

Fournier's gangrene – a clinical case report

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Abstract

Fournier's gangrene is an acute, rapidly progressive, necrotizing infection of the skin and subcutaneous tissues surrounding the genitals and perineum. Necrotizing fasciitis of the genital area is a rare disease entity. Although it concerns mostly males, can also occur in females and adolescents. In this syndrome, bacteria produce gases which accumulate in the infected tissue. The damage may also comprise tissue of the penis and scrotum. The infection is caused by aerobic and anaerobic bacteria. Usually the Fournier's gangrene is caused by *Staphylococci*, *Streptococci* and *Enteric bacteria*. Bacterial infection can accompany the fungal infection. The high mortality rate is associated with bacterial contagion of the skin, fat, fascia and blood vessels. Harmful enzymes, produced by micro-organisms, induce numerous blood clots. They can lead to ischemia, which contribute to the development of necrosis. Fournier's syndrome is a disease with a high mortality rate. Immunodeficiency, diabetes and chronic alcohol abuse favor the development of gangrene. Abrasion, burn or surgery complication may be the route of infection for microorganisms. Clinical symptoms appear within few days. Diagnostic process is based on the clinical picture. It is crucial to start treatment as soon as possible. Delay of the wide spectral intravenous antibiotic therapy and surgical removal of the necrotic tissue may result in death of the patient.

Keywords: Fournier's gangrene, necrotizing fasciitis, syndrome,

Introduction

Fournier's gangrene was first described in 1764 by Baurienne, but only in 1883 venereologist from Paris, Jean Alfred Fournier presented 5 cases of rapidly developed gangrene of the genital area. Initially, the etiology of the disease was not known [1]. Currently, we know that it is a necrotizing fasciitis of the external genitals, perineum and anus caused by microorganisms. Although it concerns mostly males, can also occur in females and adolescents. The syndrome in 10% relates to females [2,3]. Fifty-five cases have been reported among pediatric patients. In this group, two-thirds of children were younger than 3 months [4,5].

The onset is characterized by pain, tenderness, swelling and erythema around anorectal and urogenital area. Fournier's gangrene is caused in most cases by the bacterial infection of abovementioned region. Patients with immunodeficiency connected with diabetes or HIV are especially prone to gangrene development [6]. The most common cause of the disease is damage of the external genital skin area. The route of infection for bacteria and fungi is mostly skin laceration and burn. Microorganisms penetrate through the damaged barrier and lead to contagion of the skin, fat, fascia and blood vessels. Internal activation of the coagulation cascade by aerobic bacteria and the production of heparinase by anaerobic bacteria is responsible for vascular thrombosis. Formed blood clots block blood flow, cause tissue ischemia and prevent purifying the blood from toxins. Reactive oxygen species which are formed in the hypoxic tissues and cells, damage the DNA, thereby the ability of tissue to reconstruct is reduced [7]. Specific enzymes, secreted by anaerobic bacteria are responsible for characteristic crepitations. Enzymes such as hyaluronidase or collagenase digest the fascia and at the same time produce hydrogen and nitrogen - gases responsible subcutaneous crackling [8].

Loar et al. have described the Fournier's gangrene severity index score (FGSIS) in 1995. [9,10,11]. We used FGSIS [Table 1] to evaluate the prognosis and to assess risk in reported case. In this scale, nine parameters are estimated and extend of departure from reference range. These parameters are: temperature, heart rate, respiratory rate, serum sodium, serum potassium, serum creatinine, hematocrit, leukocyte count (WBC) and serum bicarbonate levels [Table 1]. Yenyol CO et al. validated that when an FGSIS of 9 was used as threshold parameter to anticipate the outcome, patients with an index score of ≤ 9 were associated with a 78% probability of survival and subjects with a score >9 had a 75% probability of death [10].

We claim that this index score is simple and useful method to quantify the metabolic status and it should be used to evaluate the therapeutic options.

Physiologic Variable/Point Assignment	High Abnormal Values				Normal	Low Abnormal Values			
	4+	3+	2+	1+	0	1+	2+	3+	4+
Temperature (°C)	>41	39–40.9	—	38.5–38.9	36–38.4	34–35.9	32–33.9	30–31.9	<29.9
Heart rate	>180	140–179	110–139	—	70–109	—	55–69	40–54	<39
Respiratory rate	>50	35–49	—	25–34	12–24	10–11	6–9	—	<5
Serum sodium (mmol/L)	>180	160–179	155–159	150–154	130–149	—	120–129	111–119	<110
Serum potassium (mmol/L)	>7	6–6.9	—	5.5–5.9	3.5–5.4	3–3.4	2.5–2.9	—	<2.5
Serum creatinine (mg/100/mL × 2 for acute renal failure)	>3.5	2–3.4	1.5–1.9	—	0.6–1.4	—	<0.6	—	—
Hematocrit	>60	—	50–59.9	46–49.9	30–45.9	—	20–29.9	—	<20
WBC (total/mm ³ × 1000)	>40	—	20–39.9	15–19.9	3–14.9	—	1–2.9	—	<1
Serum bicarbonate (venous, mmol/L)	>52	41–51.9	—	32–40.9	22–31.9	—	18–21.9	15–17.9	<15

Table 1. The Fournier's gangrene severity index score(FGSIS).

Case Report

A 53-year-old male with history of duodenal ulcer, hypertension and gout was hospitalized in the Department of Urology. He was diagnosed with Fournier's gangrene. Initially, the patient developed symptoms characteristic for the fascia and skin of the external genital area necrosis. On 14.03.2018 the patient was operated on an emergency basis because of a ruptured duodenal ulcer. After surgery, the patient was taken to the ICU (intensive care unit). SIMV (Synchronized Intermittent Mandatory Ventilation) and pharmacological treatment were used. On the integumentary system within the abdomen and scrotum induration was found in the perineum - abscess. Patient received wide spectral antibiotic therapy: Gentamicin, Cefuroxime and Metronidazole. Laboratory results showed: serum sodium - 151.0 mmol / L (ref. 136.0-150.0), serum potassium - 4.08 mmol / L (ref. 3.5-5.1), serum creatinine - 2.2 mg / dL (ref. 0.5-1.5), hematocrit - 30.8% (ref. 42-54) × 10³ / uL (ref. 4.00-11.0), bicarbonate - 25.0 mmol / L (ref. 22-26).

On 16.03.2018 surgeons made a deep incision of the abdomen and scrotum. Incision of the perineal abscess and resection of the left testis were performed. The sample was drawn for microbiological assessment. *Escherichia coli*, *Streptococcus group C-beta-hemolytica* and *Morganella morganii* were isolated. Dressings were changed several times per day. The patient was in a severe condition. In addition to the man's skin symptoms, the septic shock syndrome occurred. Symptoms of general infection and high fever were observed. On 18.03.2018 tracheostomy was performed. Gradually the symptoms of kidney failure accumulated. Amikacin was added to the other medicaments. Laboratory analysis revealed on 24.03.2018: serum sodium - 147.6 mmol / L, serum potassium - 5.17 mmol / L, serum creatinine - 6.5 mg / dL, hematocrit - 22.3% WBC - 13.1 × 10³ / uL, bicarbonate - 17.0 mmol / L. From that day the patient was haemodialysed every two days.

Based on clinical symptoms pneumonia was diagnosed. *Acinetobacter baumannii* was isolated from the bronchial secretions collected by the catheter. Antibiotics were used in accordance with the result of bacteriological tests. In the localized wound around the scrotal sac the following bacteria and fungi were isolated: *Pseudomonas aeruginosa*, *Morganella*

morganii, *Escherichia coli*, *Candida krusei*. The following antibiotics were applied: Ampicillin / Sulbactam and Netilmicin.

The patient underwent number of ultrasonography examinations. On 5.04.2018 stoma was formed. The condition of local wound was getting better - features of acute inflammation subsided. Repeatedly local bleeding was observed. The patient was treated with blood products. Laboratory results showed: serum sodium - 130.0 mmol / L, serum potassium - 4.62 mmol / L, serum creatinine - 6.7 mg / dL, hematocrit - 25.8% WBC - 10.9x 10³ / uL, bicarbonate - 15.7 mmol / L.

Tissue	Histopathology results
left testicle	orchitis purulenta
epididymis	epididymitis purulenta cum formation abscesus
spermatic cord	inflammatio purulenta funiculi spermatici
duodenum	ulcus pepticum chronicum duodeni et duodenitis concomitans

Table 2. Tissue and histopathology results

General condition of the patient has been stabilized. An improvement of renal function and clinical condition of the patient were observed. Doctors decided to suspend hemodialysis. On 16.04.2018 the tracheostomy tube was removed. On 20.04.2018 the patient was transferred to the General Surgery Department for further treatment. Laboratory analysis from that day showed: serum sodium - 139.6 mmol / L, serum potassium - 3.71 mmol / L, serum creatinine - 5.33 mg / dL, hematocrit - 27.6% WBC - 7.9x 10³ / uL, bicarbonate - 17.7 mmol / L. On the day of discharge from the ICU, the patient was conscious, periodically tangled, respiratory and circulatory efficient. Gastrointestinal function was preserved. The patient was nourished orally. The catheter in the bladder and the cannula dialysis in the right internal jugular vein were left.

Discussion and Literature Review

Fournier's gangrene is a rare disease, but with a high mortality. Mortality of the necrotizing fasciitis of the external genital area is about 20-30% [12, 13]. Gangrene is usually caused by mixed bacterial flora. On average, from a sample we can isolate four types of microorganisms [8]. Anaerobic bacteria are rarely cultured in the samples rather than aerobic bacteria. In over 90% of the cases identification of the etiological agent is possible [14]. Unfortunately, sometimes it is unviable because of tissues' necrosis. Most often isolated microorganisms are Gram-negative bacteria *E. coli*, *Proteus*, anaerobic *Bacteroides* and Gram-positive beta-hemolytic streptococci and staphylococci. Fungi of *Candida species* and mycobacteria are sometimes pathogens of the Fournier's gangrene [7]. The most common microorganisms' location is the genitourinary area. This type of gangrene occurs primarily in predisposed people - immunocompromised and with circulatory disorders. Even 6 of 10 patients with necrotizing fasciitis infection suffer from diabetes [15]. Hyperglycemia reduces the phagocytic ability and impairs chemotaxis. It provides to cell-mediated immunity's reduction. In addition, diabetes is associated with microcirculation's dysfunction, which cause disturbance of blood flow, blood clots and difficulty with the elimination of bacterial toxins [7]. Immunosuppression conditions that may increase the risk of Fournier's gangrene are: HIV / AIDS, chemotherapy, chronic steroid therapy and treatment after organ transplantation. Moreover, other risk factors include: alcoholism, cirrhosis, obesity, malnutrition and poor hygiene.

There are many causes of Fournier's gangrene. In addition to mechanical damage to the skin, we can distinguish the urogenital and perineal pathologies of the genitourinary

system, for example: narrowing and inflammation of the urethra, long-term catheterization, prolonged use of condoms, kidney stones or biopsy [16] and trauma of the prostate. Gangrene may arise as a result of iatrogenic injury. There are cases of the Fournier's gangrene after vasectomy [17, 18], circumcision, removal of the hydrocele or cauterization of the genital warts. Furthermore, we also distinguish the proctologic causes, ie. perianal, intersphincteric abscesses [19, 20, 21], ligation of haemorrhoids [22], biopsy of rectal mucosa [23], diverticulitis [24] and tumors of the sigmoid colon [25] and the rectum [24]. We can extract the dermatological agents, including exudative dermatitis, inflammation of the skin glands, scrotum cellulitis and bedsores. There are still plenty of other causes of this disease, the more frequent - caused by transurethral surgery, very rare - necrosis of surrounding retroperitoneal fat induced pancreatitis [14].

Diagnosis is based on the clinical picture. Fournier's gangrene usually begins with prodromal symptoms that last for 2-9 days. This period is characterized by high body temperature, nausea, vomiting and exhaustion [7]. Onset of the disease is manifested by itching, pain, swelling, redness around the external genital organs, leukocytosis and a rise in fever. An expression of incipient gangrene is the appearance of Brodie's spots. They are black spots, which are located in the anogenital area. Their presence usually indicates a start of the rapid course of the skin and subcutaneous tissue's necrosis [26]. In Fournier's gangrene, necrosis is accompanied by purulent discharge with fecal odor. In 60% of cases during the palpation, crackling can be established symptom. It is heard due to the presence of gas in the subcutaneous tissues. When the course of disease is more advanced, the pain intensity decreases. This is due to the nerve endings' damage [27]. Rapid diagnosis and institution of treatment prevent the development of septic shock that is a complication more than 40% of cases.

Conclusion

Although Fournier's gangrene is a rare disease, it is important to know how to diagnose it quickly. This disease is characterized by high mortality rate of 20-30% on average. The basis of the treatment is a surgical drainage and systematic treatment of necrotic tissue. Due to the number of microorganisms, that are the causative agents of Fournier's gangrene, broad spectral antibiotics should be implemented as soon as possible. Development in the field of diagnostic, surgical and antibiotic therapy significantly decreases mortality. Diseases such as diabetes and multiple organ failure notably worsen the prognosis. Continuous monitoring of patient's parameters contained in the Fournier's gangrene severity index score is useful to achieve therapeutic success.

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