

Acceptance date: 19/02/2025

DIAGNOSTIC AND THERAPEUTIC APPROACH TO INGUINAL HERNIAS: AN INTEGRATIVE REVIEW

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Abstract: The article analyzed the main studies on inguinal hernia, emphasizing the importance of a detailed physical examination in its identification and classification. Clinical observation makes it possible to detect protrusion and differentiate between types of hernia, contributing to an accurate diagnosis. However, in inconclusive cases, imaging tests such as ultrasound, magnetic resonance imaging or computed tomography may be necessary to confirm the suspicion and guide the appropriate course of action. Conservative treatment, based on vigilant observation, is indicated mainly for asymptomatic men and pregnant women, who may present with inguinal bulging without the need for immediate intervention. However, it is essential to inform patients about the risks of the disease progressing, especially the possibility of strangulation, which can lead to ischemia and necrosis of the abdominal tissues. In symptomatic or more complex cases, the surgical approach is the most appropriate and is chosen based on factors such as the patient's clinical conditions, accessibility to the procedure and the surgeon's experience. Surgical techniques include open repair, with or without the use of a mesh, and laparoscopy, which stands out for being minimally invasive and offering a more comfortable post-operative period. The findings of this study contribute to furthering knowledge about inguinal hernia and its therapeutic options, as well as encouraging new research in the area.

Keywords: Inguinal hernia, Physical examination, Differential diagnosis, Inguinal protrusion

INTRODUCTION

Inguinal hernia is a common condition that occurs when a portion of the intra-abdominal contents, such as intestine or fat, protrudes through a weakness in the abdominal wall, forming a bulge in the groin area [1,2]. This condition is prevalent at all ages, but is more commonly seen in men due to anatomical factors. During fetal development, the testicles descend from the abdomen into the scrotum through this canal, leaving a region of fragility in the abdominal wall [1,2]. In some cases, this path does not close completely, predisposing to the appearance of inguinal hernias, especially the indirect ones [1,2,3]. Although some hernias are asymptomatic, many patients report pain or discomfort, especially when performing activities that increase intra-abdominal pressure, such as coughing, lifting weights or standing for prolonged periods [1,2,3].

The main types of inguinal hernia are indirect and direct, differentiated by the mechanism of formation and anatomical path [2,3]. Indirect inguinal hernia is the most common and occurs when the hernial content passes through the deep inguinal ring, traveling through the inguinal canal and can reach the scrotum in men [2,3]. Direct inguinal hernia results from the weakening of the posterior wall of the inguinal canal, allowing the abdominal contents to protrude directly through Hesselbach's triangle. While the indirect hernia is more related to congenital factors, the direct hernia usually arises due to acquired weakness of the muscles, and is more frequent in elderly individuals [2,3,4].

Symptoms can vary from mild to intense, and some patients notice a worsening throughout the day, especially after physical exertion [2,3,4]. In many cases, the bulging disappears when the patient lies down, which suggests a reducible hernia [2,3,4,5]. However, the absence of a palpable mass does not exclude the diagnosis, as some hernias can be small or hid-

den, becoming detectable only by imaging tests [2,3,4,5]. Careful clinical assessment is essential for an accurate diagnosis and for defining the best therapeutic approach [2,3,4,5].

The pain associated with an inguinal hernia can manifest itself in different ways, including a feeling of heaviness, pulling or burning in the groin area [3,4,5]. Over time, the hernia can increase in size and lead to progressive discomfort, impacting the patient's quality of life [3,4,5]. In some cases, severe pain can indicate a complication, such as hernia incarceration, a situation in which the hernial contents become trapped and cannot be manually reduced [3,4,5]. Strangulation, which occurs when blood circulation to the herniated segment is compromised. This can result in ischemia and necrosis of the affected tissue, making it a surgical emergency [3,4,5].

The diagnosis of inguinal hernia is usually clinical, based on the patient's history and physical examination. The doctor may ask the patient to cough or strain to better visualize the protrusion during the Valsalva maneuver [3,4,5]. In doubtful cases or when there is a suspicion of an occult hernia, imaging tests such as ultrasound or computed tomography may be necessary [5]. In addition, differential diagnosis should be considered to exclude other causes of groin pain, such as muscle injuries, joint pathologies or scrotal diseases [5].

The definitive treatment for inguinal hernia is surgical and can be performed using an open or laparoscopic technique [4,5,6,7]. The aim of surgery is to repair the defect in the abdominal wall and reinforce the area using synthetic mesh, reducing the risk of recurrence [4,5,6,7]. The choice of technique depends on factors such as the size of the hernia, the presence of complications and the patient's clinical conditions [4,5,6,7]. In cases of small, asymptomatic hernias, clinical observation can be chosen, as long as the patient is monitored regularly [4,5,6,7].

Given the possibility of serious complications, it is essential that patients with a suspected inguinal hernia seek medical assessment as soon as possible [5,6,7]. Early diagnosis and appropriate intervention are fundamental to avoiding complications and improving patients' quality of life [5,6,7]. Information and appropriate medical follow-up ensure effective and safe treatment for this condition [5,6,7].

An integrative review on inguinal hernia is essential to synthesize the available evidence and compare the different diagnostic and therapeutic approaches [6,7]. Given the evolution of surgical techniques, including open, laparoscopic and robotic methods, it is essential to gather and analyze data to help choose the best strategy for each patient profile [6,7]. Furthermore, the review makes it possible to identify gaps in knowledge, helping to improve clinical protocols and guide future research [6,7]. By integrating clinical studies, medical guidelines and technological advances, this approach offers a comprehensive and up-to-date view, promoting better decision-making in medical practice [6,7,8].

OBJECTIVES

The main aim of this integrative review is to provide a comprehensive and up-to-date overview of inguinal hernia, covering everything from physical examination and diagnostic imaging to the treatment options available [8,9]. The review seeks to synthesize the best available scientific evidence to help healthcare professionals make more informed clinical decisions and optimize care for patients with inguinal hernia [8,9].

The review details the importance of the physical examination in the initial diagnosis of inguinal hernia, highlighting the correct technique of visual inspection and palpation in both men and women [8,9]. It also discusses the role of imaging tests, such as ultrasound and magnetic resonance imaging, in the diag-

nosis of complex or doubtful cases, including occult hernias and other conditions that can mimic inguinal hernia [9].

With regard to treatment, the review addresses the different options available, from vigilant observation in selected cases to the various surgical techniques, including open and laparoscopic approaches [9,10]. The review also highlights the importance of individualizing treatment, taking into account the patient's characteristics, the surgeon's experience and the availability of resources [9,10]. In the end, the integrative review aims to provide a complete and up-to-date resource on inguinal hernia, which can be used by doctors, nurses and other health professionals to improve the diagnosis, treatment and follow-up of patients with this condition [9,10].

METHODOLOGY

This integrative review was conducted with the aim of analyzing the best available evidence on the diagnosis and treatment of inguinal hernia, comparing the open, laparoscopic and robotic approaches [11]. To do this, the PUBMED, VHL and MEDLINE databases were consulted, covering publications between 2019 and 2024. The search was carried out using keywords such as "Inguinal Hernia", "Surgical Repair", "Laparoscopic Hernia Repair", "Robotic Surgery" and "Open Hernia Repair", combined by Boolean operators (AND, OR) to maximize the relevance of the results [11].

Additional filters were applied to limit the selection of studies to the English language, excluding narrative review articles and non-peer-reviewed studies [11,12]. The inclusion of articles followed strict criteria, including studies that addressed surgical techniques, recurrence rates, postoperative complications, recovery time and patients' quality of life [11,12]. Articles dealing with other abdominal conditions or which did not detail the diagnostic and therapeutic methods used were excluded [12].

The article selection process was carried out in two stages [12,13]. In the first phase, 289 titles and abstracts were analyzed to identify relevant studies within the initial set of retrieved articles [12,13]. In the second phase, 40 full texts of the selected articles were evaluated in detail, extracting data on patient characteristics, types of surgical approach, clinical outcomes and hospital costs [12,13].

The data was organized systematically, allowing a comparison between the different surgical methods and their respective advantages and limitations [12,13]. The final analysis was conducted based on the criteria of the technique's effectiveness, the incidence of complications and the impact on patients' quality of life [13,14]. This integrative approach enabled a synthesis of the best available evidence, offering a comprehensive view to guide decision-making in clinical practice and contributing to the definition of more effective protocols in the management of inguinal hernia [13,14,15].

RESULTS AND DISCUSSION

PHYSICAL EXAMINATION FOR INGUINAL HERNIA

The physical examination is the main tool for the initial diagnosis of inguinal hernia, allowing the doctor to identify clinical signs suggestive of the condition [15,16,17]. The procedure should begin with a visual inspection of the groin area, especially with the patient standing, as this position makes it easier to observe any bulging that may be present [15,16,17]. During this stage, performing the Valsalva maneuver, in which the patient strains as if evacuating, can make the hernia more obvious, allowing the doctor to assess its presence and characteristics [17,18,19,20]. Differentiating between direct and indirect inguinal hernias can also be helped by the shape and location of the protrusion identified [17,18,19,20].

Palpation is an essential step in the physical examination, especially when the hernia is not visible [19,20,21,22]. In men, the assessment includes invaginating the skin of the scrotum and inserting the index finger through the external inguinal ring into the inguinal canal [19,20,21,22]. With this technique, it is possible to detect the presence of a hernial impulse by asking the patient to cough or push, which increases intra-abdominal pressure and can push the hernial contents against the examiner's finger [20,21,22,23,24]. In women, on the other hand, diagnosis can be more challenging, as inguinal hernias generally do not cause obvious bulging [20,21,22,23,24]. However, careful palpation and performing the Valsalva maneuver can help identify the hernia, making the physical examination an indispensable step for diagnosis [22,23,24].

The correct distinction between direct and indirect inguinal hernias on physical examination is of clinical importance, as it can influence the surgical approach [22,23,24]. Indirect hernias tend to follow the path of the inguinal canal and can reach the scrotum, while direct hernias arise from a weakening of the posterior wall of the inguinal canal, generally without reaching the scrotum [23,24]. Furthermore, early detection of an incarcerated or strangulated hernia can prevent serious complications, such as ischemia and necrosis of the herniated tissue, which require emergency surgical intervention [22,23,24,25,26].

Therefore, the physical examination is an essential method for identifying the inguinal hernia and determining its characteristics [22,23,24,25,26]. However, in doubtful cases, complementary exams such as ultrasound or computed tomography may be necessary to confirm the diagnosis, especially in obese patients or those with small, hidden hernias [24,25,26]. Thus, a detailed clinical assessment, combined with imaging exams when necessary, allows for an accurate diagnosis

and appropriate therapeutic planning, reducing the risk of complications associated with inguinal hernias [24,25,26,27].

IMAGING TESTS THAT FACILITATE DIAGNOSIS

Imaging exams play an important role in the diagnosis of inguinal hernia, especially in situations where clinical assessment is inconclusive [24,25,26,27]. In men, most cases can be diagnosed by physical examination alone, while in women and patients with suspected occult or recurrent hernia or post-operative complications, the use of complementary exams may be necessary for a more accurate diagnosis [25,26,27]. In addition, other conditions that cause pain in the inguinal region, such as masses, hydrocele and inflammatory processes, can be differentiated using these tests [26,27].

Ultrasound is the examination of first choice in the assessment of inguinal hernias [26,27,28]. Because it is a non-invasive method, accessible and without exposure to radiation, it is often used as an initial diagnostic tool [26,27,28]. The sensitivity of ultrasound can vary between 33% and 86%, while its specificity ranges between 77% and 90%, depending on the operator and the patient's characteristics [26,27,28,29]. The exam is useful in detecting hidden hernias and differentiating other causes of groin pain, such as lymph node enlargement and tumors [26,27,28,29].

Magnetic resonance imaging (MRI) can be indicated when ultrasound cannot confirm or exclude the presence of an inguinal hernia, especially in cases where clinical suspicion remains high [28,29,30]. This test has a sensitivity of 91% and specificity of 92%, and is superior to ultrasound and computed tomography in identifying occult inguinal hernias [28,29,30]. In addition, MRI offers excellent anatomical detail, allowing a precise assessment of the structures of the abdominal wall and the inguinal canal [30,31,32].

Herniography, although less used today, can still be used in selected cases [30,31,32]. This examination consists of injecting contrast into the hernia sac, allowing direct visualization of the hernia [30,31,32]. It has a sensitivity of 91% and specificity of 83%, and is more effective than ultrasound and computed tomography in detecting occult hernias [30,31,32]. However, because it is an invasive procedure, its use is reserved for situations where other imaging methods have not provided a definitive diagnosis [31,32,33,34].

Computed tomography (CT) can be useful in some specific cases, such as differentiating between inguinal hernia and other abdominal conditions that cause groin pain [31,32,33,34]. However, its sensitivity and specificity are lower than those of MRI and herniography, making it less suitable as a routine examination [32,33,34]. Even so, CT can be used when complications are suspected, such as incarceration or strangulation of the hernia, allowing a detailed assessment of the structures involved [32,33,34].

Therefore, the choice of imaging test depends on the clinical context of the patient [33,34,35]. While ultrasound is the first choice for most cases, magnetic resonance imaging stands out in more complex diagnoses, and herniography can be useful when other modalities are inconclusive [34,35,36]. The appropriate use of these exams allows for a more accurate diagnosis, contributing to the definition of the best therapeutic plan and avoiding unnecessary approaches [34,35,36].

SURGICAL TECHNIQUES

Conservative treatment, especially close observation, can be a safe option for men whose activities are not limited by pain or discomfort and who have no difficulty in reducing the hernia [36]. However, surgery should be considered if pain develops [36,37,]. For non-pregnant women, close observation is not recommended due to the high risk of femoral hernias, which have a higher probability of strangulation [36,37].

The main risk of close observation is incarceration, in which the abdominal contents become trapped inside the hernia sac and can develop into strangulation and ischemia [36,37]. A rare but serious complication is Richter's hernia, which occurs when only part of the intestinal circumference is trapped, with a high mortality rate [37]. For this reason, patients should be informed about the natural course of the disease and the risks of possible emergency surgery [37]. During conservative treatment, it is essential that the patient undergoes regular medical follow-up to monitor symptoms and identify complications early [36,37,38]. However, there is still no consensus on the ideal frequency for this follow-up, and it is up to the health professional to define the best approach for each case [36,37,38].

In pregnant women, close observation is often used, as bulging in the inguinal region can be caused by varicosities of the round ligament, a benign and self-limiting condition [36,37,38]. Doppler ultrasound can be used to differentiate these varicosities from a true hernia [37,38]. Studies indicate that most cases do not require surgical intervention during pregnancy, and spontaneous resolution after delivery is common [37,38].

Surgical repair of inguinal hernia can be carried out using three main approaches: open, laparoscopic and robotic [37,38]. Each of these techniques has advantages and disadvantages that influence the choice of procedure based on

the patient's profile, the surgeon's experience and the resources available [37,38]. The main objective of any technique is to restore the integrity of the abdominal wall and reduce the risk of hernia recurrence, providing a faster return to normal activities [37,38,39].

The open technique is the traditional approach and can be performed with or without the use of a mesh (herniorrhaphy and hernioplasty, respectively) [37,38,39]. The main advantage of this method is its wide applicability, making it a viable option even in services with few resources [37,38,39]. In addition, surgical time is generally shorter compared to minimally invasive techniques [37,38,39]. However, the larger incision can result in greater postoperative pain, an increased risk of infection and a longer recovery period [37,38,39].

The laparoscopic technique is less invasive and can be performed via the transabdominal pre-peritoneal (TAPP) or extraperitoneal totally pre-peritoneal (TEP) route [37,38,39]. Both use small incisions to insert trocars and allow the mesh to be placed with less tissue damage [37,38,39]. Their main advantages include less post-operative pain, faster recovery and a lower incidence of infection [37,38,39]. However, laparoscopy requires general anesthesia, a greater learning curve for the surgeon and has a higher cost due to the equipment required [37,38,39].

Robotic surgery represents an evolution of laparoscopy, providing greater precision and ergonomics for the surgeon [38,39]. As with the laparoscopic approach, it allows for less tissue aggression, faster recovery and fewer post-operative complications [38,39]. However, the main disadvantage is the high cost of the procedure and the need for advanced equipment, which limits its availability in most hospital centers [38,39]. In addition, surgical time may be longer initially due to the need to assemble the robotic system [38,39].

When choosing the best technique for inguinal hernia repair, it is essential to consider factors such as the patient's clinical condition, the type of hernia, the experience of the surgical team and the resources available [39]. While open surgery is still widely used due to its practicality and lower cost, minimally invasive approaches are gaining ground because they provide better recovery and lower complication rates in selected cases [39]. Thus, the decision must be individualized, always aiming for safety and the best outcome for the patient [39].

CONCLUSION

The aim of this article was to analyse and organize the main studies and evidence on inguinal hernias, and from this it has obtained important results, including the importance of a good physical examination, which, if carried out in detail, is very effective in identifying inguinal hernias, as it is possible to observe the protrusion and also classify the type. However, in cases that are inconclusive or where there are still doubts, it is important to request imaging tests, such as ultrasound, which is the most widely used due to its accessibility and because it is non-invasive. However, magnetic resonance imaging or computed tomography may be requested in more complex cases. Thus, analyzing the complete exams and associating them with the findings of the physical examination will be of great importance for concluding the diagnosis and choosing the best treatment option according

to the individuality of each patient. The main format for conservative treatment is vigilant observation, which consists of monitoring the patient and the progression of the disease, without the need for immediate surgical intervention. This treatment is more recommended for asymptomatic men and pregnant women who have inguinal bulging due to varicosities of the round ligament.

However, it is extremely important to inform the patient who is under observation about the natural history of the disease and the need for immediate surgical treatment, clarifying that in conservative treatment there is a possibility of strangulation of the abdominal contents which can develop into ischemia and necrosis. On the other hand, surgical treatment is more indicated in complex cases with symptomatic patients whose daily activities are limited due to the consequences and symptoms of the inguinal hernia. The choice of surgical technique depends on a number of factors, including the accessibility of the procedure, the clinical conditions of the patients and also the preferences of the surgeon and the patient. The main surgeries used include open anterior repair, open posterior repair, tension-free mesh repair and laparoscopy, which is the most commonly used surgical technique in these cases, as it is a non-invasive procedure and provides better post-operative care. Therefore, it is believed that these findings will help to broaden our understanding of the diagnosis and treatment of inguinal hernia, as well as guiding and inspiring future research.

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