

Fournier's Gangrene

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Fournier's gangrene (Meleney's synergistic gangrene,^{1,2} perineal necrotizing fasciitis^{3,4}) is a fulminant necrotizing infection of the perineum and genitalia that constitutes a surgical emergency and can rapidly progress to sepsis and death. Physicians unfamiliar with this infection will likely misdiagnose it, and those who have seen it will never forget it. Although it has been recently dramatized in the lay press as a disease caused by "flesh-eating bacteria,"⁵ Fournier's gangrene has been known since biblical times.³ All physicians who work in the acute care setting should be aware of this virulent infection, which is frequently misdiagnosed as cellulitis with potentially devastating results. This article presents the case of a man with Fournier's gangrene that was initially diagnosed as cellulitis.

CASE PRESENTATION

Initial Presentation

A 51-year-old man presented to the emergency department with a 2-day history of scrotal swelling. He denied fever, chills, malaise, and other symptoms except for mild scrotal and left buttock pain. His medical history was negative for drug abuse, steroid use, diabetes, and other medical conditions except for hypertension, but heavy alcohol use was suspected. Edema of the scrotum and cellulitis of the perineum were noted during physical examination. The erythema extended onto the left buttock, where an extremely indurated area with skin sloughing was noted medially. No perianal or perirectal abscess was found. The results of urinalysis were negative, and the leukocyte count was within normal limits. The urologist on call admitted the patient to the hospital with a diagnosis of scrotal cellulitis. Treatment with levofloxacin was then initiated.

Diagnosis and Subsequent Management

By the following day, the patient's physical condition had deteriorated. He exhibited signs of sepsis, with fever, tachycardia, and leukocytosis with left shift. The severity of the scrotal edema and the skin sloughing on the left buttock had worsened, and the area of induration had increased (**Figure 1**). Consultation was requested with the general surgeon on call, who noted a patch of green-black, necrotic skin 1- to 2-cm in size

on the patient's medial left buttock, pneumoscrotum (crepitation of the scrotal skin), and a foul odor. The surgeon correctly diagnosed the infection as Fournier's gangrene, and the patient underwent immediate surgery.

Rigid sigmoidoscopy did not reveal an anorectal source of infection. The frankly necrotic skin was excised, and necrotic, green-grey, gelatinous, subcutaneous fat was revealed (**Figure 2**). Malodorous "dishwater" fluid drained from along the gluteal fascial planes. Wide excision and débridement of all devitalized tissue from the medial buttock into the base of the scrotum was performed (**Figure 3**). The subcutaneous necrosis was much more extensive than the cutaneous necrosis.

After having undergone this procedure, the patient was treated with triple antibiotic therapy (ampicillin, gentamycin and clindamycin) to cover gram-positive, gram-negative, and anaerobic bacteria. By the next day, the leukocytosis, edema, and cellulitis had begun to resolve. Examination under anesthesia revealed no need for additional débridement. Antibiotic treatment was continued, and whirlpool therapy was initiated. Gram stain of tissue obtained during the surgical procedure revealed numerous gram-positive and gram-negative bacteria, including *Staphylococcus aureus* and *Escherichia coli*.

Case Resolution

By postoperative day 22, the edema had resolved, the wound was healing well, and no sign of surrounding infection was detected (**Figure 4**). In the operating room, the wound underwent primary closure over a Penrose drain to prevent abscess. The drain was removed in 5 days. At the final follow-up evaluation

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DISCLAIMER: This article was written by CDR Zsolt T. Stockinger, MC, USNR, during his fellowship training in trauma surgery and surgical critical care at Tulane University School of Medicine in New Orleans, Louisiana. The views expressed in this article are those of the author and do not reflect the official policy or position of the US Department of the Navy, the US Department of Defense, or the government of the United States.



Figure 1. Scrotal edema with skin bronzing and sloughing on the left medial buttock. The characteristic green-black spot is indicated by the arrow.

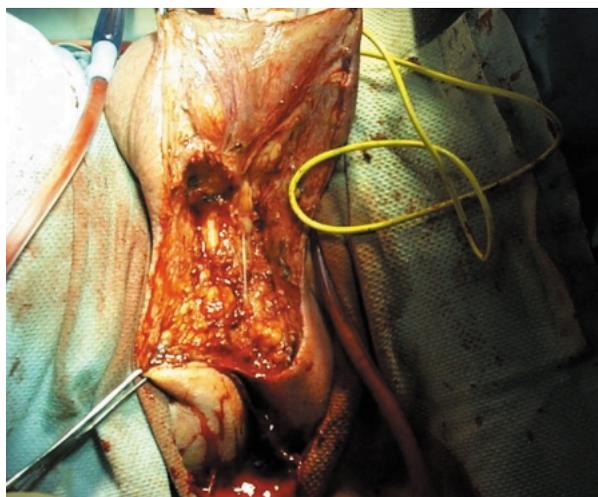


Figure 3. Completed débridement. The involved area is much greater than that suggested by skin necrosis.

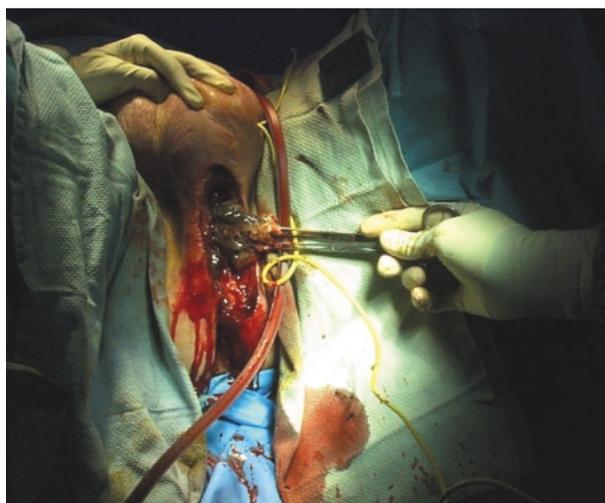


Figure 2. Excision of necrotic skin reveals extensive liquefaction necrosis of the underlying subcutaneous fat.

several weeks later, the patient was well and a good cosmetic and functional result had been achieved.

DISCUSSION

Fournier's gangrene is a fulminant soft tissue infection that spreads through the subcutaneous tissue planes and can rapidly cause death from sepsis, acute renal failure, diabetic ketoacidosis, or multiple organ failure.²⁻⁴ It occurs with a male-to-female predominance of 10:1.³ The mean age of patients ranges from 46 to 56 years,^{2,4,6,7} although Fournier's gangrene has been reported in children.²⁻⁴ Mortality rates range



Figure 4. Twenty-two days after débridement. The wound is much smaller after the resolution of edema. Note the flaccidity of the scrotal skin in comparison with its appearance before the first débridement (Figure 1).

from 3% to 45%,^{3,4,6,8} and more than 1700 cases from 5 continents have been reported in the literature.³

Pathogenesis

Fournier's gangrene is a polymicrobial infection,³ the source of which is anorectal in 13% to 50% of cases,^{3,7,8} genitourinary in 17% to 87%,^{3,7,8} and cutaneous in 21% to 24%.^{2,3} It develops after urologic and anorectal procedures, including vasectomy.^{3,4} Thus, it is not surprising that the most common etiologic pathogens are commensal genitourinary or anorectal bacteria. In decreasing incidence, these are *E. coli*; *Proteus*, *Klebsiella*, and *Bacteroides* species; streptococci; and staphylococci.²⁻⁴ Anaerobes are rarely recovered from tissue culture, probably because of inadequate sample collection or the improper handling of samples.⁴ The reasons for which organisms of normally low virulence produce such an aggressive infection are unclear. However, the frequent comorbid conditions associated with Fournier's gangrene, which include diabetes mellitus (21%–79% of cases),^{3,4,6-8} immunodeficiency,^{3,4,7} alcoholism (25%–66% of cases),^{3,4,7,8} intravenous or subcutaneous drug abuse,⁶ and malnutrition,^{2,4} may contribute to the rapid progression of the infection.

A more typical superficial cellulitis is characterized by spreading erythema with edema but without cellular necrosis. In Fournier's gangrene, infection leads to obliterative endarteritis and thrombosis of the subcutaneous vessels.^{3,4} That thrombosis in turn causes ischemic necrosis of the overlying skin, the appearance of which fails to indicate the extent of infection. The localized tissue hypoxia then promotes the growth of the anaerobic bacteria usually identified in cases of Fournier's gangrene. Liquefaction necrosis of the subcutaneous fat may be caused by toxic bacterial products, such as hyaluronidases and collagenases from staphylococci and streptococci, coagulases from β -hemolytic streptococci, heparinases from some anaerobic bacteria, and lipopolysaccharides from gram-negative bacteria.^{2,8} Infection spreads along the subcutaneous and fascial planes, although myonecrosis is rare.³

Although Jean Alfred Fournier's original description of the disease that bears his name included only scrotal involvement,³ Fournier's gangrene can also involve the penis, labia, abdominal wall, thighs, and buttocks. Because Colles' fascia attaches to the perineal body posteriorly and to the pubic rami laterally, the spread of infection is most likely to occur anteriorly along Scarpa's or Camper's fascia to the abdominal wall and to the scrotum if the source is perianal.^{2,4,8} The testes are usually uninvolved because their blood supply arises separately from the intraabdominal aorta, but the blood supply of the scrotum arises from branches of the femoral artery.^{3,8} However, orchiectomy rates of 10% to 30% have been reported.^{2,4}

Diagnosis

The classic signs of Fournier's gangrene are pain, swelling, and erythema of the scrotum in addition to fever.^{2,4,8} Patients usually present after 2 to 7 days of symptoms.^{2,4} As the infection progresses, cyanosis, blistering, and bronzing of the skin^{2,4,8} evolve into the formation of black or green plaques of frank dermal necrosis in up to 100% of cases (Figure 1).⁹ These plaques are perhaps the hallmark diagnostic finding of the infection on physical examination. Pain may diminish after skin necrosis has occurred.² Pneumoscrotum has been reported in 18% to 62% of cases.^{4,8} That finding can lead to misdiagnosis as gas gangrene, even though *Clostridium perfringens* is infrequently isolated from tissue cultures.³ Septic symptoms may be disproportionate to the appearance of the scrotal skin.^{4,8}

Urinalysis, cystoscopy, anoscopy, or rigid sigmoidoscopy may be indicated because a genitourinary or anorectal source of infection is often identified.^{3,8} A search for the previously mentioned comorbid conditions frequently associated with Fournier's gangrene is also warranted.^{2,4} Fournier's gangrene has also been reported as the initial presentation of HIV infection⁴ and of diabetes mellitus.^{2,3}

Fournier's gangrene is most frequently misdiagnosed as strangulated hernia, scrotal cellulitis, or other intrascrotal pathology (eg, torsion, abscess).^{2,4} However, pyoderma gangrenosum and dry (noninfectious) gangrene caused by vasculitis are occasionally misdiagnosed as Fournier's gangrene.² Cellulitis that does not respond appropriately to antibiotic treatment is highly suggestive of Fournier's gangrene⁸ and should prompt early surgical consultation. A high index of suspicion is required for accurate, early diagnosis, which minimizes tissue loss and mortality.

Although imaging studies such as plain radiographs, computed tomography, and ultrasonography can reveal tissue gas or edema, those evaluations usually are not necessary in the diagnosis of this infection.^{2,4} Ultrasonography is probably most useful to rule out other acute scrotal pathologies in questionable cases.^{2,8}

Treatment

At diagnosis, treatment with broad-spectrum parenteral antibiotics effective against gram-positive, gram-negative, and anaerobic bacteria should be initiated.³ An appropriate empiric antibiotic regimen could include ampicillin or penicillin G to cover gram-positive bacteria, an aminoglycoside or third-generation cephalosporin to cover gram-negative and coliform organisms, and clindamycin or metronidazole to cover anaerobic bacteria.^{6,8} However, the primary treatment remains surgical; in fact,

the removal of devitalized tissue can alleviate systemic toxicity.³

Delay in surgical treatment is a key factor in mortality.⁶ Definitive treatment requires prompt, aggressive surgical débridement and removal of all nonviable tissue, which may require multiple surgical procedures.²⁻⁴ According to Yaghan et al, "Under no circumstance should the surgeon worry about the amount of tissue excised [sic] needed to reach viable margins."⁴ Because the spread of infection is subcutaneous, the débrided area is usually greater than that suggested by necrotic skin² (Figures 2 and 3). If the débridement involves the perianal region, colostomy for fecal diversion may be required to facilitate wound care.^{2,3} Urinary diversion by Foley catheter is usually sufficient,⁴ and débridement of muscle and deep fascia is not usually required.²

Occasionally, the removal of all scrotal skin will leave the testes hanging on their spermatic cords "like the clappers of a bell,"³ or the penis may need to be degloved. In such cases, creative reconstruction is required at a later date, but the testes must be protected from desiccation in the interim. This can be accomplished by creating a temporary or permanent thigh or abdominal wall pouch that is superficial enough to allow the lower temperatures required for spermatogenesis; alternatively, wet-to-dry dressings can be used.^{2,8} Fertility is rarely compromised.³

Regardless of the results of Gram stain or tissue culture, Fournier's gangrene is assumed to be a polymicrobial infection, and broad-spectrum antibiotic coverage should be continued postoperatively.^{3,8} Treatment to eradicate anaerobic bacteria, which frequently fail to grow in culture, is mandatory. Hyperbaric oxygen has been proposed for the treatment of Fournier's gangrene,⁷ possibly because scrotal crepitation erroneously suggests clostridial gangrene.³ However, that treatment has not been uniformly advocated,^{3,4} and under no circumstance should its use delay surgical débridement.^{2,4}

Although extensive débridement of affected areas is required, the apparent degree of tissue loss decreases as edema resolves (Figures 3 and 4), and wounds are often left to heal by secondary intention.^{2,4} In spite of this, skin grafting or flap reconstruction is frequently required,^{2-4,8} and lengthy hospitalizations for wound care and reconstruction are common. Wound care after the completion of débridement should follow the

usual surgical principles⁸ and may involve the use of wet-to-dry dressings, hydrotherapy, or enzymatic débridement.⁴ Maintenance of positive nitrogen balance, preferably by enteral feeding, is necessary.³

CONCLUSION

Fournier's gangrene is an aggressive necrotizing infection of the perineum and genitalia that can rapidly progress to sepsis and death. Unfamiliarity with this disease results in misdiagnosis and a delay in treatment, which contribute greatly to morbidity and mortality. Fournier's gangrene is often misdiagnosed as scrotal cellulitis, strangulated hernia, or other intrascrotal pathology and should be suspected in patients with cellulitis that does not respond appropriately to antibiotic treatment. A green or black patch of necrotic skin is the classic sign of this infection. Fournier's gangrene spreads subcutaneously, and as a result, visible signs of the disease fail to indicate the extent of tissue destruction.

Fournier's gangrene is associated with a mortality rate of 3% to 45%. Because the infection is usually polymicrobial, treatment with broad-spectrum antibiotics is required to eliminate gram-positive, gram-negative, and anaerobic bacteria. Operative débridement remains the definitive treatment, and surgical consultation should be obtained early to ensure the best possible outcome. **HP**

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