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AN EVIDENCE-BASED APPROACH TO EMERGENCY MEDICINE

# An Evidence-Based Approach To Male Urogenital Emergencies

*It's shortly after midnight, and a 12-year-old male is triaged with a chief complaint of severe testicular pain. His parents tell you that he just woke them up because of his inability to sleep; however, the onset of symptoms was several hours prior to ED arrival. You evaluate him without delay and discover that he has an acute, painful, swollen, tender hemiscrotum. You promptly phone the on call urologist, who asks you to "kindly order a sonogram" and says she will be in to see the patient first thing in the morning. Although you are uneasy with the proposed plan, you oblige. Your next call is to the on call radiologist, who informs you that he would be happy to coordinate the study, although it will be "several hours" until the tech arrives from home. Suddenly, you find yourself faced with several difficult decisions: How much pressure should you place on the urologist to see the patient more expeditiously? Is "several hours" waiting for the sonogram (not to mention the time to obtain the interpretation) too long? If your institution is unable to provide an emergent evaluation, should you transfer the patient to an institution that can? You realize you are in a tenuous position, yet in the end, the responsibility to make the right decisions is yours . . .*

**Acute** scrotal or penile pain can cause a high level of anxiety for the patient, parent, and even, at times, for the health care provider. Presentations are often delayed as a result of the patient's embarrassment, and the patient may not be initially forthright with the exact nature of the complaint. The care provider must be sensitive to both the emotional and physical needs of the patient.

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**CME Objectives**

Upon completion of this article, you should be able to:
1. Cite the 5 true genitourinary emergencies.
2. Identify the three most frequent etiologies of the "acute scrotum."
3. Describe the diagnostic utility of the cremasteric reflex in evaluating the "acute scrotum."
4. Describe the role of sonography in male urogenital emergencies.

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The challenge in emergency practice is to differentiate conditions requiring prompt evaluation and action from urgent conditions that are amenable to outpatient management. Missed or delayed diagnosis of testicular torsion threatens testicular viability and future fertility. Similarly, early identification and aggressive management of necrotizing fasciitis of the perineum (Fournier's disease or Fournier's gangrene) is critical to maximizing outcomes. Emergent penile conditions include priapism and paraphimosis. Any form of GU trauma is presumed to be an emergency until proven otherwise.

The goal of this issue of *Emergency Medicine Practice* is to provide a risk management tool and to provide an evidence-based best practice approach to the male complaining of acute scrotal or penile pain.

## Critical Appraisal Of The Literature

One of the inherent difficulties in formulating an evidence-based approach to male GU emergencies is the paucity of available literature that is actually useful in "real-time" to the emergency clinician. For example, literature attempting to answer the age-old debate of "boxer briefs" versus "tighty-whities" is just not that helpful to the emergency practitioner at 3 o'clock in the morning![2] Therefore, it is necessary to rely on weak studies (retrospective studies, case series, case reports) to guide us in our clinical decision-making.

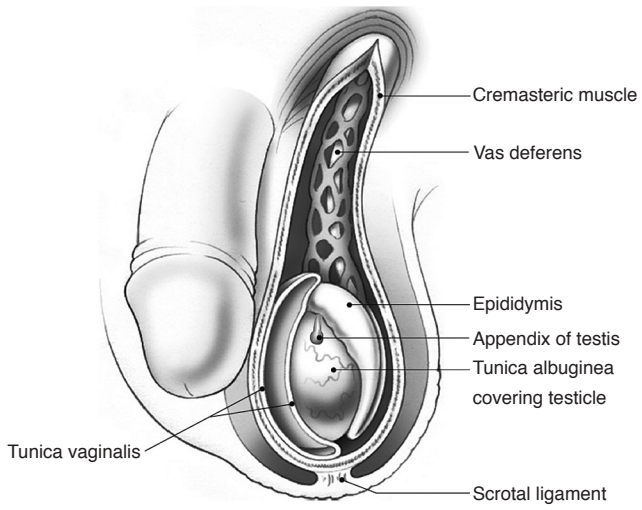
## Etiology and Pathophysiology

The male genitalia is composed of the penis (paired erectile bodies and penile urethra) and the scrotum (encases the testis, epididymis and spermatic cord bilaterally). (**See Figure 1.**) The scrotal wall consists of several layers all deep to the epidermis, many of which are contiguous with the penis, perirectal region, and anterior abdominal wall. Each testis is encapsulated with a dense connective tissue layer termed the tunica albuginea. External to the tunica albuginea is the tunica vaginalis, which envelops each testicle and fastens it to the posterior scrotal wall. A lack of firm testicular attachment by the tunica vaginalis subjects it to potential horizontal or vertical rotation around or within the spermatic cord, resulting in testicular torsion. The appendix testes are embryologic remnants with no known physiologic function located at the uppermost pole of the testes. These appendages are prone to torsion as well, leading to localized, self-limited necrosis. The epididymis adheres closely to the posterolateral aspect of each testis, and it is responsible for promoting sperm maturation and motility. Similar to the appendix testis, the appendix epididymis is an embryologic remnant attached to the head of each epididymis and frequently is involved in self-limiting torsion that can simulate testicular torsion.

The penis consists of the 2 corpora cavernosa (erectile bodies, each encapsulated by tunica albuginea) and the solitary corpus spongiosum, which surrounds the penile urethra. In uncircumcised males, the retractile penile foreskin (prepuce) is a sleeve that normally covers the head of the penis (glans). The potential constricting effect of a proximally retracted foreskin may lead to paraphimosis. Priapism is a pathologic condition defined by the presence of a persistent erection lasting longer than about 4 hours in the absence of any sexual desire or stimulation. It most frequently results from engorgement of the corpora cavernosa with stagnant blood (termed low-flow priapism). Although rare, high-flow priapism results from the development of a traumatic arterial-cavernosal fistulae, resulting in the accumulation of oxygen-rich blood in the corpora.

In the male presenting with GU pain, it is essential to delineate the precise anatomic regions where the pain is located. Pain may be due to structures within or adjoining a particular region or may be referred from adjacent areas. The majority of patients complaining of acute scrotal (or penile) pain will have a problem isolated to the genitalia. However, it is equally important to consider the etiologies of referred pain, including retroperitoneal processes such as renal colic, pyelonephritis, or abdominal aortic aneurysm.

### Figure 1. Anatomy Of The Scrotum




*From: Davis JE. Chapter 31: Scrotal Pain, in Mahadevan SV, Garmel GM, Eds. An Introduction to Clinical Emergency Medicine: Guide for Practitioners in the Emergency Department. New York: Cambridge University Press; 2005:p461. Reprinted with the permission of Cambridge University Press.*

## Differential Diagnoses

GU complaints are broadly categorized into those involving the scrotum and the structures that it envelops (testicle, epididymis, and spermatic cord) or those involving the penis. Child abuse must be considered in the differential diagnosis for any pediatric patient presenting with GU complaints. The American Academy of Pediatrics (AAP) has published guidelines regarding the evaluation of sexual abuse in children.[3]

### Acute Scrotal Pain

There are a wide variety of clinical conditions that present as an acute, painful, swollen, tender hemiscrotum, **see Table 1, page 4**.

Distinguishing exact causes can be particularly challenging in children, who are most likely to present with an undifferentiated "acute scrotum." Fortunately, in the vast majority of cases, the "acute scrotum" can be attributed to 1 of 3 diagnostic entities: testicular torsion, epididymitis, or appendage torsion. (**See Table 2**). This fact serves to better focus the ED evaluation. The frequency of each diagnosis varies significantly from study to study (depending on factors such as the age distribution of the population studied), making it difficult to draw firm conclusions from the data.[5,6] Having said this, each contributes to roughly one-third of pediatric "acute scrotum" cases.[7] In a review of 238 consecutive cases presenting to a children's hospital ED, incidences of testicular torsion, appendage torsion, and epididymitis were 16%, 46%, and 35%, respectively.[8] Similar to other studies, the predominant diagnosis varied by age group: testicular torsion in the first year of life, appendage torsion in the toddler to pre-pubertal (3-13 year old) range, and epididymitis after 13 years of age. Specifically, bimodal peaks in the incidence of testicular torsion were noted in newborns as well as peri-pubertal males, which is concordant with other investigations.[9,10] In addition, up to 10% to 20% of cases may result from other causes entirely (such as incarcerated inguinal hernia or idiopathic scrotal edema,[11] among others).

Fournier's disease should be considered in elderly, diabetic, or other immuno-compromised males complaining of perineal pain "out of proportion" to physical findings. Although Fournier's is typically thought of as an "elderly male" disease, it has also been reported in children (as well as females).[12] Interestingly, in contrast to adults, children with Fournier's disease may appear relatively non-toxic despite marked tissue inflammation and necrosis.[13]

### Acute Penile Pain

Patients with penile complaints often present non-specifically, complaining of a "painful" or "swol-

**Table 2. Differentiating Testicular Torsion Versus Epididymitis Versus Appendage Torsion**

| | Testicular Torsion | Epididymitis | Appendage Torsion |
|---|---|---|---|
| **Historical Features** | | | |
| Age | Incidence peaks in neonatal and adolescent groups but may occur at any age | Primarily adolescents and adults | In years prior to puberty |
| Risk factors | Undescended testicle (neonate), rapid increase in testicular size (adolescent), failure of prior orchiopexy | Sexual activity/promiscuity, GU anomalies, GU instrumentation | Predisposing anatomy |
| Pain onset | Sudden | Gradual | Sudden or gradual |
| Prior episodes of similar pain | Possible (spontaneous detorsion) | Unlikely | Occasional |
| History of trauma | Possible | Possible | Possible |
| Nausea/vomiting | Common | Rare | Rare |
| Dysuria | Rare | Common | Rare |
| | | | |
| **Physical findings** | | | |
| Fever | Rare | Common in advanced disease (epididymo-orchitis) | Rare |
| Location of swelling/tenderness | Testicle, progressing to diffuse hemi-scrotal involvement | Epididymis, progressing to diffuse hemi-scrotal involvement | Localized to head of affected testicle or epididymis |
| Cremasteric reflex | Testicular torsion unlikely if present | Typically present | Typically present |
| Testicle position | High riding testicle, transverse alignment | Normal position, vertical alignment | Normal position, vertical alignment |
| Pyuria | Less likely | More likely | Less likely |

## Table 1. Differential Diagnosis Of Acute Scrotal Pain

| Most Threatening | Common Age | Symptoms | Signs |
|---|---|---|---|
| Testicular torsion | Any; neonates and adolescents have the highest risk | Sudden and severe onset of pain; often associated with nausea and vomiting ("systemic" symptoms) | High-riding testicle with transverse lie; intact ipsilateral cremasteric reflex significantly decreases the probability of testicular torsion |
| Fournier's gangrene | Any | Perineal pain, swelling, redness, bruising, fever, vomiting, lethargy, weakness ("systemic" symptoms); commonly associated with diabetic symptoms | Paucity of local findings in early stages ("pain out of proportion to physical findings"); may rapidly progress to fulminant sepsis with shock |
| GU trauma | Any | History of blunt or penetrating injury | Highly variable depending on mechanism and the organ that is injured |
| Abdominal aortic aneurysm | The elderly have the greatest risk | Non-specific flank, abdominal, and/or GU pain; often simulates renal colic | Tachycardia, hypertension (prior to rupture), or hypotension (post rupture); abdominal and/or CVA tenderness |
| **Other GU Etiologies** | | | |
| Appendage torsion | Typically prepubertal | Often simulates testicular torsion; less frequently manifests "systemic" symptoms such as nausea and vomiting | Tender nodule at head of testicle or epididymis; "blue dot sign" is pathognomonic and is seen most often when scrotal skin is hormonally unstimulated |
| Epididymitis | Sexually active men or young/middle aged laborers | More indolent onset of symptoms compared with testicular torsion; thorough history is key to the diagnosis | Early: tenderness isolated to the tail of the epididymis<br>Late: with unrecognized progression, inflammatory process becomes contiguous with testicle (epididymo-orchitis) |
| Epididymo-orchitis | Same as above | Often more "systemic" findings compared with isolated epididymitis | Large, swollen scrotal mass; indistinct border between testicle and epididymis |
| Hematocele | Any | Painful scrotal mass with bruising; often antecedent history of trauma | Ecchymoses of scrotal skin; testicular /epididymal mass and tenderness |
| Hydrocele | Any | Fluid accumulation produces gradual scrotal swelling | Transillumination seldom helpful |
| Idiopathic scrotal edema[4] | Children less than 10 years old | Typically unilateral scrotal swelling and edema | Scrotal, perineal, inguinal erythema, and edema |
| Orchitis | Any | Gradual onset of unilateral (or bilateral) testicular swelling and pain | Swelling and tenderness primarily isolated to testicle (or testes) |
| Scrotal skin disorders (ie, infection, inflammation, others) | Any | Variable depending on cause | Must distinguish between lesions localized to the scrotal wall versus those contiguous with deeper structures |
| Tumor | Any | Gradually enlarging testicular mass/fullness; often painless initially | May appreciate mass, firmness, or induration on examination |
| Varicocele | Any | Gradual onset of unilateral swelling in the upright position; minimally painful | Abnormally enlarged spermatic cord (pampiniform) and venous plexus (described as a "bag of worms"); more common on the left |
| Vasculitis (ie, Henoch-Schonlein purpura (HSP) | Typically childhood for HSP | Testicular swelling and pain | Associated vasculitis findings (such as buttock/lower extremity purpura and renal involvement in case of HSP) |
| **Other Etiologies** | | | |
| Acute appendicitis | Any | Fever, nausea/vomiting, anorexia, right-lower quadrant (RLQ) pain | RLQ tenderness is classic; may have associated abdominal rebound/guarding |
| Hernia | Any | Unilateral inguinal/scrotal swelling and pain; usually better when recumbent unless incarcerated | Reducible, incarcerated, and strangulated forms; latter two often more tender on examination |
| Renal colic | Any | Sudden, severe, "colicky" pain that may be referred to ipsilateral groin/testicle mimicking testicular torsion; often associated flank pain or urinary symptoms and systemic findings such as nausea, vomiting, and diaphoresis | Costovertebral angle (CVA) tenderness, low abdominal tenderness |
| Pyelonephritis | Any | Constant and progressive flank pain that may be referred to ipsilateral groin/testicle; often associated urinary symptoms and systemic findings such as nausea, vomiting, or fever | Costovertebral angle (CVA) tenderness, low abdominal tenderness, fever |

len" penis. When penile swelling is the complaint, localized edema must be distinguished from that caused by a systemic derangement (ie, nephrotic syndrome or heart failure). Localized processes include constriction (ie, paraphimosis, entrapment injury), inflammation (ie, balanoposthitis), infection (ie, "bite" injury),[14,15] or other trauma (ie, abrasion, contusion, burn).

Patients with problems localized to the penis are often readily distinguished from those presenting with an acute scrotum by history and findings on physical examination alone. Indeed, the etiology of acute penile pain, although not straightforward, is usually more apparent when compared with an "acute scrotum." (**See Table 3.)** Emergent penile conditions include priapism and paraphimosis (or entrapment injuries that mimic paraphimosis). Priapism is readily distinguishable by the presence of a persistent erection. Paraphimosis, on the other hand, must be differentiated from other conditions resulting in pain or edema of the distal penis. Balanitis and posthitis are defined as inflammation of the glans or prepuce, respectively, and typically result from inflammation (ie, local irritation) with or without coexisting bacterial (ie, *Streptococcal* or *Staphylococcal species*) or fungal (ie, *Candida*) infection. Phimosis is the inability to retract the penile foreskin proximally. This is typically a chronic condition, which may rarely present acutely to the ED as urinary retention when a patient is unable to void spontaneously as a result of distal foreskin obstruction caused by the chronic inflammatory process.[16,17]

## Genitourinary Trauma

Traumatic injury must be included in the differential of any GU complaint, whether localized to the scrotum (and its contents), the penis, or to surrounding perineal structures. (**See Table 4, page 6.**) Importantly, trauma-induced testicular torsion has been reported.[18] As such, consideration of testicular torsion in the differential of blunt scrotal trauma is prudent.[19]

## Sexually Transmitted Disease

Genital infections that are likely to cause acute symptoms can be divided into diseases characterized by genital ulceration and diseases causing penile discharge (urethritis). (**See Table 5, page 6.**) Among the many infections that can cause genital ulceration, genital herpes, syphilis, and chancroid are most commonly seen in the United States, with genital herpes being most prevalent. Urethritis is typically characterized by discharge of mucopurulent or purulent material, with or without accompanying dysuria or urethral pruritis. The principal bacterial pathogens of proven clinical importance in men with urethritis are *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. However, asymptomatic infections are common as well. In select populations, it is the author's experience that urethral trauma from compulsively stripping the urethra in search of purulent discharge is a potential cause of dysuria in sexually active men. The diagnosis is based soley on a thorough history by a suspicious physician.

# Prehospital Care

Not surprisingly, there remains a paucity of data regarding the management of male GU conditions in the prehospital setting. With this in mind, it appears

**Table 3. Differential Diagnosis Of Acute Penile Pain**

| Most Threatening | Common Age | Symptoms | Signs |
|---|---|---|---|
| Priapism | Any | Persistent erection | Persistent erection |
| Paraphimosis | Any | Swelling and pain of glans and prepuce in uncircumcised male | Edema of glans and prepuce; potential for distal penile vascular compromise |
| Entrapment injury | Any | Swelling and pain of the head of the penis; circumcised or uncircumcised male | Glans edema, with possibility of distal penile vascular compromise; may see constricting object proximal to glans |
| Penile fracture | Postpubescent | Sudden "snapping" sound, followed by immediate loss of erectile function | Edema, tenderness, ecchymoses, flaccidity of penile shaft ("eggplant penis") |
| GU trauma | Any | History of blunt or penetrating mechanism of injury | Variable depending on mechanism |
| **Other Etiologies** | | | |
| Balanitis | Any | Pain, itching, swelling of glans | Tenderness, excoriation, rash |
| Posthitis | Any | Pain, itching, swelling of prepuce | Tenderness, excoriation, rash |
| Phimosis | Any | Foreskin "stuck" in distal position (covering the glans); may present with inability to void spontaneously | Inability to retract foreskin |
| Sexually transmitted disease (STD) | Postpubescent; consider abuse if prepubescent | Variable depending on cause | Genital ulceration(s); penile discharge |

### Table 5. Common STD's Presenting With GU Symptoms

| | |
|---|---|
| **Genital Ulceration** | Genital Herpes (Herpes Virus) |
| | Syphillis *(Treponema pallidum)* |
| | Chancroid *(Haemophilus ducreyi)* |
| **Urethritis** | Gonorrhea *(Neisseria gonorrhoeae)* |
| | Chlamydia *(Chlamydia trachomatis)* |

plausible to focus on symptom relief, typically with narcotic analgesics and antiemetic agents. In addition, administration of intravenous fluids (as well as maintenance of "NPO" status) is prudent for any conditions that may require procedural sedation or surgical intervention following ED arrival.

## ED Evaluation

A diligent history and physical examination of the patient complaining of acute scrotal or penile symptoms is the cornerstone of formulating an appropriate plan of action. Such complaints will often be shadowed by a component of patient embarrassment and apprehension; this is especially true in adolescents. Care must be taken to respect and address privacy issues in the adolescent and prepubescent age groups. Similarly, parents may in some cases be uncomfortable discussing their child's problem. This may hold true for caretakers of adult patients as well. A useful approach to facilitating a more comprehensive history and examination is to offer to first interview, examine, and discuss with the patient alone and then speak with all parties in concert.

### The Acute Scrotum: Important Historical Questions

Scrotal pain that begins abruptly and severely is testicular torsion until proven otherwise. The sudden twisting of the spermatic cord, characteristic of testicular torsion, leads to rapid diminution of blood supply to the affected testicle that causes "ischemic" pain. This is in contrast to the more indolent and smoldering pain of epididymitis, which is a gradually progressive inflammatory (rather than ischemic) process. Indeed, the pain of testicular torsion (or appendage torsion) often develops over seconds or minutes, whereas the pain associated with epididymitis frequently develops over the course of hours or days.

The distinction between constant/progressive and intermittent/colicky pain is very useful in the diagnosis of acute scrotal pain. Constant and progressive pain typically results from progressive inflammatory processes, such as epididymitis. Patients may exhibit pain with ambulation or movement resulting from the inflammation. Intermittent and colicky pain is more consistent with rapid "onset" and "offset" conditions, as occurs in testicular torsion. Pain may be intermittent, as the spermatic cord may torse and detorse spontaneously.

It is critical to ask about "systemic" findings in the patient presenting with an acute scrotum. As a general rule, patients with testicular torsion are more ill-appearing (with associated systemic symptoms such as nausea and vomiting) than patients with the other common etiologies of acute scrotal pain (epididymitis or appendage torsion).[20,21] While patients with epididymitis may present with nausea, malaise, or low grade fever, it is typically those with

### Table 4: Genitourinary Trauma

| | Condition | Etiology, Presentation | Treatment |
|---|---|---|---|
| **Scrotum** | | | |
| | Testicular dislocation | Significant blunt-force mechanism (dislocation to the abdomen or subcutaneous tissues surrounding the external inguinal ring) | Surgical intervention |
| | Testicular rupture | Disruption of the tunica albuginea | Surgical intervention |
| | Testicular contusion | Intratesticular hematoma; intact tunica albuginea | Typically conservative: ice, rest, elevation |
| | Hematocele | Blood accumulation in the tunica vaginalis | Surgical drainage for large hematocele; conservative otherwise |
| | Penetrating injury | Varies depending on cause | Typically surgical exploration/intervention |
| | Traumatic testicular torsion | Traumatically-induced torsion has been reported | Surgical exploration/intervention |
| **Penis** | | | |
| | Penile fracture | Disruption of the tunica albuginea; swelling and ecchymoses of penile shaft | Typically surgical intervention |
| | Penile contusion | Pain, swelling, ecchymoses; intact tunica albuginea | Typically conservative: ice, rest |
| | Penetrating injury | Varies depending on cause | Typically surgical exploration/intervention |

more advanced degrees of infection (epididymo-orchitis) whom exhibit more "systemic" involvement. It is common for patients with acute scrotal pain to complain of low abdominal, proximal lower extremity (ie, inner thigh, groin, inguinal), or back/flank pain. Likewise, it is important to consider acute GU pathology in any male patient presenting with seemingly isolated pain to the aforementioned anatomic regions. For instance, always consider GU conditions in the differential for any male with a presenting complaint of abdominal, inguinal, or flank pain.

Always inquire about changes in urination, including urgency, frequency, dysuria, hesitancy, and hematuria. Urinary symptoms may accompany many causes of acute scrotal pain. Classically, epididymitis may be accompanied by urinary complaints such as dysuria and urgency.

## The Acute Scrotum: Important Physical Findings

When examining a patient with acute scrotal complaints, their general appearance provides important diagnostic clues. Patients with "intermittent and colicky" pain (ie, testicular torsion or renal colic) tend to writhe on the gurney or pace about the examination room as they cannot find a position of comfort. In contrast, patients with progressive inflammatory conditions (such as epididymitis or epididymo-orchitis) tend to minimize activity, as the slightest degree of movement may exacerbate their pain, while rest and elevation bring relief.

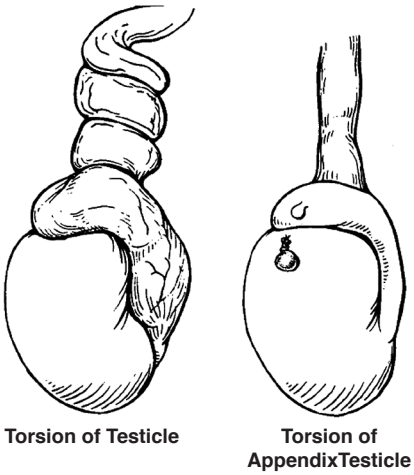
A complete abdominal examination is crucial in any patient presenting with an acute scrotum, as many intra-abdominal conditions may present with a component of GU pain. It is important to examine the male genitalia both while the patient is standing and lying supine. Exercise caution when examining a standing patient as some males may experience a strong vagal response to scrotal (or prostate) stimulation, leading to pre-syncope or syncope. Also, examination of the testicle and epididymis may cause significant discomfort even in the absence of pathology. Always examine the unaffected side first since many patients will have unilateral localization of pain. This serves as a control and will help in gaining patient confidence and trust (which may rapidly wane after examination of a swollen and painful scrotum). Key visual features of testicular torsion include a high riding testicle with a transverse lie, both resulting from twisting of the spermatic cord. (**See Figure 2.**) Unfortunately, such "textbook" presentations rarely, if ever, occur in clinical practice. More commonly, patients with acute scrotal pain, regardless of the underlying etiology, present identically: with a diffusely painful, swollen, tender hemiscrotum.

As mentioned, differentiating among the etiologies of acute scrotal pain is challenging. Often confounding the problem is the exquisite pain and discomfort elicited by examination itself. However, there are some findings which, if present, may facilitate a more accurate diagnosis.[22]

If isolated swelling and tenderness of the epididymis is present, epididymitis is the likely diagnosis. The natural progression is to initially affect only the epididymis and then progress to the ipsilateral testicle as well (epididymo-orchitis).

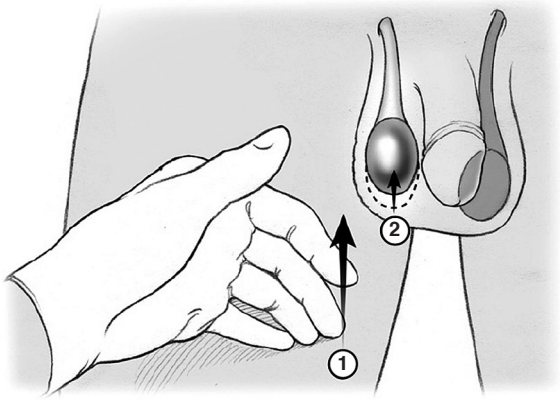
The presence of an intact ipsilateral cremasteric reflex is reportedly highly sensitive for excluding

### Figure 2. Testicular Torsion Versus Appendage Torsion




*Reproduced with permission of the McGraw-Hill Companies from: Tintinalli JE et al, Eds. Emergency Medicine: A Comprehensive Study Guide, 4th Ed. New York: McGraw-Hill;1996:536:Figure 92-7.*

### Figure 3. Cremasteric Reflex




The reflex is elicited by (1) stroking the ipsilateral inner thigh with a tongue depressor or gloved hand, resulting in (2) the elevation of the testicle through contraction of the cremasteric muscle.
*From: Davis JE. Chapter 31: Scrotal Pain, in Mahadevan SV, Garmel GM, eds. An Introduction to Clinical Emergency Medicine: Guide for Practitioners in the Emergency Department. New York: Cambridge University Press; 2005:p466. Reprinted with the permission of Cambridge University Press.*

the diagnosis of testicular torsion.[23,24] The reflex is elicited by stroking the ipsilateral inner thigh with a tongue depressor or gloved hand (see **Figure 3**), resulting in elevation of the testicle through contraction of the cremasteric muscle. Although the presence of an intact cremasteric reflex is useful in ruling-out torsion, it is a soft finding as the absence of this reflex is non-specific, and some healthy individuals lack the reflex altogether (particularly males in their first few years of life).[25] Importantly, there have been several published reports of testicular torsion presenting with an intact cremasteric reflex.[26,27,28]

Prehn's sign, or relief of pain with scrotal elevation, was previously thought to help in differentiating epididymitis (inflammatory pain relief with scrotal elevation) from testicular torsion (no change in ischemic pain with elevation).[29] However, this sign is generally considered unreliable in distinguishing these 2 disorders (although a specific reference to its sensitivity and specificity remains elusive after much searching).[30] Therefore, its use for this purpose is additive but not diagnostic.

Isolated nodularity at the superior pole of either the testicle or epididymis is often the result of appendage torsion, given the anatomic location of these vestigial structures. The blue dot sign is pathognomonic for appendage torsion.[31] As appendage torsion is most common in the prepubescent age group, visualization of the infarcted appendage (the "blue dot") may be seen through thin, non-hormonally stimulated prepubertal skin. This finding is very specific, yet insensitive.

Scrotal transillumination may be helpful in cases of suspected hydrocele. The scrotal fluid will supposedly transilluminate when a light is shined against the posterior scrotal wall. However, practitioners whom seldom utilize this technique tend to "overcall" positive test results (ie, every scrotum transilluminates), so results should be cautiously interpreted in the context of the overall clinical picture.[32]

**Table 6. Etiologies Of Low-Flow Priapism**

| Selected Etiologies Of Low-Flow Priapism | Examples |
|---|---|
| **Medications** | |
| Impotence agents | Intracavernosal therapies (prostaglandin E1, papaverine, phentolamine) and oral agents (sildenafil) |
| Antihypertensives | Hydralazine, prazosin, doxazosin |
| Antidepressants | Trazadone, fluoxetine, sertraline, citalopram |
| Antipsychotics | Phenothiazines, atypical antipsychotics |
| Illicit substances | Cocaine, marijuana |
| General anesthetics | |
| Miscellaneous | Hydroxyzine, metoclopramide, omeprazole, total parenteral nutrition (TPN) |
| **Hematologic Disorders** | |
| Sickle cell disease | |
| Leukemia | |
| Myeloma | |
| **Central Nervous System** | |
| Brain | Cerebrovascular accident |
| Spinal cord | Spinal stenosis, spinal cord injury, lumbar disc herniation |
| **Others** | |
| Infections | Malaria, rabies |
| Toxins | Black widow, scorpion |
| Carbon monoxide | |
| Hypertriglyceridemia | |
| Idiopathic | |

## Priapism

Patients with low-flow priapism often complain of a prolonged and exquisitely painful erection. Stagnant, oxygen-poor, acidic blood accumulates in the corpora, resulting in "ischemic" pain. Ischemia resulting from prolonged erection may lead to irreversible cellular damage, permanent fibrosis, and impotence. Several common etiologies of low-flow priapism are listed in **Table 6**. Of important note, use of oral erectile dysfunction treatments such as sildenafil has only rarely been associated with priapism.[33] Patients with high-flow priapism often complain of a persistent, yet painless, erection. In this condition, there is continuous inflow of oxygen-rich blood through traumatic arterial-cavernosal fistulae.

## Paraphimosis

Paraphimosis classically develops in uncircumcised males when the proximally retracted tight foreskin acts as a constricting band on the distal portion of the penile shaft. Initial disruption of venous drainage by the constricting foreskin leads to a cycle of progressive glans edema followed by arterial compromise with subsequent glans necrosis and gangrene. The penile foreskin should always be replaced (reduced) after retraction for examination or urethral catheter placement to prevent iatrogenic paraphimosis. Glans edema mimicking paraphimosis can occur in circumcised or uncircumcised males in the case of penile entrapment injury. External objects may constrict the mid to distal shaft leading to the same pathophysiologic derangements as seen with paraphimosis. These objects may be placed intentionally for sexual stimulation (ie, string, metal rings, or rubber rings) or may occur accidentally, as in the case of a hair tourniquet in male infants.[34] Hair tourniquets may be particularly difficult to diagnose, as the offending hair may be nearly invisible

within a ring of edema fluid or edematous coronal sulcus of the glans penis. An occult hair tourniquet should be considered (along with testicular torsion) in the infant with inconsolable crying.

## Genitourinary Trauma

Trauma to the GU system may be either blunt or penetrating in nature. Although a detailed discussion is beyond the scope of this article, several pertinent points deserve mention.

### Scrotum Trauma

Significant trauma to the scrotum and its associated structures (testicle, epididymis, and spermatic cord) occurs infrequently with minor blunt force mechanisms owing to both testicular mobility (ie, testes can "roll with the punches") and the protective cremasteric reflex. In addition, each testicle is encapsulated by its fibrous tunica albuginea, which may protect the testicular parenchyma from injury. Blunt force injury may cause a testicular contusion or, less frequently, rupture of the tunica albuginea (testicular rupture). Also, traumatic dislocation of the testicle to an aberrant location outside of the scrotal confines is possible with significant blunt force trauma. All but the most superficial penetrating scrotal injuries will require specialty consultation for possible exploration.[35] Patients with either blunt or penetrating GU trauma may present with a hematocele, which is a painful, tender, ecchymotic scrotal mass resulting from the accumulation of blood within the tunica vaginalis.

### Penis Trauma

Trauma to the penis often presents with a distressing component of pain. A penile fracture results from an acute tear or rupture of the tunica albuginea of the corpus cavernosum. Patients often relate a history of a sudden "snapping" sound during intercourse or other sexual activity or as a result of blunt trauma in the setting of an erect penis. Physical examination reveals a swollen, ecchymotic, detumescent (limp) penis that is tender to palpation.[36] A penile contusion results from less severe direct blunt force trauma to a typically detumescent penis. In a penile contusion, the tunica albuginea remains intact, and the patient presents with localized ecchymoses and tenderness at the site of trauma. This may result from a toilet seat injury sustained while toilet training in the toddler/pre-school age groups or as a result of a "straddle" injury in any age group. Penetrating penile injuries necessitate specialty consultation in all cases.

## Sexually Transmitted Disease

### Genital Ulceration

Genital herpes (either primary or recurrent) may present with severe pain, pruritis, or burning localized to the penis, scrotum, rectum, or elsewhere in the perineum. However, the typical pattern of multiple grouped vesicular (or ulcerative) lesions may be absent entirely in many acutely infected persons, rendering the diagnosis elusive. Definitive diagnosis of any ulcerative condition based on history and physical examination alone is frequently inaccurate.[37]

### Urethritis

Any patient presenting to the ED with a complaint of penile discharge should be assumed to have urethritis. However, the distinction between urethritis with or without accompanying epididymitis is critical in the male presenting with penile discharge, as it has important management implications. When accompanying epididymal pain or tenderness is present, both the dosage and duration of antimicrobial treatment increase, as epididymitis represents a more advanced infection.

Although testing to determine the specific etiology in cases of STD (whether ulcerative or urethritis) is recommended, this is often impractical in the busy ED setting, given the difficulties in ensuring timely follow-up counseling and treatment for abnormal test results. Therefore, empiric antimicrobial treatment for likely pathogens should be initiated, and counseling regarding notification of sexual contacts should be underscored.

## Diagnostic Studies

The key to managing acute GU problems is the timely recognition of fertility and testicular viability threatening conditions. Most routine diagnostic aids (such as blood work and urinalysis) add little to distinguish among the common etiologies of acute scrotal pain. Instead, they detract from patient outcome by causing delays in diagnosis, referred to by some as "castration through procrastination." If the history and examination suggests the diagnosis of testicular torsion, urology (or pediatric surgery) consultation and plans for immediate surgical exploration should be initiated without delay. A patient of appropriate age (neonate, adolescent) with classic findings of testicular torsion does not require any diagnostic tests. Indeed, testicular salvage rates are time sensitive. A meta-analysis of 1140 patients in 22 series demonstrated a greater than 90% salvage rate with surgery within 6 hours of pain onset. Likewise, the risk of subsequent testicular atrophy increased (despite surgical detorsion) beyond this 6 hour window. (**See Figure 4**).[38] However, with less distinct ("indeterminate") circumstances, a confirmatory diagnostic study (typically color Doppler ultrasound) is indicated.[39] In fact, although surgical exploration is the initial treatment of choice with a strong clinical suspicion for testicular torsion,

guidelines published by the American College of Radiology state that confirmatory imaging can be performed if readily available and performed within 30 to 60 minutes of the request to ***simultaneously*** prepare the operating room.[40]

The diagnosis of priapism and paraphimosis are made solely on clinical grounds. In cases of GU trauma, a sonogram can be very useful in delineating the extent of injury and for assessing distal penile vascular integrity. STD's may require additional confirmatory microbiologic laboratory testing, including direct culture or other automated techniques such as polymerase chain reaction testing, none of which are practical in the ED setting because of the difficulties with ensuring follow-up on abnormal test results.

### Radiologic Testing

When utilized in the appropriate clinical setting, sonography remains the most useful diagnostic modality in the evaluation of GU complaints. A color flow duplex Doppler ultrasound may be very helpful in indeterminate cases of acute scrotal pain. The classic sonographic finding suggestive of testicular torsion is diminished intratesticular blood flow. In addition, examination of the spermatic cord itself with high-resolution gray-scale sonography may reveal "coiling" or "kinking" of the cord at the site of torsion (see 'Controversies/Cutting Edge' section).[41] Sonography is used not only to exclude testicular torsion but also to search for alternative causes of acute scrotal pain.[42] In epididymitis, perfusion will be normal (or increased) due to the effects of inflammatory mediators on local vascular beds.[43] An infarcted appendage (resulting from appendage torsion) may be visualized on ultrasound as well.[44] Ultrasonography may also identify hydroceles, hematoceles, varicoceles, hernias, tumors, abscesses or gonadal vasculitis. Finally, ultrasound is an invaluable tool in the evaluation of GU trauma.[45,46] At least one recent study suggests that emergency physicians may be able to accurately diagnose patients presenting with acute scrotal pain using bedside sonography.[47]

Radionuclide scintigraphy and color Doppler sonography show similar sensitivity as well as false negative rates for the diagnosis of testicular torsion.[48] However, given the widespread availability and expertise with ultrasound technology and the inherent risks associated with radiation exposure, radionuclide procedures have fallen out of favor at many centers. Magnetic resonance imaging (MRI) has been explored as well.[49,50] However, major limitations include availability and the amount of time required for adequate imaging. Computed tomography (CT) may be helpful in assessing the degree of extension in cases of GU infection (abscess, Fournier's disease), or in the search for coexisting injuries in the evaluation of GU trauma.[51] In cases of Fournier's disease, delays in recognition and definitive surgical debridement can be life threatening, so imaging should not delay surgical consultation.

## Treatment

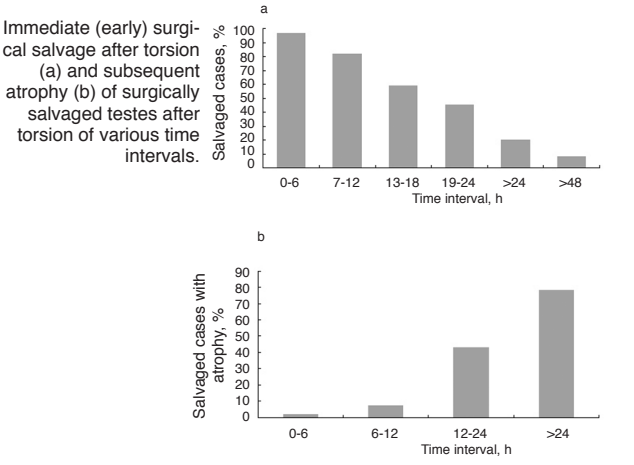
The primary goals of treatment in the ED setting are physiologic stabilization, symptom relief, administration of antibiotics when indicated, and, in some cases, preparation for surgical intervention.

### Pain Relief

Acute scrotal and penile problems encountered in the ED commonly present with a significant (and often distressing) component of pain. The greatest priority is identifying GU pathology that necessitates rapid surgical intervention. Therefore, initial pain relief should in many cases be administered parenterally. Under no circumstance should analgesia be withheld pending consultation. If the likelihood of surgical intervention is low or if the pain is mild on presentation, a trial of oral medications can be offered. Agents used most frequently are narcotic analgesics, non-steroidal anti-inflammatories (NSAIDs), or acetaminophen.

The pain of testicular torsion may be relieved following a trial of manual detorsion of the affected testicle.[52] As the testes most frequently torse in a lateral to medial fashion, detorsion is often accomplished by rotation of the affected testicle from medial to lateral (frequently described as "opening a book"). The end-point of the detorsion procedure is relief of pain or sonographic evidence of improved intratesticular blood flow. A case series and meta-analysis of previously reported series demonstrated

### Figure 4: Testicular Salvage And Atrophy Rates Over Time In Testicular Torsion




*Reprinted with permission from Visser AJ, Heyns CF. Testicular function after torsion of the spermatic cord. BJU Int 2003;92:201. © 2003 BJU International, Blackwell Publishing, United Kingdom.*

an overall success rate of greater than 95% (100 out of 105 cases) following manual detorsion.[53]

Scrotal elevation may be beneficial in patients with inflammatory conditions such as epididymitis. This is easily accomplished by use of a towel roll or supportive undergarments (such as a "jock strap"). In addition, ice may reduce edema and provide a mild degree of analgesia.

## Antimicrobials

Antimicrobial agents are indicated in cases of suspected or proven infection. Early intravenous broad-spectrum antibiotic therapy (covering Gram positive, Gram negative, and anaerobic species) is imperative in any case of suspected Fournier's disease. Suggested regimens include extended-spectrum penicillin/beta-lactamase inhibitors (such as ampicillin/sulbactam or piperacillin/tazobactam), a third generation cephalosporin plus clindamycin, or vancomycin plus metronidazole. In addition, there is some emerging literature to suggest a potent synergistic role of clindamycin along with beta-lactam antimicrobials (ie, clindamycin plus piperacillin/tazobactam) in combating necrotizing soft tissue infections, particularly when Streptococcal species are involved.[54,55] The role of hyperbaric oxygen therapy in the management of Fournier's disease has been suggested, although its utility is still the subject of much debate in the medical literature.[56,57] Although early consultation and administration of broad-spectrum antibiotics is indicated in all suspected cases of Fournier's disease, surgical debridement is imperative and remains the definitive treatment.[58,59,60]

Antibiotics are the cornerstone of therapy for epididymitis. Antimicrobial selection is guided by patient demographics: younger (less than 35 years old) sexually active males are treated with agents to cover *Neisseria gonorrhoeae* and *Chlamydia trachomatis*, such as ceftriaxone (250 mg IM single dose) with oral doxycycline (10 day course). It is important to note that both the dosage and duration of antimicrobial treatment differ for epididymitis when compared with urethritis. For instance, a typical treatment regimen for isolated urethritis is a single dose of ceftriaxone 125 mg (IM) plus azithromycin 1 g (PO), whereas typical treatment for epididymitis is ceftriaxone 250 mg (IM) plus doxycycline 100 mg (PO) twice daily for 10 days. Importantly, fluoroquinolones (such as ciprofloxacin) are no longer recommended for the treatment of gonococcal infections owing to increased resistance patterns in the United States and abroad.[61]

Epididymitis may also occur in prepubescent males.[62] This is thought by some to be caused by reflux of sterile urine into the epididymis, which may result from congenital GU anomalies, although the precise mechanisms remain unclear.[63,64] Recommendations regarding treatment of the resulting inflammation vary from treating all boys with antibiotics[65] to limiting their use to patients with documented urinary findings (pyuria, positive urine culture).[63] If utilized, prophylactic antibiotics should cover the common urinary pathogens. Treatment for other STDs is covered in **Table 7.**

## Priapism

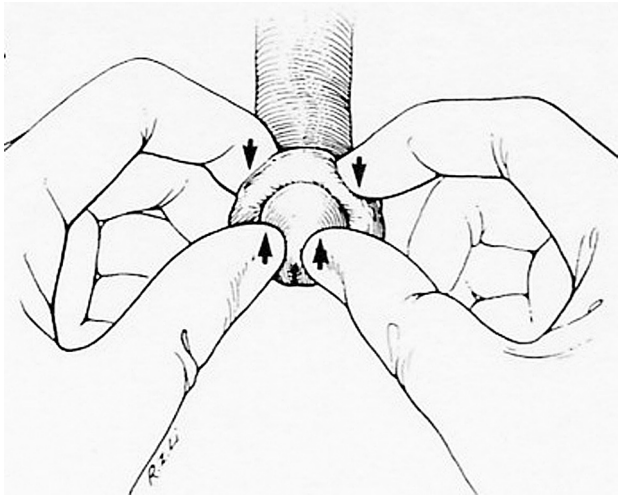
The treatment of priapism will most frequently be managed by a urologist. However, in certain circumstances, it may be necessary for the emergency physician to initiate treatment for low-flow pria-

## Key Points

1. There are five GU emergencies: testicular torsion, Fournier's disease (necrotizing fasciitis of the perineum), priapism, paraphimosis, and any form of GU trauma unless proven otherwise.
2. Differentiating true GU emergencies (requiring prompt action) from urgent conditions (safe for outpatient management) takes precedence over definitive diagnosis in the majority of cases.
3. Ultrasound examination is widely available and extremely useful at differentiating among the etiologies of acute scrotal pain, including indeterminate presentations; it is also an invaluable tool in assessing distal penile vascular integrity.
4. In cases of suspected testicular torsion, emergent specialist consultation is imperative: remember that "time is testicle," so be careful to avoid "castration by procrastination."
5. The appearance of overt physical findings in Fournier's disease may indicate that it's too late to mitigate patient morbidity and mortality. The hallmark of this disease is pain out of proportion to physical findings in any high-risk (ie, diabetic or other immune compromised) patient.
6. Although largely of unproven benefit, the initial treatment for priapism is the same regardless of precipitating cause – a trial of oral or subcutaneous terbutaline (a beta-adrenergic agonist) remains the first-line ED treatment.
7. Paraphimosis is relatively unique among the GU emergencies, as successful reduction can often be performed solely by the emergency physician, without the need for specialty consultation.
8. Consider consulting urology (telephone conversation at a minimum) in all but the most minor cases of GU trauma to help guide clinical decision making and patient disposition.

pism in the ED. The classic teaching is that the initial treatment (oral or subcutaneous terbutaline) for low-flow priapism is the same regardless of inciting etiology.[66] It is thought that terbutaline, a beta-2 adrenergic agonist, may increase venous outflow from the engorged corpora by way of relaxation of venous sinusoidal smooth muscle, although the precise mechanisms are poorly understood. However, additional evidence, as well as consensus expert opinion, question the utility of this intervention.[67,68] Overall, terbutaline is of unproven benefit. However, given its fairly "low risk" profile for untoward events, its use may still be warranted.[69] Other treatments include corporal blood aspiration, saline irrigation, and injection of an alpha-adrenergic receptor agonist (such as phenylephrine, epinephrine, or pseudoephedrine). The goal of treatment in the sickle cell disease patient with priapism is reduction of red cell sickling thereby reducing vascular sludging and vaso-occlusion. Preferred treatments in this setting include oxygen, intravenous hydration, and possibly simple or exchange transfusions,[70] although evidence-based guidelines are lacking.[71] Regardless of precipitating etiology, surgical shunt procedures are used as a last resort in patients with low-flow priapism unresponsive to the aforementioned treatments.

**Figure 5. Paraphimosis Reduction**



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## Paraphimosis

Paraphimosis is relatively unique among the GU emergencies, as it may be managed by the emergency practitioner without the need for emergent specialty consultation. The most commonly employed maneuvers involve initial alleviation of distal penis and prepuce edema, followed by reduction of the glans penis back through the constricting band of foreskin. (**See Figure 5, page 12.) Paraphimosis Reduction.**)[72] Various techniques to assist in alleviation of glans and prepuce edema have been reported in the medical literature. These include non-pharmacologic methods (ice water filled glove,[73,74] circumferential pressure with a gloved hand,[75] circumferential compressive elastic dressing,[76]) pharmacologic treatments (application of granulated sugar to the surface of the glans and prepuce,[77] injection of hyaluronidase into the edematous prepuce,[78]) and minimally invasive techniques (placement of multiple puncture wounds in the swollen glans or prepuce with a goal of expressing edema fluid.[79-81]) An evidence-based review in 2004 concluded that given the lack of comparative or randomized trials, current treatment recommendations are based solely on local practice preference.[82] However, these treatment recommendations are to be discouraged as there is no firm evidence that they work. The only definitive treatment here is reduction of the foreskin with the thumb and index fingers or incision of the phimotic ring by a practitioner experienced in this procedure.

**Table 7. Medication Dosages For STDs**

| | Recommended Treatment | Alternative |
|---|---|---|
| **Ulcerative Disease** | | |
| Genital Herpes | | |
| Primary | Acyclovir 400 mg TID x 7-10d | Valacyclovir 1 g BID x 7-10d |
| Recurrent | Acyclovir 400 mg TID x 5d | Valacyclovir 1 g once daily x 5d |
| Syphilis | Benzathine Penicillin G<br>2.4 million units IM x 1 dose | Doxycycline 100 mg BID x 14d |
| Chancroid | Azithromycin 1 g PO x 1 dose | Ceftriaxone 250 mg IM x 1 dose |
| **Urethritis** | | |
| Gonorrhea | Ceftriaxone 125 mg IM x 1 dose | Cefixime 400 mg PO x 1 dose |
| Chlamydia | Azithromycin 1 g PO x 1 dose | Doxycycline 100 PO BID x 7d |

*From United States Centers for Disease Control and Prevention (CDC). Sexually transmitted diseases treatment guidelines, 2006. MMWR 2006;55(No. RR-11). Available from: http://www.cdc.gov/std/treatment/default.htm (Treatment Guideline)*

## Risk Management Pitfalls For Male Urogenital Emergencies

1. **"They were new parents; their newborn was afebrile and looked fine overall, just a bit fussy. I figured it was most likely colic and sent them home to follow-up with their pediatrician the following morning."** In the male infant with inconsolable crying, always perform a GU examination to exclude conditions such as testicular torsion, paraphimosis, or penile entrapment injury (ie, hair tourniquet).

2. **"Sure, he was a bashful teenager, but I asked if there were any other symptoms, and the answer was a definitive 'no.' How was I supposed to know that he had testicular pain?"** In any male patient with abdominal pain, always ask about GU symptoms and maintain a low threshold for performing a thorough GU examination. This is particularly important in the prepubescent and adolescent age groups, who may try to hide such "sensitive" complaints.

3. **"He was sent from the nursing home for fever. There was no mention of scrotal signs or symptoms anywhere in the nursing home documentation."** In the non-communicative male patient (ie, dementia, mental retardation, other), always perform a comprehensive GU examination as a potential cause of illness in the work-up of fever, vomiting, crying, or any other change in the patient's baseline health status. In some cases, caretakers may be entirely unaware of acute GU problems.

4. **"I figured he was just another drug seeker. He was complaining of severe perineal pain, but the skin examination would barely qualify as a 'faint' cellulitis!"** When faced with a patient complaining of pain out of proportion to physical findings (particularly in patients who are elderly, diabetic, or immuno-compromised) consider early Fournier's disease and initiate surgical consultation and broad-spectrum antimicrobial treatment without delay.

5. **"We placed the urinary catheter, but when it became clear that he would be safe for ED discharge, we decided to remove it. We didn't even think to check his foreskin prior to sending him home."** In uncircumcised males, always replace penile foreskin following examination or urethral catheter placement (or removal) to avoid an iatrogenic paraphimosis.

6. **"There was a malodorous stench in the room, but the pain was present for several days and he reported a yellow-green discharge. I just empirically treated him for urethritis without even looking down there!"** Turns out that it wasn't urethritis at all, but, it was a vacuum cleaner-induced penile injury! In patients with an inconsistent history, difficult examination, or when things just don't make sense, question the possibility of GU trauma (self-induced or other mechanism).

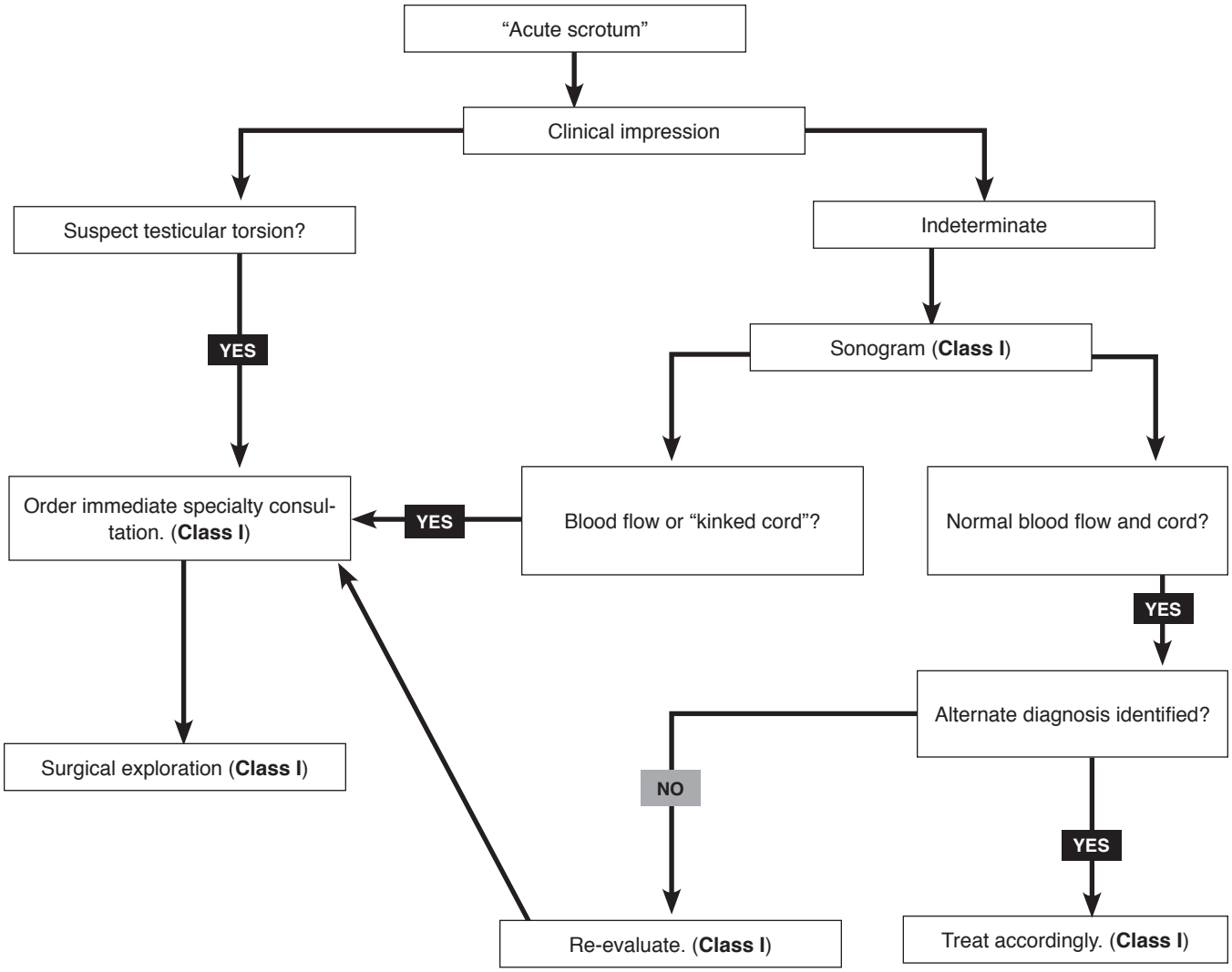
7. **"Urology said to get the sonogram, and they would be in to see the patient first thing in the morning. I didn't realize that testicular salvage rates decreased so precipitously with time!"** Testicular torsion is a true GU emergency. As such, 'time is testicle' and we need to be careful to avoid 'castration by procrastination!' If you are having difficulty convincing a consultant to see a high-probability patient based on history and examination alone, offer to activate the internal machinery to have a sonogram performed simultaneously as the urologist (or pediatric surgeon) makes their way into the ED.

8. **"It was a busy shift, and I only had a few minutes with the patient. He was complaining of left testicular pain, so I decided to save a step by examining the left side first."** When examining the testes, always examine the unaffected side first. This serves as a control and will help in gaining patient confidence and developing trust (which may rapidly wane after examination of a swollen and painful scrotum!).

9. **"He's now getting a head CT after 'hitting the deck' during my GU examination!"** Always examine the GU system with the patient in both supine and standing positions; however, exercise caution when examining a standing patient, since some males may experience a particularly strong vagal response to scrotal (or prostate) stimulation, which leads to pre-syncope or syncope.

10. **"They talk about Prehn's sign in every textbook…I always thought that it was one of those key exam features that truly stood the test of time!"** Although Prehn's sign (elevation of the scrotum relieves the pain of epididymitis, while increasing the pain of testicular torsion) is frequently referenced as a historical method of differentiating testicular torsion from epididymitis, the information provided is additive but by no means diagnostic.

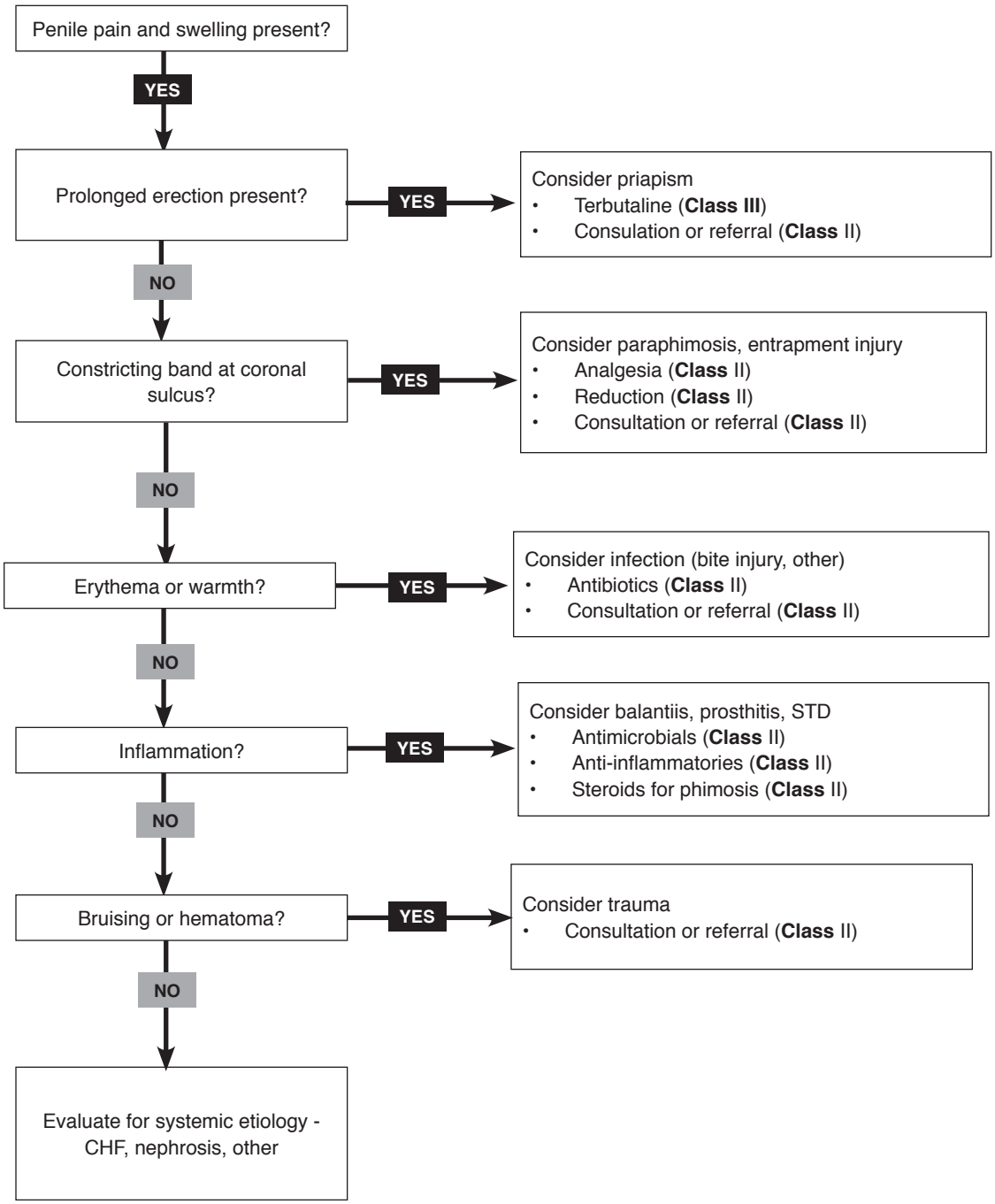
# Clinical Pathway For The Treatment Of "Acute Scrotum"




The **evidence for recommendations** is graded using the following scale. For complete definitions, see back page. **Class I:** Definitely recommended. Definitive, excellent evidence provides support. **Class II:** Acceptable and useful. Good evidence provides support. **Class III:** May be acceptable, possibly useful. Fair-to-good evidence provides support. **Indeterminate:** Continuing area of research.

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

# Clinical Pathway For The Treatment Of "Penile Pain And Swelling"

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This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

## Special Circumstances

In terms of diagnosis, vigilance is essential in order to arrive at the possibility of a GU source for a vague or non-specific complaint in the first place. As such, in males of any age, it is important to always consider GU pathology in your differential and take the time to look "down there." This is particularly important in males at the extremes of age or otherwise non-communicative patients. Parents or caretakers may be entirely unaware of the possibility of a GU etiology of a patient's symptoms.

Immuno-compromised patients may exhibit an atypical (or "blunted") response (ie, blunted fever, pain, or peritoneal signs) to medical or surgical disease. Always be weary of pain that appears to be "out of proportion" to what you see on examination. This is the hallmark of necrotizing fasciitis (Fournier's).

Finally, although essential in any patient, it is particularly important to address privacy and confidentiality issues in the peripubescent age group. Otherwise, you may find yourself forced to make decisions with limited information from the history or examination.

## Controversies/Cutting Edge

### High Resolution Ultrasound In The Evaluation Of The "Acute Scrotum"

Color flow Doppler ultrasonography (CDUS) has long been regarded as the diagnostic modality of choice in indeterminate presentations of the acute scrotum. However, sporadic reports began to emerge in the early 1990's regarding the limitations (ie, false negatives) of sonography in the diagnosis of testicular torsion.[83-89] Many of these studies are limited by small numbers and retrospective design (case reports or small case series). Despite this, the most concerning data comes from Baud[90] and Kalfa,[41] where 6 of 23 cases (26%) and 50 of 208 cases (24%) of testicular torsion, respectively, had demonstrated flow on CDUS. CDUS assessment may reveal the presence of seemingly adequate intratesticular arterial flow with partial torsion, which can be very misleading to the practitioner. Similar limitations of CDUS resulting from partial torsion have been documented in animal models.[91]

Given the potential limitations of CDUS, investigations began to focus on alternative techniques to improve the diagnostic accuracy of sonography in the evaluation of the "acute scrotum." Recent reports have suggested that the addition of high-resolution ultrasound (HRUS) imaging of the spermatic cord to standard CDUS imaging of the testicle may improve diagnostic accuracy.[92,93] However, Karmazyn[94] noted some important limitations of HRUS imaging. Importantly, the spermatic cord may appear entirely normal during the "detorsed" interval with intermittent torsion-detorsion. In addition, a "tortuous" spermatic cord (resulting from inflammation and edema in epididymitis) may be very difficult to differentiate from a "coiled" or "kinked" spermatic cord as seen with testicular torsion.

The latest (and greatest) evidence for HRUS comes from Kalfa et al,[41] who conducted a multicenter investigation of 919 patients (208 patients with proven testicular torsion). They found that HRUS was highly sensitive for ruling-in as well as highly specific for ruling-out spermatic cord torsion (HRUS detected a "twist" of the cord in 96% (199/208) of patients with testicular torsion; HRUS revealed a normal "linear" cord in 99% (705/711) of patients without testicular torsion). The authors concluded that given its high sensitivity and specificity, HRUS can significantly improve the management of children presenting with an acute scrotum. However, they were careful to point out that spermatic cord HRUS requires extensive practice and experience, is highly operator-dependent, and therefore should be performed by a radiologist experienced in the procedure (and not by an emergency physician with limited experience.)

So, what's the bottom line regarding sonography for the diagnosis of testicular torsion? While excellent overall, important limitations of CDUS exist (false negatives). The addition of HRUS imaging of the spermatic cord appears to significantly improve the overall diagnostic accuracy of sonography. HRUS may be a very useful adjunct; however, it may not yet be ready for "prime time" at many centers. The real bottom line is if the HRUS is not definitively diagnostic, the scrotum needs to be explored as soon as possible.

**Table 8. Documentation Keys**

| | |
|---|---|
| Testicular Torsion | Document findings of the cremasteric reflex and response to any initial interventions, such as a trial of manual detorsion. |
| Fournier's Disease | Document any comorbidities that may cause immuno-compromise; also document presence (or absence) of subtle perineal skin findings. |
| Priapism | Document any history of "high-risk" medication use, history of sickle cell disease, or other pertinent history suggesting a potential etiologic culprit. |
| Paraphimosis | Document the neurovascular status of the distal glans penis both pre- and post-paraphimosis reduction; also document the presence of any foreign objects causing a penile entrapment injury. |
| Trauma | Document the findings of a comprehensive secondary survey to exclude coexisting injury. |

## Disposition

There are several GU emergencies which require immediate evaluation by an appropriate specialist (ie, urologist or surgeon) in the ED. Emergent "scrotal" conditions include suspected (or indeterminate) cases of testicular torsion and Fournier's disease. Emergent penile conditions include persistent priapism and non-reduced paraphimosis. In addition, maintain a very low threshold for specialty consultation in cases of GU trauma, whether blunt or penetrating.

On the other hand, many GU "emergencies" may be suitable for close specialty follow-up following telephone consultation (ie, priapism that has resolved, paraphimosis that has been successfully reduced, minor GU trauma). However, err on the side of caution, and obtain appropriate consultation while the patient is in the ED. When evaluating pediatric GU complaints, always remain vigilant to the possibility of child abuse; obtain additional history, diagnostic testing, or social services consultation if specific concerns arise.

Always provide prescription analgesics or recommendations for over-the-counter analgesics. Also, provide prescriptions for outpatient antimicrobials, when indicated.

Patients with unclear diagnoses, intractable pain or vomiting, unreliable follow-up, or an unstable social situation may require inpatient management by an appropriate specialist (urologist, pediatric surgeon, general surgeon) or a primary care provider (internist, pediatrician, family practitioner).

### Documentation Keys And Patient Teaching Tips

Documentation keys are presented in **Table 8.** Documentation of the time and nature of any discussions with specialty consultants (ie, urology, radiology, general surgery, pediatric surgery) is crucial. In addition, always document the results of the GU examination in the evaluation of any non-verbal patient. This is particularly important in the elderly population, as well as in infants with inconsolable crying. Discharge instructions and patient teaching tips are provided for your use on page 21.

## Summary

Male GU problems are anxiety provoking for all parties involved. Precise diagnosis of GU problems is not always feasible in the ED setting. However, differentiating GU emergencies from GU urgen-

## Cost-Effective Strategies

- **For males presenting with GU complaints, standard laboratory testing is useless in the vast majority of cases.** Routine investigations (CBC and chemistry panel) add little to distinguish among the causes of acute scrotal or penile pain. ***Caveats*:** A urinalysis (and urine culture) may be helpful in assessing for urinary tract infection. In addition, it may provide valuable information in the diagnosis of epididymitis. Also, in the case of Fournier's disease, comprehensive laboratory testing should be undertaken to assess for the many physiologic derangements that may be present in association with this potentially devastating disease.
- **It is prudent to invest in an ultrasound examination in "indeterminate presentations," as the acute scrotum is a very high-risk complaint from a medicolegal perspective.** ***Caveat:*** 'time is testicle,' so be careful to avoid 'castration through procrastination!' In a patient of appropriate age, with suggestive findings by history and on examination, specialty consultation takes precedence over confirmatory radiographic testing. Precious time may be wasted in the radiology suite. As an alternative, focus on activating the pathways necessary in order to get the patient to the operating room for surgical exploration as rapidly as possible.
- **You may not need the urology (or pediatric surgery) consultant to come in from home after-all.** Paraphimosis is relatively unique among the GU emergencies, as it can frequently be managed solely by the emergency physician. Although numerous techniques to assist in paraphimosis reduction have been reported in the medical literature, the time-tested method of manual reduction using your thumb/index digits is all that is typically required. ***Caveat:*** if your initial trials of reduction are met without success, it is prudent to summon the assistance of your more experienced colleagues!
- **No need to look beyond…the medicine chest?** Removal of the offending hair from the coronal sulcus in an infant presenting with a hair tourniquet entrapment injury can be challenging. It has been reported that over-the-counter chemical depilatories have been used successfully in the removal of digital (finger, toe) hair tourniquets, suggesting their utility for genital hair tourniquets as well.[95] ***Caveat:*** although it has been reported in the medical literature, this recommendation is extrapolated from comparatively weak (case series) and limited data regarding the treatment of digital (finger, toe) hair tourniquets.

cies takes precedence over definitive diagnosis. Identification of testicular torsion is of paramount importance, given its implications for future fertility. The 2 other most common causes of the "acute scrotum" are epididymitis and appendage torsion, both of which can typically be managed in the outpatient setting once testicular torsion has been excluded. Other GU emergencies include Fournier's disease, priapism, paraphimosis, and any form of GU trauma. With a careful history and thorough examination, as well as ultrasound assistance when needed, the initial phase of these "high-risk" conditions can be skillfully and effectively managed by the emergency practitioner.

## Case Conclusion

*With that lingering uneasy feeling that remains after speaking with the on call urologist and radiologist regarding your 12-year-old patient with an acute scrotum, you decide to place more pressure on both consultants. First, remembering that "time is testicle," you urge the urologist to come to the ED right away to evaluate the patient for possible exploratory surgery. The urologist balks at first but then reconsiders the high-risk nature of the complaint and informs you that they will be in as soon as possible. In the meantime, you broker a deal with your consultant, simultaneously activating the internal hospital machinery needed to make the sonogram happen as rapidly as possible…whoever gets to the patient first is fine, but at least both wheels are in motion. Given the patients presentation (appropriate age, sudden onset of symptoms, high-riding testicle with transverse lie, absent cremasteric reflex), you perform manual detorsion that unfortunately, is unsuccessful. Urology arrives shortly thereafter, just as ultrasound images are filtering-in. The sonogram reveals significantly diminished intratesticular blood flow and a "kinked" spermatic cord. The patient is whisked to the operating room for surgical detorsion and bilateral orchiopexy. Fortunately, his testicle is salvaged. However, the long-term fertility consequences will take time to uncover. By acting swiftly and aggressively, you feel confident that you did everything to ensure that your patient has the best possible chance for favorable short and long-term outcomes.*

## References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study, will be included in bold type following the reference, where available.


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## CME Questions

**1. The "blue dot" sign is pathognomonic for which of the following conditions:**
a. Testicular torsion
b. Epididymitis
c. Appendage torsion
d. Fournier's gangrene
e. None of the above

**2. What is most correct regarding the role of the cremasteric reflex in the diagnosis of testicular torsion?**
a. If absent, testicular torsion is likely
b. If absent, testicular torsion is unlikely
c. If present, testicular torsion is likely
d. If present, testicular torsion is unlikely
e. None of the above are correct

**3. What is the most appropriate treatment for an 18-year-old sexually active male with acute epididymitis?**
a. Ciprofloxacin PO
b. Ciprofloxacin PO and 1 g azithromycin PO
c. Ceftriaxone IM and 1 g azithromycin PO
d. Ceftriaxone IM and doxycycline PO x 10 days
e. No antimicrobial treatment indicated

**4. Paraphimosis reduction is best accomplished by:**
a. Manual reduction by manipulation with provider's thumb and index fingers
b. Use of a hemostat to dilate the distal penile foreskin
c. Placement of a urinary catheter
d. Rotation of the testes in a medial to lateral fashion
e. None of the above

**5. Which medication is most useful in the initial treatment of low-flow priapism?**
a. Glucagon
b. Enoxaparin
c. Terbutaline
d. Aspirin
e. Hydralazine

**6. Which of the following regarding the role of Prehn's sign in differentiating testicular torsion and epididymitis is most correct?**
a. High sensitivity, high specificity
b. High sensitivity, low specificity
c. Low sensitivity, high specificity
d. Strong negative predictive value for testicular torsion
e. Its use for this purpose is additive but not diagnostic

**7. What finding on examination is most suggestive of testicular torsion:**
a. Testicle: transverse lie
b. Testicle: vertical lie
c. Scrotum: erythema
d. Scrotum: ecchymoses
e. None of the above

**8. What sonographic finding is most suggestive of acute epididymitis?**
a. Diminished intratesticular blood flow
b. Increased intratesticular blood flow
c. "Kinked" or "coiled" spermatic cord
d. Presence of an infracted appendage
e. Engorged pampiniform venous plexus

**9. What age group is epidemiologically at greatest risk for testicular torsion?**
a. 2-year-old (toddler)
b. 7-year-old (school age)
c. 14-year-old (adolescent)
d. 21-year-old (young adult)
e. 75-year-old (senior adult)

**10. What radiologic study is most useful in the evaluation of a male with blunt testicular trauma?**
a. Sonogram
b. CT scan
c. MRI
d. Radionuclide study
e. None of the above

**11. What cause of acute testicular pain represents the greatest immediate threat to life?**
a. Testicular torsion
b. Ruptured abdominal aortic aneurysm
c. Epididymitis
d. Appendage torsion
e. Renal colic

**12. What is the single most important treatment for Fournier's gangrene?**
a. Glycemic control
b. Cardiac monitoring
c. Antimicrobial therapy
d. Surgical debridement
e. Hyperbaric oxygen therapy

**13. Ultrasound may be helpful in diagnosing which of the following conditions?**
a. Appendage torsion
b. Testicular torsion
c. Epididymitis
d. Hydrocele
e. All of the above

**14. A 12-year-old male presents with acute scrotal pain. Physical examination findings are suggestive of testicular torsion. What is the most appropriate next step in management?**
a. Contact urology
b. Order an MRI
c. Order nuclear scintigraphy
d. Order a CT scan
e. Order a sonogram

**15. What is the most appropriate treatment for sickle cell disease associated priapism?**
a. Supplemental oxygen
b. Intravenous (or oral) hydration
c. Analgesia
d. Transfusion of red blood cells
e. All of the above

**16. What is the most prevalent cause of genital ulceration in the United States?**
a. Chancroid
b. Chlamydia
c. Gonorrhea
d. Herpes
e. Syphillis

## Discharge Instructions And Patient Teaching Tips

### Return precautions

☐ Return for any persistent, progressive, or worsening symptoms or any other change in your condition.

☐ Although no "emergent" conditions were discovered during the course of your ED stay, many serious conditions take time to evolve to the point where a diagnosis can be made with certainty.

☐ If there is no significant improvement in symptoms within 12 hours, return to the ED for a re-evaluation.

### Timecourse: When will this get better?

☐ You should experience a fairly rapid decline in symptoms (ie, within the next 24-48 hours) following the initiation of proper treatments.

☐ However, a more gradual decline in symptoms (ie, over the course of 2-5 days) should be anticipated for infectious processes (ie, epididymitis).

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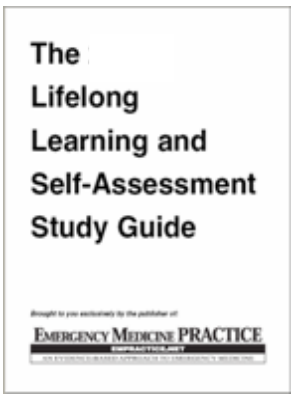


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## Class Of Evidence Definitions

Each action in the clinical pathways section of *Pediatric Emergency Medicine Practice* receives a score based on the following definitions.

**Class I**
- Always acceptable, safe
- Definitely useful
- Proven in both efficacy and effectiveness

*Class of Evidence:*
- One or more large prospective studies are present (with rare exceptions)
- High-quality meta-analyses
- Study results consistently positive and compelling

**Class II**
- Safe, acceptable
- Probably useful

*Class of Evidence:*
- Generally higher levels of evidence
- Non-randomized or retrospective studies: historic, cohort, or case control studies
- Less robust RCTs
- Results consistently positive

**Class III**
- May be acceptable
- Possibly useful
- Considered optional or alternative treatments

*Class of Evidence:*
- Generally lower or intermediate levels of evidence
- Case series, animal studies, consensus panels
- Occasionally positive results

**Indeterminate**
- Continuing area of research
- No recommendations until further research

*Class of Evidence:*
- Evidence not available
- Higher studies in progress
- Results inconsistent, contradictory
- Results not compelling

Significantly modified from: The Emergency Cardiovascular Care Committees of the American Heart Association and representatives from the resuscitation councils of ILCOR: How to Develop Evidence-Based Guidelines for Emergency Cardiac Care: Quality of Evidence and Classes of Recommendations; also: Anonymous. Guidelines for cardiopulmonary resuscitation and emergency cardiac care. Emergency Cardiac Care Committee and Subcommittees, American Heart Association. Part IX. Ensuring effectiveness of community-wide emergency cardiac care. *JAMA.* 1992;268(16):2289-2295.

## Coming In Future Issues

Cervical Spine Injuries

Musculoskeletal MRI

Facial Anesthesia

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**Date of Original Release:** February 1, 2009. Date of most recent review: January 10, 2009. Termination date: February 1, 2012.

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**Target Audience:** This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

**Goals & Objectives:** Upon completion of this article, you should be able to: (1) demonstrate medical decision-making based on the strongest clinical evidence; (2) cost-effectively diagnose and treat the most critical ED presentations; and (3) describe the most common medicolegal pitfalls for each topic covered.

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# An Evidence-Based Approach To Male Urogenital Emergencies

Davis, J, Schneider, R. February 2009, Volume 11; Number 2

*This issue of Emergency Medicine Practice reviews the evidence and current understanding of the pathophysiology, clinical assessment, and treatment options for maximizing outcomes in male urogenital emergencies. Here we outline key recommendations for practice based on valid research evidence within this journal issue. For a more detailed and systematic look at the latest evidence on male urogenital emergencies as well as other considerations such as diagnostic studies, clinical pathways, and special circumstances not noted here, see the full text article.*

## EVIDENCE-BASED CLINICAL RECOMMENDATIONS FOR PRACTICE

| Key Points | References | Comments |
|---|---|---|
| Differentiating true GU emergencies from urgent conditions takes precedence over definitive diagnosis in the majority of cases. | 38 | Missed or delayed diagnosis of testicular torsion threatens testicular viability and future fertility. Early identification and aggressive management of necrotizing fasciitis of the perineum (Fournier's disease or Fournier's gangrene) is critical to maximizing outcomes. Emergent penile conditions include priapism and paraphimosis. Any form of GU trauma is presumed to be an emergency until proven otherwise. |
| Ultrasound examination is widely available and extremely useful at differentiating among the etiologies of acute scrotal pain, including indeterminate presentations; it is also an invaluable tool in assessing distal penile vascular integrity. | 41 | A color flow duplex Doppler ultrasound may be very helpful in indeterminate cases of acute scrotal pain. In addition, examination of the spermatic cord itself with high-resolution gray-scale sonography may reveal "coiling" or "kinking" of the cord at the site of torsion. |
| In cases of suspected testicular torsion, emergent specialist consultation is imperative: remember that "time is testicle," so be careful to avoid "castration by procrastination." | 23,24,38 | The presence of an intact ipsilateral cremasteric reflex is reportedly highly sensitive for excluding the diagnosis of testicular torsion. |
| The appearance of overt physical findings of Fournier's disease may indicate that it's too late to mitigate patient morbidity and mortality. The hallmark of this disease is pain out of proportion to physical findings in any high-risk (ie, diabetic or other immuno-compromised) patient. | 12 | Although Fournier's is typically thought of as an "elderly male" disease, it has also been reported in children (as well as females). |
| Although largely of unproven benefit, the initial treatment for priapism is the same regardless of precipitating cause – a trial of oral or subcutaneous terbutaline (a beta-adrenergic agonist) remains the first-line ED treatment. | 66-69 | Other treatments include corporal blood aspiration, saline irrigation, and injection of an alpha-adrenergic receptor agonist (such as phenylephrine, epinephrine, or pseudoephedrine). |
| Paraphimosis is relatively unique among the GU emergencies, as successful reduction can often be performed solely by the emergency physician, without the need for specialty consultation. | 72 | The most commonly employed maneuvers involve initial alleviation of distal penis and prepuce edema, followed by reduction of the glans penis back through the constricting band of foreskin. |
| Consider consulting urology (telephone conversation at a minimum) in all but the most minor cases of GU trauma to help guide clinical decision making and patient disposition. | | |

** See reverse side for reference citations.*

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# REFERENCES

***These references are excerpted from the original manuscript. For additional references and information on this topic, see the full text article at ebmedicine.net.***


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