Fournier’s Gangrene: A Rare Infectious Entity in an Adolescent with Type II Diabetes

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Abstract
Fournier’s gangrene is a rapidly progressive necrotizing fasciitis of the perineum and external genital organs that is uncommon in the pediatric age group. We present a case report of a 17-year-old obese male with comorbidities of type II diabetes, hypertension, and tobacco use, who presented to the hospital with vague systemic symptoms and pain in the gluteal area. On examination, he was febrile and had erythema and induration of his left scrotum, perineum, and gluteal region. Imaging obtained due to rapid progression of symptoms was consistent with a diagnosis of Fournier’s gangrene. He was managed with broad-spectrum antibiotics, aggressive surgical debridement, and a diverting colostomy. This case brings to light to a classically adult diagnosis that should be considered in adolescents, especially given the rising numbers of risk factors in this population, such as diabetes, obesity, and smoking.

Keywords
Fournier’s gangrene, necrotizing fasciitis, adolescent, perineal infection

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Clinical Observation
A 17-year-old male with past medical history of poorly-controlled persistent asthma, obesity, hypertension, and type II diabetes presented to the emergency department (ED) with shortness of breath. He was febrile (temperature 40.6°C), tachycardic (heart rate 140 beats/minute), and tachypneic (respiratory rate 28 breaths/minute) with a slightly elevated blood pressure (127/74 mmHg). His oxygen saturation was 98% on room air. His weight was 122 kg with a body mass index (BMI) of 50.1 kg/m². He also reported skin tenderness and warmth in the gluteal area for 4 days. He had a 2 pack-year history of smoking and was non-adherent with his prescribed home medications of metformin and insulin glargine.

On exam, he was obese and non-toxic appearing, with dry mucous membranes. His breath sounds were diminished bilaterally without wheezing. His abdomen was soft without guarding or tenderness. His left scrotum, left perineum, and bilateral buttocks were erythematous and indurated without drainage, fluctuance, or crepitus.

Laboratory evaluation was notable for sodium of 131 mEq/L (131 mmol/L), potassium of 3 mEq/L (3 mmol/L), chloride of 92 mEq/L (92 mmol/L), phosphate of 2.3 mg/dL (0.74 mmol/L), and glucose of 320 mg/dL (17.8 mmol/L). C-reactive protein (CRP) was significantly elevated to 28.6 mg/dL (286 mg/L). An ultrasound obtained of the gluteal region was consistent with cellulitis without abscess formation.

He was admitted to the pediatrics service for electrolyte abnormalities, uncontrolled type II diabetes, and perineal cellulitis. He was started on oral clindamycin, intravenous (IV) fluids for rehydration, and insulin for hyperglycemia. In the hours following admission, he remained febrile and tachycardic with worsening hypertension. The perineal cellulitis progressed to large, fluid-filled blisters, which ruptured and drained purulent fluid.

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on hospital day 2. A repeat ultrasound was obtained and showed no changes. The antibiotic regimen was broadened to cefepime and vancomycin due to signs of sepsis. A complete blood count (CBC) revealed a white blood cell count of 11 K/uL (0.01 × 10^9/L) with 35% bands and a worsening CRP of 46.4 mg/dL (464 mg/L). A contrast computed tomography (CT) scan of the pelvis was obtained, which showed scrotal wall edema and fluid within the scrotum, as well as extensive fat stranding and air in the subcutaneous tissue of the lower pelvis, perineum, and medial buttocks consistent with Fournier’s gangrene (Figure 1). There were no fluid collections and no evidence of extension into the peritoneum. General surgery was consulted for urgent debridement. IV clindamycin was added to vancomycin and cefepime for anaerobic coverage. He underwent extensive surgical debridement on hospital day 2; intraoperative findings revealed significant necrotic soft tissue of the left perineum, extending to the left thigh, inguinal region, and posteriorly; approximately 560 cm^2 of necrotic tissue was debrided. Post-operatively, he developed septic shock and diabetic ketoacidosis, prompting transfer to the pediatric intensive care unit for 48 hours, where he required vasopressors and an insulin infusion. He underwent a second debridement on hospital day 3, where there was no evidence of ongoing necrotizing infection and a vacuum-assisted closure (VAC) was performed.

The wound culture from the first debridement grew *Actinomyces* species. The initial fungal culture and anaerobic cultures had no growth; however, fungal cultures from a repeat debridement were positive for *Candida albicans*. His blood cultures remained negative. His antimicrobial regimen was narrowed to piperacillin-tazobactam and fluconazole. Over the next several weeks, he underwent a total of 6 surgical debridements with wound VAC changes, a diverting colostomy and Foley catheter placement to avoid wound contamination, and multiple reconstructive surgeries with split-thickness skin grafts and fasciocutaneous flaps. He was discharged sixty days after admission to the hospital. His surgical wounds were healing well at follow-up appointments in the 2 months following hospital discharge and he was cleared by Plastic Surgery for colostomy takedown; this procedure was delayed by several months due to barriers to follow-up and continued smoking. He was discharged on a 6-month course of amoxicillin and has had no known recurrences.

**Discussion**

This case of Fournier’s gangrene (FG) in an adolescent with poorly controlled type II DM emphasizes the importance of a broad differential and thorough physical exam to identify this rare but lethal infection. Fournier’s gangrene is a polymicrobial necrotizing fasciitis involving the perineum, scrotum, and penis. It is characterized by obliteratorative endarteritis of the subcutaneous arteries leading to gangrene of the subcutaneous tissues. FG is extremely rare but critical to recognize given its high mortality rate, with an incidence of 1.6 cases per 100 000 population and a mortality rate of 3% to 67%. It typically affects patients over 50 years old and is rare in children. Diabetes mellitus is the most common risk factor and is present in 20% to 70% of adult cases. Other risk factors in adults include hypertension, obesity, congestive heart failure, immunosuppression, and alcohol or tobacco use. In children, predisposing factors include trauma,
burns, omphalitis, genitourinary surgery, immunocompromised states, and hematologic malignancies. Previous case reports have documented FG in pediatric patients with underlying illnesses including Crohn’s disease and malignancies, and in neonates. This case highlights the importance of considering typically adult-onset conditions like FG in adolescents with obesity and/or type II DM.

Early clinical recognition of FG is essential for prompt antibiotics and surgical management. The diagnosis is primarily clinical, based on presence of pain, edema, and erythema. Symptoms indicative of later stages of necrotizing infection such as bullae, skin necrosis, and crepitus are less common at presentation. CT imaging can aid in early diagnosis in ambiguous cases by identifying abnormal gas collections and revealing the origin and extension of infection. However, prompt treatment is imperative and should not be delayed by waiting for imaging studies. Treatment involves intensive fluid resuscitation, extensive debridement and resection to remove necrotic tissue, and broad-spectrum antibiotics with coverage of enteric and skin flora (aerobic gram-positive, gram-negative, and anaerobic organisms). Early surgical intervention is critical. Vacuum-assisted closure (VAC) following debridement exposes the wound to subatmospheric pressure to promote debridement and healing, leading to reduction of edema and approximation of the wound edges. Hyperbaric oxygen therapy has also been used as an adjunctive treatment.

Although wound cultures may not yield microorganisms in all patients, Escherichia coli, Bacteroides, Streptococcus, Peptostreptococcus, and Clostridium species are frequently identified as causative organisms. Our patient grew Actinomyces species from his wound culture. Actinomyces species are not commonly reported in FG; however, being a fastidious organism, its role is likely underestimated. This bacteria is a known colonizer of the gastrointestinal tract and is known for its ability to spread locally without regard to fascial planes. As FG is typically polymicrobial, this organism was not thought to be the sole pathogen. Fungi are rare causes of necrotizing fasciitis with Candida albicans being the primary organism identified. Given the difficulty isolating many of the bacteria commonly associated with FG on culture, broad spectrum antibiotic therapy is recommended regardless of culture results.

This case of Fournier’s gangrene in a teenager with type II diabetes and obesity brings to light to a classically adult diagnosis that should be considered in adolescents, especially given the rising numbers of risk factors in this population, such as diabetes, obesity, and smoking. Thorough physical examination and recognition that adolescents with one typically adult onset condition, such as type II DM and obesity, are at risk for other adult onset conditions like FG are critical for early surgical and medical management.

Author Contributions
Drs. Sanders, Balamohan, Smith, Taylor, and Cantu contributed equally to this work, revisions, and gave final approval.

Declaration of Conflicting Interests
The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Drs. Sanders, Balamohan, Smith, Taylor, and Cantu declare that they have no conflicts of interest.

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