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CLINICAL ANATOMY OF THE INGUINAL REGION AND ITS IMPORTANCE IN THE DIAGNOSIS AND TREATMENT OF INGUINAL HERNIAS

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Abstract: The inguinal region is one of the most clinically significant areas of the anterior abdominal wall because of its complex anatomical organization and frequent involvement in hernia formation. The inguinal canal contains the spermatic cord in males and the round ligament of the uterus in females and is surrounded by several fascial, muscular, vascular, and neural structures. The aim of this study was to analyze the clinical anatomy of the inguinal region and evaluate its importance in the diagnosis, classification, and surgical treatment of inguinal hernias. A literature-based analytical approach was used to examine the boundaries of the inguinal canal, deep and superficial inguinal rings, inferior epigastric vessels, Hesselbach's triangle, and the anatomical differences between direct and indirect inguinal hernias. The analysis demonstrates that precise understanding of regional anatomy is essential for correct diagnosis and for avoiding injury to nerves, vessels, and structures of the spermatic cord during surgery. The relationship of a hernia sac to the inferior epigastric vessels represents a major anatomical criterion for distinguishing direct from indirect inguinal hernia. Therefore, clinical anatomy of the inguinal region has direct relevance to general surgery, radiology, emergency medicine, and medical education.

Keywords: clinical anatomy, inguinal canal, inguinal hernia, Hesselbach's triangle, inferior epigastric vessels, abdominal wall, surgery.

Introduction

The inguinal region is located in the lower part of the anterior abdominal wall and represents an area of relative anatomical weakness. Because several structures pass through this region, it has a complex arrangement of muscular, fascial, vascular, and neural elements.

Inguinal hernias are among the most common surgical conditions encountered in clinical practice. Their development is closely related to the anatomy of the inguinal canal and surrounding structures.

The inguinal canal is an oblique passage situated above the medial half of the inguinal ligament. It extends from the deep inguinal ring to the superficial inguinal ring.

In males, it contains the spermatic cord, whereas in females it transmits the round ligament of the uterus.

The anatomical characteristics of the inguinal canal create a balance between allowing necessary structures to pass through the abdominal wall and maintaining sufficient mechanical strength to resist intra-abdominal pressure.

Disruption of this balance may result in hernia formation.

The aim of this study was to analyze the main clinical anatomical features of the inguinal region and describe their relevance to the diagnosis and treatment of inguinal hernias.

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Materials and Methods

This study was conducted as a qualitative analytical review of anatomical and clinical literature related to the anterior abdominal wall and inguinal region.

The analysis focused on the structure and boundaries of the inguinal canal, the deep and superficial inguinal rings, Hesselbach's triangle, inferior epigastric vessels, spermatic cord, ilioinguinal nerve, and surrounding muscular and fascial layers.

Particular attention was given to the anatomical differences between direct and indirect inguinal hernias.

The clinical significance of these structures during physical examination, imaging, open surgery, and laparoscopic hernia repair was also evaluated.

Results

The inguinal canal is approximately four centimeters long and runs obliquely through the lower anterior abdominal wall.

Its anterior wall is formed mainly by the external oblique aponeurosis, reinforced laterally by fibers of the internal oblique muscle.

The posterior wall is formed mainly by the transversalis fascia and is reinforced medially by the conjoint tendon.

The roof is formed by arching fibers of the internal oblique and transversus abdominis muscles.

The floor is formed primarily by the inguinal ligament, with the lacunar ligament contributing medially.

The deep inguinal ring is an opening in the transversalis fascia located lateral to the inferior epigastric vessels.

The superficial inguinal ring is a triangular opening in the external oblique aponeurosis near the pubic tubercle.

The inferior epigastric vessels are of major clinical importance because they help distinguish indirect from direct inguinal hernias.

An indirect inguinal hernia enters the inguinal canal through the deep inguinal ring and therefore lies lateral to the inferior epigastric vessels.

It may pass along the inguinal canal and, in some cases, extend into the scrotum.

Indirect hernias are frequently associated with persistence or incomplete closure of the processus vaginalis.

A direct inguinal hernia, in contrast, protrudes through a weakened posterior wall of the inguinal canal.

It usually occurs within Hesselbach's triangle.

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Hesselbach's triangle is bounded medially by the lateral border of the rectus abdominis muscle, laterally by the inferior epigastric vessels, and inferiorly by the inguinal ligament.

A direct hernia therefore appears medial to the inferior epigastric vessels.

This anatomical distinction is important during surgery and imaging.

The spermatic cord is another clinically important structure.

It contains the ductus deferens, testicular artery, pampiniform venous plexus, autonomic nerves, lymphatic vessels, and other structures.

During inguinal hernia repair, these elements must be preserved.

The ilioinguinal nerve is also at risk during surgery.

It passes through part of the inguinal canal and emerges through the superficial inguinal ring.

Injury or entrapment may contribute to postoperative pain or sensory disturbances.

Other nerves in the region, including the iliohypogastric nerve and genital branch of the genitofemoral nerve, may also be affected during hernia surgery.

Clinical examination remains important in the assessment of inguinal hernias.

Patients may present with a groin swelling that becomes more prominent during standing, coughing, or straining.

Imaging, especially ultrasonography, can be useful when the diagnosis is uncertain.

Computed tomography or magnetic resonance imaging may also demonstrate hernia anatomy in selected cases.

Modern laparoscopic surgery provides a posterior view of the inguinal region.

This perspective emphasizes structures such as the inferior epigastric vessels, deep inguinal ring, femoral canal, vas deferens, and gonadal vessels.

Therefore, detailed anatomical knowledge is essential for both open and minimally invasive repair.

Discussion

The findings demonstrate that the inguinal region is a clinically important example of how anatomical knowledge directly influences surgical diagnosis and treatment.

The distinction between direct and indirect inguinal hernias depends largely on their relationship to the inferior epigastric vessels.

This is not simply a descriptive anatomical detail but a major diagnostic and surgical landmark.

The anatomy of Hesselbach's triangle is particularly relevant to direct hernias.

Weakness of the posterior wall in this region allows abdominal contents to protrude forward.

Indirect hernias follow a different anatomical pathway through the deep inguinal ring.

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This explains why indirect hernias can descend farther through the canal and potentially enter the scrotum.

Knowledge of the layers of the abdominal wall is also important.

During surgery, the surgeon must identify and separate tissue planes correctly.

Failure to recognize nerves or spermatic-cord structures may result in postoperative complications.

Chronic postoperative groin pain is one of the clinically significant concerns following inguinal hernia repair.

Nerve injury, entrapment, scarring, and mesh-related factors can contribute to this problem.

Thus, awareness of neural anatomy is essential.

The development of laparoscopic techniques has increased the importance of viewing inguinal anatomy from the internal surface of the abdominal wall.

The landmarks seen during laparoscopic repair differ from those emphasized during traditional open dissection.

Therefore, modern clinical anatomy teaching should include both anterior and posterior perspectives.

Imaging can further strengthen understanding.

Ultrasonography allows dynamic evaluation during coughing or straining and may demonstrate movement of hernia contents.

Cross-sectional imaging may help identify complicated, recurrent, or unusual hernias.

Clinical anatomy education should therefore integrate cadaveric anatomy, surgical images, ultrasound, three-dimensional models, and clinical cases.

This approach can help students understand why precise anatomical relationships are essential in real medical practice.

Conclusion

The inguinal region has major clinical and surgical significance because of its complex anatomy and vulnerability to hernia formation.

The inguinal canal, deep and superficial rings, inferior epigastric vessels, Hesselbach's triangle, spermatic cord, and regional nerves are the principal structures that determine the anatomy of inguinal hernias.

Indirect inguinal hernias occur lateral to the inferior epigastric vessels and usually enter through the deep inguinal ring.

Direct inguinal hernias occur medial to the inferior epigastric vessels and typically protrude through Hesselbach's triangle.

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Accurate knowledge of these relationships is essential for clinical diagnosis and safe surgical repair.

Understanding neural and vascular anatomy is also important for reducing intraoperative injury and postoperative complications.

Overall, the clinical anatomy of the inguinal region demonstrates the close relationship between basic anatomical knowledge and practical surgical medicine.

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