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Influence of pain duration on the prognosis of pediatric testicular torsion: A retrospective study in Quito (2019–2024)

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Abstract

Introduction: Testicular torsion is a urological emergency that requires prompt diagnosis and surgical management to preserve testicular viability. The time elapsed since symptom onset is considered the most important prognostic factor.

Objective: To analyze the relationship between pain duration and surgical outcome (orchidopexy vs. orchiectomy) in pediatric patients with testicular torsion treated at a referral center in Quito, Ecuador.

Materials and Methods: A retrospective, observational, and descriptive study was conducted using 112 clinical records of pediatric patients diagnosed with testicular torsion between 2019 and 2024. Variables analyzed included age, pain duration, and final surgical procedure (orchidopexy vs. orchiectomy).

Results: The cohort was divided into two groups according to surgical outcome: orchidopexy (N=50) and orchiectomy (N=62). Mean pain duration was significantly shorter in the orchidopexy group (7.9 hours) than in the orchiectomy group (25.1 hours). Median pain duration was 6 hours in the orchidopexy group and 15.5 hours in the orchiectomy group. No statistically significant correlation was found between patient age and final outcome.

Conclusions: Pain duration is a key predictor of testicular prognosis. Early surgical intervention—ideally within the first 6 hours after symptom onset—significantly increases the likelihood of testicular salvage. These findings reinforce the need for awareness campaigns targeting parents and healthcare professionals regarding immediate medical evaluation in suspected testicular torsion.

Keywords: Testicular torsion; Prognostic factor; Orchidopexy; Orchiectomy

1. Introduction

Testicular torsion is a urological emergency that requires timely diagnosis and treatment to preserve testicular viability [1,2]. It involves rotation of the spermatic cord around its axis, compromising blood flow and, if not corrected promptly, potentially leading to testicular ischemia and infarction [3]. Although relatively uncommon, its incidence is clinically

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relevant in pediatric and adolescent populations, and prognosis depends critically on the time interval from symptom onset to surgical detorsion [4].

2. Theoretical background

2.1. Testicular torsion: definition, pathophysiology, and epidemiology

Testicular torsion is classified into two types: intravaginal and extravaginal [5]. Extravaginal torsion occurs mainly in the prenatal and neonatal period, whereas intravaginal torsion is most common in children and adolescents and is associated with an abnormal attachment of the tunica vaginalis to the spermatic cord, known as the "bell-clapper" deformity [6]. This anomaly allows the testis to move and rotate freely within the scrotum, increasing the risk of torsion.

Pathophysiology centers on vascular occlusion. As the spermatic cord twists, the thin-walled testicular vein collapses first, causing venous congestion and testicular edema. If torsion persists, the testicular artery also becomes occluded, interrupting arterial inflow and leading to complete ischemia, irreversible cellular injury, and ultimately necrosis of the testicular parenchyma [7].

The incidence of testicular torsion varies by age and shows two peaks: one during the neonatal period and another between 12 and 18 years [8]. Although torsion can occur at any age, adolescence is the most affected group. Prevalence is estimated at approximately 1 in 4,000 males younger than 25 years [9].

2.2. Clinical presentation and diagnosis

Diagnosis is primarily clinical. The cardinal symptom is sudden-onset, severe acute scrotal pain, often accompanied by nausea and vomiting [10]. Physical examination may reveal a high-riding, horizontally oriented testis (negative Prehn sign, although this is unreliable) and marked tenderness to palpation [11]. The cremasteric reflex is often absent on the affected side; while this sign has high sensitivity, its absence is not definitive [12].

Definitive diagnosis is supported by scrotal Doppler ultrasonography, which can demonstrate reduced or absent blood flow to the affected testis and may also show edema and enlargement [13]. However, reliance on immediate availability of this imaging modality can delay intervention. Therefore, when clinical suspicion is high, urgent surgical exploration is the safest and recommended approach [14].

2.3. Prognosis: the critical role of symptom duration

The most crucial prognostic factor in testicular torsion is the time elapsed between pain onset and surgical detorsion [15,16]. Testicular viability decreases dramatically as ischemia time increases. The medical literature describes a "window of opportunity" for detorsion and testicular salvage:

- Less than 6 hours: salvage rates >90–100% [17].
- 6 to 12 hours: viability decreases to 50–70% [18].
- More than 12 hours: prognosis becomes poor, with salvage rates <20%, and even close to 0% after 24 hours [19].
- More than 24 hours: testicular necrosis is generally irreversible; orchiectomy (testis removal) is usually the treatment of choice [20].

Delays in seeking medical care are a major problem, particularly in highly rural areas or when parents and caregivers fail to recognize the severity of the condition. This underscores the importance of public education and optimization of care protocols in hospital settings [21].

2.4. Therapeutic approach: orchidopexy vs. orchiectomy

Definitive management of testicular torsion is emergency surgical exploration [22]. During surgery, the spermatic cord is detorsed. If the testis recovers normal color and consistency (i.e., viability is restored), orchidopexy is performed—fixation of the testis to the scrotum to prevent recurrence [23]. This procedure is performed bilaterally because the bell-clapper deformity is commonly present in the contralateral testis.

If, in contrast, the testis has sustained irreversible ischemic injury and shows no evidence of viability after detorsion, orchiectomy is performed to remove the affected testis [24]. This aims to prevent complications of a necrotic testis, such as infection risk and potential impact on future fertility due to anti-sperm antibody formation.

2.5. Local context and rationale

Testicular torsion in pediatric patients is influenced by local healthcare system characteristics [25]. Factors such as access to care, transport times, referral pathways, and hospital capacity are determinants of prognosis. Studying cases in a pediatric hospital in Quito, Ecuador, allows evaluation of how these factors affect symptom duration and, consequently, testicular salvage rates over a five-year period.

This retrospective analysis enables comparison of symptom duration with testicular viability, the need for orchiectomy, and longer-term outcomes. The findings may support implementation of more effective clinical practice guidelines, optimization of pediatric urologic emergency care, and training of healthcare personnel, potentially increasing testicular salvage rates in the region [26].

3. Materials and methods

A retrospective study was conducted at the Pediatric Specialty Hospital in Quito, reviewing clinical records of all patients who underwent surgery for confirmed testicular torsion between January 2019 and December 2024. Incomplete cases or records missing key variables were excluded.

The main variables analyzed were:

- Patient age: recorded in years.
- Pain duration: reported by the patient or parents, in hours, from symptom onset to hospital presentation.
- Surgical outcome: classified as orchidopexy (testicular preservation) or orchiectomy (testicular removal).

Descriptive analyses were performed to obtain means, medians, and ranges. Group comparison analyses were used to evaluate differences in pain duration between outcome groups.

4. Results

The study cohort comprised 112 patients, ranging in age from 3 months to 17 years.

The results of the cross-tabulation analyses are presented below:

- Relationship between pain duration and surgical outcome:
- Of the 112 patients, 50 (44.6%) were treated with orchidopexy and 62 (55.4%) required orchiectomy.
- Mean pain duration in the orchidopexy group was 7.9 hours, with a median of 6 hours.
- Mean pain duration in the orchiectomy group was 25.1 hours, with a median of 15.5 hours.

The difference in pain duration between both groups was statistically significant, indicating that longer symptom duration is directly associated with testicular loss.

5. Discussion

The findings of this study in a referral hospital in Quito are consistent with the global literature, which clearly demonstrates that prognosis in testicular torsion depends on time to detorsion. Delays in seeking medical attention or in clinical diagnosis can result in irreversible testicular ischemia.

Our results suggest an inflection point around 6–8 hours, after which orchiectomy rates increase dramatically. It is important to highlight that timely clinical and ultrasound assessment is crucial; however, the most important variable remains how quickly the patient reaches a healthcare facility.

Study limitations: the main limitation is the retrospective, single-center design. Nevertheless, the findings are sufficiently clear to emphasize the urgency of this condition and the need to educate both the community and healthcare personnel about its symptoms and the importance of immediate management.

6. Conclusions

Pain duration is the most decisive prognostic factor in testicular torsion. Reducing the time between symptom onset and surgery is associated with higher testicular preservation rates. Orchiectomy as a final outcome is a direct consequence of delayed presentation and/or delayed care. Implementation of protocols for pediatric urologic emergencies that enable rapid and effective response is strongly recommended to improve clinical outcomes and patients' quality of life.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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