### **Research Article**

DOI: http://dx.doi.org/10.18203/2349-2902.isj20160225

# Surgical management of testicular torsion

# Ashok Suryabhanji Gajbhiye\*, Ambrish Shamkuwar, Kuntal Surana, Kishor Jivghale, Mahesh Kumar Soni

Department of Surgery, IGGMC and Hospital, Nagpur, Maharashtra, India

Received: 27 October 2015 Revised: 23 December 2015 Accepted: 09 January 2016

#### \*Correspondence:

Dr. Ashok Suryabhanji Gajbhiye, E-mail: gsashok1972@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** Testicular torsion is a correctable true surgical emergency and early diagnosis forms the basis for salvaging this catastrophe. Hence the aim of this study is to identify factors and discuss the management of torsion of testes.

**Methods:** A prospective study was carried out from 2005 to 2015 at our institute and total 60 cases diagnosed as testicular torsion were studied. The clinical features, radiological investigations and treatment measures were evaluated in details.

**Results:** Of total 60 cases of testicular torsion the mean age of presentation was 20±5.5 years. The patients presented 12 hours after onset of pain. Pain was present in all 60 (100%) patients. Left testes involved in 38 (63.33%) patients and right in 22 (36.67%) patients. With only the facilities of ultrasound it was found that it was useful in 56 (93.33%) patients. All patients were explored and only 12 (20%) patients had a successful detorsion while 48 (80%) cases underwent orchidectomy. No post-operative complications were noted.

**Conclusions:** According to our results nearly 80% cases presented late and hence testes could not be salvaged. Left testicular torsion is more common in our region and ultrasonography is a reliable diagnostic tool. Proper awareness, health education and prompt surgical intervention, forms the key to prevent removal of an organ which signifies masculinity.

Keywords: Testicular torsion, Orchidectomy

## INTRODUCTION

Testicular torsion is a twisting of the spermatic cord and its contents and this surgical emergency affects 3.8 per 100,000 males younger than 18 years annually. The term testicular torsion is a misnomer as the twisting occurs at the cord and not in the testes. It accounts for 10% to 15% of acute scrotal disease in children, and results in an orchiectomy rate of 42% in boys undergoing surgery for testicular torsion. Prompt recognition and treatment are necessary for testicular salvage, and torsion must be excluded in all patients who present with acute scrotum. Testicular torsion is a clinical diagnosis, and patients

typically present with severe acute unilateral scrotal pain, nausea, and vomiting. Physical examination may reveal a high-riding testicle with an absent cremasteric reflex. Imaging does not hold the key to delineate acute scrotum hence a heavy reliance on history and physical examination is often required. If history and physical examination suggest torsion, immediate surgical exploration is indicated and should not be postponed to perform imaging studies. There is typically a four to eight hour window before permanent ischemic damage occurs. Delay in treatment may be associated with decreased fertility, or may necessitate orchidectomy. With the above information at hand, this study was performed to

understand and evaluate the surgical management of testicular torsion.

#### **METHODS**

A prospective study was carried out at our institute from 2005 to 2015. All patients with clinical and on table diagnosis of testicular torsion were included in the study. The patients with acute scrotum and with differential like epididymo-orchitis, urinary infections, mumps orchitis, traumatic conditions etc. were excluded from the study. Apart from clinical history and physical findings only ultrasound imaging was used to confirm the diagnosis in all the patients. The diagnosis was properly conveyed to the patients. An informed written consent was taken for enrollment into the study and for removal of devascularised testes. All patients were explored as early as possible after evaluating our study parameters and anesthetic fitness. After exploration testes were noted for its axis of torsion and manually detorted for examining whether to preserve or be removed. A low inguinal orchidectomy was performed for non-salvageable testes. The opposite testes was explored after the first treatment and fixed to prevent torsion of the same as prophylaxis. Drains were kept as per need. All specimens underwent histopathological studies. Patients were discharged on post-operative day 3 and sutures removed on day 8. All post-operative complications were noted. Patients were followed up till next 6 months of the operative procedure.

#### RESULTS

A total of 60 patients were studied prospectively and surgically managed as confirmed cases of testicular torsion. The patients presented for most between 12 to 30 years age group with only one patient of 44 years age group. The mean age group came out to be 20±5.5 years. The presentation to hospital varied with literacy and socio-economic status as maximum patient presented after the golden period of salvage of the testes. No patient presented within 4 hours of testicular pain. 8 (13.33%) patients presented between 4-8 hours of onset of pain, 6 (10%) patients within 8-12 hours and rest 46 (76.67%) patients presented after 12 hours from onset of pain. All patients presented with pain that is pain was consistent finding in 100% cases. Similarly physical findings of tenderness and other signs of inflammation were present in all candidates. All patients underwent color Doppler ultrasonography and 56 (93.33%) patients showed the finding of absent vascular flow. All patients explored within 2 hours of presentation avoiding delay to enhance the salvage of the affected testes. 38 (63.33%) patients had a left testicular torsion while 22 (37.67%) patients had a right testicular torsion. Total 48 (80%) patients underwent low inguinal orchidectomy and 12 (20%) patients were detorted successfully. On exploration the alignment as of axial torsion was varied and no proper conclusion on clockwise and anticlockwise torsion was noted with correspondence to a particular site. No postoperative complications were noted and hence all were discharged on day 3. All sutures were removed on day 8. All patients were followed for 6 months post operatively.

Table 1: Age distribution of patients with testicular torsion.

Sr. no.	Age group (years)	No. of patients
1	1-10	0
2	11-20	34
3	21-30	17
4	31-40	8
5	41-50	1
6	>50	0

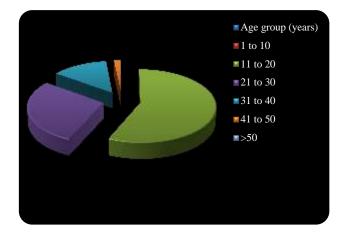


Figure 1: Age distribution of patients with testicular torsion.

Table 2: Patient presentation after onset of pain.

Sr. no.	Time of onset (hours)	No. of patients
1	<4	0
2	4-8	8
3	8-12	6
4	>12	46

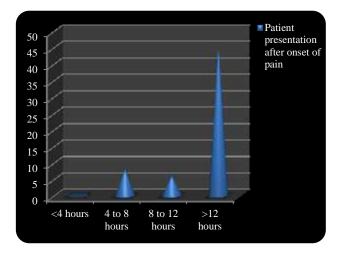


Figure 2: Patient presentation after onset of pain.

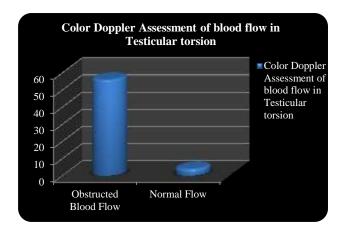


Figure 3: Results from Doppler study.

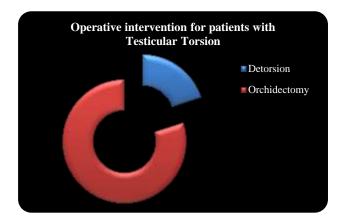


Figure 4: Surgical management for patients with testicular torsion.



Figure 5: Intra-operative photograph in a case of testicular torsion showing gangrenous testis.

#### DISCUSSION

A bimodal age peak in incidence of testicular torsion [TT] is seen, beginning in the neonatal period and early adolescence. Most boys who present with an acute scrotum (approximately 50%) will have torsion of the appendix testis. However, around 13-20% will have

testicular torsion, with epididymo-orchitis the most common of the other contributing conditions. Other conditions to consider in the differential diagnosis range from mumps orchitis, hematoma, renal colic, appendicitis and strangulated inguinal hernias and, rarities like the scrotal manifestations of Henoch-Schonlein purpura and communicating hematocoeles following abdominal trauma. 6,7

Testicular torsion can occur in several different ways, and can be classified as intravaginal, extravaginal or mesorchial. A slight preponderance in left-sided TT has been noted in some series, although the mechanism for this is unclear.<sup>8-11</sup> Intravaginal torsion most often occurs due to a congenital malformation of the processus vaginalis as the testis descends into the scrotal sac. This type of torsion accounts for the majority of testicular torsions, and is most often seen in pubertal boys, where rapid growth and increased vasculature may be a precursor. Under normal circumstances, the tunica vaginalis does not fully extend around the testicle, and attaches to the posterolateral scrotal wall allowing the testis to remain suspended in an upright vertical position. However, in up to 12% of boys, the tunica vaginalis completely envelopes the testis and epididymis, resulting in a "bell-clapper" testicle that is more horizontally oriented, with greater ability to freely rotate around an axis.12

Extravaginal torsion, which is rare, occurs during the perinatal period and is due to a different mechanism. It occurs during descent of the testes into the scrotum before scrotal investment of the tunica vaginalis has taken place, where complete adhesion to the surrounding tissues is usually completed by six weeks age. Twisting of the processus vaginalis with its contents results in necrosis and absence of blood flow within the testis, epididymis and cord. If torsion has occurred in the prenatal period, the clinical presentation is a neonate with unilateral or bilateral blue non-tender hard masses in the scrotum. However, if it occurs in the postnatal period; the presentation is more classic with acute inflammation and erythema in a previously normal neonatal scrotum, requiring exploration and fixation.

Mesorchial torsion is exceedingly rare and has an atypical presentation. It occurs due to anomalies in the mesothelium that covers the anterior half of the testis and suspends it from the vasculature and epididymis. When the attachment is narrow, mesorchial torsion can occur when there is a twist in the tissue overlying the vasculature (anteriorly) between the epididymis and parietal tunica vaginalis. In the majority of cases, rotation of the testes initially compromises venous return. However, as time progresses and edema ensues, arterial flow is reduced or occluded. Whilst the majority of TT occurs in a medial direction, several studies have shown torsion in a lateral direction in up to 29-33% of cases. 9,16

The degree of testicular rotation varies according to the literature. One retrospective study of 200 pediatric boys with testicular torsion showed a higher degree of rotation in non-salvageable (managed with orchidectomy) versus salvageable testes (median of 540 vs. 360 degrees). However, the authors also noted that testicular infarction can occur with rotation as mild as 180 degrees.

A careful history is vital in the assessment of the acute scrotum. The classical presentation for TT is sudden onset severe unilateral pain. The pain, being ischemic in nature, typically requires opiate analgesia. Persistent pain after opiate analgesia should arouse suspicion of TT. The pain may be accompanied by a history of previous bouts of intermittent testicular pain, which likely represents episodes of torsion and detorsion.<sup>7</sup>

Duration of symptoms before presentation can vary significantly, ranging from several hours to several days. However, patients with TT tend to have a shorter duration of symptoms before presentation.<sup>1,18</sup> Early presentation in TT is associated with higher likelihood of salvage. The presence of nausea and vomiting, caused by reflex stimulation of the coeliac ganglion, can be a useful clue in diagnosing TT, but incidence varies significantly in the literature. Some series report nausea and vomiting in 57-69% of patients with TT, with positive predictive values for nausea and vomiting as high as 96% and 98%, respectively, compared with 8% and 4% in appendix of testes and none in epididymo-orchitis.<sup>9,10</sup> Other series have shown that nausea and vomiting do occur in torsion of the testicular appendix and epididymo-orchitis, but the complaint is much rarer. 1,18 Dysuria is an uncommon complaint in testicular torsion, and its presence likely indicates an alternate diagnosis such as epididymoorchitis.<sup>19</sup> A history of trauma should not discount the possibility of TT. Although the large majority of cases of TT are unprovoked, 4-10% of cases have been reported to occur in the setting of trauma. 4,9,20

In a normal scrotum, the testis is mobile, and the cord and epididymis is palpable posterior to the testis. In TT, the affected testis is usually riding high. The globe of the testis is very tender, and venous distension and transudate often result in a larger testis compared to the contralateral and unaffected testis. Focal areas of tenderness in the superior testis or caput epididymis may indicate a torted testicular appendix or epididymitis. However, anatomical landmarks may be obliterated as edema and erythema increase in later stages of torsion.<sup>8</sup>

Assessment of the cremasteric reflex is important, and its absence is generally considered as one of the more reliable physical signs of the presence of TT. The reflex is elicited by stroking or pinching the medial thigh. Contraction of the cremasteric muscle results in elevation of the testis, and the sign is considered positive if there is movement of less than 0.5 cm on the affected side with a movement greater than 0.5 cm on the unaffected side. One series of 245 boys presenting with acute scrotal

swelling reported absence of the cremasteric reflex in 100% patients with torsion. Similarly, in a large retrospective study of over 1200 cases over an 18 year period, 94% of boys with TT had an absent cremasteric reflex. Whilst the sign can be observer dependent and published reports have demonstrated an intact cremasteric reflex in cases of TT, its absence should raise significant clinical suspicion of the diagnosis. 4,22,23

The epididymis may be located medially, laterally or anteriorly, depending on the degree of torsion, but may appear normally located if there is 360 degree torsion, or may be difficult to palpate in a significantly edematous scrotum. A reactive hydrocele may be present, as well as scrotal edema. A well performed clinical examination may not reliably exclude TT as a differential diagnosis and avoid scrotal exploration, but should raise significant concern where TT is likely and expedite management. Several studies have demonstrated that the most reliable physical signs of TT include (a) a high-riding testis, (b) absent cremasteric reflex, and (c) an anteriorly rotated epididymis or abnormally oriented testis. 18,19,24

High-resolution ultrasound (HRUS) with color-flow Doppler ultrasonography (CDS) and radionuclide imaging can provide information about blood flow to the testes. 25 Absent arterial flow within the suspect testis on CDS is indicative of testicular torsion. However, the availability of ultrasound in the emergency setting will vary between institutions, and the results will be dependent on the skill and experience of the radiographer or radiologist. Many studies advocate CDS as a useful tool in excluding torsion and confirming other testicular pathology. However, the accuracy of CDS in diagnosing TT can vary significantly in the literature. 10

A recent retrospective study of 298 patients who underwent CDS followed by surgery regardless of the result, CDS was shown to have a sensitivity and specificity for TT of 96.8% and 97.9%, respectively.<sup>4</sup> Positive and negative predictive values were 92.1% and 99.1%, respectively. Other studies have also shown similarly high sensitivity (95.7-100%) and specificity (85.3-100%) for CDS in diagnosing testicular torsion. <sup>26-2</sup> However, CDS can be inaccurate and false-negatives can occur, especially in cases of early TT, intermittent torsion or incomplete torsion of the spermatic cord. Several studies have demonstrated arterial flow in affected testes, which were subsequently shown to be torted at surgery.<sup>29,30</sup> Thus delaying or avoiding surgery in a patient with torsion and a false negative US can result in a missed diagnosis of TT, hence many treating clinicians prioritize a strong clinical suspicion over radiological findings in the decision of whether or not to perform scrotal exploration.

HRUS can be used to directly visualize the spermatic cord along its entire length (beginning at the inguinal canal to postero-superior border of testis) and assess for any degree of twisting. In a retrospective study of 44

patients with surgically confirmed testicular torsion, CDS detected absent blood flow in only 31 patients (70% sensitivity), but HRUS detected twisting of the spermatic cord in all 44 cases.<sup>31</sup> The authors described the appearance as a snail shell-shaped mass, separated from the testis, and characterized by an abrupt change in course, size, shape and echotexture below the point of torsion. In a larger multicenter study of 919 patients with an acute scrotum, HRUS was used to detect spermatic cord torsion in 199 of 208 patients with surgically proven testicular torsion (96% sensitivity), compared with 158 confirmed on CDS (sensitivity 76%). 32 Whilst HRUS revealed a linear cord in the remaining 711 patients (99% specificity), the authors did show that increasing reliability correlated with the degree of experience by the radiologist, and that visualization of a spermatic cord twist is difficult in very high or inguinal testes.<sup>11</sup>

TT is a true surgical and time-critical emergency. In patients with testicular pain that is highly suspicious of TT on clinical grounds, urgent exploration should be undertaken with minimal delay, although a risk of "overtreatment" must be accepted. Some series have reported surgical exploration for suspected TT to be unnecessary in up to 28% of cases, but in 15% TT was found to be the cause of acute scrotal pain where the diagnosis was suspected to be torsion of the appendix testis. 33

Scrotal exploration within six hours of presentation is associated with a significantly higher rate of organ salvage. A large retrospective study showed median time between pain onset and presentation to 5 hours for cases managed with orchidopexy (organ salvage and fixation) compared to 2.2 days for those managed with orchidectomy. After 12 hours of pain, the salvage rate appears to reduce dramatically, but the reported salvage rate varies in the literature. One study of 83 boys with surgically confirmed torsion demonstrated no salvageable testes after 12 hours of pain. Other studies have demonstrated a rate of organ loss of 64%-90%. 1,34,35

Manual detorsion can lessen the severity of testicular torsion, if tolerated by the patient. The classical description is that detorsion should be performed with medial-to-lateral rotation of the testicle, likened to the action of "opening a book." If successful, relief from pain is often immediate. As approximately one-third of torsions can be in a lateral direction, manual detorsion in a medial direction can be performed if the first attempt is unsuccessful. However, relief of symptoms from manual detorsion can be misleading, as a degree of torsion may still be present. Residual torsion has been shown to be present in 27-32% of patients in who manual detorsion was attempted prior to surgery. Thus manual detorsion can decrease the degree of ischemia, but is not a substitute for exploration and orchidopexy.

Testicular atrophy, as evidenced by reduced volume in the affected testis compared to the contralateral testis, has been shown to occur in up to 12% of patients, with increased risk if surgery is delayed for more than six hours after onset of symptoms. However, parents and patients should be aware of the risk of testicular atrophy despite earlier presentation, as it can still occur in patients presenting within five hours. Here

Our present study is in compliance with the above mentioned excerpts. In the population residing in this locality left testicular torsion is common and a low socioeconomic status abides them from attending the casualty within the golden period. Improved study protocol is still needed to improve the rate of testicular salvage and also study other factors associated with testicular torsion.

#### **CONCLUSION**

According to our results nearly 80% cases presented late and hence testes could not be salvaged. The golden period still lies between 4-8 hours of presentation. Left testicular torsion is more common in our region and ultrasonography is a reliable diagnostic tool. Diagnosis is more clinically oriented rather than radiological methods. Proper awareness, health education, improving literacy with economy and prompt surgical intervention, forms the key to prevent removal of an organ which signifies masculinity.

Funding: No funding sources Conflict of interest: None declared Ethical approval: The study was approved by the

Etnical approval: The study was approved by the

institutional ethics committee

#### REFERENCES

- 1. Mushtaq I, Fung M, Glasson MJ. Retrospective review of pediatric patients with acute scrotum. ANZ Journal of Surgery. 2003;73:55-8.
- 2. Selbst SM, Friedman MJ, Singh SB. Epidemiology and etiology of malpractice lawsuits involving children in US emergency departments and urgent care centers. Pediatric Emergency Care. 2005;21:165-9.
- 3. Van Glabeke E, Khairouni A, Larroquet M, Audry G, Gruner M. Acute scrotal pain in children: results of 543 surgical explorations. Pediatric Surgery International. 1999;15:353-7.
- Waldert M, Klatte T, Schmidbauer J, Remzi M, Lackner J, Marberger M. Color Doppler sonography reliably identifies testicular torsion in boys. Urology. 2010;75:1170-4.
- 5. Boettcher M, Bergholz R, Krebs TF. Differentiation of epididymitis and appendix testis torsion by clinical and ultrasound signs in children. Urology. 2013;82:899-904.
- 6. Celik A, Ergun O, Ozcan C, Ozok G. Acute communicating hematocoele: unusual presentation after blunt abdominal trauma without solid organ injury. European Journal of Emergency Medicine. 2003;10:342-3.

- 7. Soreide K. Surgical management of nonrenal genitourinary manifestations in children with Henoch-Schonlein purpura. Journal of Pediatric Surgery. 2005;40:1243-7.
- 8. Watkin NA, Reiger NA, Moisey CU. Is the conservative management of the acute scrotum justified on clinical grounds? British Journal of Urology. 1996;78:623-7.
- 9. Sessions AE, Rabinowitz R, Hulbert WC, Goldstein MM, Mevorach RA. Testicular torsion: direction, degree, duration and disinformation. Journal of Urology. 2003;169:663-5.
- 10. Jefferson RH, Perez LM, Joseph DB. Critical analysis of the clinical presentation of acute scrotum: a 9-year experience at a single institution. Journal of Urology. 1997;158:1198-200.
- 11. Williamson RC. Torsion of the testis and allied conditions. British Journal of Surgery. 1976;63:465-76.
- 12. Caesar RE, Kaplan GW. Incidence of the bell-clapper deformity in an autopsy series. Urology. 1994;44:114-6.
- 13. Gatti JM, Murphy PJ. Current management of the acute scrotum. Seminars in Pediatric Surgery. 2007;16:58-63.
- Hawtrey CE. Assessment of acute scrotal symptoms and findings. A clinician's dilemma. Urologic Clinics of North America. 2005;25:715-23.
- 15. Chan JL, Knoll JM, Depowski PL, Williams RA, Schober JM. Mesorchial testicular torsion: case report and a review of the literature. Urology. 2009;73:83-6.
- 16. Ransler CW, 3rd, Allen TD. Torsion of the spermatic cord. Urologic Clinics of North America. 1982;9:245-50.
- 17. Sakurai H, Ogawa H, Higaki Y, Yoshida H, Imamura K. Torsion of appendix of testis and epididymis: a report of 4 cases. Hinyokika Kiyo Acta Urologica Japonica. 1983;29:1657-68.
- 18. Yang C, Song B, Liu X, Wei G-h, Lin T, He D-w. Acute scrotum in children: an 18-year retrospective study. Pediatric Emergency Care. 2011;27:270-4.
- Ciftci AO, Senocak ME, Tanyel FC, Buyukpamukcu N. Clinical predictors for differential diagnosis of acute scrotum. European Journal of Pediatric Surgery. 2004;14:333-8.
- Seng YJ, Moissinac K. Trauma induced testicular torsion: a reminder for the unwary. Journal of Accident & Emergency Medicine. 2000;17:381-
- 21. Rabinowitz R. The importance of the cremasteric reflex in acute scrotal swelling in children. Journal of Urology. 1984;132:89-90.
- 22. Hughes ME, Currier SJ, Della-Giustina D. Normal cremasteric reflex in a case of testicular

- torsion. American Journal of Emergency Medicine. 2001;19:241-2.
- 23. Nelson CP, Williams JF, Bloom DA. The cremasteric reflex: a useful but imperfect sign in testicular torsion. Journal of Pediatric Surgery. 2003;38:1248-9.
- 24. Boettcher M, Krebs T, Bergholz R, Wenke K, Aronson D, Reinshagen K. Clinical and sonographic features predict testicular torsion in children: a prospective study. BJU International. 2013;112:1201-6.
- Wright S, Hoffmann B. Emergency ultrasound of acute scrotal pain. Eur J Emerg Med. 2014;6:6.
- 26. Pepe P, Panella P, Pennisi M, Aragona F. Does color Doppler sonography improve the clinical assessment of patients with acute scrotum? European Journal of Radiology. 2006;60:120-4.
- 27. Gunther P, Schenk JP, Wunsch R. Acute testicular torsion in children: the role of sonography in the diagnostic workup. European Radiology. 2006;16:2527-32.
- 28. Lam WW-C, Yap T-L, Jacobsen AS, Teo HJE-L. Color Doppler ultrasonography replacing surgical exploration for acute scrotum: myth or reality? Pediatric Radiology. 2005;35:597-600.
- 29. Arce JD, Cortes M, Vargas JC. Sonographic diagnosis of acute spermatic cord torsion. Rotation of the cord: a key to the diagnosis. Pediatric Radiology. 2002;32:485-91.
- 30. Baud C, Veyrac C, Couture A, Ferran JL. Spiral twist of the spermatic cord: a reliable sign of testicular torsion. Pediatric Radiology. 1998;28:950-4.
- 31. Kalfa N, Veyrac C, Baud C, Couture A, Averous M, Galifer RB. Ultrasonography of the spermatic cord in children with testicular torsion: impact on the surgical strategy. Journal of Urology. 2004;172:1692-5.
- 32. Kalfa N, Veyrac C, Lopez M. Multicenter assessment of ultrasound of the spermatic cord in children with acute scrotum. Journal of Urology. 2007;177:297-301.
- 33. Soccorso G, Ninan GK, Rajimwale A, Nour S. Acute scrotum: is scrotal exploration the best management? European Journal of Pediatric Surgery. 2010;20:312-5.
- 34. Dunne PJ, O'Loughlin BS. Testicular torsion: time is the enemy. Australian & New Zealand Journal of Surgery. 2000;70:441-2.
- 35. Davenport M. ABC of general surgery in children. Acute problems of the scrotum. BMJ. 1996;312:435-7.

Cite this article as: Gajbhiye AS, Shamkuwar A, Surana K, Jivghale K, Soni MK. Surgical management of testicular torsion. Int Surg J 2016;3:195-200.