes of direction, and rotational movements, may contribute to the development of groin symptoms through mechanisms involving muscular imbalance, impaired trunk stability, and pelvic structural abnormalities (Kopscik et al., 2023; Pedrinelli et al., 2024; Serafim et al., 2022). These mechanisms suggest that the assessment of athletes should consider not only the presence of a hernia but also the specific movements and physical demands associated with their sport.

In addition to its potential relationship with injury development, physical activity may play an important role in the management and rehabilitation of patients with hernias. Appropriately selected exercise programmes may improve quality of life in individuals with abdominal wall hernias, particularly during the perioperative period, although their effectiveness in reducing pain remains uncertain (Gil Delgado et al., 2025). In athletes presenting with groin pain, initial management generally involves modification or temporary restriction of sporting activities, appropriate medication when indicated, and physiotherapy. Active rehabilitation programmes that improve the strength, coordination, and functional capacity of the muscles responsible for pelvic stabilisation, particularly the adductor muscles, represent an important component of conservative treatment (Serafim et al., 2022). These findings support an individualized approach to exercise rather than the universal avoidance of physical activity in all patients with hernia-related conditions.

Surgical intervention may be considered when appropriately conducted conservative treatment does not provide sufficient improvement. The reviewed evidence indicates that treatment decisions should depend on the underlying diagnosis, symptom persistence, functional limitations, and response to rehabilitation (Christoffersen & Henriksen, 2023; Forlizzi et al., 2023). In athletes with persistent groin symptoms, endoscopic totally extraperitoneal (TEP) repair using lightweight polypropylene mesh was associated with reductions in pain and improvements in physical function. In the analysed study, patients had completed at least 10 weeks of active physiotherapy before surgery, suggesting that surgical treatment was considered after conservative management had failed to achieve adequate improvement. Significant improvements in pain and physical functioning were observed within 6 weeks after surgery, and most patients returned to sporting activities within a relatively short period (Garcia et al., 2022). These findings suggest that surgical treatment may be beneficial in appropriately selected athletes with persistent symptoms.

The management of abdominal wall hernias also requires consideration of individual clinical characteristics and the risk of postoperative complications. Factors such as obesity, diabetes mellitus, smoking, and nutritional disorders may adversely affect wound healing and increase the risk of surgical site complications (Christoffersen & Henriksen, 2023). Preoperative optimisation, appropriate selection of surgical technique, and consideration of recurrence risk are therefore important components of treatment planning. Although surgical mesh is commonly used to reduce recurrence risk, the choice of repair technique should be based on the anatomical characteristics of the hernia and the patient's overall clinical condition.

Several limitations of the present review should be acknowledged. The review was narrative in design and did not involve a systematic review protocol or quantitative synthesis of the available evidence. The distinction between true inguinal hernias and athletic pubalgia is complicated by inconsistent terminology across the literature (Mitrousias et al., 2023; Pedrinelli et al., 2024). Finally, the limited number of studies specifically examining athletes and return-to-sport outcomes restricts the conclusions that can be drawn regarding optimal rehabilitation protocols and the timing of return to competitive activity.

Overall, the findings indicate that the relationship between physical activity and hernia development is multifactorial and that accurate diagnosis is essential for appropriate management. Although exercise may contribute to increased intra-abdominal pressure under certain circumstances, individualized physical activity and structured rehabilitation may also support functional recovery and improve quality of life.

5. Conclusions

Inguinal and abdominal wall hernias are multifactorial conditions associated with anatomical predisposition, age, sex, previous surgical procedures, and other individual and external risk factors (Ma et al., 2023; Saiding et al., 2023; Yu et al., 2026). Although increased intra-abdominal pressure during strenuous physical exertion may contribute to hernia development, the available evidence does not establish a simple or uniform relationship between physical activity and hernia risk (Boruah et al., 2024; Kopscik et al., 2023; Yu et al., 2026). Physical activity should therefore be considered in the context of individual susceptibility, the type of exertion, and the underlying clinical condition.

A major conclusion of this review is that accurate differential diagnosis is essential in athletes presenting with groin pain. True inguinal hernias must be distinguished from athletic pubalgia and other musculoskeletal conditions because similar symptoms may require different treatment approaches (Forlizzi et al., 2023; Mitrousias et al., 2023; Pedrinelli et al., 2024; Picasso et al., 2021). A comprehensive clinical assessment and appropriate imaging, when indicated, are important for selecting the most suitable management strategy.

Treatment should be individualized according to the type of hernia, symptom severity, functional limitations, and response to conservative management. Structured rehabilitation may improve muscular strength, coordination, and pelvic stability, while surgical intervention may be considered in appropriately selected patients with persistent symptoms despite adequate conservative treatment (Garcia et al., 2022; Gil Delgado et al., 2025; Serafim et al., 2022).

Further research, particularly larger controlled studies involving athletes, is needed to clarify the relationship between physical activity and hernia development, evaluate the effectiveness of exercise-based rehabilitation, and identify factors influencing recovery and return to sport.

Disclosure

Supplementary Materials

Not applicable

Author Contributions

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Conflicts of Interest

All authors deny any financial or personal relationships with other people or organisations that could inappropriately bias their work.

AI

During the preparation of this manuscript, generative artificial intelligence (AI) (chatgpt.com) was used in a limited and supportive capacity. AI-assisted tools were used only to review the grammatical and stylistic correctness of selected portions of the manuscript. AI was not used to generate the scientific content, identify or select sources, perform the literature review, interpret the evidence, or develop the conclusions. The authors remain fully responsible for the content, accuracy, interpretation, and final form of the manuscript. All AI-assisted suggestions were reviewed and, where applicable, revised by the authors.

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