Section: General Surgery

Original Research Article

ETIOPATHOGENESIS AND CLINICAL OUTCOME OF ACUTE SCROTAL SWELLINGS

K. Thenmozhi[1], S. Veeranan[2], N. Gautham[3], P. Prabu[4]

[1]Assistant Professor, Department of General Surgery, Coimbatore Medical College Hospital, Coimbatore, Tamil Nadu, India.
[2]Assistant Professor, Department of General Surgery, Coimbatore Medical College Hospital, Coimbatore, Tamil Nadu, India.
[3]Assistant Professor, Department of General Surgery, Coimbatore medical College Hospital, Tamil Nadu, India.
[4]Assistant Professor, Department of General Surgery, Govt. Tirupur medical College hospital, Tirupur, Tamil Nadu, India.

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Corresponding Author:
Dr. P. Prabu,
Email: prabhucmc@gmail.com

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ABSTRACT

Background: Acute scrotal swellings are a urological emergency often presenting with sudden onset pain and swelling. Prompt diagnosis is essential, as delays in intervention—particularly in cases of testicular torsion—can lead to irreversible testicular damage. Due to overlapping clinical features among various etiologies, differentiation between surgical and non-surgical causes remains a diagnostic challenge. **Aim:** To evaluate the etiopathogenesis, clinical presentation, and treatment outcomes in patients presenting with acute scrotal swellings. **Materials and Methods:** This analytical study was conducted over a one-year period at the General Surgery Department of Coimbatore Medical College Hospital, Tamil Nadu, India. A total of 50 patients admitted with acute scrotal swellings were prospectively evaluated using a structured proforma. Inclusion criteria encompassed all acute scrotal swellings, while patients with painless swellings, chronic pain, or hydrocele were excluded. Clinical assessment included detailed history, physical examination, and relevant investigations such as laboratory tests and Doppler ultrasonography. Management was categorized as conservative or surgical based on the diagnosis. Postoperative complications, morbidity, and mortality were recorded during hospital stay and follow-up. **Results:** Epididimo-orchitis was the most common cause of acute scrotum (60%), followed by torsion testis (26%) and trauma (14%). Epididimo-orchitis affected a wide age range, with highest incidence in the 31–40 years group. Torsion testis predominantly affected patients under 18 years. Scrotal pain was present in 100% of cases. Fever and dysuria were more common in epididimo-orchitis, while nausea and absent cremasteric reflex were characteristic of torsion. All epididimo-orchitis cases were managed conservatively. Surgical intervention was required in all torsion and trauma cases, with 46% of torsion patients undergoing orchidectomy. Notably, 100% of torsion cases presenting within 12 hours were salvaged via orchidopexy, compared to only 25% in those presenting after 12 hours. **Conclusion:** Clinical evaluation remains the cornerstone in diagnosing acute scrotal swellings. Testicular torsion should be strongly suspected in patients with acute unilateral scrotal pain and absent cremasteric reflex. Early surgical exploration is critical to optimize testicular salvage rates. Epididimo-orchitis remains the most common etiology, particularly in males above 12 years, and typically responds well to conservative management.

INTRODUCTION

Acute scrotal swellings are a commonly encountered clinical scenario in both pediatric and adult populations, often requiring urgent attention due to the possibility of serious underlying pathology. These conditions are characterized by the sudden onset of scrotal pain, swelling, and tenderness, which may or may not be accompanied by systemic symptoms such as fever, nausea, or vomiting. Despite their frequent occurrence, the accurate and timely diagnosis of acute scrotal conditions continues to pose a significant challenge for clinicians, particularly in emergency settings, where delayed or incorrect diagnosis can lead to devastating consequences, including testicular infarction and subsequent

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loss.[1,2] The term "acute scrotum" is broadly defined as an acute onset of pain and/or swelling in the scrotum that necessitates emergency surgical exploration or targeted medical intervention.[3] While several conditions can lead to acute scrotal symptoms, testicular torsion remains the most critical and time-sensitive among them. It is a true surgical emergency, wherein the spermatic cord twists, leading to compromised blood supply to the testis. If left untreated, irreversible ischemic damage can occur within six hours, making early diagnosis and prompt surgical management essential to salvage the affected testis.[4,5]

The clinical presentation of testicular torsion is often nonspecific, with symptoms that overlap with several other scrotal conditions, including torsion of the appendix testis, epididymo-orchitis, testicular trauma, hematocele, and strangulated inguinal hernia. This symptomatic overlap increases the risk of misdiagnosis or delayed diagnosis, especially in younger patients where communication barriers and atypical presentation further complicate clinical judgment.[6,7] Among these, torsion of the appendix testis is more frequently observed in prepubertal boys and may mimic torsion of the testis, but typically presents with less severe pain and localized tenderness at the upper pole of the testis. Conversely, epididymo-orchitis, often seen in adolescents and adults, is usually associated with urinary tract infections or sexually transmitted infections and presents with gradually progressive scrotal pain, fever, and dysuria. Scrotal trauma, whether blunt or penetrating, may present with swelling and ecchymosis, and can be complicated by hematocele or testicular rupture. Strangulated inguinal hernias, though primarily abdominal, may descend into the scrotum, presenting with pain and swelling that mimic other scrotal emergencies.[6]

Given the potential for irreversible testicular damage, many urologists and pediatric surgeons advocate for early scrotal exploration in all suspected cases of torsion, particularly when the diagnosis is uncertain.[1,8] While unnecessary explorations may lead to increased healthcare costs and patient anxiety, the consequences of missed torsion far outweigh these concerns. Studies have shown that the window for effective testicular salvage is narrow—ideally within six hours of symptom onset, with success rates significantly decreasing thereafter.[4,5] Despite this, several patients still present beyond this critical period due to lack of awareness, delayed referrals, or misinterpretation of symptoms by non-specialist clinicians. To aid in early diagnosis and reduce unnecessary surgical exploration, various clinical scoring systems and imaging modalities have been introduced. Among these, the TWIST score (Testicular Workup for Ischemia and Suspected Torsion), which incorporates factors like testicular swelling, hard consistency, absent cremasteric reflex, nausea/vomiting, and high-riding testis, has been validated as a reliable tool for triaging patients with acute scrotum.[9-11]

Doppler ultrasonography, particularly color Doppler, is a non-invasive and widely used imaging technique that helps evaluate testicular blood flow. In cases of torsion, reduced or absent flow is a diagnostic hallmark, whereas increased vascularity suggests epididymitis or orchitis.[9] However, reliance on imaging alone is not without pitfalls—operator dependency, limited availability during off-hours, and overlapping features in equivocal cases may compromise diagnostic accuracy. Therefore, clinical judgment remains paramount, and in cases of high suspicion, surgical exploration should not be delayed for imaging.[10,12] Recent literature also highlights the need for increased awareness and education among primary healthcare providers and caregivers, particularly in rural and under-resourced settings, where delays in seeking medical care are more common. Educational programs and public health initiatives focused on the recognition of acute scrotal pain and the importance of early intervention can substantially improve outcomes and reduce the incidence of avoidable testicular loss.

Furthermore, acute scrotal swellings have significant psychosocial implications, especially in adolescents and young adults, where testicular loss can impact future fertility and body image. This further underlines the importance of timely diagnosis, individualized patient care, and long-term follow-up for those who undergo orchiectomy. In pediatric patients, concurrent contralateral orchidopexy is routinely recommended during surgical intervention for torsion to prevent future torsion on the unaffected side, given the bilateral anatomical predisposition commonly found in conditions like the bell clapper deformity.[4] As testicular salvage is time-sensitive, institutional protocols must prioritize rapid triage, specialist consultation, and emergency operative facilities to manage these cases efficiently. Several studies from both high-income and low-resource countries have documented that integrated protocols and multidisciplinary approaches significantly improve testicular salvage rates and reduce complication rates.[2,6,7]

MATERIALS AND METHODS

This analytical study was conducted over a period of one year in the General Surgery Department of Coimbatore Medical College Hospital, Tamil Nadu, India, with the objective of evaluating the etiopathogenesis, clinical presentation, and treatment outcomes in patients presenting with acute scrotal swellings. All patients admitted to the general surgical wards with acute scrotal swellings during the study period were considered for inclusion. A total of 50 patients meeting the eligibility criteria and diagnosed with acute scrotal swellings were enrolled in the study.

Selection Criteria

Inclusion Criteria: All patients admitted with acute scrotal swellings during the study period.

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Exclusion Criteria: Patients presenting with painless scrotal swellings, chronic scrotal pain, and primary or secondary hydroceles were excluded from the study.

Methodology

Data for this study were collected prospectively using a pre-designed proforma that captured comprehensive clinical and investigative details of each patient. Information recorded included history and clinical features such as the onset and duration of symptoms, pain characteristics, presence of fever, urinary symptoms, and relevant past medical history. A thorough physical examination was conducted, incorporating inspection, palpation, and transillumination findings. Investigations included laboratory tests like complete blood count, urine analysis, and relevant biochemical markers. Imaging studies, primarily scrotal ultrasonography with Doppler, were performed to evaluate vascularity and detect structural abnormalities. Additional diagnostic tools such as fine needle aspiration cytology (FNAC) or surgical exploration were used when required. Management modalities were categorized as either conservative—comprising bed rest, scrotal elevation, antibiotics, and analgesics—or surgical, where operative interventions were undertaken for conditions such as torsion or scrotal abscess. Operative findings were meticulously documented. The postoperative course was assessed in terms of complications, duration of hospital stay, and overall recovery. All morbidity and mortality outcomes were recorded during the hospital stay and follow-up period. The Departments of Radiology, Pathology, and Biochemistry provided diagnostic support throughout the study. Ethical clearance was obtained from the Institutional Ethics Committee, and informed written consent was secured from all participants prior to inclusion.

RESULTS

Table 1: Distribution of Causes of Acute Scrotum

Among the 50 patients evaluated for acute scrotal swellings, the most common diagnosis was epididimo-orchitis, accounting for 60% (n=30) of cases. Torsion of the testis was identified in 26% (n=13) of patients, while traumatic causes accounted for 14% (n=7). This distribution highlights that infective-inflammatory conditions such as epididimo-orchitis are the leading cause of acute scrotal presentations in this study population, followed by surgical emergencies like torsion and physical trauma.

Table 2: Age Distribution – Epididimo-Orchitis

Patients with epididimo-orchitis were fairly evenly distributed across age groups. The 31–40 years age group had the highest number of cases (n=9), followed closely by the <18 and 18–30 years groups (each with n=8), and >40 years (n=5). This suggests that epididimo-orchitis can affect a broad age range, though it appears slightly more prevalent among young to middle-aged adults.

Table 3: Age Distribution – Torsion Testis

Testicular torsion predominantly affected younger individuals, with 9 out of 13 cases (69%) occurring in the <18 years age group, and the remaining 4 cases (31%) in those >18 years. This finding is consistent with the known epidemiology of testicular torsion, which is more common during adolescence due to anatomical and developmental changes.

Table 4: Distribution of Symptoms & Signs According to Causes

Scrotal pain was a universal symptom across all three etiologies, reported in 100% of patients. The average duration of symptoms varied, with the longest in epididimo-orchitis (28.9 hours), followed by torsion (16.7 hours), and the shortest in trauma cases (13.4 hours), reflecting the acute and often sudden onset nature of the latter two. Fever was more frequently observed in epididimo-orchitis (33.33%) compared to torsion (15%) and trauma (14%), supporting the infectious-inflammatory basis of the condition. Dysuria was reported exclusively in epididimo-orchitis (10%), correlating with urinary tract involvement. Nausea and vomiting, symptoms associated with visceral pain, were seen in 30% of torsion cases but absent in others. Swelling was most prevalent in epididimo-orchitis (70%), while tenderness was universal in trauma cases (100%) and more common in epididimo-orchitis (83%) than torsion (30%). A hallmark finding of absent cremasteric reflex, which aids in diagnosing torsion, was observed in 100% of torsion patients and absent in other etiologies.

Table 5: Management According to Causes

All patients with epididimo-orchitis were managed conservatively (100%), indicating favorable outcomes with medical therapy. In contrast, torsion testis required surgical intervention in all cases—54% underwent orchidopexy (testis-sparing surgery), while 46% required orchidectomy due to delayed presentation and irreversible testicular damage. For traumatic scrotal swellings, 28% underwent orchidopexy and 72% required orchidectomy, suggesting significant testicular injury in the majority.

Table 6: Management of Torsion Testis According to Duration of Symptom

The outcome of surgical management in torsion testis was significantly influenced by the duration of symptoms. All patients (n=5) who presented within 12 hours underwent orchidopexy with 100% testicular salvage. In contrast, of the 8 patients presenting after 12 hours, only 2 (25%) could be managed with orchidopexy, while 6 (75%) required orchidectomy due to non-viable testis. This underlines the critical importance of early diagnosis and intervention in testicular torsion to prevent loss of the organ.

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Table 1: Distribution of Causes of Acute Scrotum

Diagnosis	No. of Cases	Percentage
Epididimo-Orchitis	30	60%
Torsion Testis	13	26%
Trauma	7	14%

Table 2: Age Distribution – Epididimo-Orchitis

Age Group	No. of Cases
<18	8
18–30	8
31–40	9
>40	5

Table 3: Age Distribution – Torsion Testis

Age Group	No. of Patients
<18	9
>18	4

Table 4: Distribution of Symptoms & Signs According to Causes

Symptoms	Epididimo-Orchitis	Torsion Testis	Trauma
Scrotal Pain	30 (100%)	13 (100%)	7 (100%)
Average Duration	28.9 hours	16.7 hours	13.4 hours
Fever	10 (33.33%)	2 (15%)	1 (14%)
Dysuria	3 (10%)	-	-
Nausea & Vomiting	-	4 (30%)	-
Swelling	21 (70%)	5 (38%)	4 (57%)
Tenderness	25 (83%)	4 (30%)	7 (100%)
Absent Cremasteric Reflex	-	13 (100%)	-

Table 5: Management According to Causes

Treatment	Epididimo-Orchitis	Torsion Testis	Trauma
Conservative	30 (100%)	-	-
Orchidopexy	-	7 (54%)	2 (28%)
Orchidectomy	-	5 (46%)	5 (72%)

Table 6: Management of Torsion Testis According to Duration of Symptom

Duration	Orchidopexy	Orchidectomy
<12 hours	5 (100%)	0
>12 hours	2 (25%)	6 (75%)

Figure 1

Figure 2

Figure 3

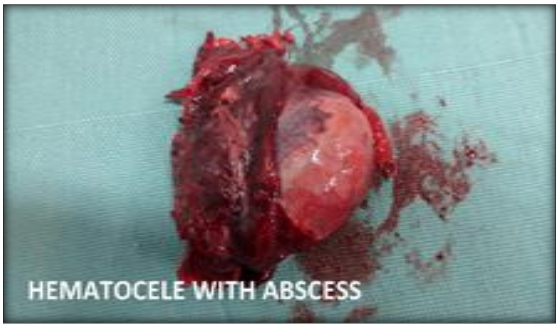

Figure 4

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Figure 5

Figure 6

DISCUSSION

The present study demonstrated that epididimo-orchitis was the most prevalent cause of acute scrotal swellings, accounting for 60% of cases, followed by torsion of the testis at 26% and trauma at 14%. This pattern aligns with earlier findings by Mestrovic et al. (2013), who emphasized that inflammatory conditions such as epididymo-orchitis often dominate in adult populations, in contrast to children where torsion is more common. The predominance of epididymo-orchitis in our cohort might be attributed to the sexually active age group, poor genital hygiene, or underlying urinary tract infections, consistent with known etiological patterns.[13]

Analysis of age distribution showed that epididymo-orchitis affected a wide range of age groups, whereas testicular torsion predominantly occurred in individuals under 18 years of age. This is consistent with the epidemiological profile described by Goetz et al. (2019), who reported a higher incidence of testicular torsion in prepubertal and adolescent males due to anatomical predispositions like the bell clapper deformity. These findings highlight the importance of age-based clinical suspicion, as torsion in younger patients requires immediate surgical intervention to salvage the testis.[14] The comparison of clinical symptoms among the different etiologies revealed that scrotal pain was universal across all groups, whereas features like fever and dysuria were more associated with epididymo-orchitis, and nausea and vomiting with torsion, which corresponds with systemic sympathetic responses. The absence of the cremasteric reflex, a highly specific sign for torsion, was noted in all torsion cases and none of the others, reinforcing observations made by Kumar et al. (2020) and MacDonald et al. (2018), who reported it as a crucial diagnostic clue. Moreover, the duration of symptoms played a vital role in differentiating causes—epididymo-orchitis had the longest average symptom duration, which is typical of infective causes, while trauma and torsion presented more acutely.[15,16]

Management outcomes further underlined the diagnostic distinctions. All epididymo-orchitis cases responded to conservative treatment, affirming the findings of Mestrovic et al. (2013) that inflammatory causes rarely necessitate surgical intervention. Conversely, torsion testis and severe trauma frequently required surgical management.[13] Among torsion cases, 54% underwent orchidopexy, while 46% required orchidectomy. These outcomes are comparable to those reported by MacDonald et al. (2018) and Nason et al. (2013), who found salvage rates ranging from 26–87%, influenced primarily by the time to intervention.[16,17]

Time-dependent surgical outcomes in testicular torsion were striking. All patients presenting within 12 hours underwent successful orchidopexy, while those presenting after 12 hours had a significantly higher rate of orchidectomy (75%). This sharply declining salvage rate echoes the findings of Friedman et al. (2019) and Ubee et al. (2014), who highlighted the critical importance of prompt diagnosis and intervention in testicular torsion.[18,19] Our data, showing a 100% salvage rate within 12 hours and only 25% beyond that window, mirrors earlier reports by Mushtaq et al., where the salvage rate dropped markedly with delayed presentation. This reinforces the need for community and parental education regarding early recognition of scrotal pain symptoms.[20]

CONCLUSION

When diagnosing boys with acute scrotum, the history and physical examination are still the most important factors. When a patient presents with unilateral acute scrotal discomfort, primary care providers need to be very suspicious. Testicular torsion is strongly suggested when there is no cremasteric reflex in conjunction with testicular discomfort. According to the current study, the most frequent cause in males older than 12 is epididymo orchitis.

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REFERENCES

1. Murphy F, Fletcher L, Pease P. Early scrotal exploration in all cases is the investigation and intervention of choice in all cases of acute pediatric scrotum. Pediatr Surg Int. 2006; 2:413–6.
2. Dajusta D, Granberg CF, Villanueva C, Baker LA. Contemporary review of testicular torsion: new concepts, emerging technologies and potential therapeutics. J Pediatr Urol. 2013; 9:723–30.
3. Ombredanne L. Torsion testiculaire. In: Ombrédanne L, editor. Précis Clinique et opératoire de chirurgie infantile. Paris: Livraria Masson et Cie Ed; 1927.
4. Lyon RP. Torsion of the testicle in childhood: a painless emergency requiring contralateral orchiopexy. JAMA. 1961; 178:702–5.
5. Molokwu CN, Somani BK, Goodman CM. Outcomes of scrotal exploration for acute scrotal pain suspicious of testicular torsion: a consecutive series of 173 patients. BJU Int. 2011; 107:990–3.
6. Pogorelic Z, Mustapic K, Jukic M, Todoric J, Mrklic I, Mestrovic J, et al. Management of acute scrotum in children: a 25-year single center experience on 558 pediatric cases. Can J Urol. 2016; 23:8594–601.
7. Bowlin PR, Gatti JM, Murphy JP. Pediatric testicular torsion. Surg Clin North Am. 2017; 97:161–72.
8. Kadish HS, Bolte RG. A retrospective review of pediatric patients with epididymitis, testicular torsion and torsion of testicular appendages. Pediatrics. 1998; 102:73–6.
9. Lemini R, Guana R, Tommasoni N, Mussa A, Di Rosa G, Schleef J. Predictivity of clinical findings and Doppler ultrasound in pediatric acute scrotum. Urol J. 2016; 13:2779–83.
10. Liang T, Metcalfe P, Sevcik W, Noga M. Retrospective review of diagnosis and treatment in children presenting to the pediatric department with acute scrotum. Am J Roentgenol. 2013;200: W444–9.
11. Sheth KR, Keays M, Grimsby GM, Granberg C, Menon VS, DaJusta DG, et al. Diagnosing testicular torsion before urological consultation and imaging: validation of the TWIST score. J Urol. 2016; 195:1870–6.
12. Frohlich LC, Paydar-Darian N, Cilento BG Jr, Lee LK. Prospective validation of clinical score for males presenting with an acute scrotum. Acad Emerg Med. 2017; 24:1474–82.
13. Mestrovic J, Biocic M, Pogorelic Z, Furlan D, Druzijanic N, Todoric D, et al. Differentiation of inflammatory from non-inflammatory causes of acute scrotum using relatively simple laboratory tests: prospective study. J Pediatr Urol. 2013;9(2):313–7.
14. Goetz J, Roewe R, Doolitle J, Roth E, Groth T, Mesrobian HG. A comparison of clinical outcomes of acute testicular torsion between prepubertal and postpubertal males. J Pediatr Urol. 2019;15(6):610–6.
15. Kumar V, Matai P, Prabhu SP, Sundeep PT. Testicular loss in children due to incorrect early diagnosis of torsion. Clin Pediatr (Phila). 2020;59(4):436–8.
16. MacDonald C, Kronfli R, Carachi R, O'Toole S. A systematic review and meta-analysis revealing realistic outcomes following paediatric torsion of testes. J Pediatr Urol. 2018;14(6):503–9.
17. Nason GJ, Tareen F, McLoughlin D, McDowell D, Cianci F, Mortell A, et al. Scrotal exploration for acute scrotal pain: a 10-year experience in two tertiary referral pediatric units. Scand J Urol. 2013;47(5):418–22.
18. Friedman N, Pancer Z, Savic R, Tseng F, Lee MS, Mclean L, et al. Accuracy of point-of-care ultrasound by emergency physicians for testicular torsion. J Pediatr Urol. 2019;15(6):608.e1–6.
19. Ubee SS, Hopkinson V, Srirangam SJ. Parental perception of acute scrotal pain in children. Ann R Coll Surg Engl. 2014;96(8):618–20.
20. Mushtaq I, Fung M, Glasson MJ. Retrospective review of paediatric patients with acute scrotum. ANZ J Surg. 2003;73(1–2):55–8.

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