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CASE REPORT
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Genital gangrene in a patient with type II diabetes mellitus, treated with dapagliflozin: a case report

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Abstract Fournier gangrene (FG) is a necrotizing soft tissue infection initiated from the genital area or perineum, irrespective of the sex of the patient. A patient presented in the hospital with the chief complaints of inflammation in the scrotum from the past three days, which finally led to a rise in the body temperature. He also observed the discharge from the scrotum for two days. Six days back, he got mildly injured on the left side of his scrotum after falling off from his two vehicle and did not take any treatment. Local examination revealed that the size of the scrotum is slightly enlarged, tender, and oedematous, along with palpable crepitations. There were very observable patches of gangrene all over the scrotum, with no past of Diabetes Mellitus (DM). After the investigation, broad-spectrum antibiotics cefoperazone with sulbactam along with metronidazole were prescribed. After that, the patient was prepared for surgery immediately. After the surgery, the patient was prescribed appropriate antibiotics, followed by a wet dressing. The antibiogram results interpretation confirms that the combined form sulbactam and cefoperazone cause sensitivity towards *Staphylococcus Aureus*and *Escherichia coli.* His response was positive towards the treatment. The morbidity and mortality of this medical condition have declined over time due to improvements in diagnostic methods, surgical procedures, powerful antibacterial, and intensive care. This is advised to use an advanced approach while handling FG cases to reduce morbidity and mortality, mainly when concomitant conditions like diabetes and multiple organ failure are present.

Keywords: fournier gangrene, soft tissue infection, diabetes mellitus, dapagliflozin

1. Introduction

Fournier gangrene (FG) is a urologic emergency with a potentially high fatality rate. It is polymicrobial necrotizing fasciitis with a rapid progression that affects the vaginal, perianal, and perineal areas (Czymek et al 2010). The use of SGLT2 inhibitors has been linked to an increased risk of genital infection resulting from increased glycosuria. This has caused the FDA to issue a warning regarding the possibility of FG in patients receiving SGLT2 inhibitor therapy. We present the first individual who got FG after dapagliflozin medication at our facility.

A dermatologist and venereologist named Jean Alfred Fournier (1832-1914) described a severe surgical condition known to be Fournier's Gangrene (FG) in 5 young male patients (Czymek et al 2009). They all were presented with an advancing infection of superficial tissue of the human penis and scrotum (Eke 2000). There is not any etiological factor responsible for the condition. It is a well-known fact that Bauriene represented a case similar to FG; the case presented was of scrotal gangrene arising from the wound caused by the impact of an ox horn (Levenson et al 2008). It was treated with multiple surgical interventions. With the passage of time, the definition of FG broadens to include necrotizing infections of the genitalia (Sharma et al 2021; Moon et al 2020).

Currently, FG can be put under the subclassification of necrotizing fasciitis. Therefore we can describe FG as necrotizing soft tissue infections initiated from the genital area or perineum, irrespective of the sex of the patients (Gupta et al 2018), (Muhammad et al 2020).

2. Case Presentation

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A patient presented in the hospital with the chief complaints of inflammation in the scrotum from the past three days, which finally led to a rise in the body temperature. He also observed the discharge from the scrotum for two days. Six days back, he got mildly injured on the left side of his scrotum and did not take any treatment. He was a non-alcoholic, non-smoker. After his complete examination, his vitals were as listed: pulse- 110/min, blood pressure - 110/78 mm Hg, and no pallor, icterus, or lymphadenopathy. No abnormalities were observed in the systemic examination. At the same time, local examination revealed that the size of the scrotum is slightly enlarged, tender, and oedematous, along with the palpable crepitations.

There were very observable patches of gangrene all over the scrotum, with no past of Diabetes Mellitus (DM). After the investigation, broad-spectrum antibiotics cefoperazone with sulbactam along with metronidazole were prescribed. After that, the patient was prepared for surgery immediately. Before getting under surgery, his blood profile was seen, which revealed specific parameters like hemoglobin (Hb%) – 114 gm%, WBC – 19,500/cm, which shows polymorph nuclear leucocytosis (N-85%). Other blood investigations such as urea in blood; 39 mg%, blood serum creatinine: 1.0 mg%, LFT: within regular range random blood sugar: 110 mg%, all were within acceptable limits. The patient then underwent debridement, and the extracted tissues were removed. The extracted discharge containing pus cells was sent for laboratory investigation using a culture sensitivity test. After the surgery, the patient was prescribed appropriate antibiotics, followed by a wet dressing. The antibiogram results after interpretation confirm that the combined form sulbactam and cefoperazone cause sensitivity towards *Staphylococcus aureus* and *Escherichia coli*. His response was positive towards the treatment. The povidone-iodine solution was used regularly for antimicrobial action, followed by wet dressing. After ten days of the surgery, the missing tissue was restored through secondary suturing; the patient was discharged from the hospital on the 22nd post-surgical day. Follow-up and proper clinical examination conducted post six weeks of operation shows that the patient was now free of all the symptoms.

The study correctly followed the ethical policies on human subject studies, according to Helsinki guidelines.

3. Discussion

FG is a grave problem, resulting in a very high mortality and morbidity rate. Although FG revolves around men only now, we can also see it in the pediatric group (Auerbach et al 2020). Till today we have never encountered any such condition in females, but there is a high incidence rate of 31.6% in females, as suggested by a recent publication; it is all because of vulvar and Bartholin gland abscesses and also due to the post-surgical period followed by episiotomy and hysterectomy (Engels et al 2020).

Many etiological factors are responsible for the condition, such as obesity, renal insufficiency, alcoholism, age, and paraplegia (Ekingen et al 2008). Around 30 % to 40% of cases have no predisposing factors. A focus of infection usually arises from GIT in up to 50% of cases, gastro urinary tract in up to 40%, and cutaneous injuries and soft tissues (20%). According to the sources, we have observed that FG gets fulminant from minor injuries or soft tissue infections (Itami et al 2022).

FG is multi-microbial sepsis of (GU) genitourinary; it is nearly impossible to detect its entrance path. Two methods only observe the microbial growth: direct injury over the scrotum or directly speeded from urogenital organs or ruptured viscus, for example, colon, anal orifice, and rectum (Kostovski et al 2021). A study shows that the path of the entrance is found to be colorectal (21%), urogenital (19%), and dermatological (19%), whereas the remaining 36% do not have any exact way to enter was found. We usually see infection in three types of necrotizing soft tissues. TYPE1: in these, two or more bacteria act together, like gram +ve and gram -ve with anaerobes, which are observed in the culture. TYPE 2: usually, only one bacterium is responsible for the caused infection, Group A *streptococcus* or maybe *Staphylococcus aureus*. TYPE 3: we have never encountered this infection-causing variety called *Vibrio vulnificus*. Type 2 is more common than type 1 (Prasan et al 2012).

FG can be clinically diagnosed using different radiological methods; Plain radiography is used to detect gas in the soft tissues, and ultrasonography will help in the detection of gas in the wall of the scrotum. However, except all the methods, a CT scan will help in the diagnosis and will help reach the extent of the disease. Although all the above scans are beneficial, ultrasound is easily and commonly reachable by the patients and helps diagnose moderately. Therefore, ultrasound is used in almost every case to get a final opinion.

Biochemical studies such as WBC will be an indicator during diagnosis and clinical presentation. After observing several cases, we concluded that specific parameters such as low albumin, high (BUN) blood urea nitrogen, low hematocrit, hypercalcemia, and increased serum lactate indicate a high mortality rate (Serrano et al 2022).

FG management is very much dependent on the versatile approach. Firstly, rejuvenating the fluid therapy, controlling the cardiopulmonary functions, and getting it in the normal ranges, especially for patients with septic shock, is most important at that time. Broad-spectrum antibiotics were suggested to suppress all the aggressive surgical debridement. It is the primary treatment. We can modify the suggested antibiotics or their dose per the culture report. It is essential to remove all the devitalized tissues; it will help in the progression of the infection. It will simultaneously eliminate toxins and bacteria. It requires more than one surgical debridement to control the local infection. It is essential to handle the post. It has been recommended to use wet-to-dry dressings, VAC dressings (dressings with vacuum-assisted closure devices), and other topical treatments. We choose daily wet dressing and povidone-iodine topical treatment. Comparing VAC treatments to wet-to-dry dressings has revealed improved granulation tissue and decreased wound surface area. Healthy granulation tissue develops with appropriate

surgical debridement, regional wound care, and antibiotic therapy. Most of the time, as observed in both patients, primary wound closure is possible. However, any reconstructive treatment, including different flap covers, may be considered depending on the circumstances and the extent of the tissue loss. High morbidity from severe cell debris loss in the genitalia and perineum can be prevented by restoring surgery procedure that uses enough tissue to cover the defect (Thwaini et al 2006)

5. Conclusions

With a fatal outcome, FG is a significant surgical emergency. The morbidity and mortality of this medical condition have declined over time due to improvements in diagnostic methods, surgical procedures, powerful antibacterial, and intensive care. The mortality rate regarding FG in hospital settings has dropped to 10 and 20 percent due to the better multimodality therapy approach. Two FG cases are presented here. The young adult in our first example had FG but no other concurrent conditions. Without any substantial postoperative morbidity, he made a full recovery. Our second example was an elderly man with diabetes mellitus, other concurrent conditions, and numerous abnormal organ functions. The subject experienced a turbulent post-surgery period with considerable morbidity. He recovered more slowly than others. In our experience, lowering morbidity and mortality in FG with diabetes mellitus is almost always more complicated. This is advised to use an advanced approach while handling FG cases to reduce morbidity and mortality, mainly when concomitant conditions like diabetes and multiple organ failure are present.

Ethical considerations

The study correctly followed the ethical policies on human subject studies according to Helsinki guidelines.

Conflict of Interest

The authors declare that they have no conflict of interest.

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ERRATUM
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Erratum to: HER2/p53 ratios among canine mammary tumours and respective derived cell culture

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The article was originally published with two missing author names and incorrect author name sequencing. This erratum aims to correct the original paper, which has been updated:

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