Testicular Torsion: The Race Against Time

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ABSTRACT

Background: Testicular torsion is a urological emergency that predominantly affects young males, requiring urgent intervention to prevent testicular necrosis and preserve fertility. Early surgical intervention is crucial for achieving favorable outcomes. **Objective:** This study aims to evaluate the effectiveness of early surgical intervention in salvaging testicular viability in cases of acute testicular torsion at a tertiary health care center. **Methods:** A retrospective observational study was conducted, analyzing 20 pediatric cases diagnosed with acute testicular torsion. All patients received surgical treatment at a single tertiary care center. The time from symptom onset to surgical intervention was recorded, along with the outcome concerning testicular salvageability. **Results:** Of the 20 patients treated, 40% received surgery within 24 hours of symptom onset. Early intervention within this time frame resulted in a testicular salvage rate of 62.5%, significantly higher than in patients who received later intervention, where salvage was not achieved in any of the cases (P-value = 0.039). The average time to surgery was significantly delayed at 213.60 hours due to various factors including delayed presentation and referral. **Conclusion:** The study highlights the importance of prompt diagnosis and immediate surgical management in cases of testicular torsion to optimize testicular salvage. These findings advocate for improved educational and procedural protocols to ensure rapid response to this emergent condition.

Keywords: Testicular Torsion, Pediatric Urology, Early Surgical Intervention

INTRODUCTION

Testicular torsion represents a urological emergency that demands immediate attention to prevent testicular death and preserve future fertility. It primarily affects the pediatric population, with the highest incidence in preadolescents and young adults. The pathophysiology involves the rotation of the spermatic cord, which leads to ischemia and subsequent necrosis of the testis if not promptly managed. The urgency of diagnosing and surgically correcting testicular torsion cannot be overstated, as the window for effective intervention is notoriously short.[1][2]

Literature underscores the necessity for rapid response; studies indicate that the likelihood of testicular salvage declines sharply if surgery is delayed beyond 6 hours from symptom onset. The prognosis of testicular torsion hinges critically on the time from the onset of symptoms to detorsion. Early diagnosis facilitated by high-resolution ultrasonography and prompt surgical intervention forms the cornerstone of managing this condition.[3][4]
The implications of testicular torsion extend beyond the acute surgical setting, impacting the patient's psychological well-being, future reproductive and sexual health. Long-term outcomes of testicular torsion include testicular atrophy and infertility, which are significant considerations in pediatric care. Therefore, understanding the dynamics of timely intervention provides valuable insights into pediatric urology practice and patient counseling.[5][6]

Aim

To evaluate the effectiveness of early surgical intervention in salvaging testicular viability in pediatric patients with acute testicular torsion.

Objectives

1. To assess the rate of testicular salvage in cases of acute testicular torsion with interventions within 24 hours of symptom onset.
2. To analyze the role of ultrasonography in the early diagnosis of testicular torsion in a pediatric cohort.
3. To determine the association between time to surgery and outcomes in testicular torsion cases.

MATERIAL AND METHODOLOGY

Source of Data: The study retrospectively examined clinical records of pediatric patients diagnosed with acute scrotum conditions at a tertiary care hospital.
Study Design: This was a retrospective observational study, focusing on the outcomes of testicular torsion cases managed surgically.
Study Location: The study was conducted at a tertiary care hospital in Dharawad, providing specialized pediatric urology services.
Study Duration: The data collection spanned from July 2020 to October 2023, covering a period sufficient to assess a variety of cases across different seasons and management conditions.
Sample Size: The study included a total of 20 children who presented with symptoms indicative of acute scrotum.
Inclusion Criteria: Included in the study were male children aged less than 14 years presenting with acute scrotum symptoms and diagnosed with testicular torsion based on clinical and ultrasonographic findings.
Exclusion Criteria: Patients were excluded if they were over 14 years old, had a previous history of testicular surgery or torsion, or lacked complete medical records.
Procedure and Methodology: Upon presentation, each patient underwent a detailed clinical evaluation followed by ultrasonography of the scrotum to confirm the diagnosis. Surgical intervention was performed based on the findings, and intraoperative assessments of testicular viability were recorded.
Sample Processing: Surgical findings were documented, including the degree of torsion, time elapsed from symptom onset to surgery, and intraoperative assessment of testicular salvageability.
Statistical Methods: Data were analyzed using descriptive statistics to summarize the frequency of testicular salvage and logistic regression to explore the correlation between time to surgery and salvage outcomes.

Data Collection: Data were collected from patient medical records, which included demographic details, clinical presentation, diagnostic imaging results, surgical reports, and follow-up outcomes.

OBSERVATION AND RESULTS

Table 1: Evaluation of the Effectiveness of Early Surgical Intervention

Variable	Value	Statistics	95% CI	P-value
Total Patients	20	N/A	N/A	N/A
Mean Age	8.27	SD = 6.27	5.95 - 10.59	N/A
Salvageable Testes	5	25%	8.7% - 49.1%	0.022
Non-salvageable Testes	15	75%	50.9% - 91.3%	0.022
Time to Surgery (hours)	N/A	Mean = 213.60, SD = 424.31	84.22 - 342.98	N/A

This table presents the effectiveness of early surgical intervention in a study involving 20 pediatric patients with acute testicular torsion. The average age of the participants was 8.27 years with a standard deviation of 6.27 years, falling within a 95% confidence interval (CI) of 5.95 to 10.59 years. Out of the total cases, 25% (5 patients) had salvageable testes post-intervention, which was statistically significant with a P-value of 0.022, indicating effective salvage within the early intervention window. This is further emphasized by the 75% (15 patients) with non-salvageable testes, also significant, reflecting the urgency of timely medical response. The mean time to surgery was notably high at 213.60 hours, with a broad standard deviation of 424.31 hours, suggesting variability in the time to surgical intervention.

Table 2: Rate of Testicular Salvage Within 24 Hours

Time to Intervention	No. of Patients	% of Total	95% CI	P-value
≤24 Hours	8	40%	19.8% - 64.3%	0.034
>24 Hours	12	60%	35.7% - 80.2%	

This table illustrates the impact of the timing of intervention on testicular salvage rates. Within 24 hours of symptom onset, 40% (8 patients) of torsion cases were addressed with surgical intervention, resulting in a salvage rate that falls within a 95% CI of 19.8% to 64.3% and a significant P-value of 0.034, suggesting that earlier intervention correlates with higher salvage rates. Conversely, cases intervened upon after 24 hours comprised 60% (12 patients), demonstrating the decline in salvage success rate with delayed intervention.

Table 3: Role of Ultrasonography in Early Diagnosis

Ultrasonography Findings	No. of Patients	% of Total	95% CI	P-value
No Vascularity	13	65%	42.7% - 83.6%	0.105
Vascularity	7	35%	16.4% - 57.3%	

The table assesses the utility of ultrasonography in the early diagnosis of testicular torsion. It shows that in 65% (13 patients) of cases, ultrasonography revealed no vascularity—indicative of severe torsion with compromised blood flow, while 35% (7 patients) showed vascularity, suggesting less severe torsion. The broader confidence intervals for both findings (42.7% - 83.6% for no vascularity and 16.4% - 57.3% for vascularity) reflect the diagnostic challenge and variability in presentation, though the P-value of 0.105 indicates no significant statistical conclusion can be drawn from the vascularity data alone.

Table 4: Association Between Time to Surgery and Outcomes

Time to Surgery	Salvageable	Non-salvageable	% Salvageable	95% CI	P-value
≤24 Hours	5	3	62.5%	24.5% - 91.5%	0.039
>24 Hours	0	12	0%	0% - 23.2%	

This table correlates the timing of surgical intervention with the rate of testis salvage. Surgery within 24 hours led to a salvage rate of 62.5%, significantly higher as reflected by the 95% CI of 24.5% - 91.5% and a P-value of 0.039. This suggests a strong benefit of prompt surgery. In stark contrast, no testes were salvageable in cases where surgery occurred more than 24 hours after onset, with the upper limit of the 95% CI at 23.2%, underscoring the critical nature of time in managing testicular torsion effectively.

DISCUSSION

Table 1: Evaluation of the Effectiveness of Early Surgical Intervention

The data indicates that out of 20 cases of testicular torsion, only 25% resulted in salvageable testes, which is statistically significant (P-value = 0.022). This aligns with findings from other studies, such as those by Thaker H *et al.*(2020)[7], which reported that the likelihood of testis salvage decreases dramatically with delayed intervention beyond 6 hours. The mean age of patients in this study was 8.27 years, similar to the demographic most commonly affected by testicular torsion as noted in the literature Howe AS *et al.*(2017)[8]. However, the mean time to surgery (213.60 hours) is considerably longer than recommended, suggesting potential delays in diagnosis or referral, which could account for the high rate of non-salvageable outcomes.

Table 2: Rate of Testicular Salvage Within 24 Hours

The salvage rate within 24 hours was 40%, with a significant improvement in outcomes compared to those intervened after 24 hours (P-value = 0.034). This is consistent with the findings of Barbosa JA *et al.*(2016)[9], who observed that prompt surgical intervention within the 6-hour window post-symptom onset significantly increases the probability of testicular viability. The high percentage (60%) of interventions occurring after 24 hours illustrates a critical area for improvement in clinical practice.

Table 3: Role of Ultrasonography in Early Diagnosis

In this study, 65% of the cases showed no vascularity on ultrasonography, which typically indicates a high likelihood of testicular necrosis if not promptly managed. This finding, however, was not statistically significant (P-value = 0.105), possibly due to the small sample size. Previous studies Laher A *et al.*(2020)[10] & Menzies-Wilson R *et al.*(2022)[11] have validated the role of ultrasonography as crucial in diagnosing testicular torsion, particularly through the absence of blood flow, which strongly suggests torsion.

Table 4: Association Between Time to Surgery and Outcomes

The findings reveal that surgery within 24 hours resulted in a salvage rate of 62.5%, significantly higher than in those with delayed surgery, where the salvage rate was 0% (P-value = 0.039). These results are echoed in the literature by Jacobsen FM *et al.*(2019)[12], who reported that earlier surgery significantly increases the chances of testicular salvage. This emphasizes the need for rapid diagnosis and immediate surgical referral and intervention.

CONCLUSION

The study underscores the pivotal role of prompt surgical intervention in preserving testicular viability and function in pediatric patients. Our findings reveal that timely surgical management—specifically within 24 hours of symptom onset—significantly enhances the likelihood of testicular salvage, with a salvage rate of 62.5% for surgeries performed within this critical window compared to 0% for delayed interventions.

The data highlights that only 25% of all cases resulted in testicular salvage, emphasizing the severe consequences of delayed treatment. The study also illustrates the crucial role of ultrasonography in the early and accurate diagnosis of testicular torsion, despite its findings not reaching statistical significance. This diagnostic tool is invaluable in guiding urgent clinical decisions and ensuring timely surgical referrals.

Our study further identified areas needing improvement, particularly in reducing the time to surgery, which was notably longer than recommended. Enhancing awareness among healthcare providers and caregivers about the symptoms of testicular torsion and the critical nature of this condition is essential. Early recognition and immediate medical intervention are crucial steps in mitigating the risk of long-term fertility issues and testicular loss in affected patients.

Overall, the results from this study advocate for heightened vigilance and rapid response in suspected cases of testicular torsion to optimize patient outcomes in pediatric emergency settings. This approach will be pivotal in safeguarding future reproductive capabilities and overall health in young males presenting with acute scrotal symptoms.

LIMITATIONS OF STUDY

1. **Small Sample Size**: With only 20 cases included in the study, the small sample size limits the statistical power and generalizability of the findings. This sample size may not adequately represent the broader population of pediatric patients experiencing testicular torsion.
2. **Retrospective Design**: Being a retrospective observational study, the analysis is subject to inherent biases such as selection bias and information bias. Retrospective data collection may also compromise the accuracy and completeness of the clinical data, including the exact timing of symptom onset and surgical intervention.
3. **Lack of Control Group**: The study did not include a control group of patients who received different or no intervention. This limits the ability to compare the outcomes directly attributable to early surgical intervention versus other management strategies.
4. **Variability in Time to Surgery**: The significant variability in the time to surgery (mean = 213.60 hours, SD = 424.31) highlights a potential confounding factor. This wide range may reflect differences in the urgency with which cases were handled or disparities in patient access to care, which could affect outcomes independently of the intervention itself.
5. **Single-Center Study**: Conducted at a single tertiary care center, the findings may not be applicable to other settings with different patient demographics, medical facilities, or clinical protocols. The center-specific factors could influence both the management strategies and outcomes.
6. **Subjectivity in Diagnostic Criteria**: Although ultrasonography was utilized for diagnosis, the interpretation of ultrasound findings can be subjective and operator-dependent. This variability might influence the decision-making process regarding the urgency of intervention.
7. **Exclusion of Older Adolescents**: By limiting the study to children aged less than 14 years, the results may not be extrapolatable to older adolescents, who also frequently experience testicular torsion. The pathophysiology and response to treatment may differ across different age groups.
8. **No Long-Term Follow-up**: The study does not address long-term outcomes such as fertility status or chronic testicular pain, which are crucial for assessing the full impact of early surgical intervention in testicular torsion cases.

REFERENCES

1. Minas A, Mahmoudabadi S, Gamchi NS, Antoniassi MP, Alizadeh A, Bertolla RP. Testicular torsion in vivo models: Mechanisms and treatments. Andrology. 2023 Oct;11(7):1267-85.
2. Mellick LB, Sinex JE, Gibson RW, Mears K. A systematic review of testicle survival time after a torsion event. Pediatric emergency care. 2019 Dec 1;35(12):821-5.
3. Morin OA, Carr MG, Holcombe JM, Bhattacharya SD. Optimal predictor of gonadal viability in testicular torsion: time to treat versus duration of symptoms. Journal of Surgical Research. 2019 Dec 1;244:574-8.
4. Ryan KA, Folkard SS, Bastianpillai C, Green JS. The management of testicular torsion in the UK: how can we do better? A national quantitative and qualitative analysis of the factors affecting successful testicular salvage. Journal of Pediatric Urology. 2020 Dec 1;16(6):815-e1.
5. Samson P, Hartman C, Palmerola R, Rahman Z, Siev M, Palmer LS, Ghorayeb SR. Ultrasonographic assessment of testicular viability using heterogeneity levels in torsed testicles. The Journal of Urology. 2017 Mar;197(3 Part 2):925-30.
6. Fehér ÁM, Bajory Z. A review of main controversial aspects of acute testicular torsion. Journal of Acute Disease. 2016 Jan 1;5(1):1-8.
7. Thaker H, Nelson CP. Adjuvant pharmacological and surgical therapy for testicular torsion: Current state of the art. Journal of pediatric urology. 2020 Dec 1;16(6):807-14.
8. Howe AS, Vasudevan V, Kongnyuy M, Rychik K, Thomas LA, Matuskova M, Friedman SC, Gitlin JS, Reda EF, Palmer LS. Degree of twisting and duration of symptoms are prognostic factors of testis salvage during episodes of testicular torsion. Translational andrology and urology. 2017 Dec;6(6):1159.
9. Barbosa JA, Denes FT, Nguyen HT. Testicular Torsion—Can We Improve the Management of Acute Scrotum?. Journal of Urology. 2016 Jun 1;195(6):1650-1.
10. Laher A, Ragavan S, Mehta P, Adam A. Testicular torsion in the emergency room: a review of detection and management strategies. Open Access Emergency Medicine. 2020 Oct 12:237-46.
11. Menzies-Wilson R, Folkard SS, Sevdalis N, Green JS. Serious incidents in testicular torsion management in England, 2007–2019: optimizing individual and training factors are the key to improved outcomes. BJU international. 2022 Feb;129(2):249-57.
12. Jacobsen FM, Rudlang TM, Fode M, Østergren PB, Sønksen J, Ohl DA, Jensen CF. The impact of testicular torsion on testicular function. The world journal of men's health. 2019 Apr 10;38(3):298.