

CHAPTER 101

ACUTE SCROTUM

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Introduction

Acute scrotum is defined as an acutely painful and/or swollen scrotum. One of the possible causes, torsion of the testis or epididymis requires urgent surgical intervention to salvage the testis. There are, however, no pathognomonic signs that clearly differentiate torsion of the epididymis from other possible diagnoses.¹ The acute scrotum should therefore be assumed to be due to torsion of the epididymis until proven otherwise.

Demographics

The incidence of the various causes of acute scrotum varies across studies.^{1–4} Torsion of the testis, torsion of a testicular appendage, and epididymitis are the most common causes of acute scrotum, contributing more than 85% of the causes. The aetiology and pathophysiology of these and other, less frequent causes are discussed in the next section.

The incidence of torsion of the epididymis accounts for 10–40% of the causes of acute scrotum in children, and is more common in the neonatal and adolescent years. It occurs with an incidence of about 1 in 4,000 boys aged less than 25 years. It is often unilateral, more often on the left side, but it also may be bilateral.

Torsion of a testicular appendage occurs at a frequency of 30–45% of causes of acute scrotum and is common in the prepubertal period.

Epididymitis occurs in 30–50% of causes of acute scrotum and usually affects postpubertal boys worldwide. It may also occur in infancy. There are no studies that show the incidence in Africa, but there also is no evidence that the frequency is different.

Aetiology/Pathophysiology

Causes of acute scrotum include torsion of the testis, torsion of a testicular appendage, epididymitis, trauma, Henoch-Schönlein purpura, varicoceles, hernias, hydroceles, idiopathic scrotal oedema, and testicular tumours.

Torsion of the Testis

Torsion of the testis refers to a twist of the spermatic cord. This could be extravaginal or intravaginal. The precipitating factor that causes the twist is not known for sure but there may be a history of trauma.

Extravaginal torsion occurs when the spermatic cord twists at a site proximal to the tunica vaginalis. This is due to lack of attachment of the tunica vaginalis to the scrotal wall. It usually occurs in utero before the tunica vaginalis has fixed to the scrotal wall. The child is therefore born with an infarcted testis; this may be bilateral. It may, however, also occur soon after birth in the neonatal period. Metachronous bilateral torsion of testis has also been recognised.

Intravaginal torsion occurs when the cord twists at a site within the tunica vaginalis. It is often associated with a high attachment of the tunica to the cord rather than close to the testis (the “bell clapper” anomaly). This anomaly is usually bilateral. The testis often has a transverse lie, and this allows the cord to twist.

Torsion of the testis may also be associated with undescended testis due to poor fixation to the scrotum. Torsion is usually away from the midline and leads initially to venous obstruction and then to arterial obstruction, ischaemia, and infarction. About 720 degrees of torsion is required for ischaemic damage to occur.

Torsion of a Testicular Appendage

Torsion of a testicular appendage occurs when there is a twist in either the appendix testis, which is a remnant of the Müllerian duct, or the appendix epididymis, which is a remnant of the Wolffian duct. The appendix testis is attached to the superior pole of the testis, whereas the appendix epididymis is attached to the superior pole of the epididymis.

Epididymitis

Epididymitis is inflammation of the epididymis and may be due to reflux of urine, urinary tract infection (UTI), or a sexually transmitted disease (STD). In children, reflux of urine or a UTI is more likely to be the cause and is usually associated with an anomaly of the urinary system. The organisms involved in the younger child may be those that usually cause UTIs, such as *Escherichia coli*. In the postpubertal child, the causative organisms are usually those that cause STDs such as gonorrhoea and chlamydia. Schistosomiasis may, however, be a rare cause of epididymitis in endemic regions.⁵ Epididymitis may eventually lead to orchitis.

Trauma

Trauma to the scrotum due to blunt or penetrating injury may result in an acute scrotum. Blunt injury may be as a result of a blow to the scrotum or a straddle injury. The trauma may lead to a haematocele, a ruptured testis, or a haematoma in the testis. A penetrating injury is usually accompanied by an entry and exit wound.

Henoch-Schönlein Purpura

Henoch-Schönlein purpura is a generalised vasculitis that affects the skin, joints, gastrointestinal tract (GIT), and kidneys. It causes inflammation of the scrotal wall and a vasculitis, which may involve the epididymis or testis. The cause is not known, but may be due to an abnormal reaction of the immune system to normal antigens.⁶

Varicoceles

Varicoceles are dilated tortuous veins in the scrotum due to a failure of the valves draining the testicular veins. Varicoceles may lead to pain, swelling, subfertility, oligospermia, or reduced sperm motility. The warm environment created in the scrotum is believed to contribute to subfertility.

Hernias and Hydroceles

Hernias and hydroceles occur as a result of a patent processus vaginalis that allows abdominal viscera or fluid to move in and out of the processus. When viscera such as bowel are involved, it may become irreducible, obstructed, or strangulated, leading to a painful scrotal swelling.

Idiopathic Scrotal Oedema

Idiopathic scrotal oedema is sudden onset of oedema and redness of the scrotum in children, usually not associated with pain. The aetiology is not known for certain, but it is suspected to be an allergic reaction.

Testicular Tumours

Testicular tumours may present as painful scrotal swellings in children, probably due to bleeding into them. Teratomas are a common cause of tumours in children.

Clinical Presentation

Although no pathognomonic signs differentiate torsion of the epididymis from other diagnoses, a complete history, physical examination, and necessary investigations help to narrow down the possibilities and thus reduce the number of unnecessary explorations.⁷ Table 101.1 summarises the clinical presentations for torsion of the epididymis, torsion of a testicular appendage, and epididymitis.

History

The age at presentation is important in the differential diagnosis of acute scrotum. In the neonatal period, torsion of the testis is likely, whereas Henoch-Schönlein purpura or torsion of a testicular appendage may occur in the prepubertal period. In the postpubertal period, torsion of the testis and epididymitis are more common. No childhood age is exempt, however, from any of these pathologies, and all children should be treated promptly.

Symptoms in patients with acute scrotum may include pain, swelling, nausea and vomiting, urinary symptoms, or fever.

Pain is an important symptom in the history of acute scrotum. Sudden onset of severe scrotal pain in a patient who has been well suggests torsion of the testis. Gradual onset of pain becoming severe over a number of days suggests epididymitis or torsion of a testicular appendage. The site of pain may be the abdomen or scrotum in torsion of the testis or epididymitis. Hence, the testes should be examined in all cases of pain in the abdomen, especially in smaller children. Pain localised to the top of the scrotum may be due to torsion of a testicular appendage. Joint pains associated with abdominal pain, bloody stool, and sometimes haematuria suggests Henoch-Schönlein purpura.

A history of a scrotal swelling that appears on straining and then disappears on relaxation suggests a hernia, whereas a recurrent swelling that appears while awake and disappears when sleeping may suggest a varicocele or a hydrocoele. Swelling that occurs after severe pain suggests torsion of the testis.

Nausea and vomiting may occur at the onset of torsion of the epididymis.

Urinary symptoms, such as frequency and dysuria, may suggest a UTI and epididymitis, whereas a urethral discharge suggests epididymitis due to a sexually transmitted infection. A previous history of urinary instrumentation or urinary anomaly suggests epididymitis.

A history of fever suggests epididymitis.

A history of trauma may suggest injury but may also suggest torsion of the testis, especially if the severity of symptoms is not explained by the nature of the trauma. A previous history of recurrent pain in the scrotum that subsides without much intervention suggests torsion of the testis.

Physical Examination

A thorough physical examination is mandatory. As previously mentioned, fever suggests epididymitis.

Abdominal distention may be present in a patient with an obstructed hernia and may be associated with visible peristalsis. Tenderness and rebound tenderness suggest peritonitis, which may be due to a strangulated hernia.

The scrotum may be enlarged in torsion of the testis, torsion of a testicular appendage, epididymitis, trauma, hydrocoele, hernias, idiopathic scrotal oedema, varicocele, and testicular tumours. The enlargement is inguinoscrotal in hernias but purely scrotal in the others. In torsion of the testis, the testis may be visibly high and lying transversely, although this is not invariably the case.

In lighter-skinned individuals, the scrotum may look red and oedematous in torsion of the testis, torsion of a testicular appendage, epididymitis, trauma, strangulated hernias, Henoch-Schönlein purpura, and idiopathic scrotal oedema. A blue dot may be noted at the superior end of the testis in light-skinned individuals in torsion of a testicular appendage, and this finding in addition to localised tenderness at this spot is pathognomonic of this condition.

Tenderness in the scrotum is elicited in torsion of the epididymis, torsion of a testicular appendage, epididymitis, strangulated inguinal hernias, trauma, and Henoch-Schönlein purpura. Tenderness may be localised to the top of the scrotum in torsion of a testicular appendage, where a nodule may also be palpated. It may be localised to the epididymis posterior to the testis in early epididymitis, but the whole testis becomes tender and enlarged in late epididymitis. In torsion of the epididymis, tenderness affects both testis and epididymis early in the history. There is no tenderness in idiopathic scrotal oedema.

Lack of relief of pain on lifting the scrotum upwards suggests torsion of the testis (Prehn's sign). Relief of pain on rotating the testis toward the midline in an attempt to detort the epididymis suggests torsion of the testis. The cremasteric reflex, which is elicited by stroking the medial aspect of the thigh, suggests torsion of the epididymis when absent, but suggests torsion of the appendix testis or epididymitis when present.

An enlarged, firm, well-circumscribed swelling that may or may not be tender may be palpated in testicular tumours.

A palpable "bag of worms" suggests varicocele.

Table 101.1: Clinical presentations.

Clinical feature	Torsion of the epididymis	Torsion of a testicular appendage	Epididymitis
Pain in the scrotum	Sudden severe onset	Gradually getting severe over days	Gradually getting severe over days
Nausea and/or vomiting	May be present at onset	Not usually present at onset	Not usually present at onset
Urinary symptoms	Usually absent	Usually absent	May be present
Urethral discharge	Usually absent	Usually absent	May be present
History of trauma	May be present	Usually absent	Usually absent
Previous history of recurrent pain	May be present	Usually absent	Usually absent
Previous history of instrumentation or urinary anomaly	Usually absent	Usually absent	May be present
Fever	Usually absent	Usually absent	May be present
Swollen tender testis and epididymis	Occurs early	Occurs late	Occurs late
Localised tenderness	Usually not localised	Localised to nodule at top of testis at the onset	Localised to epididymis posterior to testis at the onset
Prehn's sign	Negative	Positive	Positive
Cremasteric reflex	Absent	Present	Present

Investigations

Investigations may be helpful if there is a great likelihood that the acute scrotum is not due to torsion of the testis or if presentation is late. The time spent on this, however, may lead to the demise of a viable testis. Early exploration is therefore mandatory if torsion of the testis cannot be ruled out clinically.³

Routine urine examination may show pyuria and bacteriuria or pyuria alone and support the diagnosis of epididymitis in a patient with other suggestive clinical signs. However, the presence of microscopic pyuria alone does not rule out other conditions.

Colour Doppler ultrasonography (US) may show absence of blood flow or reduced flow to the testis in torsion of the testis while showing normal or increased flow in patients with torsion of the appendix testis or epididymitis. This investigation may not, however, be easily available in Africa, and the need to explore should be based on clinical findings rather than any investigation. In centres where it is available, colour Doppler US is used to rule out torsion of the testis in cases where this is not likely. Colour Doppler US may confirm the diagnosis of varicocele.³ Doppler is operator-dependent, however, and needs a well-trained operator to diagnose these patients.

Radioisotope scan may show blood flow to the testis in epididymitis or torsion of a testicular appendage, and absent or reduced blood flow in torsion of the epididymis. This scan, however, is not 100% sensitive or specific, and may lead to delay in exploration of the scrotum. Its absence in most parts of Africa makes it unavailable to most clinicians. Where available, it may be used in patients who present late or have symptoms that do not suggest torsion of the epididymis.

Ultrasonography may help confirm the diagnosis of a hernia, hydrocoele, varicocele, or testicular tumour.

Management

The aim of management is to save all viable testes in cases due to torsion while minimising unnecessary explorations. It is important to explore the scrotum early in those patients in whom the diagnosis of torsion is likely or cannot be ruled out clinically. As much as possible, exploration should be done within 6 hours of the onset of symptoms. An attempt may be made to detort the testis, which causes immediate relief if successful. The testis may then be fixed later. In neonates, however, presentation is almost always late, and an elective exploration may be planned to remove the nonviable testis and to fix the viable testis.

Epididymitis, Henoch-Schönlein purpura, and idiopathic scrotal oedema are managed conservatively. Bed rest and scrotal elevation allow the inflammation to subside. Analgesics may be necessary for pain, and antibiotics for infection. US and micturating cystourethrogram (MCUG) are necessary to rule out any urinary anomaly in prepubertal children with epididymitis.

Hernias and hydroceles are treated surgically electively unless a hernia cannot be reduced or there is a high likelihood of gangrenous viscera.

Testicular tumours are excised through an inguinal approach. Where frozen section is available, this may help to confirm the diagnosis before excision.

In children with varicoceles, Palomo's operation of high ligation of testicular vessels could be performed either open or laparoscopically.

Torsion of a testicular appendage, if confirmed preoperatively, may be treated conservatively. However, it is difficult to diagnose torsion of appendix testis, and hence this should be treated by early exploration of scrotum. Scrotal exploration should also be performed if the child has severe pain.

If in doubt about the diagnosis, urgent scrotal exploration and bilateral fixation of the testes should be the treatment of choice.

Technique of Surgery for Torsion of Epididymis

1. A midline scrotal incision or two longitudinal incisions in each hemiscrotum are made. The involved testis is brought out and inspected. Any twist is reduced and the testis is observed for improvement in colour. While waiting for colour change, the other testis could be fixed.

2. If the colour does not improve, if the blood from the testis on incising the tunica albuginea remains black, and if the onset of symptoms is more than 24 hours, the testis may be excised. Otherwise, it is fixed.

3. The tunica vaginalis is incised and the testis sutured to the scrotal wall by using 3-point fixation with nonabsorbable stitches. Alternatively, the edges of the opening in the tunica vaginalis could be sutured to the tunica albuginea to expose a wide surface of the albuginea directly to the subcutaneous tissue of the scrotum, thus allowing fixation to a wider area.

Management of Neonatal Torsions

Most neonatal torsions are present when the child is born and are antenatal events. They are usually unilateral and hence are traditionally treated by a wait-and-watch approach if there is no sign of acute onset of torsion.

Recently, however, multiple reports of bilateral neonatal torsions have been noted. In 33% of the cases, the torsion can be metachronous. If diagnosis is delayed, the salvage rate is very low. Hence, urgent exploration and fixation of the testis should be the treatment of choice in neonatal torsions.⁸

Postoperative Complications

Infection, abscess formation, reactive hydrocoele, haematoma, infarction, and atrophy of the testis are possible complications. These resolve with rest and relevant antibiotics. An infarcted testis may have to be excised later.

Prognosis

The ability to salvage the testis following torsion of the epididymis depends on the time interval between the onset of symptoms and exploration of the scrotum. Exploration done within 6 hours of the onset gives the best results. A few testes may still be viable after 12 hours; however, beyond 24 hours the probability of having viable testes drops to almost nil. It is important, therefore, that exploration be done as soon as possible.

In Africa, this is a particular problem due to the time it takes for a patient to see a relevant specialist who could explore the scrotum. Distance from hospitals, cultural practices, delay in referrals, and economic considerations contribute to this late presentation and thus reduce the number of viable testes obtained. More often than not, exploration is done to remove the infarcted testis and fix the normal one.

Prevention

Prevention of the loss of viable testes depends on early diagnosis and exploration of the scrotum. Acute scrotum is a surgical emergency and everything must be done to make it possible for patients to reach relevant experts in time. Education of the general public is therefore very important to make them recognise the possible dangers of presenting to the hospital late with an acute scrotum. The media, various political leaders, religious groups, and nongovernmental organisations may

play key roles in increasing awareness of this condition. Inclusion of this topic in school health education programs may also help increase awareness of this condition.

Lack of enough medical personnel as well as financial and other resources make this difficult in the African setting. Training of medical officers and other primary health care providers to recognise the condition and refer as quickly as possible to a surgeon who could manage the condition is important.

The provision of an efficient emergency ambulance service may make it possible for patients to reach a relevant specialist on time. In the absence of an ambulance service, it may be necessary to transport patients in any available vehicle to the nearest surgeon. All surgeons should be trained to recognise and fix the testis, because enough subspecialists may not be available close enough to all patients.

Evidence-Based Research

Table 101.2 presents a large retrospective study that reviewed clinical diagnosis of acute scrotum.

Table 101.2: Evidence-based research.

Title	The diagnosis and treatment of acute scrotum in children and adolescents
Authors	Knight PJ, Vassy LE
Institution	Departments of Surgery of St. Francis Regional Medical Centre, Wesley Medical Centre, and St. Joseph Medical Centre, Wichita, Kansas, USA; Children's Hospital and Mount Carmel Hospital, Columbus, Ohio, USA
Reference	Ann Surg 1984; 200:664
Problem	The difficulty in the diagnosis of acute scrotum.
Intervention	The use of specific symptoms, physical signs, and investigations to guide decision making.
Comparison/control (quality of evidence)	The clinical signs suggesting a particular diagnosis were compared with the findings at surgery and on follow-up.
Outcome/effect	Patients with a previous history of recurrent scrotal pain benefited from scrotal exploration, even when physical findings were normal, because most were due to recurrent torsion. Patients with at least three suggestive symptoms and signs of epididymitis almost always had epididymitis. Watchful observation in doubtful cases was not beneficial when the diagnosis was unclear. Investigation was not usually helpful when the diagnosis of torsion of the testis could not be ruled out.
Historical significance/comments	This study showed that, with careful history and examination, it is possible to make a reasonable diagnosis of epididymitis in some children with acute scrotum. It also showed that exploration of testes in those with recurrent pain could help salvage a number of testes before they become irreversibly torsed. No investigation is foolproof, although it may be helpful when clinical signs point to epididymitis. It may however delay the appropriate treatment of a torsed testis. In Africa, where this may be difficult to obtain, the use of clinical signs to rule out cases of epididymitis where possible and the early exploration of doubtful cases are more appropriate.

Key Summary Points

1. There is no pathognomonic sign that helps in making a definite diagnosis of acute scrotum.
2. In a number of patients, the history and physical findings together may make it possible to make a definite diagnosis of either torsion of the testis (sudden onset of pain, transverse lie of the testis, etc.), torsion of the appendix testis (palpable blue tender nodule at superior end of testis), or epididymitis (frequency of micturition, fever, urethral discharge, etc.). These may be treated accordingly.
3. In most patients, no definite diagnosis can be made based on history and physical examination, and early exploration without further investigation is the diagnostic and usually therapeutic procedure of choice.

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Suggested Reading

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