

# The acute scrotum in children

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## Abstract

The acute scrotum is a common referral to paediatric emergency departments. The term covers a wide range of diagnoses, with variable severity. The most time-sensitive diagnosis is testicular torsion, and this should be ruled out in all cases due to the risk of gonadal loss. History and examination may give some indication of the underlying cause of pain; however, surgical exploration of the scrotum is often required as an emergency procedure. This article describes the presentation, differential diagnosis and acute management of this common condition, as well as touching on some areas of debate.

**Keywords** Acute scrotum; hydatid of morgagni; scrotal exploration; testicular fixation; testicular torsion

## Definition

The term ‘acute scrotum’ is used to encompass the presentation of any boy with pain in the scrotum or testis. The range of eventual diagnoses is therefore varied.

Common features are pain, often limited to one hemi-scrotum, which may be accompanied by swelling and/or erythema of the scrotal skin. Severe testicular pain is sometimes accompanied by vomiting. On rare occasions there may be urinary symptoms. The boy is normally systemically well.

## Differential Diagnosis (Box 1)

Potentially the most critical diagnosis is a testicular torsion; however, torsion of a testicular appendage is a more frequent finding in childhood. Other possibilities include: acute epididymo-orchitis, idiopathic scrotal oedema, Henoch-Schonlein purpura or testicular tumour.

## Testicular torsion

### Pathogenesis

The pain of testicular torsion is caused by ischaemia to the testis secondary to obstruction to vascular flow resulting from a twist in the cord. Testicular torsion may be either intravaginal or extravaginal. Extravaginal torsion occurs almost exclusively during the perinatal period – it consists of a twist of the entire tunica vaginalis and its contents. It is thought to occur during the process of testicular descent when the tunica evaginates into the surrounding loose areolar tissue.

More commonly, the torsion is intravaginal – meaning the testis and cord twists within the tunica vaginalis. Intravaginal

## Differential diagnosis of acute scrotum

- Testicular torsion
- Torsion of testicular appendage
- Epididymo-orchitis
- Idiopathic scrotal oedema
- Henoch-Schonlein purpura
- Tumour
- Acute hydrocele
- Perinatal torsion

## Box 1

torsion may be intermittent and varies in the number of twists seen. (Figure 1).

## Aetiology

The cause of testicular torsion in most cases is unknown. A transverse or ‘bell-clapper’ lie is widely stated to increase the likelihood of a twist, although this remains unproven. Given that the most common time of presentation is during puberty, a hormonal influence seems likely. However, the acute presentation and unpredictable timing mean that proving the association would be extremely difficult. Some studies have identified seasonal variations, with torsion being more common in the colder months, however this remains debated.

## Epidemiology

The overall incidence of referral for an acute scrotum is not clear. Appreciation of the difficulty in making a definite diagnosis and the consequences of a missed torsion mean that a high proportion of cases undergo surgical exploration; true testicular torsion is found in a relatively low proportion of explored cases (1 in 4 in some series). Torsion peaks in incidence perinatally and at adolescence with a relatively low incidence outside these times although it can occur at any age. Population-based studies suggest an annual incidence of around 3 per 100,000 for males under 18 years of age.

## Diagnosis

Definitive diagnosis is most commonly made during surgical exploration of the scrotum. The decision to be made when the patient presents is whether testicular torsion can be confidently excluded, or whether he warrants an exploration. History and examination are often the best guide, investigations often add very little, and merely delay definitive management.

The ‘textbook’ history describes an acute onset of unilateral scrotal pain, which is severe in nature and is occasionally accompanied by vomiting. Physical examination reveals testicular tenderness, often with associated erythema and swelling of the hemi-scrotum. The testicle may be lying higher than the one on the opposite side. The findings are limited to one hemi-scrotum. Movement typically exacerbates the pain if a testicular torsion is present.

As with any clinical scenario, however, the presentation may be extremely variable, and the history is often more long-lasting, with gradually increasing pain. Elucidating the true sequence of

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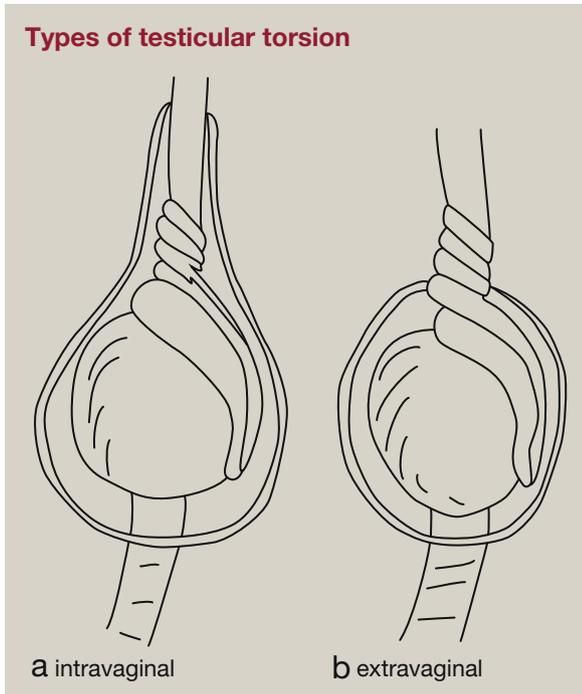


Figure 1

events can be complicated if the boy has been embarrassed to divulge the nature and/or location of the pain.

Ultrasound of the testis and cord can very occasionally be useful. Ultrasound can look at vascular flow within the testis – but struggles to tell us if this is partially occluded, or if the testis has recently ‘un-torted’ with secondary hyperaemic appearances. The majority of ultrasonographers would be extremely reluctant to confidently exclude a torsion – and with the inevitable delay resulting from the investigation, it should only rarely be requested. In exceptional circumstances (such as the patient with known recurrent episodes of epididymitis, or the possibility of a testicular mass) it may be helpful in answering a specific question.

The key question is whether a true testicular torsion can be confidently excluded. If it cannot, then the patient needs surgical exploration as the consequences of missing the diagnosis can be significant. For many paediatric surgeons, the threshold is low – and if there is any doubt then the scrotum should be explored.

### Management

Where testicular torsion is diagnosed or suspected, urgent surgical exploration is required. The benefit of imaging or further investigation in the acute phase is limited and should be balanced against the knowledge that the earlier a testis is untwisted, the more likely it is to be salvaged. There is no doubt that success in testicular salvage following torsion is greater with a shorter duration of symptoms. The exact timing is impossible to define (due to variation in severity through number of twists, inaccuracy in symptom onset, etc.); however, 6 hours from onset to untwisting is often quoted.<sup>1</sup>

Patients should be given adequate analgesia and prepared for theatre. The case should be undertaken as an emergency without waiting for normal ‘starvation’ times in order to maximize the

chances of saving the testis. Indeed, due to the gastric stasis associated with torsion, most anaesthetists use rapid sequence anaesthesia in these patients whether they have been fasted or not.

### Operative procedure

After appropriate skin preparation, the scrotal skin and fascial layers are opened (either via a transverse or midline incision depending on surgical preference) and the testis delivered into the wound. The colour of the testis is inspected and the cord assessed for any twist. If a twist is present, this should be corrected. The testis is then wrapped in warm swabs for at least 5 minutes to encourage the return of blood flow. After this, a decision needs to be made whether there is any potential for the testis to survive. In case of doubt, an incision into the testis to elicit fresh bleeding can be helpful. If there is no possibility of recovery, an orchidectomy should be performed. However, if there is any chance of survival the testis should be returned to the scrotum and fixed to prevent further twists. The contralateral testis should also be fixed.

The method of fixation varies amongst surgeons, but for a proven torsion, most surgeons would perform a three-point fixation to the scrotal tissues at least on the affected side. There is a debate whether in children this should be done using a non-absorbable suture (as in adults) or an absorbable one.

### Complications

The vast majority of scrotal explorations do not result in any complications. Wound infection is always a possibility and usually responds to simple oral antibiotics. Infection or necrosis of a preserved testis that has remained ischaemic is a risk and sometimes requires re-exploration. Scrotal haematoma can also occur due to the vascularity of the region and the laxity of the scrotum, meaning there is very little natural tamponading effect. When seen, this can often be managed conservatively with scrotal support and possible antibiotic cover. In severe cases a return to theatre may be needed for evacuation of the haematoma and haemostasis.

### Follow-up

Most surgeons will follow-up a true torsion with an out-patient appointment perhaps 2 months after the event to document the fate of the untwisted testis. When an orchidectomy has been performed this can also be a good opportunity to discuss the possibility of inserting a testicular prosthesis at a later date.

### Outcomes

As above, testicular salvage rates are dependent on the time between symptom-onset and surgery. Single institution series suggest salvage rates of around 60%. However, accurate outcomes are difficult to ascertain since testicular preserving surgery does not necessarily equate to a viable gonad, nor does a physically present gonad necessarily function perfectly. Long-term fertility problems following torsion have been suggested, as has the presence of spermatic auto-antibodies. Both the cause and effect of auto-antibodies following a torsion continue to be debated. Some have proposed a lower threshold to remove an ischaemic testis to try and prevent antibody formation and therefore protect function in the contralateral side. However, the

evidence for this is not available and most surgeons would try and preserve an ischaemic testis wherever possible.

The most significant long-term sequel of a torsion is of course the loss of a gonad. Insertion of a testicular prosthesis is a feasible option, and may be discussed with the family. Insertion is usually delayed until the latter end of puberty to allow the appropriate size to be determined and to allow the boy to make his own choice as to whether he wants to have a silicon implant. Interestingly, many boys who have grown up with only one gonad seem happy to continue into adulthood in this way and do not return requesting a prosthesis.

### Torsion of testicular appendage

A testicular appendage (hydatid of Morgagni or similar) represents a remnant of the Mullerian duct system. A torsion of this appendage is the most common cause of an acute scrotum during childhood.

#### Aetiology

The aetiology of torsion of a testicular appendage (also known as a testicular appendix) is largely unknown. Due to its origin, hydatids of Morgagni carry oestrogen receptors on their surface, as well as possible testosterone receptors. In addition, tortured hydatids are most frequently seen when testosterone levels are just beginning to rise at the beginning of puberty. A hormonal influence has therefore been implicated, but the true mechanism remains unclear.

#### Diagnosis

The history for torsion of a torsion of an appendix testis is classically less acute and less severe than for a true testicular torsion. However, there is frequently overlap and often they are difficult to distinguish clinically.

Examination of the child reveals unilateral signs and symptoms which may show significant variation. In some cases there is significant swelling of the hemi-scrotum with erythema of the skin, particularly if the tortured hydatid is more long-standing. In others there may be very few signs. The scrotal contents are usually tender. In compliant patients, it may be possible to localize the tenderness to the upper pole of the testis, but this is the exception.

Where there are minimal overlying skin changes it may be possible to identify a 'blue-dot' usually at the upper pole of the scrotum, which correlates to the point of maximal tenderness. This is a tortured, ischaemic appendix testis seen through the scrotal skin and is sometimes termed the 'blue-pea sign'. In these rare cases the diagnosis can be clear. Some surgeons would be happy to manage such cases with anti-inflammatory painkillers and wait for the pain to settle as the appendage becomes necrotic and calcifies. However, in the majority of cases there is diagnostic doubt which leads to surgical exploration. In addition, the patient may prefer surgical intervention to relieve the pain and hasten recovery.

A few surgeons would advocate a bilateral exploration if a tortured appendage is found in order to remove a potential contralateral lesion. However, this is not common practice and the potential benefits of preventing a future presentation should be balanced against the risks of exposing the contralateral testis to infection or iatrogenic trauma.

#### Operative procedure

As for a true torsion, the affected testis should be delivered into the wound. The tortured appendage is usually easily identified and can be removed using bipolar diathermy. The testis can then be returned to the scrotum and the skin closed.

Where the diagnosis is clear there is no indication for surgical fixation of the testis – and most surgeons would not routinely explore the opposite side.

#### Follow-up

Routine follow-up is not normally required, as there are no common associations or need for further investigation.

#### Outcome

For the vast majority of boys who have undergone surgery for a tortured testicular appendage, there is a full recovery without any long-term sequelae. Delayed surgery is sometimes requested following conservative management if the lesion is persistently tender or becomes secondarily infected.

#### Other diagnoses

##### Epididymo-orchitis

Infection in the epididymis may present with scrotal pain and swelling and be mistaken for a potential torsion. Urinary symptoms and a positive urinary 'dipstick' can suggest the diagnosis, ultrasound can also be helpful to show the swollen thickened epididymis. In the majority of cases with a first presentation the diagnosis is made at the time of scrotal exploration. The epididymis is erythematous and thickened, and there may be some turbid fluid present.

Epididymitis is sometimes associated with abnormal configuration of the upper urinary tract resulting in urinary reflux into the epididymis. Most surgeons have, therefore, traditionally recommended routine investigation of the upper urinary tract to look for underlying structural anomalies. Although this has more recently been questioned due to a very low pick-up rate, an ultrasound of the urinary tract undertaken on an out-patient basis remains the investigation of choice for most.

Treatment for these cases is usually with oral broad spectrum antibiotics depending on local protocols.

##### Idiopathic scrotal oedema

Idiopathic scrotal oedema (ISO) presents with erythema and swelling of the scrotal skin. As its name suggests the cause for this is unknown. It most commonly occurs in pre-pubertal boys. On examination the swelling and redness is dramatic and typically extends across the midline – an unusual finding for other diagnoses. Most crucially, however, ISO is non-tender. Although this can be difficult to ascertain in a child who is very distressed about the appearances, distraction allows the lack of tenderness to be elicited. Mobilizing the testis to the scrotal neck to confirm that it is not involved in the disease process and is pain free is confirmatory, but is not always permitted by the anxious child.

Where the diagnosis is certain, most surgeons manage this condition expectantly. Some recommend the use of antihistamines (such as chlorphenamine) to expedite the resolution. The family should be reassured that the swelling should settle within a few days and that the condition looks dramatic, but is not serious.

### Henoch-Schonlein purpura

The presentation of Henoch-Schonlein purpura (HSP) can include vasculitis of the testis or epididymis, causing pain and swelling. During assessment therefore, other signs and symptoms should be sought in the history and examination. Presence of suggestive symptoms and particularly the characteristic purpuric rash should warrant investigation and review by paediatricians. Scrotal ultrasound can again be helpful in making the diagnosis.

### Tumour

The possibility of a testicular or a para-testicular tumour should always be considered in a child with a testicular mass. The history and findings are usually very different from the acute scrotum – with a more gradual onset of swelling and relative absence of pain.

If a tumour is suspected, ultrasound is usually the first investigation, and is often diagnostic. Importantly, where a tumour is suspected any surgery should be undertaken via a groin incision. This is to prevent tumour spread to the scrotal skin which has a different lymphatic drainage from the testis and groin.

### Acute hydrocoele

Rapid accumulation or enlargement of a hydrocele can cause concern and present for evaluation as an acute scrotal swelling. The majority of paediatric hydrocoeles are present from birth, but infection – either local or systemic – can cause a rapid increase in size. In these cases the swelling is non-tender and it

should be possible to palpate the testis separately. Of course, a reactive hydrocele may occur with any underlying pathology of the scrotal contents.

### Perinatal torsion

Perinatal torsion presents as a swollen, erythematous scrotum at the time of delivery, or noticed very soon afterwards. Although the cause is unclear, the torsion differs in that it is extra-vaginal. The differential of a neonatal testicular tumour should be actively considered, and ultrasound can be very helpful in these cases.

Management continues to be debated.<sup>2</sup> Testicular salvage even when surgery is undertaken as an emergency is extremely low. Given the increased anaesthetic risks in this group, many would argue that surgical exploration can be delayed or even omitted. Fixation of the contralateral testis is also contentious – extra-vaginal torsion is a different process, and boys do not seem to be at greater risk of a twist on the other side when they are older. However, when only one testis survives, many would prefer to fix and therefore protect it. ◆

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