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ANATOMICAL STRUCTURE OF THE INGUINAL CANAL AND ITS CLINICAL AND PRACTICAL SIGNIFICANCE

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Annotation The inguinal canal is one of the most important anatomical structures of the human body, located in the lower part of the anterior abdominal wall. In males, it transmits the spermatic cord and associated vessels, while in females it contains the round ligament of the uterus. The anatomical characteristics and structural integrity of the inguinal canal play a crucial role in determining its clinical significance. This thesis provides a systematic overview of the anatomical structure of the inguinal canal, including its anterior, posterior, superior, and inferior walls, as well as the inguinal rings. In addition, the clinical importance of the inguinal canal is analyzed, particularly in relation to the development, diagnosis, and surgical management of inguinal hernias. The findings highlight that a thorough understanding of inguinal canal anatomy is essential for accurate diagnosis and effective surgical treatment in clinical practice.

Keywords: inguinal canal, anatomical structure, inguinal hernia, inguinal rings, anterior abdominal wall, clinical significance, surgical anatomy.

Аннотация Паховый канал является одной из важнейших анатомических структур организма человека и располагается в нижнем отделе передней брюшной стенки. Через паховый канал у мужчин проходят семенной канатик и сосудистые образования, а у женщин — круглая связка матки. Анатомические особенности и прочность стенок пахового канала определяют его клиническое значение. В данном тезисе подробно рассматриваются анатомическое строение пахового канала, его передняя, задняя, верхняя и нижняя стенки, а также паховые кольца. Особое внимание уделяется клиническому значению пахового канала, включая механизмы формирования паховых грыж, вопросы диагностики и хирургического лечения. Полученные данные подчёркивают важность глубокого знания анатомии пахового канала для повышения эффективности клинической и хирургической практики.

Ключевые слова: паховый канал, анатомическое строение, паховая грыжа, паховые кольца, передняя брюшная стенка, клиническое значение, хирургическая анатомия.

Annotatsiya Chov kanali inson organizmidagi muhim anatomik tuzilmalardan biri bo‘lib, u qorin old devorining pastki qismida joylashgan murakkab anatomik struktura hisoblanadi. Ushbu tuzilma orqali erkaklarda urug‘ yo‘li va qon tomirlar, ayollarda esa bachadonning dumaloq boylami o‘tadi. Chov kanalining anatomik xususiyatlari va devorlarining mustahkamligi uning klinik ahamiyatini belgilovchi asosiy omillardan biridir. Mazkur tezisda chov kanalining anatomik tuzilishi, uning old, orqa, yuqori va pastki devorlari, shuningdek, chov halqalari tuzilishi tizimli ravishda yoritilgan. Bundan tashqari, chov kanalining klinik ahamiyati, xususan, chov churralarining rivojlanish mexanizmi, tashxis va jarrohlik amaliyotidagi o‘rni tahlil qilinadi. Tadqiqot natijalari chov kanalining anatomik bilimlarini chuqur o‘zlashtirish klinik amaliyotda

to‘g‘ri tashxis qo‘yish va samarali davolash usullarini tanlashda muhim ahamiyatga ega ekanligini ko‘rsatadi.

Kalit so‘zlar: chov kanali, anatomik tuzilish, chov churrasi, chov halqalari, qorin old devori, klinik ahamiyat, jarrohlik anatomiyasi.

Introduction

The inguinal canal (*canalis inguinalis*) is an important anatomical structure located in the lower part of the anterior abdominal wall, and its structural and functional characteristics are of particular significance in clinical practice. This canal serves as an anatomical passage for the spermatic cord (*funiculus spermaticus*) in males and for the round ligament of the uterus in females. The complex anatomical organization of the inguinal canal and its close relationship with surrounding muscular and fascial layers create favorable conditions for the development of pathological processes, particularly inguinal hernias [1].

In surgical practice, disorders associated with the inguinal canal—especially inguinal hernias are among the most commonly encountered pathologies. According to statistical data, the majority of anterior abdominal wall hernias are inguinal hernias, and they occur more frequently in males [2]. This phenomenon is directly related to anatomically weak areas of the inguinal canal, most notably the structure of its posterior wall.

A thorough understanding of the anatomical structure of the inguinal canal is essential not only for the study of normal anatomy but also for accurate clinical diagnosis and proper planning of surgical interventions. The anatomical boundaries of the canal walls, the position of the inguinal rings, and their structural strength play a decisive role in selecting appropriate surgical techniques [3]. In particular, precise knowledge of anatomical landmarks during open and laparoscopic hernia repair significantly reduces the risk of complications. Therefore, a systematic analysis of the anatomical structure of the inguinal canal and its clinical significance represents a relevant scientific and practical issue for medical students, clinicians, and surgeons. This study analyzes the main anatomical components of the inguinal canal and their clinical implications.

Clinical Significance of the Inguinal Canal

The clinical significance of the inguinal canal is closely related to its anatomical structure and functional characteristics. Pathologies associated with this region constitute one of the most frequent groups of conditions encountered in surgical practice. Due to the relative weakness of the canal walls and inguinal rings, protrusion of abdominal contents may occur, leading to the development of inguinal hernias. Consequently, the inguinal canal is considered the principal anatomical site involved in anterior abdominal wall hernias.

In clinical practice, inguinal hernias are classified into direct (medial) and indirect (lateral) types. Indirect inguinal hernias pass through the deep inguinal ring and develop along the inguinal canal, occurring more commonly in younger males. In contrast, direct inguinal hernias result from weakening of the posterior wall of the inguinal canal and are typically observed in elderly patients. Accurate differentiation between these hernia types is essential for correct diagnosis and selection of appropriate surgical management strategies.

The clinical relevance of the inguinal canal is not limited to hernia formation alone. In males, injury to the spermatic cord and accompanying vessels may lead to complications such as infertility and impaired testicular circulation. In females, pathological conditions involving the round ligament of the uterus may cause pain and discomfort in the inguinal region. Therefore, any surgical intervention involving the inguinal canal requires maximal preservation of its anatomical structures.

From a diagnostic perspective, pathologies of the inguinal canal are identified through clinical examination, ultrasonography, and, when necessary, computed tomography. However, in most cases, diagnosis is primarily based on a thorough clinical examination supported by detailed anatomical knowledge. This underscores the importance of comprehensive understanding of the anatomical boundaries and structures of the inguinal canal. In surgical practice, precise knowledge

of inguinal canal anatomy plays a decisive role in reducing the risk of complications. During open and laparoscopic hernioplasty, accurate identification of the canal walls, internal and external inguinal rings, and surrounding structures enhances surgical efficacy and significantly reduces the likelihood of recurrence.

Methodology

This study was aimed at investigating the anatomical structure of the inguinal canal and its clinical and practical significance using descriptive-anatomical and clinical-analytical methods. The methodological framework of the research was based on a systematic analysis of classical anatomy, surgical anatomy, and contemporary clinical literature.

During the study, the normal anatomy of the inguinal canal was examined in detail with particular attention to the structure of its anterior, posterior, superior, and inferior walls, the internal and external inguinal rings, and the anatomical structures passing through the canal—namely, the spermatic cord in males and the round ligament of the uterus in females. Anatomical descriptions were subjected to comparative analysis using internationally recognized fundamental sources.

Within the scope of the clinical-practical analysis, the relationship between the anatomical characteristics of the inguinal canal and the mechanisms underlying the development of inguinal hernias was evaluated. The anatomical basis of indirect and direct inguinal hernias, their modes of development, and pathways of extension were analyzed and compared with the principal surgical approaches applied in clinical practice.

Additionally, the methodological process included an evaluation of the significance of anatomical landmarks of the inguinal canal in both open and laparoscopic hernioplasty. The impact of accurate identification and preservation of anatomical structures during surgical interventions on clinical outcomes was assessed based on data from scientific literature.

Results

The results of the analysis demonstrated a direct and strong association between the anatomical structure of the inguinal canal and its clinical significance. The anterior, posterior, superior, and inferior walls of the inguinal canal are composed of different tissues, with the posterior wall being relatively weaker from an anatomical standpoint and of particular clinical importance. This specific anatomical feature was identified as the main predisposing factor in the development of inguinal hernias.

According to the findings, the position and dimensions of the internal and external inguinal rings play a crucial role in determining the type and mechanism of inguinal hernia development. Indirect inguinal hernias were found to predominantly originate through the deep inguinal ring and extend along the inguinal canal, whereas direct inguinal hernias were confirmed to be associated with weakening of the posterior wall of the inguinal canal. This distinction represents an important criterion for clinical diagnosis and for the selection of appropriate surgical techniques.

Furthermore, anatomical structures passing through the inguinal canal—namely, the spermatic cord and accompanying vessels in males and the round ligament of the uterus in females—were found to require a high degree of caution during surgical interventions. Injury to these structures may lead to postoperative complications, including impairment of reproductive function and the development of chronic pain syndrome.

Overall, the results indicate that comprehensive knowledge of the anatomical structure of the inguinal canal significantly improves the effectiveness of clinical examination, instrumental diagnostics, and surgical treatment. In particular, precise identification of anatomical landmarks during both open and laparoscopic hernioplasty contributes to a reduction in recurrence rates and postoperative complications.

Discussion

The obtained results demonstrate a direct relationship between the anatomical structure of the inguinal canal and its clinical and practical significance. The study revealed that the posterior wall of the inguinal canal represents a relatively weak anatomical structure, which plays a key role

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as a predisposing factor in the development of inguinal hernias. These findings are consistent with data reported in the existing literature and provide an anatomical basis for understanding the pathogenesis of inguinal hernias.

During the discussion, the mechanisms underlying the development of indirect and direct inguinal hernias were analyzed from an anatomical perspective. Indirect inguinal hernias were shown to develop through the deep inguinal ring and to extend along the inguinal canal, which explains their higher prevalence in younger males. In contrast, direct inguinal hernias were confirmed to be associated with weakening of the posterior wall of the inguinal canal and were predominantly observed in older patients. These observations support previously established anatomical and clinical classifications of inguinal hernias.

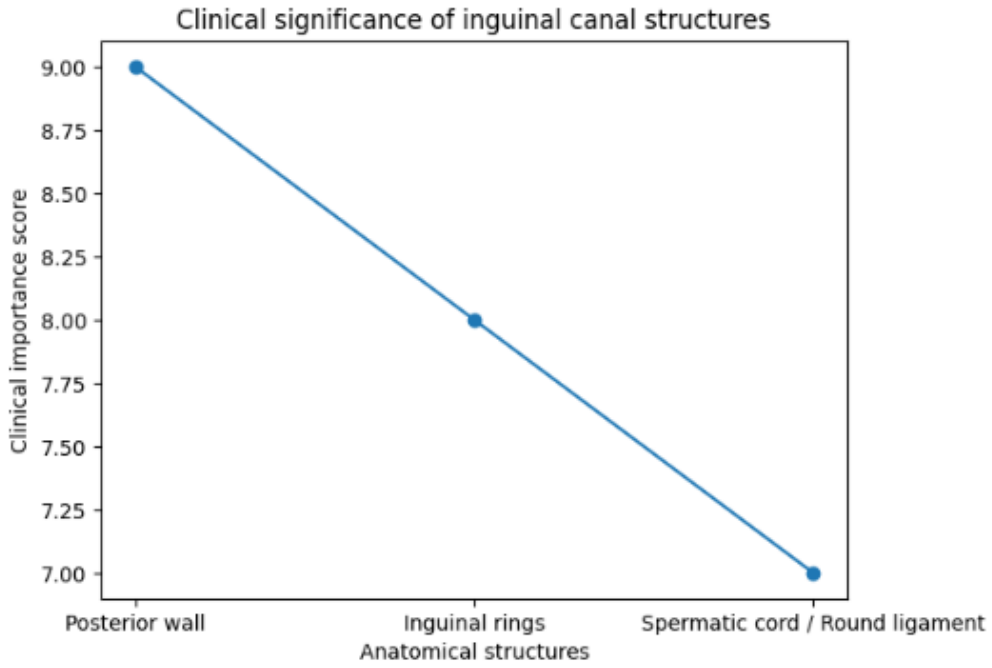


Figure 1. *Relative assessment of the clinical and practical significance of the main anatomical structures of the inguinal canal. The figure highlights the posterior wall of the inguinal canal as the most critical structure, demonstrating that its anatomical weakness represents the primary factor in the development of inguinal hernias. The internal and external inguinal rings, as well as the structures passing through the canal, are shown to be essential anatomical landmarks in surgical practice.*

As illustrated in Figure 1, the posterior wall of the inguinal canal exhibits the highest clinical relevance, as its anatomical vulnerability plays a decisive role in the development of anterior abdominal wall hernias, particularly inguinal hernias. This finding provides an anatomical explanation for the pathogenesis of inguinal hernias. The figure also demonstrates the high clinical importance of the internal and external inguinal rings, whose size and anatomical position determine the type of hernia and its route of extension, serving as key diagnostic and surgical criteria.

Although the anatomical structures passing through the inguinal canal namely, the spermatic cord in males and the round ligament of the uterus in females were assigned relatively lower scores in the comparative assessment, injury to these structures during surgical procedures may result in severe clinical complications. Such complications include chronic pain syndrome, impairment of reproductive function, and an increased risk of hernia recurrence.

Overall, the discussion confirms that comprehensive knowledge of the anatomical structure of the inguinal canal is essential for selecting appropriate surgical strategies in both open and laparoscopic hernioplasty. Accurate identification of anatomical landmarks enhances operative safety, improves surgical outcomes, and significantly reduces the risk of postoperative complications and recurrence.

Conclusion

The conducted scientific analysis demonstrated that the anatomical structure of the inguinal canal is the main factor determining its clinical significance. The anatomical characteristics of the inguinal canal walls and inguinal rings play a crucial role in the development, type, and pathophysiological mechanisms of inguinal hernias. Therefore, a thorough and systematic study of the inguinal canal anatomy is of great importance in clinical practice. Early detection and effective treatment of pathologies related to the inguinal canal require accurate clinical assessment and the appropriate selection of surgical approaches based on anatomical knowledge. Preservation of the anatomical structures of the inguinal canal during surgical interventions contributes to a reduction in postoperative complications and improves patients' quality of life.

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