Scrotal Pathology in Children:

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ABSTRACT: Acute scrotal pain, a high-riding testicle, and the absence of the cremasteric reflex on the affected side signal testicular torsion—a surgical emergency. The pain associated with torsion of the appendix testis is usually of gradual onset and is exacerbated by movement. The tenderness is often localized over the infarcted appendix, and the infarction may be visible through the scrotal skin (the "blue dot sign"). Pain associated with epididymitis is usually gradual in onset; the patient may complain of dysuria, increased frequency, and discharge, particularly if the causative pathogen is Chlamydia trachomatis or Neisseria gonorrhoeae. Hydroceles are smooth and nontender, and the scrotum transilluminates. If the scrotum does not transilluminate and compression of the fluid-filled mass toward the external ring completely reduces the mass, then a hernia is the more likely diagnosis. A patient with a varicocele typically complains of a sensation of heaviness and of "carrying a bag of worms."

A variety of pathologic conditions can cause scrotal pain or swelling in a child. Some are benign, such as a hydrocele; others, such as acute testicular torsion, require emergent surgery. Scrotal pathologic processes in children can be classified into the following categories:

• Acute scrotum.
• "Empty" scrotum.
• "Full" scrotum.

Here we highlight the clues in the history and the physical findings that can help you rapidly distinguish an acute scrotum from a chronic condition. We also discuss appropriate diagnostic studies and treatment options.

HISTORY AND PHYSICAL: WHAT TO LOOK FOR

A complete history and extensive physical examination are the most important tools in the assessment of scrotal pathology.

History. When you take the history of a child with scrotal pain or swelling, be sure to include:

• Age (because certain conditions that can cause scrotal symptoms are more common in one age group than in others; for example, epididymitis is more common in adolescents, while hernias are more common in infants).
• Any possibly associated medical conditions (such as a vasculitis or nephrotic syndrome, which can cause scrotal edema).
• A complete pain history, which documents onset, duration, and location of the pain, as well as associated symptoms, such as urinary complaints.
• A history of injury or trauma (if relevant).

Physical examination. Gait, resting position, and facial expression can help you gauge the discomfort experienced by a young patient with scrotal pathology. When you evaluate a swollen scrotum, note:

• Skin color changes (eg, the "blue dot sign," which can reveal torsion of the appendix testis).
• Whether transillumination of the scrotum is evident.
• Position of the testis.

Stroke the outer portion of the inner thigh to elicit the cremasteric reflex. Absence of this reflex can help distinguish torsion from epididymitis.

Prehn's sign (relief of pain with elevation of the scrotum) has been proposed as a clue to epididymo-orchitis, and its opposite (increased pain with scrotal elevation) as a sign of testicular torsion. However, these findings are often difficult to assess in children, and as a result, the validity of Prehn's sign is controversial.

Based on the results of the history taking and physical examination, you may want to order one or more of these additional tests:
Scrotal Pathology in Children
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• Urinalysis (to check for leukocytes, leukesterase, or nitrites in suspected epididymitis; or to check for proteinuria in scrotal edema when renal pathology is suspected).
• Urine and penile cultures.
• Ultrasonography and radioisotope scanning (to aid in the diagnosis of testicular torsion or a testicular mass).

THE ACUTE SCROTUM

Testicular torsion. This is the most serious cause of an acute scrotum and requires emergent intervention. Testicular torsion occurs most commonly in peri-adolescence. The most significant factor in the history of affected patients is the acute onset of pain and swelling; the pain is usually in the scrotum, but it may initially be referred to the inguinal area-or, because of the distribution of the ilioinguinal and genitofemoral nerves, to the abdomen or upper thigh. The patient or the responsible parent or guardian can usually state the exact time the pain began—typically less than 4 to 6 hours earlier. Often, pain onset is early in the morning. The remainder of the history taking is frequently unremarkable, although associated nausea and vomiting are sometimes seen. Rarely, patients or their parents or guardians relate a history of similar episodes. Patients are commonly uncomfortable and restless. Physical examination usually reveals a high-riding testicle and scrotal swelling (Case 1) and the absence of the cremasteric reflex on the affected side. Often, the absence of swelling in the inguinal area can differentiate the condition from an incarcerated hernia.

Urinalysis results are usually normal; however, the serum lactate dehydrogenase level (a nonspecific marker of ischemia) may be elevated. Doppler ultrasonography and radionucleotide scans can reveal compromised testicular blood flow, which is diagnostic of testicular torsion. However, it is critical that testicular torsion be corrected as rapidly as possible. Thus, do not delay surgical exploration to obtain imaging studies. Therapy for testicular torsion consists of surgical exploration, detorsion, and scrotal orchidopexy (fixation of both the torted and contralateral testicles). Manual detorsion of the spermatic cord can occasionally be accomplished in the emergency department if the patient is seen within a few hours of the onset of torsion and before significant swelling has developed. In such cases, schedule elective orchidopexy as soon as possible.

As many as 90% of testes that are surgically detorted within 6 hours of torsion and found to be viable (pink in color) will survive.¹ If a testis appears nonviable at the time of surgical exploration, orchiectomy is performed.

Torsion of the appendix testis. This is probably the most common cause of severe scrotal pain in boys aged 2 to 11 years; however, it is rare in adolescents. If medical attention has been sought early enough, the diagnosis can usually be made based on the history and physical examination findings. The pain is usually of rapid onset and is exacerbated by movement; patients typically sit very still and walk with a characteristic wide gait to avoid discomfort. Patients can often localize the pain to one spot on the testis and direct the examiner to the site of the twisted appendage, which is usually on the upper, outer portion of the testis.

Palpation of the testis typically reveals a 3- to 5-mm indurated, tender mass at the upper pole. In boys with light skin, the appendage that has undergone torsion and infarction may be visible through the scrotal skin; this finding is known as the blue dot sign. If you suspect testicular torsion, have the patient undergo a Doppler ultrasound assessment—if readily available—or possibly scrotal exploration. Otherwise, patients can be treated conservatively with bed rest and non-steroidal analgesics for approximately 5 days. The natural history of torsion of the appendix testis is resolution of the inflammation after about 10 days.

Epididymitis. This condition is a common cause of acute scrotum. Two thirds of pediatric cases occur in boys aged 12 to 18 years. Epididymitis is extremely uncommon in those younger than 6 years.² The patient or parent/guardian usually reports a gradual onset of symptoms, in contrast to the much more sudden onset of pain typical of torsion of the testis or appendix testis. The pain cannot be discretely localized because inflammation spreads to the testis and surrounding scrotal wall. Elevation of the scrotum may relieve pain in epididymo-orchitis (Prehn's sign); however, this finding is often difficult to assess in children. Irritative voiding symptoms, such as frequency and dysuria, are common.

Physical examination reveals an enlarged tender mass posterior to and usually distinct from the testis. At later stages, the entire testicle may be enlarged and tender, and no distinction between the epididymis and testis may be evident (Figure 1). Urinalysis usually reveals numerous leukocytes; obtain a urine specimen for culture as well. In sexually active patients, consider obtaining DNA
amplification tests for sexually transmitted diseases. The causes of epididymitis include the coliform bacteria that are responsible for most urinary tract infections in younger children. In older, sexually active adolescents, *Chlamydia* is the most common causative agent; a thin, watery urethral discharge is a sign of chlamydial infection. Another, less common cause in this patient population is *Neisseria gonorrhoeae* infection, which is sometimes associated with a thick, creamy discharge.

Treatment of epididymitis includes anti-inflammatory medication, scrotal elevation, and appropriate antibiotic coverage when the condition is believed to be bacterial in origin. When epididymitis is secondary to a chlamydial or gonorrheal infection (or both, because these infections often coexist), a regimen such as ceftriaxone, 250 mg IM (single dose-for gonococcal infection), and/or doxycycline, 100 mg bid for 7 days (for chlamydial infection), is indicated.

**Testicular trauma.** This is usually the consequence of a straddle injury, a direct blow to the perineum that compresses the testicle against the pubic bone, or a direct blow to the scrotum. The spectrum of testicular trauma ranges from minimal scrotal swelling and ecchymosis to rupture of the testis with a tense, blood-filled scrotum. Often, an overlying hematocele is present and the scrotum does not transilluminate well. Cutaneous ecchymosis supports the diagnosis. Testicular torsion can usually be excluded on the basis of the history; however, Doppler ultrasonography or a radionuclide scan (which can help assess blood flow to the gonad) is often helpful in this regard. Plain scrotal sonography can help assess the integrity of the testicle, which is often disrupted in trauma. Scrotal exploration and repair (Case 2) are indicated if a large hematocele is expanding and does not respond to compressive tamponade or if the testicle has ruptured.

**Rare causes of an acute scrotum.** These include Henoch-Schönlein purpura and Kawasaki disease. Henoch-Schönlein purpura is a vasculitis of small vessels in children aged 2 to 8 years. It is characterized by a petechial rash, edema, arthritis, abdominal pain and renal involvement, and it can sometimes present as an acute scrotum. The petechial rash may first be noted on the scrotum, although it usually begins on the lower extremities and buttocks and involves the scrotum later. When severe swelling is present, surgical exploration may be necessary to rule out torsion, which has been rarely noted to coexist. Kawasaki disease-another vasculitis seen in small children-is characterized by fever, rash, adenopathy, and conjunctivitis. This disease can also produce scrotal swelling and pain. It is important to be aware of this association to avoid unnecessary surgical exploration.

**THE EMPTY SCROTUM**

**Ectopy and cryptorchidism.** Ectopic testes are testes that have strayed from the path of normal descent. Possible ectopic sites include:

- The superficial inguinal area (most common).
- Perineum (rare).
- Femoral canal (rare).
- Penis (rare).
- Pelvis (rare).

In cryptorchidism, a testicle is arrested at some point in its normal descent; it may be located anywhere between the renal and scrotal areas. Unilateral arrest is more common than bilateral. The incidence of cryptorchidism at birth (after a 9-month gestation) is 3.4%; half of the involved testicles descend in the first year of life. The cardinal sign of ectopy or cryptorchidism is the absence of one or both testes from the scrotum. The scrotum may be hypoplastic on the affected side. Often, the testis can be palpated in the inguinal canal, the most common site of ectopy (Figure 2).

An associated indirect inguinal hernia always accompanies a true undescended testis and is common with ectopic testes as well. In addition, torsion of the spermatic cord or malignancy may be seen as well. Most authorities believe cancer is 20 to 46 times more common in undescended testes than in normally descended organs. In a review by Martin, seminoma was the most common tumor in 220 instances of malignancy in undescended testes (Figure 3).

Because definitive histologic change can be demonstrated in cryptorchid testes in patients as young as 1 year, placement of the testis in the scrotum should be accomplished by that age. Hormonal therapy (human chorionic gonadotropin hormone, by intramuscular injection) has sometimes been used to stimulate descent and may be effective in 10% to 20% of patients; its effectiveness is greater in bilateral than in unilateral cryptorchidism. Reserve surgical treatment for patients in whom hormonal therapy has failed or who have an associat-ed inguinal hernia. Orchidopexy and
hernioplasty are often performed at the same time. In testicles that are properly placed in the scrotum by age 6 years, hormonal and spermatogenic functioning is generally adequate, and the scrotum has a normal appearance. However, retrospective studies report fertility rates from 78% to 92% in patients with surgically corrected unilateral cryptorchidism. The sperm concentration in men with a history of untreated unilateral undescended testis is often lower than that of men with normal descended testes. In men who have bilateral cryptorchidism, whether treated or untreated, fertility rates are poor. "Retractile testis," or physiologic cryptorchidism. This is a common phenomenon that requires no treatment. Retractile testis is thought to result from the small mass of the prepubertal testis and the strength of the cremaster muscle; the latter involuntarily retracts the testis up toward the spermatic cord. The diagnosis is often made on the basis of a normal scrotum on physical examination and the ability of the physician to manually push the testis into the scrotum from its inguinal location. When retractile testis is suspected, examine the patient in a sitting position with legs crossed; this allows the abdominal muscles to relax and thus negates the cremasteric reflex.

**THE FULL SCROTUM**

The "full scrotum" refers to presentations in which the testicles and scrotum are described as "abnormal," "full," or "big"; the conditions are usually painless. In children, these clinical findings are usually secondary to benign conditions such as a hydrocele or inguinal hernia; less commonly, they are associated with varicoceles or epididymal cysts. Rarely, a boy may present with a hard, fixed mass in the scrotum that represents malignancy.

**Hydrocele.** This is a collection of fluid that surrounds the testis within the scrotum (technically within the tunica vaginalis). Hydroceles in children are usually detected by the parents, who describe a swelling in the groin or scrotum. A hydrocele in a male neonate usually represents peritoneal fluid that is retained after the processus vaginalis has closed. However, when the amount of fluid varies with time, there is communication with the peritoneal cavity. If the processus vaginalis remains patent, a neonatal hydrocele will change when the infant cries or exerts himself, and gravity will make it larger during the day and smaller in the morning after a night's sleep. The swelling itself is not painful. Small hydroceles disappear by age 1 year. Congenital hydroceles that persist for longer than 24 months are usually the result of a patent processus vaginalis. If a hydrocele has not resolved by age 2 years and has increased in size, repair is warranted. In older children, an acute hydrocele is usually the result of an inflammatory process. Typically, there is a history of local injury, torsion, or epididymitis. Rarely, a hydrocele is a complication of malignancy.

On examination, hydroceles are smooth and nontender and, in boys with light skin, the scrotum transilluminates. If compression of the fluid-filled mass toward the external ring completely reduces the mass, then a hernia is the more likely diagnosis. Because a scrotal hernia may be confused with a hydrocele in children, never attempt aspiration in young patients. Surgical correction of a hydrocele is usually effected by eversion of the tunica vaginalis after removal of the hydrocele fluid.

**Varicocele.** This is a painless scrotal swelling caused by a collection of spermatic cord vessels that are the result of spermatic vein incompetence. Varicoceles normally occur on the left side because the left spermatic vein drains into the renal vein at a right angle, while drainage of the right spermatic vein into the vena cava is at an oblique angle and thus more direct. Occasionally, patients with a varicocele present with some mild discomfort, but the usual complaints are of heaviness and the sensation of "carrying a bag of worms." A varicocele is most evident when the patient is standing or performing the Valsalva maneuver. In equivocal cases, an ultrasonographic scan with the patient in an upright position performing the Valsalva maneuver may help with diagnosis.

Varicoceles are very common in both fertile and infertile men, although they have been associated with infertility in some men. If a child has a varicocele and there is a significant discrepancy between the growth of the ipsilateral testis and of that on the unaffected side, or if results of a semen analysis are abnormal (although such analysis is rarely performed in young patients), repair of the varicocele is warranted.

**Hernia.** Approximately 1% to 3% of prepubertal children have a hernia that has resulted from a patent processus vaginalis; this allows protrusion of peritoneal contents through the internal ring-in some cases, as far distally as the scrotum. In premature infants, the rate is approximately 3 times as high as in full-term infants. Approximately 10% of children with hernias have a family history of the condition, although there is no known inheritance pattern. At least one third of childhood hernias are...
diagnosed before 6 months of age; there is a significant male-to-female predominance. About 16% of childhood hernias are bilateral. Hernias, much like hydroceles, typically present as painless masses—although an incarcerated hernia often produces pain. Hernias do not transilluminate. When nonincarcerated, they can usually be reduced.

References:


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