





Vacuum-Assisted Treatment in Fournier Gangrene

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ABSTRACT

Purpose: Fournier gangrene is a potentially morbid, polymicrobial infection-related disease with aggressive progression. Suitable antibiotherapy, aggressive surgery, recurrent dressing, and debridement are sufficient for Fournier gangrene treatment. However, owing to the extended duration of hospitalization and high mortality rates, there is still a need for new treatment options. The aim of the present study was to investigate the effects of vacuum-assisted closure (VAC) therapy on the difficult recovery process following the operation.

Methods: The study was conducted on 23 patients diagnosed with Fournier gangrene who applied to our clinic between July 2010 and October 2014. All parameters in the clinical study were evaluated retrospectively. Fournier gangrene diagnosis was based on the criteria defined by Fisher et al. in 1979. On postoperative day 1, all patients were re-debrided, and the wounds were dressed with silver nitrate VAC. Patients included in the study were evaluated based on age, comorbidities, duration of the surgical procedure, number of debridement procedures, duration of hospitalization, duration of VAC use, mortality, blood transfusion, and need for enterostomy.

Results: The mean age of the patients was 61.5±7.6 (48-77) years. The total operation time was 52 (30-98) min. The average number of debridement procedures was 1.6 (1-3). Clinical examination and laboratory tests of 23 patients in our clinic showed that 17 patients met the sepsis criteria. Of the 17 patients, nine had kidney failure, five had respiratory organ failure, and three had adequate organ failure. The wound of 11 out of 21 patients was closed primarily. The remaining 10 patients were closed with plastic surgery. The mean duration of VAC was 12.8±3.7 (3-21), and the mean duration of hospitalization was 13.8±3.7 (4-22).

Conclusion: Owing to high rates of mortality, there is still a search for new treatment options for Fournier gangrene. VAC treatment is indicated to decrease the duration of hospitalization and number of debridement procedures. The decrease in the duration of hospitalization also decreases the number of work days lost.

Keywords: Fournier gangrene, sepsis, vacuum treatment

INTRODUCTION

Fournier gangrene is a potentially lethal disease characterized by necrotizing fasciitis of the perianal, perineal, and genital regions due to polymicrobial infection. The disease was named after Jean Alfred Fournier, a Parisian dermatologist and venereologist, who was the first to define it in 1883. The disease also affects the subcutaneous adipose tissue and the skin of the perineal and scrotal areas, and, for women, may have indications on the vulva (1).

In the beginning, it was thought to be an idiopathic disease that develops secondary to bacterial colonization. Rudolph showed that the infectious nature of the disease frequently includes *Escherichia coli*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus mirabilis*, Enterococci, *Bacteroides fragilis*, and anaerobic *Streptococcus*, and the special anatomy of the genitoperineum is a result of its unique complicated bacterial flora (2).

Since delays in diagnosis and treatment are known to increase mortality rates, these patients should not be missed even though they may not be symptomatic. Classical treatment approach is aggressive surgical debridement of the regions with necrotic tissue ischemia (1). Aggressive debridement and antibiotic treatment are sufficient for Fournier gangrene, but debridement has to occur repeatedly (3).

Thus, the wounds of patients with Fournier gangrene remain open for a long time and require frequent dressing. During this lengthy and troublesome period, patients may sometimes need anesthesia. Recurrent dressings and debridement can have as much negative effect on the physician as they have on the patient. A wound care system that works with a vacuum system increases the blood build-up of the tissue, decreases the pressure on the wound, as well as edema, and, therefore, speeds up the healing process. Vacuum-assisted closure (VAC)

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is successfully used in the treatment of a range of wounds. VAC is a treatment method during which a sealed dressing consisting of silver nitrate foam, binder, and a cover is applied to an open wound with negative atmospheric pressure (75 mm Hg) (Figure 1) (4).

Following the surgical resection of Fournier gangrene, VAC treatment is used efficiently as antibiotic or antiseptic dressings and hyperbaric oxygen treatment (5). VAC treatment has been used for years for infected inguinal wounds, and wounds that require emergency femoral artery surgery and skin graft (6).

The aim of the present study was to investigate whether VAC treatment, a successful method for a range of wounds, provides efficient results for patients with Fournier gangrene, which has a significantly compelling healing process.

METHODS

A total of 23 patients diagnosed with Fournier gangrene who applied to our clinic between July 2010 and October 2014 were included in the study. The study was conducted in accordance with the Declaration of Helsinki. Fisher et al. (7) assert the following six histological criteria for diagnosis of necrotizing fasciitis:

1. extensive necrosis of the superficial fascia,
2. moderate to severe systemic toxicity,
3. absence of muscle involvement,
4. no demonstration of Clostridia in wound and blood cultures,
5. absence of major vascular occlusion,
6. intensive leukocytic infiltration, necrosis of subcutaneous tissue, and microvascular thrombosis on pathological examination of the debrided tissue.

All parameters were evaluated retrospectively. Abscess and soft tissue infections that do not fit the Fournier criteria were excluded from the study. Gangrenes that do not include the scrotum were also excluded.

Statistical Analysis

Data from the patients were statistically analyzed using Statistical Package for Social Sciences 16.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive and frequency analyses were conducted to evaluate demographic and clinical data.



Figure 1. VAC Equipment
VAC: vacuum-assisted closure

Patients were started on triple antibiotics without waiting for their histopathology results and were transferred to surgery. On postoperative day 1, all patients were dressed using silver nitrate VAC (VAC; Kinetic Concepts, Inc., San Antonio, TX, USA) (Figures 2, 3).

Patients included in the study were evaluated based on age, comorbidities, duration of the surgical procedure, number of debridement procedures, duration of hospitalization, duration of VAC use, mortality, blood transfusion, and need for enterostomy.

All patients were operated on the day of their application after starting their triple antibiotic treatment (ceftriaxone 2 g, gentamicin 3 mg/kg/day, and metronidazole 1-1.50 g/day). Infected and necrotic tissues were debrided with aggressive surgery. The surgical region was washed with oxygenated water and covered with antiseptic bandage.

On postoperative day 1, all patients were debrided once again, and the wounds were dressed with silver nitrate VAC. Patients underwent radical surgical debridement. The dressing was changed every 48 or 72h. Minimal debridement procedures that did not occur under anesthesia were not included as data.

RESULTS

The mean age of the patients was 61.5±7.6 (48–77) years. The mean duration of operation was 52 (30–98) min. The mean number of debridement procedures was calculated as 1.6 (1–3). The wound was dressed with VAC under constant negative pressure (75 mm Hg).

In one patient with perineal fasciitis, an enterostomy procedure had to be conducted to prevent wound contamination.

Of the 23 patients, 60.8% had a history of diabetes, whereas 43% had a history of chronic disease, such as hypertension, chronic obstructive lung disease, or ischemic heart disease. Two patients were exitus due to sepsis-related multiple organ failure on postoperative days 4 and 6 in the intensive care unit prior to their extubation.

Of the 23 patients who applied to our clinic, clinical examination and laboratory tests of 17 patients indicated that they met the sepsis criteria. Of the 17 patients, nine had renal impairment, five had respiratory difficulties, and three had multiple organ failure.

The wounds of 11 out of 21 patients were closed primarily. The remaining 10 patients were closed by plastic surgery. Mean VAC duration was 12.8±3.7 (3–21), and mean number of hospitalization duration was 13.8±3.7 (4–22).

DISCUSSION

In 1883, Professor Jean Alfred Fournier reported three cardinal clinical factors for Fournier gangrene: scrotal swelling for young males with sudden painful onset, fast progressing gangrene, and absence of a definite cause (8). Currently, the disease affects females and children as well, even though the prevalence rate in males is 10 times higher than that in females (9). Lower prevalence rates in females are partially due to fewer reports and better perineal drainage (10). Children are also rarely affected due to the lack of risk factors, such as alcoholism or diabetes (11).



Figure 2. First post-operative day debridement

All 23 patients who applied to our clinic were males. Since female patients are inclined to apply to gynecology clinics, and since children are usually examined in pediatric surgery clinics, our series lacks data from these patient groups.

When perineal, genital, or perianal necrotizing fasciitis is identified, primary surgery must be conducted without waiting for the results of pathological evaluations, or the patient should be transferred to a hospital with specialists who treat such cases. Fournier gangrene-related mortality rates are reported to be lower than other necrotizing fasciitis types (3%-45%) (12).

In our study, Fournier gangrene-related mortality rate was 8.7%, consistent with the literature. The primary reason for mortality was the development of sepsis, which also includes coagulopathy, acute renal failure, diabetic ketoacidosis, and multiple organ failure (13).



Figure 3. Postoperative VAC application
VAC: vacuum-assisted closure

Kaul et al. (14) reported that for these cases, hypotension, bacteremia, and age >65 years increase mortality. On the other hand, Faucher et al. (15) indicated that comorbid diseases do not have an effect on mortality. However, Francis et al. (16) argued that mortality is 50% in cases with three or more risk factors (age >50 years, malnutrition, alcoholism, hypertension, and intravenous drug addiction). In our study, two exitus patients were compatible with Faucher's study and had diabetes, hypertension, and cardiopulmonary diseases. Cause of death was sepsis-related multiple organ failure. These patients had applied to our hospital in the late phases of the disease and they were people living on the streets under significantly disadvantageous conditions. These factors were also observed to be effective on mortality. Fournier gangrene is related to low socioeconomic status and is more frequent in poor societies (17).

Concerns may arise regarding a possible increase in anaerobic microorganisms as a result of applying a closed suction system to an anaerobic wound. The working principle of the system is to increase the tissue's oxygenation by increasing the region's angiogenesis. VAC decreases tissue edema and, therefore, annihilates the suitable environment for bacteria (4, 18).

Vacuum-assisted closure (VAC) treatment and conventional treatment were observed to have similar costs in Fournier gangrene. Patients recover faster with VAC treatment, lightening the workload of physicians.

The primary side effect of VAC treatment is pain (19). When compared with patients treated with methods other than VAC, this pain is not a direct effect of VAC and is rather related to the wound itself. To avoid this pain, patients may be provided with epidural anesthesia or sedation during dressing (20).

Fournier gangrene has a lengthy treatment process and requires extended hospitalization. Oymaci and Alejandro reported the average hospitalization duration as 25.5 and 23.7 days, respectively (21, 22). In our study, the average duration of hospitalization was 13.8 days. Therefore, VAC treatment was observed to significantly decrease the duration of hospitalization. El Bachir Benjelloun conducted a study with 50 patients and reported the mean number of surgical debridement procedures as 2.5 (23). In our study, patients treated with VAC had an average of 1.6 debridement procedures, suggesting a significant decrease.

CONCLUSION

When compared with other studies in the literature, patients treated with VAC remained in the hospital for significantly lesser number of days than patients treated with other methods. Eliminating the need for daily open wound dressing has increased the patient's comfort and reduced the workload of the attending physician. VAC treatment has also significantly decreased the number of debridement procedures. However, mortality rates remained unchanged. In conclusion, VAC treatment prevents labor loss for both the patient and the physician. VAC provides promising results in the treatment of this disease with high rates of mortality and morbidity. However, more studies should be conducted for the prevention and treatment of Fournier gangrene.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: Informed consent was not taken from patients due to the retrospective nature of the study.

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