Case Report

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Laparoscopic diagnosis of transverse testicular ectopia initially misdiagnosed as inguinal hernia: A case report of two adult cases and literature review

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Abstract

BACKGROUND: Inguinal hernia is a common surgical condition; however, rare entities such as transverse testicular ectopia (TTE) can present with similar symptoms, often resulting in misdiagnosis and inappropriate initial management. This report underscores the diagnostic value of laparoscopy in such challenging cases.

CASE PRESENTATION: We present two adult male patients who were initially diagnosed with inguinal hernia based on the clinical evaluation and imaging. Both had a history of urogenital anomalies, including cryptorchidism or prior inguinal surgery. Due to persistent symptoms or atypical findings, both underwent laparoscopic exploration, during which TTE was identified: both testes were located on the same side with no evidence of hernia.

CONCLUSION: These cases highlight the importance of considering TTE in the differential diagnosis of atypical inguinal hernia, particularly in adults with relevant surgical or urogenital history. Laparoscopic exploration is a valuable tool for both diagnosis and definitive surgical management. Early recognition of this rare entity is essential to prevent misdiagnosis and optimize clinical outcomes.

Keywords:

Inguinal hernia, laparoscopy, transverse testicular ectopia, urogenital anomalies

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Introduction

Transverse testicular ectopia (TTE) is an exceptionally rare congenital anomaly, with an estimated incidence of approximately 1 in 4 million male births.[1] First described by Von Lenhossek in 1886, TTE is characterized by the migration of one testis across the midline, resulting in both testes residing on the same side of the scrotum or inguinal region. Diagnosis is most often made in early childhood (mean age ~4 years); adult cases are exceedingly rare.[2-7] TTE is frequently associated with additional urogenital anomalies, including undescended testis, inguinal hernia, hydrocele, persistent Müllerian duct syndrome (PMDS), and others.[8-11] Due to significant overlap in clinical presentation with more common entities such as inguinal hernia, TTE is often misdiagnosed–up to 65% of cases are only identified intraoperatively.[12-15] While imaging modalities such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) aid in preoperative evaluation, definitive diagnosis typically requires operative exploration.[16-20] Given

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the risk of delayed diagnosis and the need for timely surgical management, strategies to enhance preoperative recognition of TTE are essential.

Case Reports

Case 1

A 19-year-old male presented in October 2021 with a 2-month history of the left inguinal pain. He had previously undergone laparoscopic exploration for right-sided cryptorchidism during childhood, where the right testis was found at the left internal ring and linked to the left testis by a ligamentous structure, raising suspicion of Müllerian duct remnants. Chromosomal analysis revealed a 46XY karyotype. A subsequent surgery routed the right testis through the left inguinal canal and both testes were fixed in their respective hemiscrotal pouches. The patient has no history of sexual activity but does not present with complaints of erectile dysfunction.

At our institution, ultrasound demonstrated a heterogeneous, moderately echogenic nodule in the left inguinal region; CT revealed a soft tissue density adjacent to the left spermatic cord and peritoneum; and MRI showed features suggestive of an inguinal hernia [Figure 1]. In October 2021, diagnostic laparoscopy revealed thickened spermatic cord structures on the left side, with the right spermatic cord entering the left scrotum through the left inguinal canal. No inguinal hernia was present. TTE was diagnosed based on these findings [Figure 2].

Case 2

A 25-year-old male competitive roller skater presented in April 2021 with a 2-month history of the left inguinal discomfort, exacerbated by exercise. He had undergone surgical repair for the left testicular torsion in 2018. Ultrasound revealed a heterogeneous hypoechoic lesion in the left inguinal region, with some extension into the abdominal cavity, initially suggestive of inguinal hernia. Open exploration showed a closed internal ring and a thickened spermatic cord, likely sequelae of prior surgery. Biopsy of the cord confirmed spermatic cord tissue, including the vas deferens. The patient has no complaints of sexual dysfunction, has not fathered any children, currently has no plans for childbearing, and has not undergone testing for sperm motility or related parameters.

The patient re-presented in December 2024 with recurrent left inguinal discomfort after strenuous activity. Ultrasound and CT were again inconclusive for hernia. Given the persistent symptoms, laparoscopic exploration was performed. The left internal ring was found to be scarred and completely healed, with no hernia identified. Further exploration revealed the right spermatic cord originating from the retroperitoneum and traversing through the scarred left internal ring; the right testis had

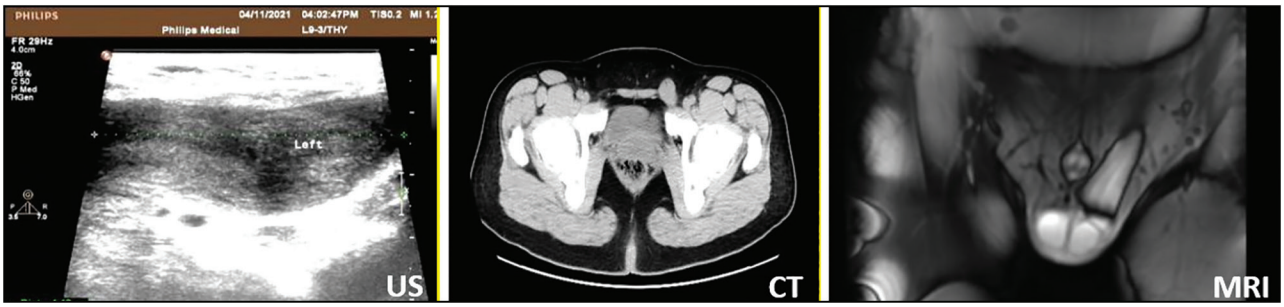

Figure 1: Imaging (ultrasound, computed tomography, and magnetic resonance imaging) demonstrated findings suggestive of the left inguinal hernia

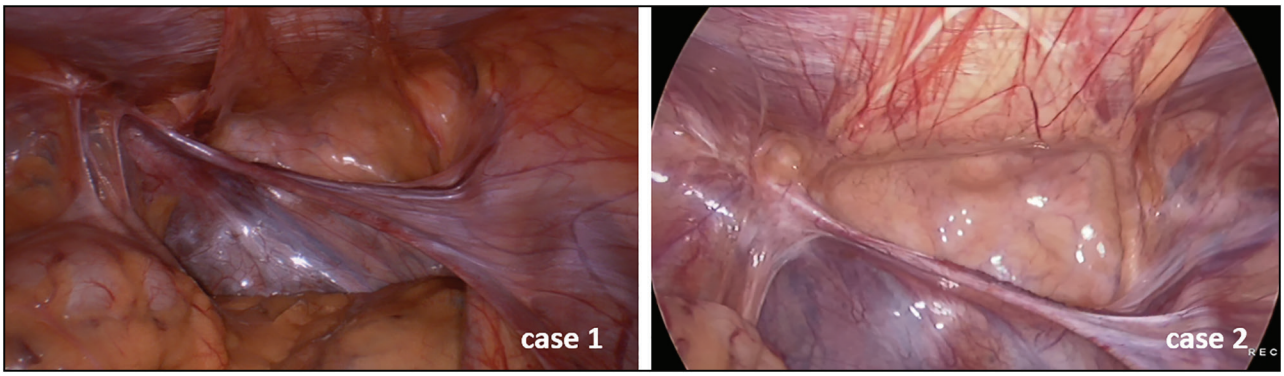

Figure 2: Diagnostic laparoscopy revealed thickened spermatic cord structures on the left side, with the right spermatic cord entering the left scrotum through the left inguinal canal. No inguinal hernia was present

descended into the left scrotum through the left inguinal canal, confirming TTE [Figure 2]. During subsequent follow-up, the patient's left inguinal discomfort was noted to recur after episodes of vigorous physical activity.

Discussion

TTE is an uncommon congenital anomaly, characterized by migration of both testes to the same side of the scrotum or inguinal canal. Clinical features include unilateral inguinal mass, discomfort, and frequent association with urogenital anomalies such as cryptorchidism, inguinal hernia, and hydrocele.[1-11] Due to its extremely low incidence and variable presentation, TTE is highly susceptible to misdiagnosis as inguinal hernia; about 65% of cases are only recognized during surgery.[12-20] Our cases illustrate the diagnostic difficulty of TTE in adults, as initial clinical and imaging workup suggested inguinal hernia, but laparoscopy revealed the correct diagnosis.

The embryological basis of TTE is intricate and remains incompletely elucidated. Several hypotheses have been proposed to explain the aberrant migration observed in TTE. One early theory suggests that both testes may originate from a single germinal ridge, resulting in what has been termed "testicular pseudoduplication." Alternatively, some researchers propose that defects in normal gubernacular development can lead to abnormal testicular descent. The gubernaculum, a key ligamentous structure guiding testicular descent, if insufficiently developed or abnormally positioned, may fail to anchor the testis correctly to its hemiscrotum, thus permitting migration along an erroneous path.[21,22]

Another significant theory implicates the persistence of Müllerian duct structures. Under typical development, Müllerian ducts regress in response to Müllerian inhibitory factor (MIF) secreted by Sertoli cells. However, in cases of MIF deficiency or tissue insensitivity, Müllerian remnants may persist, potentially tethering the testis and impeding normal descent. This mechanism is particularly evident in TTE cases associated with PMDS, although not all TTE patients have PMDS.[2,5,11,18,19]

In addition, the early adhesion or fusion of developing Wolffian ducts has been suggested as an explanation. The Wolffian ducts give rise to components of the male reproductive tract, including the vas deferens. In TTE, abnormal fusion or adhesion of these ducts may result in both testes sharing common cord structures, which can explain the frequent finding of two vas deferens converging or one testis crossing over to the opposite side, as demonstrated in our cases.[7]

In summary, while no single theory fully accounts for all presentations of TTE, the condition likely arises from a combination of aberrant gubernacular development, persistent Müllerian duct structures, and abnormal Wolffian duct fusion. A deeper understanding of these embryological mechanisms is critical–not only to refine diagnostic criteria but also to improve surgical planning and optimize management strategies for affected patients.

TTE is typically classified into three primary types based on its associated anomalies and clinical presentation.[23] Type 1 refers to TTE accompanied solely by ipsilateral inguinal hernia and represents the most common form, accounting for approximately 40%–50% of cases. In these patients, the only additional anomaly is the presence of an inguinal hernia on the side of the ectopic testis. In our two cases described above, no inguinal hernia was found on the side of the ectopic testis (right side), and the side with symptoms was the left, indicating that these cases do not belong to Type 1. Type 2 is characterized by TTE associated with persistent or rudimentary Müllerian duct structures. This type comprises about 30% of cases and is defined by the presence of Müllerian remnants, such as a uterus or fallopian tubes, resulting from a failure of regression under the influence of MIF. In our patients, there were no female phenotypic characteristics on physical examination, nor were any Müllerian duct derivatives (such as uterus or fallopian tubes) observed during laparoscopy, thus excluding type 2. Type 3 includes TTE associated with other anomalies, such as hypospadias, pseudohermaphroditism, or various scrotal abnormalities. This variant is less common, accounting for approximately 20% of cases, and is often accompanied by additional genitourinary malformations. Given that both of our patients had a history of urogenital anomalies, including cryptorchidism or prior inguinal surgery, we suggest that their condition is consistent with type 3 TTE.

This classification is critical, as it directly informs both the diagnostic approach and surgical management. For example, the presence of Müllerian remnants in type 2 may require tailored intraoperative strategies, since aggressive excision can risk vascular compromise to the testes.[10,11,17,21] Conversely, for type 1 cases, when TTE is only associated with unilateral inguinal hernia, surgical management can focus on effective orchidopexy.[3,12-14,22] Beyond these core classifications, it is important to recognize that TTE may coexist with other anomalies, including urinary tract anomalies, true hermaphroditism, or cryptorchidism.[4,8,10,16] Therefore, comprehensive preoperative evaluation–including ultrasonography and, when necessary, MRI–should be performed to identify all associated abnormalities prior to definitive surgical intervention.

The primary objectives in the management of TTE are to restore normal anatomical positioning of the testes,

preserve gonadal function, and address any associated anomalies such as hernia. The surgical approach is largely determined by the length and mobility of the spermatic cord. If adequate, orchiopexy can be accomplished[21,24]; if inadequate, laparoscopic-assisted fixation or staged procedures may be necessary.[2,5] In cases where the testis is nonviable or cannot be repositioned, orchiectomy should be considered.[2,4,6,17-19,22,24]

Although not highlighted in our cases, laboratory investigations such as hormonal profiles and karyotype analysis may be indicated in complex presentations, particularly when disorders of sexual differentiation are suspected. These assessments can help exclude underlying intersex conditions, which may occasionally be associated with TTE.

In our two patients, no specific anatomical abnormalities were identified. Therefore, no surgical intervention was performed. Regarding the discomfort experienced in the left inguinal region, we hypothesize that the pain was likely related to tension secondary to growth, development, or physical activity. As the severity of pain was mild, no analgesic treatment was deemed necessary.

A well-documented analysis of TTE cases indicates a heightened risk of malignancy in ectopic testes, particularly when undescended, with the overall incidence in undescended gonads estimated at approximately 18%.[18] This underscores the importance of early intervention and long-term surveillance. The elevated malignancy risk in TTE is attributed to factors such as delayed orchidopexy–especially when performed after 10–11 years of age–aberrant testicular position, which may create a suboptimal environment for testicular development, and complex or shared vascular anatomy, which can result in subtle ischemic changes predisposing to malignant transformation. Given these risks, long-term surveillance is essential for patients who have undergone orchiopexy for TTE. Regular clinical examinations, periodic ultrasonography, and, when indicated, serum tumor marker assessments should be integrated into a comprehensive follow-up strategy. It is important to counsel patients and their families regarding the ongoing risk of malignancy and the imperative for lifelong monitoring, even after successful surgical correction.

Conclusion

TTE is a particularly rare congenital anomaly that may coexist with an inguinal hernia or be misdiagnosed as one, thereby posing notable diagnostic challenges. A comprehensive patient history, meticulous physical examination, and careful interpretation of imaging studies are essential for accurate diagnosis. Early laparoscopic exploration should be considered in cases with refractory symptoms or inconclusive imaging findings. Clinicians should maintain a high index of suspicion for TTE in patients with atypical presentations, particularly those with a history of urogenital anomalies such as cryptorchidism or prior inguinal surgery. Furthermore, long-term, multidisciplinary follow-up is recommended to monitor reproductive function and overall quality of life in affected patients.

Author contributions

HZ was responsible for case data collection and manuscript writing. YS contributed to case analysis and manuscript revision. CJ, as the corresponding author, supervised the study and approved the final manuscript. All authors have read and approved the final version.

Ethical policy and Institutional Review Board statement

This study complies with the relevant requirements of the Declaration of Helsinki regarding medical research ethics. All patient data presented in this case report have been de-identified and do not involve personal privacy information.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

All data and materials related to this case report are included in the article. Further information is available from the corresponding author on reasonable request.

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Conflicts of interest

There are no conflicts of interest.

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Nil.

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