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LESSON 30

Evaluation and Management of the Acute Scrotum

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to describe the differential diagnosis, epidemiology, and evaluation of the acute scrotum, and define the indications for surgical and nonsurgical management of the acute scrotum.

This AUA Update aligns with the American Board of Urology Module on Core/General Urology. Additional information on this topic can be found in the AUA Core Curriculum sections on Anatomy & Physiology and Trauma.



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KEY WORDS: torsion, testis, epididymitis, ischemia, testicular trauma

INTRODUCTION

An acute scrotum refers to new-onset pain and swelling to the scrotum, testes, or surrounding structures. It is a common urological presentation with many potential etiologies affecting all ages. Timely evaluation and diagnosis are needed to identify whether emergent surgical exploration is indicated.

DIFFERENTIAL DIAGNOSIS AND EPIDEMIOLOGY

The acute scrotum may be caused by ischemic, traumatic, infectious, inflammatory, or acute-on-chronic etiologies, with ischemia and infection being the most common in both adult and pediatric populations (Table 1).

Ischemia. Ischemia arises from torsion of the testis on the axis of the spermatic cord. Testicular torsion should be highly suspected in the pediatric population as it affects 3.8 per 100,000 males aged 18 or younger each year, with bimodal peaks in the perinatal and adolescent age.^{1,2} The incidence of torsion in adults decreases to 1.3 per 100,000 males, but the diagnosis carries a high morbidity as 33.6% of those undergoing surgical intervention receive an orchiectomy.¹ In children and adults, testicular torsion most commonly occurs within the tunica vaginalis (intravaginal torsion). This type of torsion is associated with a congenital anomaly known as the bell-clapper deformity, where the tunica vaginalis fully surrounds the testis, epididymis, and the upper portion of the spermatic cord, allowing the testis to rotate freely within the investment.³ The bell-clapper deformity is bilateral in up to 80% of cases, justifying the need for bilateral orchiopexy at the time of exploration.² Moreover, in the antenatal and early postnatal periods, the testis and the tunica vaginalis may rotate as a unit (extravaginal torsion) because the scrotal contents have not fully adhered to the dartos fascia. Overall, testicular torsion is more common on the left side with medial rotation.⁴ The spermatic cord is capable of twisting >720 degrees, with higher degree of torsion correlating to more rapid ischemia onset and testicular loss.⁵

The great mimicker of testicular torsion, especially in young children, is torted appendage. Torsion of the

vestigial appendages of the testis or the epididymis about their proximal attachment sites may cause symptomatic ischemia but does not harm the testis. Although the appendix testis rotates most often, appendages may also be found on or near the epididymis.⁶

Trauma. Genitourinary injuries are present in 10% of all abdominal trauma and are caused by blunt, penetrating, thermal, and degloving mechanisms of injury.⁷ **Blunt scrotal trauma makes up the majority of scrotal injuries and is more common in younger males. It is usually caused by sports injuries, sexual activity, or motor vehicle accidents involving motorcycles or bicycles.**^{8,9} Penetrating scrotal trauma is often caused by gunshot wounds, knife stabbings, self-mutilation, and animal or human bites.⁹

In children, scrotal trauma is most often caused by blunt injury, but scrotal strangulation from zippers, as well as string, hair, or rubber bands is possible. In such cases, child abuse should always be considered.¹⁰

Infection. Infections of the scrotal contents, including orchitis, epididymitis, and epididymo-orchitis, affect 2.45 per 1,000 males.¹¹ **Epididymitis in sexually active males under age 35 is most likely caused by *Chlamydia trachomatis* or *Neisseria gonorrhoeae*.** Epididymitis in males over 35, especially those with benign prostatic enlargement, urethral stricture disease, or other causes of bladder outlet obstruction, is caused by reflux flow of contaminated urine into the ejaculatory ducts, and enteric pathogens should be suspected. Both enteric and sexually transmitted organisms should also be considered in all males who engage in insertive anal intercourse.^{12,13} **In children, only 4% of epididymitis is attributed to bacteria and it is instead most commonly associated with postinfectious inflammation associated with adenovirus or enterovirus.**^{14,15} Rare viral causes of scrotal inflammation include mumps orchitis in postpubertal boys, as well as influenza and parainfluenza viruses.¹⁶ Filarisis, a parasitic disease caused by *Wuchereria bancrofti*, is another rare cause of scrotal lymphedema or hydrocele found in association with epididymo-orchitis.¹⁷

Fournier's gangrene (FG), a necrotizing soft-tissue infection of the scrotal, perineal, or perianal regions, is a rare but life-threatening cause of acute scrotum. Predisposing

Table 1. Differential Diagnosis of Acute Scrotum

Ischemic	Trauma	Infectious	Inflammatory	Acute on chronic
Testicular torsion	Testicular rupture	Epididymo-orchitis	Henoch-Schönlein purpura	Spermatocele/varicocele/testicular tumor rupture and/or hemorrhage
Appendiceal torsion	Testicular hematoma	Cutaneous abscess		Hydrocele, compression
Intermittent testicular torsion	Contusion hematocele	Intrascrotal abscess		Hernia (strangulated or incarcerated)
	Traumatic epididymitis	Fournier's gangrene		
	Animal or human bites			

ABBREVIATIONS: Fournier's gangrene (FG), Henoch-Schönlein purpura (HSP), Testicular Workup for Ischemia and Suspected Torsion (TWIST), urinalysis (UA)

conditions are those that impair microvasculature or immunity, such as diabetes, hypertension, obesity, alcohol use disorder, and immunodeficiencies.¹⁸⁻²⁰ The infection is polymicrobial in over 80% of cases and requires emergent surgical debridement to establish source control.^{18,21} In the United States, FG carries a mortality rate of 7.5%, with many survivors requiring multiple operations and posthospital care.²⁰ Nonnecrotizing scrotal soft-tissue infections are more common, often causing abscess formation. Scrotal abscesses are also a result of infected sebaceous cysts, folliculitis, or intra-abdominal disease processes.²²

Inflammation and acute-on-chronic disease. Henoch-Schönlein purpura (HSP), or IgA vasculitis, may cause scrotal wall edema and inflammation in prepubescent boys secondary to immune complex deposition. Scrotal involvement occurs in 2%-38% of HSP cases and may mimic torsion.²³

Although exceedingly rare, chronic scrotal conditions, such as hydroceles, spermatoceles, and varicoceles, may rupture to form acute scrotal hematomas. This is often a result of sexual activity, traumatic injury, sneezing, or other sudden increases in abdominal pressure, and the hematoma requires prompt evaluation to rule out testicular ischemia.^{24,25}

An acute inguinal hernia should be considered on the differential for acute scrotum, especially if incarceration or strangulation is suspected as this is a surgical emergency. The risk of inguinal hernia is highest in preterm infants due to the patency of the proximal processus vaginalis and in aging adults due to weakened abdominal wall. In adults, other risk factors include low BMI, benign prostatic hyperplasia, history of prostatectomy, or engagement in heavy lifting.^{26,27}

DIAGNOSTICS

Systematic categorization of the differential diagnosis may provide a succinct algorithm for accurate and timely diagnosis (Figures 1-3). **History and physical exam hold great diagnostic value to quickly narrow the differential diagnosis. Additionally, microscopic urinalysis (UA) should be done at the time of presentation for all patients with an acute scrotum.** Aside from UA, labs are not routinely recommended as they are not helpful in guiding diagnosis or management. **Doppler US is almost always indicated and may strongly support a final diagnosis for most etiologies of an acute scrotum (Table 2).**

Ischemia. The most emergent diagnostic category is ischemic, with testicular torsion as the most important diagnosis to rule out. An acute presentation of severe scrotal pain with nausea and vomiting in an afebrile patient without urethral discharge is highly suspicious for torsion. The classic physical exam findings are diffuse scrotal tenderness and absent cremasteric reflex. **It is important to note that although a lack of cremasteric reflex is the classic presentation of testicular torsion, this finding does not definitely confirm or exclude torsion.**²⁸ Additional physical exam findings include a high-riding erythematous and edematous testicle in a horizontal line, which is highly specific for testicular torsion.^{2,29} If the diagnosis is highly certain, exploration should not be delayed for imaging.

However, many presentations of testicular torsion are nonspecific, requiring confirmation by Doppler US.⁴ **A sonographic finding of an enlarged testis with absent blood flow is diagnostic of torsion.** Twisting of the spermatic cord,

or the whirlpool sign, may also be appreciated as this is the most specific and sensitive US finding for torsion. Heterogeneous echotexture is a later finding and implies necrosis.³⁰ **Importantly, up to 40% of torted testes in neonates may have no apparent color flow Doppler, and clinical suspicion should remain high even with negative imaging.** The TWIST (Testicular Workup for Ischemia and Suspected Torsion) score may be used to guide diagnosis and has been shown to be particularly helpful for nonurological health care providers. TWIST is a clinical decision tool validated in adult and pediatric settings that uses history and physician exam findings to reduce unnecessary US in cases of suspected torsion.³¹ UA will likely be negative and does not play a role in diagnosis.

Prepubertal patients who present with subacute onset of pain and tenderness localized to the upper pole with a negative UA are likely experiencing appendiceal torsion. This condition is often associated with nausea and vomiting. A classic physical exam finding is the blue dot sign, a small area of bluish discoloration on the scrotum. However, this sign is not reliable as it may be absent in appendiceal torsion and falsely positive in testicular torsion.³² Instead, Doppler US should be performed. Sonography will rarely reveal an appendage, but confirmation of normal blood flow to the ipsilateral testis will rule out testicular torsion. Hyperperfusion of the associated epididymis is often appreciated.

Trauma. Scrotal trauma is a common etiology of the acute scrotum. **Penetrating scrotal trauma requires emergent surgical intervention due to high complication rates, such as orchietomy in 30% of cases.**³³ In contrast, blunt scrotal trauma should undergo immediate diagnostic evaluation to determine if surgical exploration is needed as many cases will reveal a contusion hematocoele, intratesticular hematoma, or testicular rupture. Testicular rupture should always be suspected as it is found in 48.5% of blunt testicular trauma.^{7,34} However, the pain of scrotal trauma often limits the physical exam. **As such, all presenting blunt scrotal traumas**

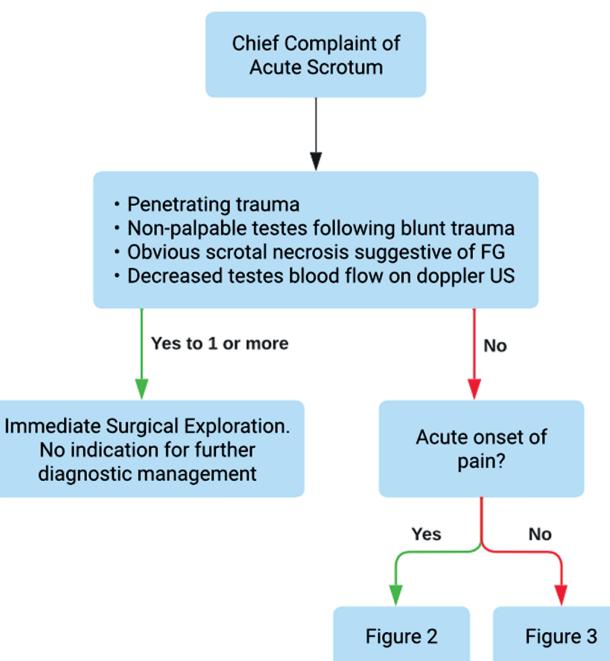


Figure 1. Algorithm, diagnostic steps for the initial presentation of acute scrotum. FG indicates Fournier's gangrene; US, ultrasound.

should be evaluated after an exam with high-resolution US and Doppler flow as scrotal US has a high specificity and sensitivity in identifying tunica albuginea rupture of 100% and 93.5%, respectively.³⁵ Traumatic epididymitis usually presents 3-5 days after mild blunt scrotal trauma that causes the testis and/or epididymis to be compressed by the surrounding bony anatomy. It is typically self-limiting, and management is supportive. Classically, a contusion hematocoele is characterized by localized tenderness, erythema, and edema with a palpable testis. An unruptured intratesticular hematoma will reveal tenderness of the testicle with no discernible contour change in the tunica albuginea on US. Testicular rupture will reveal an enlarged hemiscrotum with ecchymosis and an impalpable or deformed testicle. Sonography will demonstrate discontinuity of the tunica albuginea with hemorrhage and/or extrusion of seminiferous tubules, as well as areas of reduced testicular perfusion.^{8,34}

Animal or human bites are an uncommon etiology of scrotal trauma. They are easily clinically diagnosed, as patients present with visible bite wounds and are most often able to verbally convey the attack.³⁶

Infection. Acute scrotum related to infection is most often epididymitis, orchitis, or epididymo-orchitis. All 3 conditions have similar characteristics, and differentiation holds little diagnostic value as it does not change management. Patients may have a history of a previous sexually transmitted infection,

recent sexual activity, and/or irritative voiding symptoms. Pain secondary to infection presents insidiously over a course of days to weeks, and this extended duration and quality of pain most clearly differentiate infection from testicular torsion. Infection-related pain also localizes to the posterior scrotum and is often followed by fever. Physical exam often reveals scrotal swelling, tenderness of the epididymis, normal anatomical position with an intact ipsilateral cremasteric reflex, and a positive Prehn sign (pain alleviated by lifting the scrotum).¹³ In orchitis, the testicle may also be indurated. After a thorough history and physical exam, urinalysis and urine culture should be performed. The presence of leukocyte esterase is suggestive of inflammation in the urinary tract. PCR screening of the urine for *C trachomatis* and *N gonorrhoeae* should be performed in all patients with a suspected infectious etiology of an acute scrotum who have been sexually active. Doppler US is not necessary unless there are other signs or symptoms concerning for ischemia. If performed, an enlarged epididymis with increased Doppler wave pulsation and vascularity suggests epididymitis. If the diagnosis is orchitis, sonography will reveal testicular heterogeneity with hypoechoic and hypervascular areas.¹² **It is important to note that epididymitis in prepubertal boys is strongly associated with a urinary tract abnormality. Any episode in this population should be followed with a renal/bladder sonogram and a voiding cystourethrogram to**

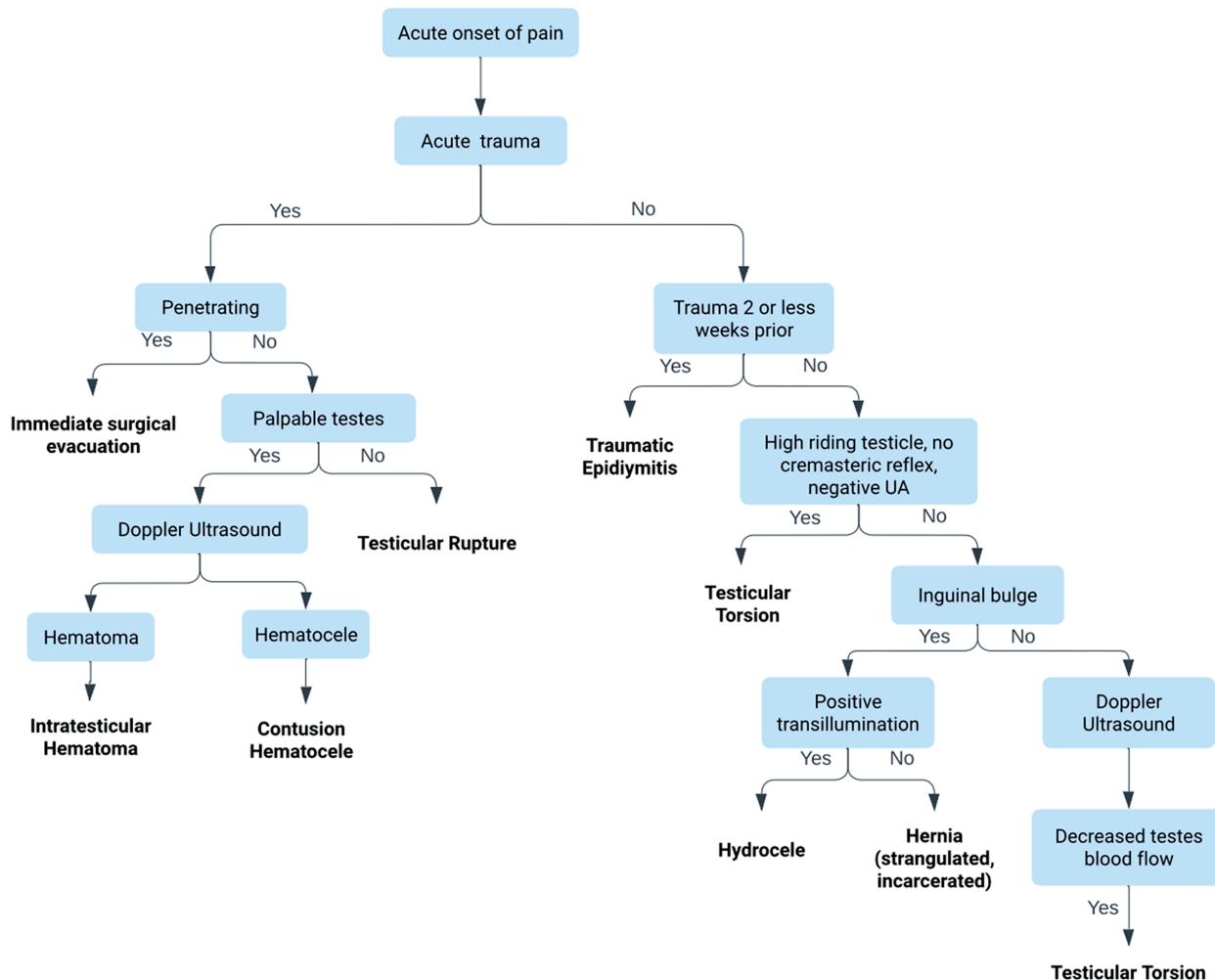


Figure 2. Algorithm, diagnostic steps for the differential diagnosis of acute scrotum with acute onset of pain. UA indicates urinalysis.

investigate for structural abnormalities or vesicoureteral reflux.

The presentation of FG is highly variable, but this rare diagnosis commonly presents as rapid-onset, severe pain and swelling in the scrotal or perineal region of older adults. Physical exam reveals exquisite tenderness, dusky macerated skin, purulence, malodor, and crepitus of the inflamed tissue. **Crepitus is the most diagnostic physical exam finding for FG as it indicates gas forming organisms.** There are often severe systemic symptoms that are out of proportion to the local extent of disease.³⁷ Such clinical findings are critical to rapid diagnosis as laboratory findings are nonspecific.³⁸ In most cases imaging is not necessary for diagnosis. However, CT scan may be useful in atypical presentations and differentiating less aggressive conditions such as soft-tissue edema, scrotal abscesses, or cellulitis as it has higher diagnostic value than a plain film or US. In addition, CT is important when investigating the true extent of disease to guide management and surgical planning. Common CT findings include asymmetrical fascial thickening, fluid collections, abscess formations, fat stranding around involved structures, and subcutaneous emphysema.³⁹

Scrotal abscess is another possible infectious etiology of acute scrotum. History and physical exams are often nonspecific with a presentation of mild to severe scrotal pain, erythema, and

edema. Cutaneous abscesses may have frank purulent drainage and are most commonly caused from infected hair follicles or scrotal laceration and may often be diagnosed clinically. Intrascrotal abscesses are most commonly due to neglected testicular torsion, or necrotizing epididymo-orchitis. US is the most appropriate imaging modality for suspected intrascrotal abscesses and will reveal an avascular mass with variable flow.⁴⁰ As previously mentioned, severe intrascrotal abscesses may be difficult to differentiate from FG. In these cases, CT may confirm diagnosis. Clinical judgment should be used when deciding to delay surgical exploration for imaging.

Similarly to infectious etiologies, late torsion may also present with a confluent mass in the scrotum with overlying edema and fixation that obliterate anatomical landmarks. However, color flow on Doppler US will be normal or increased from infection and absent in torsion.²

Inflammation. The classic HSP presentation includes progressive rash and joint pain over the course of days to a week, with scrotal erythema and swelling later in the disease course. Vital signs remain normal, and examination will show a petechial or purpuric, diffusely spread rash with an erythematous and edematous scrotum. Testes should be normally positioned but may be enlarged and tender. Doppler US is always indicated as scrotal involvement in HSP may mimic testicular torsion. Sonographic findings include diffuse

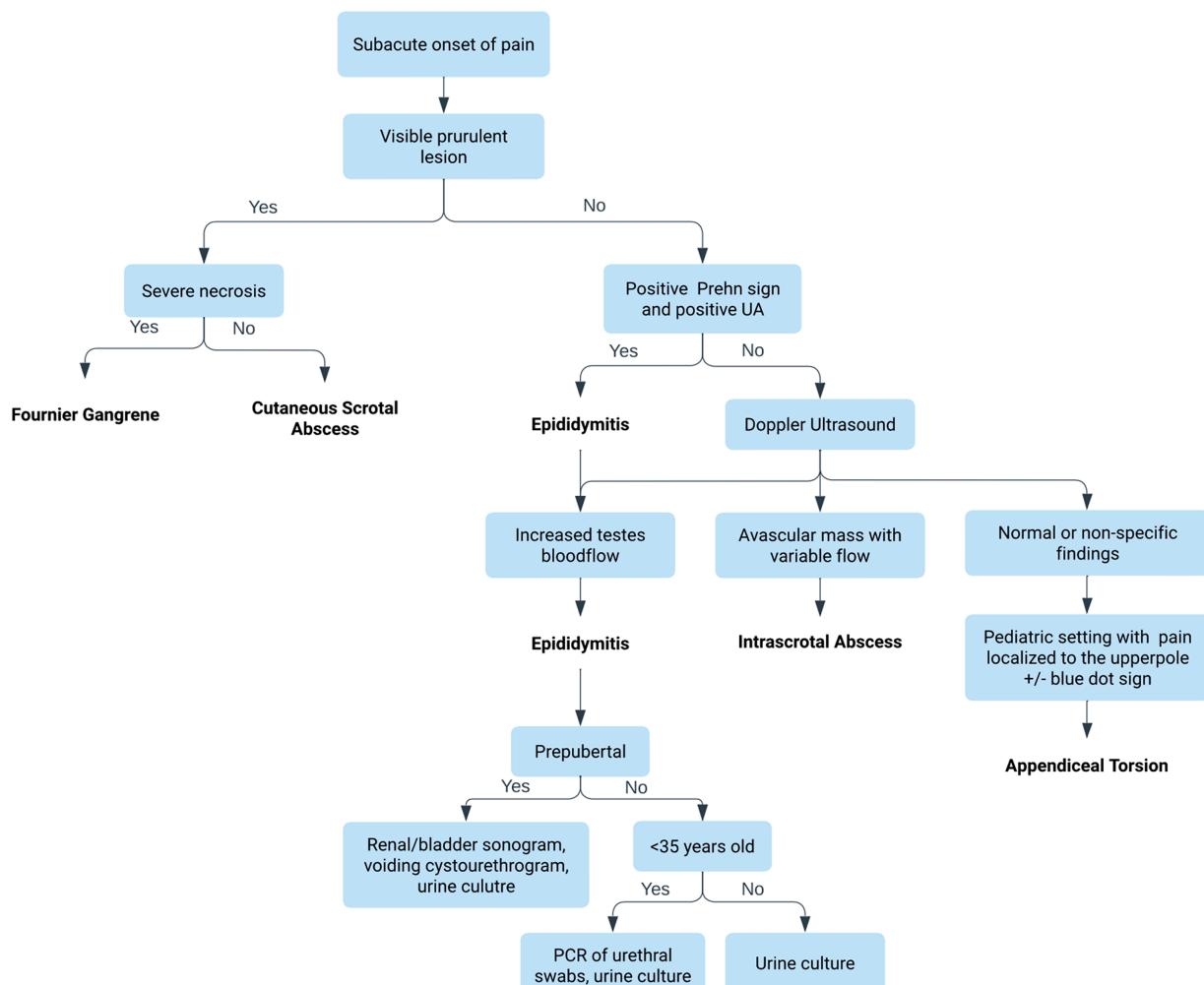


Figure 3. Algorithm, diagnostic steps for the differential diagnosis of nontraumatic acute scrotum with subacute onset of pain. PCR indicates polymerase chain reaction; UA, urinalysis.

scrotal wall edema, potential fluid collection, and increased vascularity in 1 or both testes.²³

Acute-on-chronic disease. An indirect inguinal hernia is easily diagnosed on physical exam by palpation of a reducible bulge without other scrotal changes.²⁶ For acute onset of severe pain in a patient with a known history of an indirect inguinal hernia, prompt Doppler US is required to reveal if the hernia is incarcerated or strangulated and whether testicular ischemia is present. If any one of these findings is identified, the patient should be taken for emergent surgical exploration by a urologist and/or general surgeon.

Hydroceles are an unlikely presentation of acute scrotum as they do not typically cause pain. However, they may rarely cause compression and subsequent ischemia. This warrants prompt evaluation with Doppler US.⁴¹ Associated dull tenderness or fevers are suspicious for epididymitis or orchitis and should be followed up with UA and culture.⁴²

Other acute-on-chronic events include rupture and/or hemorrhage of a spermatocele or varicocele. It often presents with pain out of proportion to clinical features.⁴³ Rarely, an acute scrotum may be caused by bleeding from within a testicular tumor. Because these conditions may present with symptoms similar to testicular torsion, evaluation should follow the previously mentioned testicular torsion diagnostic pathway.

MANAGEMENT

The most emergent diagnoses of the acute scrotum are those involving testicular ischemia as the testicular

salvage rate is 90% at 6 hours but decreases to <10% after the first 24 hours.^{5,44} Outcomes are poorer in the perinatal period, where only 9% of neonatal cases and virtually none of the prenatal cases are salvaged due to the failure of timely diagnosis and intervention.^{16,45,46} Thus, management of the acute scrotum is a surgical emergency until proven otherwise (Table 3).

Surgical management. If Doppler US or strong clinical suspicion raises concern for a decrease in blood flow, management of testicular torsion by surgical exploration should never be delayed. Due to the poor sensitivity of Doppler US in neonatal testicular torsion, all neonates with a high clinical concern for torsion should undergo surgical exploration.^{29,46} If the diagnosis is uncertain, a small negative exploration rate is acceptable in both the adult and pediatric populations to minimize the risk of missing this correctable condition. Contralateral orchiopexy should also be done at the time of surgery to prevent future contralateral torsion.³⁵ Currently, there are no data to support intraoperative US. However, clinically there may be a role following detorsion to confirm patency of blood flow. Although this is not necessary, intraoperative US is most helpful in determining viability of the testicle that does not immediately pink up when detorsed. Intermittent testicular torsion, once diagnosed, is managed identically to testicular torsion.

If urological intervention is not immediately available, manual detorsion may be attempted. The health care provider should rotate the abnormal testis medial to lateral 180 degrees (open book) and then evaluate for changes in

Table 2. Summary of US Findings

	US	Important considerations
Ischemic		
Testicular torsion	Enlarged testes with decreased blood flow ± whirlpool sign	Negative UA
Appendiceal torsion	Normal blood flow to the testes ± appendage or hyperperfusion of the epididymis	Negative UA
Trauma		
Testicular rupture	Contour abnormality of the testis, disruption of the tunica vaginalis with areas of reduced or absent testicular perfusion	
Intratesticular hematoma	Hypoechoic area in the testis with preserved or reduced perfusion	
Traumatic epididymitis	Epididymal enlargement and increased Doppler wave pulsation and vascularity	US findings can be identical to infectious epididymitis, differentiate with history and negative urine culture
Infectious		
Acute epididymo-orchitis	Epididymal enlargement and increased Doppler wave pulsation and vascularity	Insidious onset greatest differentiator from torsion. Positive UA make this diagnosis more likely
Intrascrotal abscess	Avascular mass with variable flow	If clinical concern for FG, proceed with CT
Inflammatory		
Henoch-Schönlein purpura	Diffuse scrotal wall edema with a potential fluid collection. Increased vascularity in 1 or both testes	Vital signs will be within normal limits

Abbreviations: CT, computerized tomography; FG, Fournier's gangrene; UA, urinalysis; US, ultrasound.

pain. If pain decreases, proceed with serial US to evaluate for return of blood flow.²⁹

Torsion of a testicular or epididymal appendage is typically self-limiting and will respond to conservative therapy (bed rest, scrotal elevation, ice, NSAIDs). Symptoms usually resolve in 1 week. However, if clinical

suspicion for testicular torsion remains or if the pain is severe, uncontrollable, or prolonged, scrotal exploration is warranted as torsion is a common operative finding in cases of pediatric acute scrotum.^{16,47} If surgical intervention confirms a torsed appendage, there is no indication to explore the contralateral side.⁴

Table 3. Management of the Differential Diagnosis of Acute Scrotum

	Management	Considerations
Ischemic		
Testicular torsion	Immediate surgical exploration	If urology is not available, manual detorsion should be attempted
Appendiceal torsion	Conservative management	If pain is severe and uncontrollable, proceed with surgical exploration
Trauma		
Penetrating trauma	Immediate surgical exploration	No diagnostic management
Testicular rupture	Immediate surgical exploration	
Testicular hematoma	No expansion: observation with serial Doppler US Expansion: immediate surgical exploration	If pain is severe and uncontrollable, proceed with surgical exploration
Contusion hematocoele	Surgical evacuation of the hematoma	Necessary as unabsorbed hematocoele can cause abscess formation and necrosis
Traumatic epididymitis	Conservative management	Confirm with negative urine culture
Animal or human bites	Human bites: amoxicillin-clavulanate Canine bites: ampicillin-sulbactam	Consider the infectious agents present in the oral flora of the offending animal when choosing antibiotic therapy
Infectious		
Acute epididymo-orchitis	Conservative management: empirical antibiotics until causative agent known (Table 4)	Urine culture necessary to narrow antibiotics
Cutaneous abscess	Adults: incision and drainage under local anesthesia. Antibiotics only indicated in immunosuppressed patients Pediatrics: broad-spectrum antibiotic therapy, serial scrotal exams and US. Surgical management if deteriorating condition	If spermatic cord, urethra, testes cannot be palpated, proceed with surgical management to avoid damage to surrounding structure
Intrascrotal abscess	Surgical drainage	If the testicle is involved, a partial or complete orchectomy may be indicated. Allow healing by secondary intention
Fournier's gangrene	Immediate surgical debridement	Surgery should not be delayed for diagnostics
Inflammatory		
Henoch-Schönlein purpura	Conservative management	Hospitalization is only necessary if patients have severe abdominal or joint pain, renal insufficiency, or cannot tolerate hydration
Acute on chronic		
Spermatocele/varicocele/testicular tumor rupture and/or hemorrhage	Surgical exploration	An inguinal approach is considered for testicular rupture with any suspicion of associated malignancy
Hydrocele, compression	If testicular compression or ischemia is confirmed, proceed with surgical exploration	
Hernia (strangulated or incarcerated)	If testicular compression or ischemia is confirmed, proceed with surgical exploration	

Abbreviations: US, ultrasound.

Conservative management includes bed rest, scrotal elevation, ice, NSAIDs.

Blunt scrotal traumas are most often conservatively managed. However, high rates of impaired fertility, hypogonadism, and testicular loss have been found to be associated with surgical delay. Due to such severe consequences, lingering clinical concerns warrant urgent surgical exploration.⁸ **Confirmed testicular rupture is always followed with urgent surgical exploration. Urgency is critical as salvage rates are as high as 90% if surgery is performed within 72 hours. After 72 hours salvage rates decline to 45%.**⁴⁸ For an intrascrotal hematoma, the presence of expansion will dictate management. **If there is no expansion revealed from US with an intact tunica albuginea, observation and serial scrotal US should follow.** US revealing expansion and/or severe pain is an indication for surgical exploration. **All penetrating traumas should immediately be surgically explored.**

Human or animal bites require early wound debridement, irrigation, incomplete closure, antibiotic therapy, tetanus, and rabies prophylaxis. Early wound closure and/or reapproximation is vital as late period closures increase the risk of infection and have associated unfavorable cosmetic outcomes.³⁶ Antibiotic prophylaxis in animal bites is controversial. However, due to the bacterial flora and the humid nature of the genital region, we recommend antibiotic prophylaxis for all bites to this area. Additionally, patients with diabetes, elderly age, or immunocompromised status should undoubtedly receive antibiotic therapy. Antibiotic selection is predicated on the infectious agents present in the oral flora of the offending animal. For human bites, amoxicillin-clavulanate is the agent of choice. For canine bites, we recommend the use of ampicillin-sulbactam.³⁶

After diagnosis of a contusion hematocoele, surgical evacuation of the hematoma may be necessary to avoid testicular compression. **Complete hematoma evacuation is critical as an unabsorbed hematocoele may become infected, leading to epididymo-orchitis, abscess formation, and necrosis.**⁴⁹

The high mortality of FG warrants aggressive multimodal management, including initiation of broad-spectrum antibiotics, hemodynamic stabilization, and surgical debridement. **Surgical management should never be delayed, even to wait for diagnostic confirmation on imaging, as delay has been found to negatively impact prognosis.**⁵⁰ After initial

surgical exploration, CT imaging may be indicated to investigate the extent of disease and guide further management. **Most patients require multiple surgical debridements, with an average of 3.5 procedures per patient.** During debridement, it is critical to open up deep fascial planes as all necrotic tissue must be excised. In extensive surgical debridement, urinary or fecal diversions may be necessary to prevent contamination of the wound(s). The testes are most often spared in these patients; however, orchectomy has been reported in up to 21% of patients and is appropriate when the testes are unsalvageable.⁴¹

In the adult setting, cutaneous scrotal abscesses should be incised, drained, and packed at the bedside under local anesthesia. The incision should be long enough to allow for ease of packing and to ensure that the skin does not close while the wound heals by secondary intention. For a simple incision and drainage, antibiotics are not recommended unless the patient is immunocompromised or there are signs of overlying cellulitis or systemic involvement (ie, fever). Postprocedural care includes sitz baths and frequent dressing changes. In the pediatric setting, cutaneous abscesses may be conservatively treated with antibiotic therapy paired with serial scrotal exams and US. The antibiotic of choice should be broad spectrum, covering both aerobes and anaerobes. If physical exam or imaging findings reveal a worsening condition, surgical management should ensue. However, intrascrotal abscesses are always surgically drained, and the abscess cavity should be fully opened to ensure complete drainage. If the testicle is involved, a partial or complete orchectomy is indicated based on the extent of disease. The cavity should be allowed to heal by secondary intention by leaving the wound open with packing.

Asymptomatic hydroceles and indirect inguinal hernias may safely be observed, but the presence of testicular compression or ischemia warrants surgical exploration. Acute-on-chronic events of infarct, rupture, or hemorrhage caused by either a spermatocele, varicocele, or testicular tumor also require urgent surgical exploration.^{26,30} As the standard treatment for primary testicular cancer resection is a radical inguinal orchectomy with high ligation of the cord, we recommend that an inguinal approach be considered for testicular rupture with any suspicion of associated malignancy.

Nonsurgical management. Management of epididymitis includes empirical antibiotics selected to treat the

Table 4. Recommended Antibiotic Treatment of Infectious Epididymitis Prior to Finalized Cultures^a

Population	Most likely causative agent	Antibiotic treatment
<35 y old and sexually active, or those with high-risk sexual behavior	<i>C trachomatis</i> and/or <i>N gonorrhoeae</i>	Ceftriaxone IM 500 mg once AND Doxycycline PO 100 mg twice daily for 10 d
Adults who practice insertive anal intercourse	<i>C trachomatis</i> and/or <i>N gonorrhoeae</i> and/or enteric organisms	Ceftriaxone IM 500 mg once AND Levofloxacin 500 mg once daily for 10 d
>35 y old with low-risk sexual behavior OR recent history of urinary instrumentation/ urinary tract surgery	Enteric organisms	Oral levofloxacin 500 mg for 10 d

Abbreviations: C, Chlamydia; IM, intramuscularly; N, Neisseria; PO, orally.

^aFor individuals weighing >150 kg, 1 g ceftriaxone should be administered.

most likely causative organism. Results of the urine culture or PCR test may then be used to narrow the antibiotics (Table 4). A negative culture suggests nonbacterial epididymitis caused by either urinary reflux or viral agents. In these cases, treatment should be conservative with no indication for antibiotics. Once treatment is initiated, pain and swelling should resolve in a week, but total symptomatic resolution may take several weeks.¹³

A multidisciplinary team should be involved in the management of HSP as it is a systemic disease that may require hospitalization for severe kidney or joint involvement. Given that HSP is a self-limiting disease, urological management should be conservative and without surgical intervention.²³

CONCLUSIONS

The acute scrotum is a common presentation and is a surgical emergency until proven otherwise. As testicular salvage rates sharply decline in the first 24 hours, surgical consultation should not be delayed in suspicious cases. Applying a systematic approach to the diagnosis of an acute scrotum, as highlighted in this Update, will improve diagnostic accuracy and avoid unnecessary testing and intervention.

DID YOU KNOW?

- Acute scrotum is a time-sensitive surgical emergency until proven otherwise. When indicated, urology consultation should not be delayed.
- Categorizing the differential diagnosis of the acute scrotum into ischemic, trauma, infection, inflammatory, and/or acute-on-chronic etiologies can guide management by providing a clear and succinct algorithm for timely diagnosis.
- The most common etiology of an acute scrotum in adults is epididymitis. The most common etiologies in pediatrics vary based on age and are testicular torsion, appendiceal torsion, and epididymitis. The most emergent etiology in all populations is testicular torsion.
- Thorough history and physical exam has high diagnostic value when evaluating an acute scrotum. The most appropriate supplemental imaging is Doppler US.
- The cremasteric reflex is not as sensitive as previously thought and does not definitively rule out testicular torsion.

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Study Questions Volume 42 Lesson 30

1. A 67-year-old male with hypertension and alcoholic cirrhosis presents with a 3-day history of worsening scrotal pain with associated swelling and subjective fevers. He is febrile, blood pressure 105/70, tachycardic, and the glucose is 405. The scrotum is extremely tender, erythematous, and edematous. Bilateral testes are palpable, with fluctuation on the right scrotal wall. There are no skin lesions or crepitus. After administering IV fluids, what is the best next step?
 - a. Doppler US
 - b. Urgent CT scan
 - c. Broad-spectrum antibiotics and urgent CT scan
 - d. Broad-spectrum antibiotics and urgent surgical exploration
2. A 4-year-old healthy male is in the emergency department with a 2-day history of scrotal pain and swelling. He progressively became more irritable, and his mother noticed right-sided scrotal redness and swelling. He is afebrile, the scrotum is erythematous, mildly enlarged, and tender—mainly in the upper pole of the right testis. US indicates normal testicular perfusion and “epididymitis”; the UA is negative. What is the most likely diagnosis and the best next step?
 - a. Epididymo-orchitis. Prescribe antibiotics based on regional resistance patterns and results of the urine culture
 - b. Testicular torsion. Proceed to surgical exploration immediately
 - c. Torsion of scrotal appendage. Recommend NSAIDs, rest, and outpatient follow-up
 - d. Varicocele. Offer elective surgical repair to relieve pain and testicular size discrepancy
3. You are consulted in the emergency department for scrotal swelling in a 2-day-old male. The newborn has been agitated and persistently crying for the past day and has worsening left-sided scrotal swelling. There is a solid, mildly erythematous swelling of the left scrotum with testicular tenderness. The right testis is normal. Doppler US indicates an absent blood flow signal and a heterogenous appearance of the left testis with a surrounding hydrocele. The patient is taken to the operating room for emergent surgical exploration. What are the most likely intraoperative findings?
 - a. The left testis is pink and edematous with rotation inside the tunica vaginalis
 - b. The left testis is dark, edematous, and necrotic, and rotated with involvement of the tunica vaginalis
 - c. The left testis is dark, edematous, and necrotic, and rotated inside the tunica vaginalis
 - d. The left testis is enlarged with a stiff tunica albuginea due to intratesticular blood collection
4. A 2-year-old boy is evaluated in the emergency department as he has been inconsolable and vomiting for several hours. He has been grabbing at his scrotum and pointing to his right groin. His parents report a history of intermittent right-sided scrotal swelling that used to get better when lying down, but has been constant for the past several weeks. His acute symptoms began after attempting to have a bowel movement. The right hemiscrotum is noticeably large and there is a bulge in the right groin. What is the most likely diagnosis and finding on scrotal US?
 - a. Direct inguinal hernia, increased testicular blood flow
 - b. Indirect inguinal hernia, decreased testicular blood flow
 - c. Indirect inguinal hernia, increased testicular blood flow
 - d. Direct inguinal hernia, decreased testicular blood flow
5. A 15-year-old boy presents with left testicular pain, which started yesterday morning and is worsening. It is as a dull ache at the top of his left testicle that is worse with movement. He was recently hit in the scrotum with a baseball 6 days ago. He had pain right after the impact, but it resolved spontaneously. He is sexually active and sometimes uses condoms. He denies a history of hematuria, dysuria, or urethral discharge. The scrotum is mildly edematous, and the left testis is mildly tender to palpation with a nontender right testis. Urinalysis is normal. On US, there is bilateral flow and left testicular edema without masses. What is the most likely diagnosis and appropriate management?
 - a. Infectious epididymitis. Doxycycline orally 100 mg twice daily for 10 days
 - b. Testicular torsion. Referral to an emergency department for an urgent scrotal US
 - c. Infectious epididymitis. Ceftriaxone intramuscularly 500 mg once and levofloxacin orally 500 mg once daily for 10 days
 - d. Traumatic epididymitis. Rest, ibuprofen orally 200 mg as needed, and scrotal support