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Male Genital Emergencies: Part I

To some, the term “genital emergencies” recalls junior high school with the typical adolescent male humor of the time. But to a physician, this term describes a collection of disorders with potential implications to reproductive, sexual, and urologic function. Since many of these disorders are progressive, with the potential to cause increasing injury with the passage of time, early recognition and treatment are important in minimizing damage. In this two-part series, the author discusses the current literature and makes treatment recommendations for both the common and rare emergent conditions that can affect the male genitalia.

— J. Stephan Stapczynski, MD, Editor

Fournier’s Gangrene

Case. A 24-year-old obese male presented for an evaluation of widespread pain and swelling involving the perineum. An abscess of the right upper thigh developed six days prior to presentation in the emergency department. His fiancée attempted to drain the abscess. However, the abscess continued to drain, and pain and swelling extended to involve his perirectal, perineal, and right lower abdominal areas. (See Figure 1.) His past medical history was initially reported as negative, except his fiancée reported that the patient was “prone to small abscess formation.” Intravenous levofloxacin and clindamycin were started in the emergency department. He was taken immediately to the operating room, where he underwent debridement of necrotic skin and soft tissue of the right inner thigh extending into the perineum and across the midline. The soft tissue and underlying fascia were described as clearly necrotic and all non-viable tissue was debrided. The total area surgically excised was 20 by 30 cm in size. The antibiotics linezolid and piperacillin/tazobactam were initiated and the patient was admitted to the surgical intensive care unit. In the intensive care unit, the patient was determined to be an undiagnosed diabetic on the basis of an elevated hemoglobin A1C of 10. The patient underwent a prolonged hospitalization and his wounds required extensive wound care following hospital discharge.

Case. A 58-year-old male was transferred from a smaller regional emergency department for pain, swelling, and discoloration of his perineal and scrotal area that had been present for two weeks. (See Figure 2.) Despite fever, chills, and significant pain, the patient only sought medical care after his sister forced him when she noticed that he was diaphoretic and short of breath. He complained that his heart had been “racing all week” and that he had not urinated for five days. The patient was taken to the operating room emergently, where a suprapubic catheter was placed, cystoscopy was performed, and scrotal debridement with wide local excision was accomplished. Gross necrotizing infection involving the skin, scrotum, and inferior abdominal wall was noted. Approximately 400 square centimeters of skin and subcutaneous tissue was removed, and the maximum depth resected was approximately 15 cm in the left ischioanal fossa, while the majority of resection of skin and subcutaneous tissues to the level of superficial fascia was to a depth of 3 cm. The right testicle appeared necrotic and was removed. Clindamycin, gentamicin, metronidazole, piperacillin/

Executive Summary

- Be careful when evaluating patients with apparent cellulitis of the genital or perineal area. A deeper necrotizing infection may be present that is not initially apparent.
- In a minority of patients, clinical history and physical examination may be distinctive enough to make a differentiation between epididymitis and testicular torsion, but most patients will require an imaging study to differentiate these two entities.
- The most common cause of acute epididymitis in men younger than age 35 is *Neisseria gonorrhoea* and *Chlamydia trachomatis*.
- Up to 15% of men will develop chronic epididymal pain within six months after vasectomy.
- Torsion of the testicular appendix is 3 to 6 times more common than torsion of the testicles.
- Manual detorsion of the testicle is a therapeutic option for patients with testicular torsion seen in the emergency department; however, prediction that the direction of torsion is most commonly medial is not an accurate guide to the direction to detorse the testicle.

tazobactam, and vancomycin were administered during his initial management. A return to the operating room for a diverting colostomy and further debridement was planned.

Introduction

Fournier's gangrene, an anatomical subcategory of necrotizing fasciitis, is a relatively rare but rapidly progressing necrotizing bacterial infection of soft tissue, skin, and fasciitis of the perineal region, including the external genitalia, perineal, or perianal regions. The condition was originally described in 1764 by Baurienne; however, in 1883 Jean-Alfred Fournier, a Parisian venereologist, presented a case of perineal gangrene in an otherwise healthy young man in one of his clinical lectures.¹ It is associated with high mortality and devastating tissue destruction. This disease presents with scrotal and perineal swelling, pain that is often disproportionate, with hyperemia, crepitus, and fever. This infection commonly affects men, but can also occur in women and children. The gangrene attacks both healthy individuals and those with pre-existing immune suppression. Diabetes, alcoholism, AIDS, and conditions such as malnutrition are associated with this infection.²⁻⁶ The onset is often insidious or indolent with minimal cutaneous lesions while typically advancing rapidly along deep fascial planes. This infection can progress rapidly to sepsis, with a mortality rate that averages

20-30% despite advanced management.⁷⁻⁸ Consequently, an index of suspicion is important when evaluating patients with apparent cellulitis of the genital or perineal region.

Epidemiology

The true incidence of this disease is not known. Even though the condition is rare, there is evidence that the incidence is increasing in association with the aging population, increased incidence of obesity and diabetes, and multi-drug-resistant organisms.⁹ The male-to-female predominance is 10:1.¹⁰ The mean age of patients ranges from 45 to 56 years, although it is also reported in children.^{11,12} Reported mortality varies widely and ranges from 3% to 76%.^{5,10}

Pathophysiology

Approximately 95% of cases have an identifiable cause, and it typically arises from an infection in the anus and rectum, urogenital tract, or skin of the genitalia. A host of precipitating conditions of the anus and rectal anatomy, genitourinary system, and skin have been described. Perirectal or perianal abscesses, fistulas, foreign bodies, biopsies, rectal cancer, urethral strictures, urethral catheterization, penile implants, epididymitis, penile implant insertion, septic abortions, bartholin gland abscesses, scrotal furuncles, intramuscular infections, and blunt perineal trauma are just a few of the associated conditions. Comorbid conditions are common and include diabetes mellitus

(most frequently), alcohol abuse, extremes of age, malignancy, malnutrition, and HIV infection.

Many organisms can be involved and a combination of anaerobes and aerobes are most commonly found. The polymicrobial nature of the disease is considered necessary to create the synergy of enzyme production that allows rapid multiplication and spread of the infection. However, the infection can occur from a single aerobic organism, which is commonly group A beta hemolytic streptococci.

The organisms involved are typically commensals of perineal skin and genital organs. Bacterial cultures usually reveal a polymicrobial infection with aerobic and anaerobic pathogens such as *Streptococci*, *Staphylococci*, coliforms, *Klebsiella*, clostridia, *Corynebacteria*, and *Bacteroides*. *Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* are the most commonly isolated aerobic bacteria.^{5,10,13-17} *Bacteroides fragilis* is the most common anaerobic bacteria isolated.^{5,8,17,18} Methicillin-resistant *Staphylococcus aureus* (MRSA) is more frequently being described as a cause of Fournier's gangrene.^{19,20,21,22}

Diagnosis

Imaging modalities potentially useful in diagnosing Fournier's gangrene include conventional radiography, ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI). CT is considered superior to ultrasound

and radiography in demonstrating Fournier's gangrene, its extent, and localizing the initiating site.^{23,24} Plain films of the infected area may show hyperlucencies that represent soft-tissue gas and significant swelling of the soft tissues. However, the absence of subcutaneous emphysema involving the genitalia and perineal region does not exclude the diagnosis. Furthermore, radiography rarely demonstrates deep fascial gas.

Ultrasound typically demonstrates significant skin edema throughout the affected area. Gas can also be seen even before crepitus is obvious on examination. The presence of gas will have the appearance of "dirty" shadowing that can be seen even in small amounts.^{23,25,26} Ultrasound can also be used to investigate for the origin of the infection, such as a perirectal or perianal abscess or prostate involvement.

As noted, CT is considered the best imaging modality for making the diagnosis of Fournier's gangrene.^{23,24} CT and MRI imaging techniques may detect fluid along fascial planes, asymmetric fascial thickening, fluid collections or abscess, fat stranding around involved structures, edema within tissues, and subcutaneous emphysema not seen on plain radiographic evaluation, and, just as with ultrasound, the initiating site of the Fournier's gangrene such as a perianal abscess, fistulous tract, or other infectious process.

Treatment

Fluid resuscitation, surgical debridement, and broad-spectrum antibiotic therapy are the mainstays of treatment for this necrotizing fasciitis. Empiric antibiotic choices are those that cover staphylococci, streptococci, the *Enterobacteriaceae* family, and anaerobes.^{27,28} One appropriate antibiotic regimen is ciprofloxacin and clindamycin. Other options include ampicillin-sulbactam, ticarcillin/clavulanate, or piperacillin/tazobactam plus an aminoglycoside and metronidazole or clindamycin.^{27,28} A suspected

MRSA infection can be managed with vancomycin. If a fungal etiology is suspected, antifungal agents such as amphotericin B or caspofungin should be started. The selection of antibiotics should be adjusted depending on cultures obtained during surgical debridement of tissues. European guidelines recommend vancomycin/linezolid for MRSA and clindamycin for streptococcal disease, fluoroquinolones for Gram-negative etiologies, and metronidazole for anaerobes.^{27,28} Infectious Diseases Society of America (IDSA) guidelines follow similar reasonings and state that the best choice of antibiotics for community-acquired mixed infections is a combination of ampicillin-sulbactam plus clindamycin plus ciprofloxacin.²⁹

An interruption in blood supply to the infected tissues due to microthrombi formation allows the infection to progress despite aggressive antibiotic management. Consequently, prompt surgical debridement of all devitalized tissue is central to successful management of the infection and patient survival.³⁰ Delays in surgical debridement are associated with increasing mortality.³⁰ The degree of internal necrosis is typically much greater than suggested by external findings.

Wide debridement is required, resulting in an aftermath of large tissue defects in the perineal area that require reconstruction. The extensive incisions should go beyond the area of apparent involvement in the skin and subcutaneous tissue until normal fascia is found. A return to the operating room within 24 hours to ensure adequacy of debridement and lack of progression is often recommended.²⁹ Orchiectomy is not usually necessary because the blood supply of the testicles is independent from the infected fascia and skin of the scrotum.

Hyperbaric oxygen is sometimes used as adjunctive therapy. The evidence for hyperbaric oxygen is either lacking or results are mixed. The European Urological Society has determined that there is no evidence

Figure 1: Fournier's Gangrene



Fournier's gangrene of the perirectal, perineal, and right lower abdominal areas in a 24-year-old newly diagnosed diabetic male.

Figure 2: Fournier's Gangrene of the Scrotum



that hyperbaric oxygen therapy is beneficial in Fournier's gangrene and does not recommend its use.⁹ If hyperbaric oxygen is used, it should never be allowed to delay standard therapy.

Wound care following surgery is beyond the scope of this review, but advances in wound healing such as the use of vacuum dressing to speed wound closure have been used successfully.^{31,32}

Epididymitis and Epididymo-Orchitis

Case. A 6-year-old Caucasian male presented to the emergency department complaining of intermittent scrotal pain since midnight. The examination demonstrated marked tenderness of the left testicle and epididymis with a normal lie. The cremasteric reflex was present.

Urology was consulted and an ultrasound obtained, which demonstrated asymmetrical enlargement of the left epididymis and increased blood flow consistent with epididymitis as well as a “moderate simple hydrocele.” Normal arterial and venous blood flow was noted in both testicles. The urinalysis demonstrated no signs of infection. The patient was started empirically on trimethoprim/sulfamethoxazole for treatment of epididymitis and discharged home. At follow-up with pediatric urology nine days later, the patient reported no further complaints or problems after discharge from the pediatric emergency department.

Introduction

Epididymitis can be subcategorized as acute bacterial epididymitis, nonbacterial infectious epididymitis, noninfectious epididymitis, chronic epididymitis, or chronic epididymalgia. Acute bacterial epididymitis is usually secondary to a urinary tract infection or to a sexually transmitted infection. Nonbacterial infectious epididymitis can be caused by viral, fungal, or parasitic etiologies. Noninfectious epididymitis is idiopathic, traumatic, autoimmune, drug-induced, or associated with known syndromes such as Behçet disease. Chronic epididymitis occurs after inadequately treated acute epididymitis, recurrent disease, or another associated disease process. The pain syndrome of chronic epididymalgia is usually unclear in etiology. However, it is known to occur after a vasectomy, when severe pain can occur in 15% of men six months after their procedure.³³

Pain, swelling, and inflammation of the epididymis lasting less than six weeks characterize the clinical

syndrome of acute epididymitis. The condition is considered chronic when the symptoms are equal to or greater than six weeks in duration. The term epididymo-orchitis is commonly used because in most cases the testis is also involved.

Acute epididymitis typically presents as unilateral testicular pain and tenderness along with palpable swelling of the epididymis and possibly a hydrocele. While the tail of the epididymis is where the inflammation and swelling usually begins, it typically spreads to involve the rest of the epididymis and testicle. The spermatic cord is also usually swollen and painful.

Epidemiology

As presented in the case above, acute epididymitis can occur in males of all ages. In younger children, epididymitis is often associated with a urinary tract infection, with *E. coli* being the most common pathogen isolated. Trauma to the epididymis may also be responsible for inflammation in children. Among sexually active men younger than 35 years of age, acute epididymitis is most frequently caused by *C. trachomatis* or *N. gonorrhoeae*. For men older than 35 years of age, nonsexually transmitted epididymitis is associated with urinary tract instrumentation, surgery, and systemic disease. Enteric organisms such as *Escherichia coli* and *Pseudomonas spp.* can also cause sexually transmitted acute epididymitis among men who are the insertive partner during anal intercourse.

Pathophysiology

The spread of infection is from the bladder, urethra, or prostate via the ejaculatory ducts and vas deferens into the epididymis. The infectious process begins in the tail of the epididymis and subsequently spreads to the head of the epididymis. Epididymitis in infants and boys is related to an underlying genitourinary anomaly or a urinary tract infection (UTI). In elderly males, epididymitis is often associated with stasis associated with benign prostatic hypertrophy, UTI, and

catheterization. In sexually active males younger than 35 years of age, epididymitis is most frequently due to a sexually transmitted infection.

Diagnosis

Because of the extensive overlap in signs and symptoms with other causes of acute scrotal pain, the diagnosis may require imaging studies such as radionuclide scanning or ultrasound. Ultrasound will demonstrate epididymal hyperemia and swelling in men with epididymitis. Gram stain of urethral secretions demonstrating 5 or more white blood cells (WBCs) per oil immersion field is highly sensitive and specific for detecting urethritis. White blood cells containing intracellular Gram-negative diplococci on urethral Gram stain can establish the diagnosis of a gonococcal infection. The diagnosis of epididymitis is also supported with a positive leukocyte esterase test on a first-void urine or microscopic examination of first-void urine sediment demonstrating 10 or more WBC per high power field.

Culture, nucleic acid hybridization tests, and nucleic acid amplification tests (NAATs) for the detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* are also available. Amplification tests can be performed on urine or urethral specimens, while culture and NAATs require urethral swab specimens. Amplification tests are preferred for detecting *C. trachomatis* because of their higher sensitivity.

Treatment

The Centers for Disease Control and Prevention recommend that the initial treatment for acute epididymitis be ceftriaxone as a single intramuscular dose followed by 10 days of doxycycline oral therapy.³⁴ If the infection is most likely caused by enteric organisms or testing does not confirm gonorrhea by NAAT, additional therapy with a fluoroquinolone is recommended. If the patient is at risk for sexually transmitted and enteric organisms (insertive anal intercourse), ceftriaxone with a fluoroquinolone is recommended.

Most individuals with acute epididymitis can be treated as outpatients. However, if there is severe pain suggesting other diagnoses or if the physician has doubts that the patient will be compliant with the antimicrobial regimen, than hospitalization is recommended. The presence of a high fever would also point the clinician toward admission because it is uncommon and suggests a complicated infection.

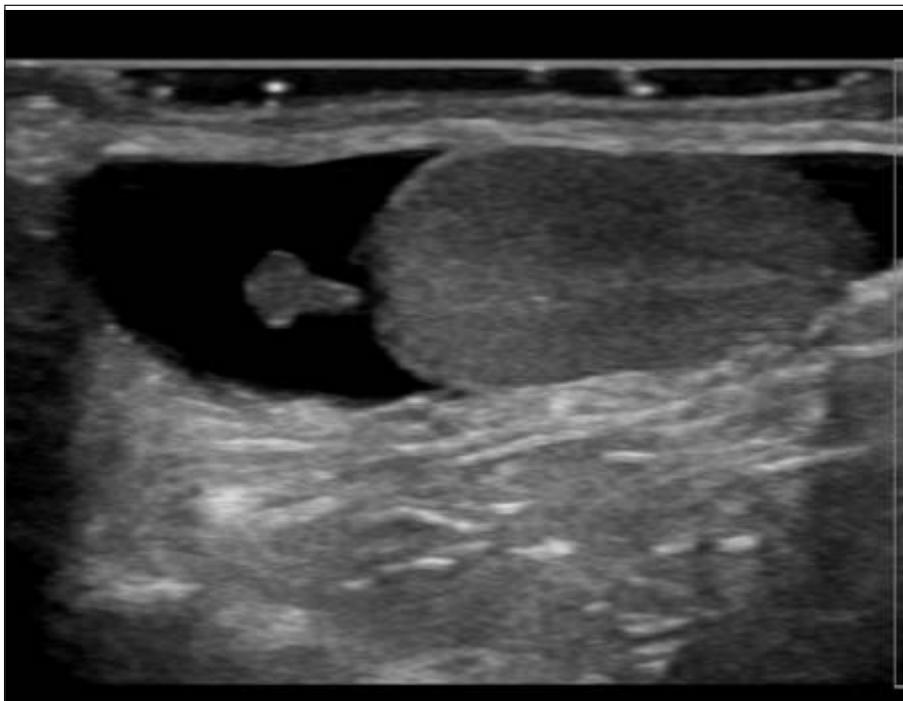
Other adjuncts to therapy include bed rest, scrotal elevation, and analgesics. Re-evaluation of the diagnosis and therapy is recommended if the signs and symptoms of epididymitis have not subsided within three days. Persistent swelling and tenderness after the completion of antimicrobial therapy requires further evaluation. Sex partners of patients with acute epididymitis confirmed or suspected to be caused by *N. gonorrhoeae* or *C. trachomatis* (who had their contact with the index patient within the 60 days preceding onset of symptoms) should be referred for evaluation and treatment. Abstinence from sexual intercourse is recommended for the patients and their sex partners until therapy is completed and symptoms have resolved.

Testicular Appendage Torsion

Case. A 6-year-old white male presented to the emergency department for evaluation of left testicular pain. The pain began when he awoke at 6:30 a.m., but he did not complain about it to his father until five hours later. He was active throughout the day and even played football. However, his father noted that the left testicle had doubled in size and had a slight bluish discoloration.

In the emergency department, he denied any pain and reported that the pain had resolved as he was checking into the emergency department. He denied nausea, vomiting, dysuria, hematuria, or fever. On examination, a hydrocele that was easily transilluminated was noted, as well as a 1 mm area of induration on the base of the left testicle. The cremasteric reflex was noted

Figure 3: Testicle with a Torsed Appendix Protruding from the Testicle and Surrounded by a Hydrocele



bilaterally. A urinalysis was within normal limits and demonstrated no signs of infection. An ultrasound study was performed, which demonstrated normal blood flow to the testicles, a moderate-sized scrotal hydrocele, and an appendix testis with no demonstrable color Doppler flow consistent with a torsion of the appendix testis. (See Figure 3.)

Introduction

There are actually four appendages on the testicle that can undergo torsion. The appendix testis is the best known appendage and is a vestigial remnant of the paramesonephric (Müllerian) duct. The appendix epididymis can also occur and is a remnant of the mesonephric (wolffian) duct. The other appendages are the paradidymis and vas aberrans and these are much less common. The appendages on the testis and epididymis were first described by Morgagni in 1761 and, consequently, these appendages are also called the “hydatis of Morgagni.” These appendages are readily viewed by ultrasound and in one small study the appendix testis was identified on 80% of testes and the appendix epididymis on 6%.³⁵ An autopsy study describes the

incidence of testicular appendices as 76% in adults (93.3% sessile) and 83.3% in neonates and children (88% sessile). An epididymal appendix was present in 21.9% of adults and 20% of neonates and children, with approximately 80% stalked in either type.³⁶ This review will focus on the torsion of the most commonly found appendix, the appendix testis.

Epidemiology

Torsion of testicular appendage is the most common cause of an acute scrotum presentation in children. Even though the condition can occur in adults, this is a disease primarily of children. The peak age of occurrence is 7 to 12 years (mean 8 to 9 years).³⁷⁻³⁹ A two-year retrospective review of 238 cases of acute scrotal pain encountered at a children’s hospital found the incidences of testicular torsion, torsion of a testicular appendage, and epididymitis were 16%, 46%, and 35%, respectively.⁴⁰

A review by Mäkelä et al of surgical explorations in 388 boys presenting with an acute scrotum revealed 100 cases (26%) of spermatic cord torsion, 174 cases (45%) of torsion of the testicular appendage, 38 cases (10%) of epididymitis, 32 cases (8%)

of incarcerated inguinal hernias, and 44 (11%) other conditions.⁴¹ Finally, another retrospective review of 100 consecutive children admitted for acute scrotal pain demonstrated an appendix torsion in 70 patients and a testicular torsion in 12 patients. Ten boys were admitted with 11 episodes of epididymitis-orchitis and seven had other pathologies, including incarcerated hernia, varicocele, and idiopathic scrotal edema.⁴²

Pathophysiology

The appendix testis measures approximately 0.3 cm, and because it is pedunculated in form, it is predisposed to torsion. Even though torsion of the appendix testis is a benign condition, it is usually painful and may present identically to testicular torsion. The pain results from the ischemia and necrosis that occurs when the pedunculated structure becomes torsed. Other local reactive tissue changes such as a hydrocele, enlarged head of the epididymis, and edema of the tunica vaginalis and scrotal wall can occur.

Diagnosis

The clinical presentation of testicular appendage torsion can be indistinguishable from that of a testicular torsion, the true acute scrotal emergency. This is especially true the longer the duration of the condition, as the scrotal examination may show increasing testicular enlargement, tenderness, and scrotal erythema. Consequently, experienced clinicians and surgeons advise a cautious approach. The pain onset is usually acute, but may be gradual and, as a result, these patients tend to have a more delayed presentation.⁴¹ The pain is often mild, but can be severe and is typically located in the superior pole of the testicle. The “blue dot” sign, a small area of bluish discoloration, may be noted in the upper lateral portion of the hemiscrotum. However, it is not consistently present. In the study by Mäkelä et al, 94% of their patients with the appendix torsion presented with testicular pain, 56% with scrotal or testicular edema, and 32% with

redness.⁴¹ The “blue dot sign” presenting as a palpable nodule at the superior aspect of the testicle, which is considered specific for this condition, was visible in only 10% of their patients.

The testicular orientation should remain normal and the not-so-reliable cremasteric reflex should remain intact. Urinary symptoms such as dysuria and pyuria, which are more common with epididymitis, do not typically occur with this condition. Vital signs should be normal and systemic signs and symptoms such as nausea and vomiting are less common with this condition.⁴¹

Diagnosis can be assisted using imaging. Color Doppler ultrasonography, the imaging modality of choice for the acute scrotum, will show normal blood flow to the testicle. Inflammation of the affected side may cause an increase in blood flow. Hyperperfusion of the epididymis with or without an enlarged (> 5.6 mm) appendix testis or a normal-appearing appendix may be noted in cases of testicular appendage torsion.⁴³ The twisted appendage may appear as an ovoid, hyperechoic, hypoechoic, or heterogeneous nodule without blood flow.⁴³ However, as discussed later, caution in interpretation is advised.

A positive radionuclide imaging study may demonstrate the “hot dot” sign caused by increased tracer uptake. However, the literature discussing radionuclide imaging is older and limited in quality and quantity. One larger study of 217 patients over 13 years reported that the “hot dot” sign, which is a small spot of increased tracer perfusion and uptake on radionuclide scrotal imaging, was not present during the first hours after the onset of symptoms. This study concluded that radionuclide scrotal imaging is inaccurate and is not indicated for the diagnosis of torsion of testicular appendages of less than 4-5 hours duration. The authors reported that overall sensitivity and accuracy of radionuclide scrotal imaging in diagnosing torsion of testicular appendages in their group of patients were 68%

and 79%, respectively.⁴⁴ However, if the hot dot sign was present, torsion of testicular appendages was consistently found at exploration (specificity 100%).⁴⁴ In general, the radionuclide study may play a role when the color Doppler ultrasound is equivocal for testicular torsion; otherwise, it is a second-line study for acute scrotal pain. For the evaluation of a suspected torsion of the testicular appendage, it should not be used. Other laboratory tests, such as a CBC and urinalysis, may provide evidence suggestive of another diagnosis such as epididymitis-orchitis.

Treatment

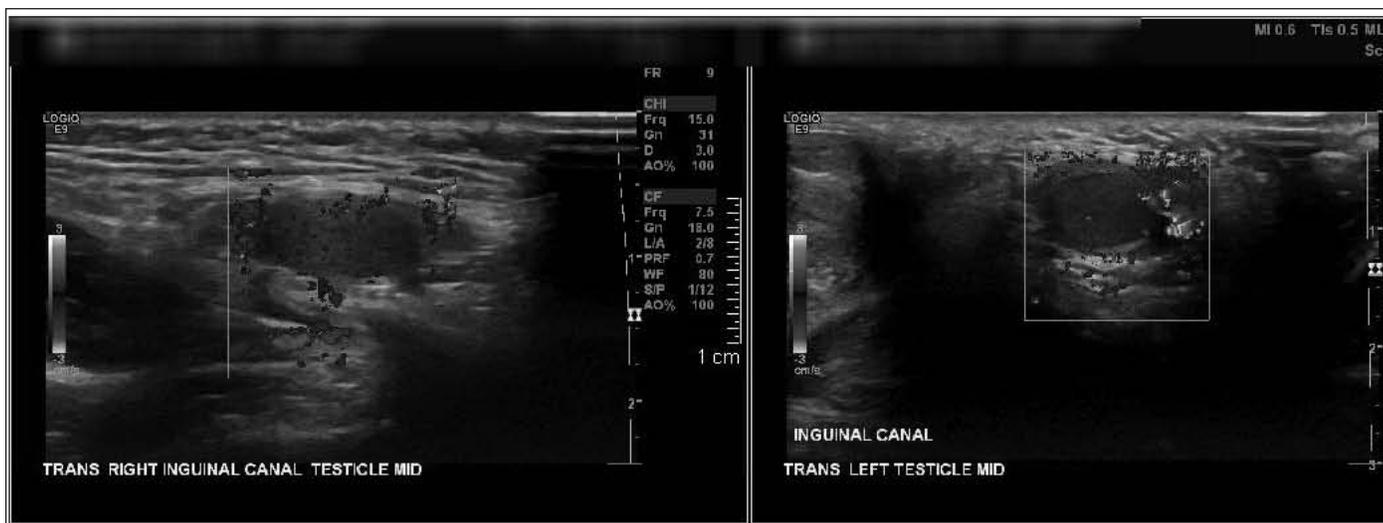
Treatment is primarily supportive. In almost all cases, the necrotic tissue is reabsorbed without any sequelae. Activity reduction, scrotal support, nonsteroidal anti-inflammatory drugs (NSAIDs), and ice are the modalities of choice. The pain usually resolves within a week, but can last longer. Persistent pain may require surgical excision of the testicular appendix or re-evaluation and reassessment of the original diagnosis.

Testicular Torsion

Case: A 3-year-old, healthy African-American male was brought to the pediatric emergency department for evaluation of scrotal pain that began approximately seven hours earlier. He reported his pain for the first time to his grandmother when she picked him up from day-care. The grandmother reported the pain to his mother, and the patient continued to complain of scrotal pain over the course of the next four hours. The patient vomited an hour and half prior to arrival. The history was negative for abdominal pain, dysuria, hematuria, fever, or chills. Examination of the right testicle demonstrated swelling, retraction compared to the left testicle, and marked pain with palpation.

Urology was consulted immediately on arrival and the consultant’s examination was consistent with the emergency department findings. However, during an emergency ultrasound, normal Doppler

Figure 4: Normal Testicular Ultrasound Following Detorsion Event



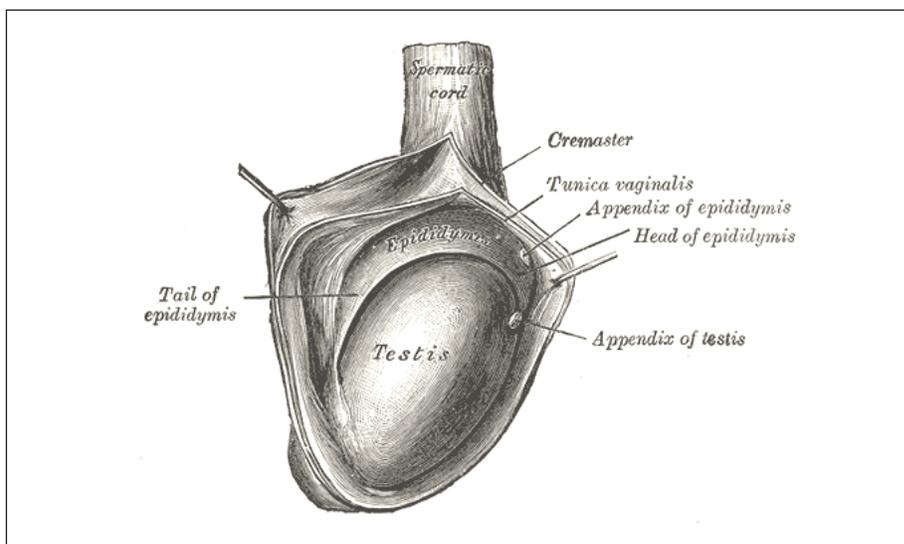
vascularity and parenchymal appearance was reported without evidence of testicular torsion. (See Figure 4.)

Upon return to the emergency department, the patient's scrotal pain had completely resolved, and the testicle examination had reverted to normal. Nevertheless, despite the resolution of the presumed testicular torsion, the patient was admitted and subsequently taken to the operating room for scrotal exploration and bilateral testicular orchiopexy. At follow-up two months later, the patient's postoperative scrotal examination was within normal limits and he was advised to return in a year for re-evaluation.

Introduction

Testicular torsion is the twisting of the suspended testicle on the spermatic cord, resulting in ischemia of the testicle from reduced blood flow and venous outflow obstruction. Without timely recognition and surgical detorsion, the ischemic testicle will eventually die and require surgical removal. The diagnosis of testicular torsion is complicated by its relative infrequency of occurrence in contrast to other conditions causing testicular pain. Furthermore, the clinical presentation and physical examination findings of the various conditions causing scrotal pain frequently overlap.⁴⁵ Consequently, testicular torsion is the third most common cause of a malpractice

Figure 5: Anatomy of the Testicle



lawsuit in adolescent males 12 to 17 years of age.⁴⁶

Epidemiology

Testicular torsion can occur at any age, but it is more common in postpubertal boys and neonates. The incidence is considered bimodal for these two age groups. In the United States, the estimated incidence of testicular torsion for males aged 1 to 25 years is 4.5 cases per 100,000 male subjects per year.⁴⁷

Pathophysiology

Inadequate fixation of the lower pole of the testis to the tunica vaginalis allows the twisting or torsion to occur. (See Figure 5.) This anatomic

abnormality, called the bell clapper deformity, is due to partial or complete fusion failure of the tunica vaginalis along the epididymis. As a result, the testis and epididymis are incompletely attached to the scrotum. The cremasteric muscle surrounds the spermatic cord. When the cremasteric muscle contracts, the testicle with insufficient fixation to the tunica vaginalis has more room to move freely, and twisting can occur around the spermatic cord. There may be an inciting event that initiates the torsion, such as a traumatic force applied to the scrotum, cold temperature, sudden movement, and a possible role of rapid growth of the testis at puberty, but the event

is often unknown or torsion occurs spontaneously. Rarely, torsion will occur following orchiopexy.⁴⁸

Diagnosis

The classic presentation of testicular torsion is characterized by sudden onset of severe scrotal pain that may occur at rest, during sleep, or during physical activity. Nausea and vomiting may also be associated with the painful testicle. However, some patients may have milder or less acute scrotal pain and some may complain primarily of inguinal or lower abdominal pain. Depending on the duration and degree of torsion, scrotal edema and erythema may be present. Boys with testicular torsion tend to present earlier (within six hours) than those with other causes of the acute scrotum.^{41,49,50} Shortening of the twisted spermatic cord may result in an asymmetrically high-riding testis. Additionally, the long axis of the testis may also be oriented transversely instead of longitudinally.

The cremasteric reflex, or cremasteric contraction causing elevation of the testis when the skin of the upper thigh is stroked, is usually absent in patients with testicular torsion. However, this examination is not reliable and the available evidence clearly demonstrates that the cremasteric reflex will be present in some testicular torsion patients. Ten of 25 (40%) patients with a surgically proven testicular torsion were found to have persistence of the cremasteric reflex in a series by Van Glabeke et al.⁵¹ Beni-Israel et al reported that 5 of 17 patients (29%) with testicular torsion had a normal cremasteric reflex.⁵² Murphy et al reported that 3 of 8 patients requiring orchiectomy for necrotic testicles following testicular torsion had a cremasteric reflex.⁵³ Finally, the persistence of the cremasteric reflex was reported by other authors in 8%, 10%, 12%, 20%, and 30% of their patients diagnosed with testicular torsion.⁵⁴⁻⁵⁸

Color Doppler ultrasonography is the diagnostic test of choice to help differentiate testicular torsion from other causes of the acute scrotum.

However, color Doppler ultrasonography is not without problems, and false-negative examinations can occur because blood flow is preserved in the torsed testicle.^{40,59-62} In a 2007 multicenter study by Kalfa et al, color Doppler ultrasonography failed to establish the diagnosis of spermatic cord torsion in 50 of 208 cases (24%), as the testicular vascularization was judged as normal or increased compared to the other testis.⁶¹

An important finding on ultrasound appears to be the identification of the torsion knot in the spermatic cord.⁶³⁻⁶⁷ In fact, direct visualization of the twisted cord with high-resolution ultrasonography with a probe frequency of 10 to 12 MHz is considered a much more reliable indicator of the diagnosis of spermatic cord torsion. However, it too will not be diagnostic in a small percentage of patients.^{60,61} High-resolution ultrasonography detected the twist as a snail shell-shaped mass, measuring 7 to 33 mm, in 199 of 208 (96%) testicular torsion patients in one large study. In contrast, color Doppler ultrasound identified only 76% of the testicular torsion patients.⁶¹ While radionuclide scanning also has a role in demonstrating loss of blood flow to the testicle, it is a secondary imaging option. If neither imaging option is available or the diagnosis is clearly established clinically, then immediate surgery is indicated.

Treatment

Treatment of testicular torsion is emergency surgery to perform intraoperative detorsion and fixation of the testes and prophylactic orchiopexy of the opposite testicle. Contralateral bell clapper deformity usually exists, making the patient vulnerable to torsion of the opposite testicle. It is a race against time, and after 12 hours of ischemia, the damage to the testis is generally considered irreversible. However, there are reports of testicular survival after longer periods of torsion. Almost all of the larger series describe patients whose testicles survive 12

to 24 hours of torsion or longer. It is also clear, however, that necrotic testicles have been noted at surgery and atrophy has been observed at follow-up in patients whose symptoms were present for less than six hours.^{49,53,68}

Nevertheless, there are a large number of papers and case series that describe longer time periods after which significant percentages of testicles have gone on to survival.^{39,40,49,53,58,63,68-76} Therefore, even for patients whose torsion has been present for greater than 6 to 12 hours, clinical nihilism concerning a timely evaluation should be avoided and a sense of urgency should be maintained.

Manual detorsion is also an option. However, there is one major caveat. Sessions et al reported that the traditional teaching that testicular torsion occurs primarily in the medial direction is misleading.⁴⁹ In their series, one-third of the cases occurred in the lateral direction. The teaching that detorsion is performed in an “open the book” or lateral rotation of the testicle away from the midline would actually worsen the degree of torsion in one-third of the patients. Additionally, since the degree of twisting of the testicle may range from 180 to more than 720 degrees, an unknown number of turns of the testicle will be required.

Summary

Failure to accomplish timely recognition and management of male genital emergencies involving the scrotum can be associated with significant morbidity and, in the case of Fournier’s gangrene, mortality. Timely recognition of testicular torsion will be the difference between viability of the testicle and the death of that reproductive organ. Epididymo-orchitis also requires urgent management to prevent associated complications. Since there is significant overlap of presentation signs and symptoms for these conditions, their diagnosis is often challenging. It is important for physicians to perform a careful history,

physical examination, and appropriate imaging studies. Timely consultation with a urology specialist and consideration for surgical exploration may also be indicated.

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CME Questions

1. Which of the following is true regarding Fournier's gangrene?
 - A. The mortality rate averages 20-30%.
 - B. The incidence is decreasing.

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Upon completion of this educational activity, participants should be able to:

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- C. The condition is not reported in children.
D. Approximately 95% of cases do not have an identifiable cause.
2. Which of the following is a mainstay of treatment for Fournier's gangrene?
A. fluid resuscitation
B. broad-spectrum antibiotics
C. surgical debridement
D. all of the above
3. Which of the following is true of acute epididymitis?
A. The spermatic cord is not usually swollen or painful with epididymitis.
B. It typically presents as unilateral testicular pain, palpable swelling, and possibly a hydrocele.
C. Inflammation is usually confined to the tail of the epididymis.
D. In young children, epididymitis is not associated with urinary tract infections.
4. The recommended initial treatment for acute epididymitis is ceftriaxone plus doxycycline.
A. true
B. false
5. Which of the following is true regarding testicular appendage torsion?
A. The blue dot sign is always present in these patients.
B. The cremasteric reflex does not remain intact.
C. Torsion of the appendix testis is a benign condition, but it is usually painful and may present identically to testicular torsion.
D. Urinary symptoms typically occur with this condition.
6. Which of the following statements is true regarding treatment for testicular appendage torsion?
A. It is mainly supportive.
B. In most cases, necrotic tissue is reabsorbed without sequelae.
C. Pain usually resolves within about a week, but persistent pain may require reassessment.
D. The main treatments are activity reduction, NSAIDs, scrotal support, and ice.
E. All of the above.
7. Testicular torsion is most common in which age group?
A. elderly men
B. neonates and post-pubertal boys
C. men 20-30 years old
D. school-age boys
8. Which anatomic abnormality is most commonly associated with testicular torsion?
A. hydrocele
B. inguinal hernia
C. bell clapper
D. spermatocele
9. The absence of the cremasteric reflex is a reliable sign to detect testicular torsion.
A. true
B. false
10. Which imaging study is considered the diagnostic test of choice for testicular torsion?
A. color flow Doppler ultrasound
B. CT scan
C. radionuclide scan
D. MRI

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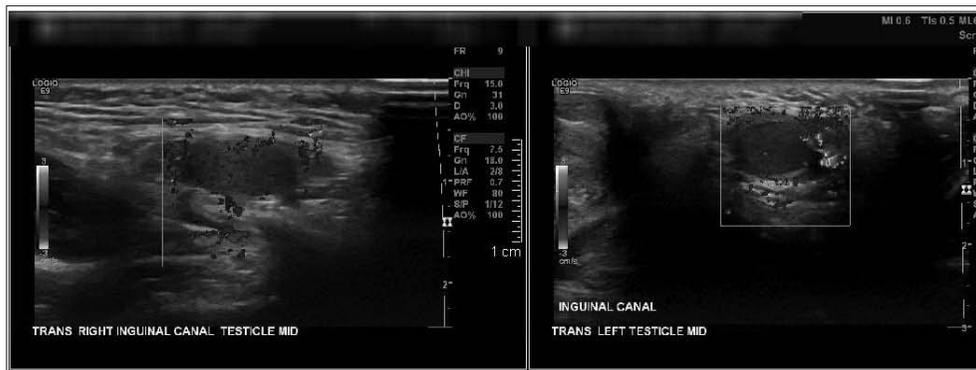
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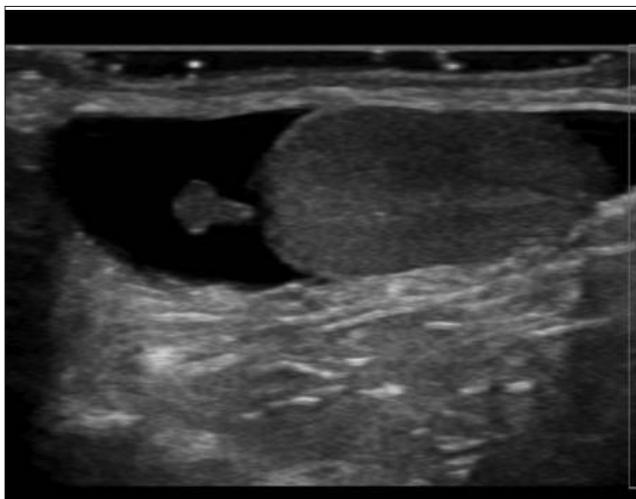
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Male Genital Emergencies: Part I

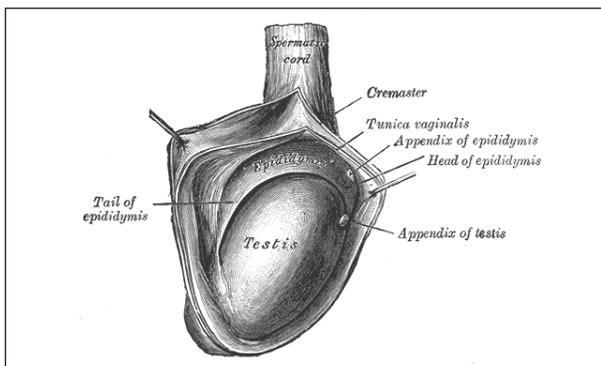
Normal Testicular Ultrasound Following Detorsion Event



Testicle with a Torsed Appendix Protruding from the Testicle and Surrounded by a Hydrocele



Anatomy of the Testicle



Fournier's Gangrene



Fournier's gangrene of the perirectal, perineal, and right lower abdominal areas in a 24-year-old newly diagnosed diabetic male.

Fournier's Gangrene of the Scrotum

