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Urology

FACTORS ASSOCIATED WITH OUTCOME OF TESTICULAR TORSION SURGERY

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ABSTRACT

Introduction: The goal in managing testicular torsion is organ salvage. In order to maximize the chances of testicular survival, prompt diagnosis and treatment of testicular torsion is essential. The aim of this study is to assess the various factors affecting the surgical outcome in patients with testicular torsion.

Material And Method: The present study was conducted in the Department of Urology, Sri Aurobindo Institute of Medical Sciences (SAIMS, Indore) among 30 patients seen in the emergency department (ED) who underwent surgical exploration at our institution. Data were collected regarding age, insurance type, ethnicity, whether or not the patient was transferred, presentation before 5pm vs. after 5pm, duration of symptoms prior to presentation in any ED, time from first presentation in any ED to surgical exploration, and results of scrotal exploration (orchiectomy vs. orchidopexy). Symptom duration was recorded as the longest duration of symptoms prior to initial presentation reported by the patient or caregiver to any provider during the evaluation.

Results: The results revealed that the chances of viable testes decrease as the degree of torsion increases. On univariate logistic regression analysis, increased time to intervention ($P<0.0001$) was significantly associated with orchiectomy or atrophy. A multivariate analysis including degree of testicular twist and time until intervention revealed that both these factors were correlated with the risk of a non-salvageable testis.

Conclusion: The viability of the torsed testis can be determined by the duration of symptoms along with degree of twisting, >6 hour of symptom duration and >360 degrees of torsion leading to higher probability of non-salvage.

KEYWORDS : Testes, Torsion, Non-salvageable, Orchiectomy, Orchidopexy

Introduction:

Testicular torsion is a twisting of the spermatic cord and its contents and is a surgical emergency, with an annual incidence of 3.8 per 100,000 males younger than 18 years[1]. Historically, the annual incidence has been closer to one per 4,000[2]. It accounts for approximately 10% to 15% of acute scrotal disease in children, and results in an orchiectomy rate of 42% in boys undergoing surgery for testicular torsion[3,4]. A good working knowledge of testicular and scrotal anatomy and development is important when assessing a patient who presents with a scrotal condition, because time from presentation to treatment is crucial in preserving organ function.

The goal in managing testicular torsion is organ salvage. In order to maximize the chances of testicular survival, prompt diagnosis and treatment of testicular torsion is essential. Parameters associated with testis viability include duration of symptoms and the sonographic echotexture of the testis. Non-surgical management by way of manual detorsion can be attempted, however, its success rate is not known. Manual detorsion is not a definitive treatment option and complete detorsion may not be achieved depending on the degree of twist; testicular ischemia may persist. In addition, testicle may still be at risk for torsion in the future. Shortcomings of manual detorsion can be addressed with surgical exploration which is the gold standard in the management of suspected testicular torsion[5].

It is well documented that there is a 4 to 8 h window of time from the onset of symptoms to surgery that is needed in order to save a torsed testicle[6]. Delays in seeking medical care result in higher chances of needing an orchiectomy, as well as the potential burden of impaired fertility. Ramachandra et al[7] demonstrated through multivariate analysis of the factors associated with testicular salvage, that duration of symptoms of less than 6 h was a significant predictor of testicular salvage. In humans, Filho et al demonstrated that the degree of testicular rotation has a multiplicative effect on the role of presentation delay in testicular torsion. Greater degree of testicular rotation is seen in patients undergoing orchidectomy vs. orchiopexy. However, testicular atrophy rates at follow-up were not measured[8]. Hence the present study was conducted to assess the various factors affecting the surgical outcome in patients with testicular torsion.

MATERIAL AND METHOD:

The present study was conducted in the Department of Urology, Sri Aurobindo Institute of Medical Sciences (SAIMS, Indore). After obtaining institutional review board approval, we recruited 39 adolescent males who presented with testicular torsion to our institution using ICD-9 and ICD-10 codes for testicular torsion (608.20 and N44.00, respectively). We included all patients seen in the emergency department (ED) who underwent surgical exploration at our institution. Our referral center is the main pediatric treatment facility for a large geographic area, routinely caring for patients who live more than two hours away. Patients who were transferred were sent from the outside facilities' EDs to the ED at our facility, where they were reevaluated prior to surgery. A diagnosis of testicular torsion was made prior to surgical exploration and confirmed at the time of surgery. All patients underwent Doppler ultrasonography either at their presenting hospitals or at our institution prior to surgical exploration. We excluded from the analysis patients with neonatal torsion and suspected intermittent torsion who were treated in a nonemergent fashion. Out of 39 subjects, 7 did not fulfill the inclusion criteria and 2 subject's refused to provide the consent. Final 30 subjects were included in the study.

All charts were reviewed and data extracted by a single reviewer (the lead author). Data were collected regarding age, insurance type, ethnicity, whether or not the patient was transferred, presentation before 5pm vs. after 5pm, duration of symptoms prior to presentation in any ED, time from first presentation in any ED to surgical exploration, and results of scrotal exploration (orchiectomy vs. orchidopexy). We decided to use a cutoff time of 5pm to analyze patients, hypothesizing that the time the patient presented could influence the decision to transfer a patient to our facility. The decision to proceed with orchiectomy or orchidopexy was made by each individual surgeon based on the appearance of the testicle during exploration. Insurance type was categorized as Medicaid, private

(PPO/HMO), or managed Medicaid (Medi-cal HMO). Symptom duration was recorded as the longest duration of symptoms prior to initial presentation reported by the patient or caregiver to any provider during the evaluation. We calculated the time to surgical exploration as time from first presentation in any ED to the operating room start time recorded on the anesthesia record at our facility.

Statistical Analysis:
Data was analysed using SPSS version 24. Univariate and then multivariate analysis was then used to predict testicular viability adjusting for the patient's age, degree of twist, and time until intervention. Testicular outcome was defined as viable (orchiopexy with adequate growth at the last clinic follow up) or non-salvageable (orchiectomy or orchiopexy with subsequent atrophy).

RESULTS:

Median age among the study subjects was 19 years. Left and right testicle involvement was reported among 56.67% and 43.33% of the subjects respectively. Median time (range) reported for surgery was 6 hours (1-24). 0-359, 360-719 and ≥720 degree of torsion was revealed among 16 (53.33%), 10 (33.33%) and 4 (13.33%) subjects respectively. Testicular outcome viz viable and non-salvageable (orchiectomy or atrophic) was reported among 66.67% and 33.33% of the subjects respectively (table 1).

Table 1: Characteristics For Entire Cohort

Variables	Value (N=30)
Median Age in years (Range)	19 (12-32)
Testicle Involved, n (%)	
Left	17 (56.67)
Right	13 (43.33)
Degree of Torsion (^{0}), n (%)	
0-359	16 (53.33)
360-719	10 (33.33)
≥720	4 (13.33)
Median time to surgery in hours [range]	6 (1-24)
Intervention, n (%)	
Orchiopexy	27 (90)
Orchiectomy	3 (10)
Testicular outcome, n (%)	
Viable	20 (66.67)
Non-salvageable (orchiectomy or atrophic)	10 (33.33)

Table 2: Comparison Of Characteristics For Viable And Non-salvageable Testes

Variables	Viable testes	Non-salvageable testes	OR (95% CI)	P value
Median Age in years (Range)	17 (12-30)	20 (12-32)	1.4 (0.96-1.62)	0.11
Testicle Involved, n (%)				
Left	11 (64.71)	6 (35.29)	0.79 (0.41-93)	0.87
Right	9 (69.23)	4 (30.67)	Ref	
Degree of Torsion (^{0}), n (%)				
0-359	14 (87.5)	2 (12.5)	Ref	
360-719	5 (50)	5 (50)	1.52 (0.98-2.74)	0.03*
≥720	1 (25)	3 (75)	2.14 (1.09-3.02)	0.008*
Median time to surgery in hours [range]	5 (1-21)	13 (4-24)	0.1 (0.1-0.2)	<0.01*

*: statistically significant

Table 3: Multivariate Analysis For Risks Of A Non-salvageable Testis

Variable	OR (95% CI)	p value
Degrees of twist (°)	1.93 (1.09-2.88)	0.003*
Time to intervention (h)	6.91 (2.98-10.62)	<0.01*

*: statistically significant

Age and testicle involvement was not associated with testicular outcome. Viable testes were found in 87.5%, 50% and 25% of the subjects with 0-359, 360-719 and ≥720 degree of torsion respectively with statistically significant difference. Hence the chances of viable testes decrease as the degree of torsion increases. On univariate logistic regression analysis, increased time to intervention (P<0.0001) was significantly associated with orchiectomy or atrophy (table 2).

A multivariate analysis including degree of testicular twist and time until intervention revealed that both these factors were correlated with the risk of a non-salvageable testis (Table 3).

DISCUSSION:

While the current data regarding the degree of twisting in the spermatic cord's effects on ultimate testicular outcomes in emergent cases of testicular torsion in humans are limited, animal studies addressing this topic have been performed. In 1986, Cosentino's team performed studies on rats to first examine the effects of duration of symptoms of testicular torsion.

The degree of twisting was fixed at 720° for all rats with duration of symptoms ranging from 0–12 h and found poor histologic findings and fertility rates after a period of recovery starting at 3 h of torsion, as well as markedly decreased fertility rates at 9 h[9]. Later, Lee's group started the investigation into the degree of twisting in testicular torsion by creating torsion in five anesthetized dogs and measuring blood flow blood flow by color Doppler sonography at serial increasing degrees of twisting. They found undetectable flows starting at 450° in all but one dog, who's flow became undetectable at 540°[10].

We agree with previous studies[6,7] that duration of symptoms greater than 6–8 h are at higher risk for testicular demise. While immediate return of blood flow to the testicle can occur after detorsion, the inevitable effects of ischemia can have lasting effects on the viability of a testis. This was seen in our data as the nonsalvageable testis rate more than doubled the orchiectomy rate due to a high number of atrophic testes seen at followup evaluation.

Filho et al[8] recently reviewed their records of 117 patients with testis torsion, and found a correlation in time (median of 8.4 h in the orchiopexy group) and degree of torsion in the orchiopexy group. Orchiectomy rates increased starting at 540°, in which duration of symptoms became more relevant in testis survival rates seen between 6 and 12 h. Testes were salvaged in all patients less than 360° and removed in all patients over 1,080° of twisting. Based on this study combined with prior animal research, it appears that somewhere between 360–540° of twisting during testicular torsion lies the point where significant occlusion to arterial flow occurs with risk of damage to the testicle.

We were also able to determine the clinical significance of the degree of twisting (separate from the duration of pain as the degree of twist did not significantly contribute to derive a formula which combined both variables) in ultimate testis viability. When there is greater than one twist (more than 360 degrees) seen in the spermatic cord at scrotal exploration, there is a higher risk of non-salvage for the testis based on our data.

Orchiectomy rates vary widely in the literature, ranging from 39% to 71% in most series[11-13]. Some groups have suggested that their orchiectomy rate is low because they achieved rapid time from arrival in the ED to surgical management. This is plausible, given that torsion is clearly a time dependent problem. While we agree with this conclusion, it may be that symptom duration before presentation is actually more important in children. Our data support this as the most significant factor in boys in whom testicular orchiectomy was avoided.

The limitations of the study are its small sample size and lack of long term followup. While more studies in humans are needed to truly determine the clinical relevance of twisting degree in relation to prognosis of testicular torsion, we must also look to other areas of torsion pathology to better enhance our knowledge in this common emergency room presentation in adolescent.

CONCLUSION:

The viability of the torsed testis can be determined by the duration of symptoms along with degree of twisting, >6 hour of symptom duration and >360 degrees of torsion leading to higher probability of non-salvage. Further studies are need to accurately characterize the significance of twisting degree in relation to time and prognosis during testicular torsion.

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