Testicular torsion in children

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Abstract

Question As a family physician caring for a large pediatric population, I evaluate numerous adolescents with testicular pain. Given the gravity of prognosis for late treatment of children with testicular torsion, what are best practices for its assessment and management?

Answer The Testicular Workup for Ischemia and Suspected Torsion (TWIST) score has been developed and validated to identify children at risk of testicular torsion. If the TWIST score is 0 and clinical suspicion is low in the office setting, a referral to urology for urgent consultation is not needed. If the TWIST score is 1 or higher or if the clinical presentation suggests torsion, manual detorsion should be attempted and the patient should be urgently sent to the nearest emergency department.

Testicular torsion, a rotation of the spermatic cord along the longitudinal axis, can result in the strangulation of blood vessels supplying the testicles.[1] Severity of blood flow obstruction directly correlates with the degree of injury, altered hormone production, and possible functional loss of a testicle and infertility.

Presentation

Testicular torsion is one of the most serious genitourinary emergencies in boys[2] and it may be difficult to distinguish from other causes of acute pediatric scrotum syndrome such as epididymo-orchitis, infected hydrocele, and torsion of the appendix of testis.[3] Common signs and symptoms of torsion, as well as other causes of acute pediatric scrotum syndrome, include sudden onset, severe, and unrelenting unilateral scrotal pain, and nausea and vomiting.[4]

Up to 15% of children presenting with acute scrotum syndrome are diagnosed with torsion,[5] and the current incidence is estimated at 3.8 per 100 000.[6] A retrospective analysis of 2443 boys who underwent surgery for testicular torsion and a nationwide epidemiologic study from the United States revealed a bimodal distribution, with peaks in the first year of life and at 12 years of age.[6,7] Nearly 1 in 1500 boys will undergo surgery for torsion by the age of 18.[6]

When ischemia occurs in scrotal tissue as a result of torsion, endothelial cells produce large volumes of reactive species and small volumes of nitric oxide. This mechanism of tissue degradation, known as *ischemia-reperfusion injury,*[8] is likely the main mechanism of injury in torsion.[2] Furthermore, necrosis as a result of ischemia may impair testicular function transiently or permanently, leading to the alteration of hormone production, future infertility, and in some cases, orchiectomy.[2,6]

The retrospective analysis of 2443 boys (aged 1 month to younger than 18 years) and 152 newborns who underwent surgery for testicular torsion demonstrated that mitigation of permanent testicular damage was statistically significantly associated with the intuitive principles of health management success (ie, early presentation, correct diagnosis, and prompt treatment).[6] A 15-year retrospective analysis of testicular torsion among 104 boys in Austria demonstrated that rates of orchiectomy were directly linked to the timing of patient presentation after symptom onset.[9] The researchers used a 6-hour cutoff to define early and late presentations to the emergency department (ED) and discovered that orchiectomy rates increased from 9.1% to 56% before and after the 6-hour mark, respectively, highlighting the importance of prompt management.[9] Similarly, a review of testicular torsion management in a pediatric hospital ED in Washington, DC, reported that the most important factor affecting orchiectomy rates in referred cases was time from symptom onset to patient presentation. They made note that 76.7% of referred patients presenting in a delayed manner (24 hours after symptom onset) underwent orchiectomy as opposed to 10% of patients with acute presentation (less than 24 hours after symptom onset; $P<.01$).[10] Furthermore, secondary analysis of acute presentations revealed that 31.6% of cases in which children traveled further than 16 km resulted in orchiectomy as opposed to 14.8% of cases when travel was recorded as less than 16 km, although this difference was not significant ($P=.2$).[10]

The "golden window of opportunity" to salvage testicular function after symptom onset is suggested to be 4 to 8 hours, as not intervening within this time decreases testicular function and increases the rate of orchiectomy.[6,11] A 25-year retrospective study involving 558 children from Croatia highlighted the importance of early presentation and treatment by demonstrating that surgical treatment within 6 hours was associated with a testicular preservation rate of 90% to 100%, whereas children arriving 6 to 12 hours and 12 to 24 hours after symptoms onset had 20% to 50% and 0% to 10% preservation rates, respectively.[12] Symptom onset and time from onset to management was based on patient history, so recall bias should be considered. However, early presentation is a well documented and crucial step to increasing rates of testicular preservation.[6,11,12]

Assessment

All boys with scrotal or abdominal pain, scrotal swelling, and nausea and vomiting should be assessed for testicular torsion.[9,11] History and physical examination are sufficient to diagnose torsion in most children.[11] In 2012, Barbosa et al suggested the Testicular Workup for Ischemia and Suspected Torsion (TWIST) scoring system (**Table 1**)[13,14] as a standardized method of diagnosis that was validated in a prospective group of 338 boys younger than 18 years of age with acute scrotal pain.[13] At a TWIST score cutoff of 2 out of 7, the negative predictive value and sensitivity were 100%. With a TWIST score cutoff of 5 out of 7, the positive predictive value and specificity were 100%.[13] Intermittent testicular torsion should also be considered in boys with acute scrotum syndrome, which usually presents as recurrent acute pain with rapid spontaneous resolution.[9] A 2017 validation study of the original TWIST score revealed that score determination by non-urologists resulted in a sensitivity of 95.5%, a specificity of 97.2%, a positive predictive value of 93%, and a high negative predictive value of 97%.[14]

In a prospective study of 128 children from the United States (mean age 12.5 years), use of the TWIST score resulted in a negative predictive value of 100% for the "low-risk" (score 0) group and a positive predictive value above 93% for the "high-risk" (score ≥6) group.[14] Among 258 children aged 3 months to 18 years with testicular torsion at Boston Children's Hospital in Massachusetts, a high TWIST score of 7 was 21% sensitive and 100% specific, compared with the clinical opinion of ED physicians, which had a sensitivity of 34% and a specificity of 97%.[15]

Doppler colour ultrasound (US) can be used to supplement the TWIST score when patients are in the moderate-risk category, although it should not delay definitive management.[11] A retrospective review of boys 1 month to 17 years of age reported sensitivity, specificity, and diagnostic accuracy of US for torsion of 100%, 97.9%, and 98.1%, respectively, with no false-negative findings and a 2.6% false-positive rate when used by an individual trained in US imaging.[16] Using the TWIST score may decrease dependence on US in up to 50% of cases in low- and high-risk groups.[3,14]

Table 1. TWIST scoring system

TWIST PARAMETER	SCORE IF PRESENT
Testicular swelling	2
Hard testicle	2
High-riding testis	1
Absent cremasteric reflex	1
Nausea or vomiting	1
Total score	_/7

TWIST—Testicular Workup for Ischemia and Suspected Torsion.
Data from Barbosa et al[13] and Sheth et al.[14]

In the prospective study in Boston validating clinical scoring systems for acute scrotum syndrome, the 258 boys experiencing acute scrotum syndrome underwent urinalysis, urine culture, and testing for sexually transmitted infections, but results of those tests did not change patient management. Frohlich et al suggested avoiding these tests routinely when assessing testicular torsion.[15]

Management

Time from arrival in the ED to incision in the operating room needs to be short[10] to ensure testicular tissue can be saved.[6,11] A TWIST score of 6 or 7 is sufficient to make a clinical diagnosis of testicular torsion, and surgical consultation should be done immediately.[14,15] Patients with a TWIST score of 1 to 5 should also be advised to visit the nearest ED and Doppler US or surgical consultation is needed. Patients with a TWIST score of 0 require no follow-up.[10]

In a retrospective series from a Canadian ED between 2008 and 2011, mean time from ED arrival to Doppler US and surgery was 209.4 and 309.4 minutes, respectively; however, the mean time from symptom onset to incision in the operating room was 20.3 hours.[16] Manual detorsion should be attempted when surgery is not immediately available, followed by surgical intervention.[9,17] If successful, manual detorsion will provide the patient with relief of pain and may increase the window of opportunity for testicular salvage.[11] In a retrospective study with 162 boys, 67% of affected testicles were rotated spontaneously in a lateral to medial direction and 33% were rotated in a medial to lateral direction, meaning manual detorsion should first be attempted in a medial to lateral direction.[18] Challenges in successfully performing manual detorsion include patient discomfort, incomplete torsion, and rotating the testicle in the incorrect direction.[3,18]

Conclusion

Testicular torsion poses a serious risk to boys and may affect hormone production, testicular preservation, and fertility. Using the TWIST score may help identify boys at risk of testicular torsion and support the need for immediate referral to an ED and surgical intervention. Immediate referral to the nearest ED is important for any boy with a TWIST score higher than 0.

Competing interests
None declared

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Can Fam Physician 2021;67:669-71. DOI: 10.46747/cfp.6709669

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Child Health Update is produced by the Pediatric Research in Emergency Therapeutics (PRETx) program (**www.pretx.org**) at the BC Children's Hospital in Vancouver, BC. **Maheshver Shunmugam** is a member and **Dr Ran D. Goldman** is Director of the PRETx program. The mission of the PRETx program is to promote child health through evidence-based research in therapeutics in pediatric emergency medicine.

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