

Fournier's gangrene: Five years' experience from a single center in Turkey

Engin Hatipoğlu, M.D., Süleyman Demiryas, M.D., Osman Şimşek, M.D.,
Kaya Sarıbeyoğlu, M.D., Salih Pekmezci, M.D.

Department of General Surgery, İstanbul University-Cerrahpaşa Cerrahpaşa Faculty of Medicine, İstanbul-Turkey

ABSTRACT

BACKGROUND: Is the present study aims to analyze demographic, clinical and surgical data of all patients with FG (Fournier's gangrene) admitted to a tertiary healthcare hospital in the largest city of Turkey.

METHODS: This study included 35 patients with Fournier's gangrene, who were followed by the General Surgery, Plastic Surgery, and Urology Departments of İstanbul University Cerrahpaşa Faculty of Medicine from January 2010 to January 2015. Demographic and clinical data, including gender, age, length of stay at the hospital, the underlying cause(s), number of debridement, predisposing factors, and surgical reconstructive data over 10 years were assessed and analyzed retrospectively.

RESULTS: The mean age of the 35 patients was 58.14±12.71 years. Diabetes mellitus was present in 20 of the 35 (57.1%) patients. Twelve of the patients (34.2%) were hospitalized in the intensive care unit (ICU). Length of stay in the ICU was found to be significantly influenced by age, hematocrit level, FGSI and UFGSI ($p=0.013$, $p=0.030$, $p=0.025$ and $p=0.002$, respectively).

CONCLUSION: Fournier's gangrene is a fulminant infection with a high mortality rate. Physical examination and anamnesis are quite important for the diagnosis of FG. DM is the most common comorbidity. Age, hematocrit level, FGSI and UFGSI scores affect the patients' length of stay in the ICU.

Keywords: Fournier's gangrene; prognosis; surgical debridement; treatment.

INTRODUCTION

Fournier's gangrene (FG) is the necrotizing fasciitis of the perineum, which progresses rapidly and has a high rate of mortality. FG frequently stems from an infection of the anorectal region (30–50%), uro-genitalia (20–40%), or genital region (20%). Most patients are males in their 60s or 70s. Fournier's gangrene may occur due to trauma in the affected area and concomitant infection. Predisposing factors are a long list, including diabetes mellitus, alcoholism, atherosclerosis, peripheral arterial disease, Raynaud's phenomenon, malnutrition, immunosuppression (e.g., chemotherapy, steroids, and malignancy), HIV infection, leukemia and liver diseases.^[1,2] Necrosis of the tissues in the affected area, pain, and tenderness are the most common symptoms. Although a definite

diagnosis of FG can only be made after surgical examination, laboratory parameters and radiological results are helpful in risk assessment and in cases with uncertainty.^[3] Unsuccessful debridement endangers the patient's life; it may also lead to significant defects that may cause reconstructive difficulties.^[4]

It is important to know the clinical features and prognostic factors of the disease, especially when considering its incidence, prevalence, mortality and high treatment and rehabilitation costs to be able to manage the disease correctly. There is limited evidence about how the clinical and therapeutic features of FG are differentiated concerning the presence of DM, which is the most important predisposing factor. Also, evidence regarding how clinical progress of FG has changed concerning recurrence or intermittence of in-

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Address for correspondence: Engin Hatipoğlu, M.D.

İstanbul Üniversitesi-Cerrahpaşa Cerrahpaşa Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, İstanbul, Turkey

Tel: +90 212 - 414 30 00 E-mail: enginhatipoglu@yahoo.com

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tensive care unit. We constructed this study on three different research questions as follows: (1) Were the treatment characteristics of patients with and without DM different? (2) Were the clinical and treatment characteristics of patients with or without ICU admittance different? (3) Were clinical and treatment characteristics of patients with and without recurrence changed?

In this study, we aimed to analyze the clinical and surgical data of all FG patients admitted to a tertiary health care institute in Turkey.

MATERIALS AND METHODS

Study Group

This study included patients with Fournier's Gangrene, who were followed by the General Surgery, Plastic Surgery, and Urology Departments of Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine from January 2010 to January 2015. The importance of this study was explained verbally to the participants, and written informed consent was obtained from all individuals before sampling.

Ethical Issues

This study was approved by the ethics review committee of the Istanbul University-Cerrahpaşa in accordance with the World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects (Date: 05.12.2017, Approval Number: 83045809-604.01.02).

Study Instrument

Fournier Gangrene Index Score (FGSI) and Uludağ Fournier Gangrene's Severity Index (UFGSI) were calculated for all patients. The FGSI is a 9-variable scoring system that is used to assess the severity of FG. Patients who have a total score above 9 points have been shown to have a 75% mortality rate.^[5] The following parameters are assessed to calculate FGSI: heart rate, respiration rate, body temperature, serum levels of sodium, potassium, creatinine, hematocrit, bicarbonate, and leukocyte count. The UFGSI adds age and disease extent into the FGSI and is also used to predict mortality.^[6]

The following characteristics of patients were recorded: Age, gender, time until presentation to the hospital, presenting symptoms, physical examination findings, comorbidities, treatment modalities and length of hospitalization. Additionally, we also assessed the intensive care unit (ICU) medical files of patients who were treated in the ICU.

Statistical Analysis

All analyses were performed on SPSS v21. For the normality check, the Shapiro-Wilk test was used. Normally distributed variables were analyzed with the independent samples t-test.

Non-normally distributed variables were analyzed with the Mann-Whitney U test. Categorical variables were evaluated

Table I. Patients' characteristics

Age	58.14±12.71
Gender	
Male	31 (88.57%)
Female	4 (11.43%)
Weight (kg)	84.06±17.49
Height (cm)	173.54±9.77
Body mass index (kg/m ²)	26.54±3.93
Time from symptom onset to the application (days)	4 (2–14)
Other surgery history	12 (34.29%)
Smokers	17 (48.57%)
Other chronic diseases	24 (68.57%)
Perianal surgery history	16 (45.71%)
Body temperature (°C)	37.07±0.77
Heart rate	91.10±13.26
Respiratory rate	20 (16–28)
Blood glucose (mg/dL)	132 (50–570)
Serum sodium (mmol/L)	136.27±6.67
Serum potassium (mmol/L)	4.10 (2.82–7.70)
Serum creatinine (mg/100/ml)	0.90 (0.55–5.39)
Hematocrit (%)	34.93±6.19
White blood cell (x1000/mm ³)	15.95±7.38
C-reactive protein (mg/L)	205.5 (27.1–565)
Serum bicarbonate (mmol/L)	21.54±2.80
Length of stay in hospital (day)	20 (3–73)
Stoma	12 (34.29%)
Need for additional debridement	24 (68.57%)
Vacuum-assisted closure	2 (5.71%)
Hyperbaric oxygen treatment	2 (5.71%)
Need for reconstructive surgery	28 (80.00%)
Need for urologic surgery	9 (25.71%)
Stay in the intensive care unit	12 (34.29%)
Recovery	
Primary	20 (57.14%)
Secondary	4 (11.43%)
Tertiary	7 (20.00%)
Flap	4 (11.43%)
Recurrence	12 (34.29%)
Exitus	4 (11.43%)
Fournier Gangrene Index Score	2 (0–14)
Uludağ Fournier Gangrene's Severity Index	4 (1–16)

Data given as mean ± standard deviation or median (minimum - maximum) for continuous variables regarding normality and frequency (percentage) for categorical variable.

by employing Chi-square tests or Fisher's exact test when required. Data were given as mean ± standard deviation or median (minimum-maximum) for continuous variables concerning the normality of distribution, and frequency (percentage) for categorical variables. Statistically, p<0.05 values were accepted to show significant results.

RESULTS

A total of 35 patients were included in this study. Among them, four (11.43%) patients were female and 31 (88.57%) were male. The mean age of the patients was 58.14±12.71 years. The mean body mass index (BMI) was 26.54±3.93 (Table 1). Sixteen patients (45.7%) had a history of perianal surgery. Four patients had undergone perianal abscess

drainage in the last week and Fournier gangrene developed as a result of insufficient drainage (case 12, 18, 20, 25). Other patients had previously undergone surgery due to any anorectal pathology (e.g., hemorrhoids, vaginal posterior wall rupture, orchiectomy). The median time interval between symptom onset and admission to the hospital was four (2–14) days. The most common symptoms were pain (n=21, 60%) and swelling (n=20, 57.1%).

Diabetes mellitus was present in 20 out of 35 (57.1%) patients. Patients' characteristics concerning the presence of Diabetes Mellitus are shown in Table 2. As seen, no significant difference was observed concerning neither presenting features (except serum glucose level) nor treatment options and outcome.

Table 2. Patients' characteristics concerning diabetes mellitus

	Diabetes mellitus		p
	Absent (n=15)	Present (n=20)	
Age	54.07±12.09	61.2±12.58	0.101
Gender			
Male	14 (93.33%)	17 (85.00%)	0.619
Female	1 (6.67%)	3 (15.00%)	
Time from symptom onset to the application (days)	5 (3–14)	3 (2–14)	0.373
Other surgery history	6 (40.00%)	6 (30.00%)	0.797
Body temperature (°C)	37.26±0.83	36.94±0.72	0.255
Heart rate	90.92±14.11	91.22±13.04	0.952
Respiratory rate	20 (19–24)	20 (16–28)	0.183
Blood glucose (mg/dL)	117 (50–360)	181 (85–570)	0.009
Serum sodium (mmol/L)	136.75±9.44	135.94±4.25	0.752
Serum potassium (mmol/L)	4.1 (2.9–7.7)	4.15 (2.82–5.90)	0.859
Serum creatinine (mg/100/ml)	1.08 (0.57–2.66)	0.90 (0.55–5.39)	0.767
Hematocrit (%)	35.77±6.06	34.36±6.37	0.535
White blood cell (x1000/mm ³)	14.17±5.50	17.16±8.36	0.268
C-reactive protein (mg/L)	211 (27.1–409)	180 (53–565)	0.705
Serum bicarbonate (mmol/L)	20.80±2.94	22.06±2.65	0.239
Length of stay in hospital (day)	19 (3–42)	22 (5–73)	0.316
Need for additional debridement	8 (53.33%)	16 (80.00%)	0.144
Vacuum-assisted closure	1 (6.67%)	1 (5.00%)	1.000
Hyperbaric oxygen treatment	0 (0.00%)	2 (10.00%)	0.496
Need for reconstructive surgery	14 (93.33%)	14 (70.00%)	0.199
Need for urologic surgery	4 (26.67%)	5 (25.00%)	1.000
Stay in the intensive care unit	4 (26.67%)	8 (40.00%)	0.644
Recurrence	7 (46.67%)	5 (25.00%)	0.329
Exitus	3 (20.00%)	1 (5.00%)	0.292
Fournier Gangrene Index Score	2 (0–14)	2 (0–9)	0.791
Uludağ Fournier Gangrene's Severity Index	4 (1–16)	4 (1–15)	1.000

Data given as mean±standard deviation or median (minimum-maximum) for continuous variables regarding normality and frequency (percentage) for categorical variable.

Twelve of the patients (34.2%) were hospitalized in the ICU. The age of the patients hospitalized in the intensive care unit (ICU) was found to be higher than the patients who did not require ICU admittance (65.33 ± 11.63 years vs. 54.39 ± 11.79 years, respectively; $p=0.013$). Median FGSI score was 2 (0–14), while the median UFGSI score was 4 (1–16). Median FGSI and UFGSI scores were found to be higher in patients accepted to the ICU compared to those who were not (4 vs. 2, $p=0.025$; and 6 vs. 3, $p=0.002$, respectively). Patients' characteristics concerning the presence of intensive care unit intermittence are indicated in Table 3.

Additional debridement(s) were required and performed in 24 (68.5%) patients. Reconstructive surgery was performed in 28 (80%) patients. Nine (25.7%) patients underwent urological surgery. Twelve (34.2%) patients had diverting stoma. Vacuum-assisted closure (VAC) was added to the procedure in the debridement of two patients (5.7%). Two patients (5.7%) underwent hyperbaric oxygen therapy (HBO).

Primary recovery was achieved in 20 patients (57.1%) and flaps were utilized in four patients (11.4%). Recurrence developed in 12 (34.2%) patients. Perianal abscess drainage was repeated

in nine patients. The patients were sent home by dressing in the outpatient clinic. There was complete recovery in the first month of follow-up. Recurrent perianal abscess drainage was performed in one patient at different times. Partial recovery was achieved in this patient (case 12). Two patients underwent partial thickness skin grafts. The patients were followed up in the hospital after the procedure. Full recovery was achieved in these patients (cases 30 and 31).

Respiratory rate and hematocrit levels were statistically different in patients with and without recurrence (20/min vs. 22/min, $p=0.023$ and $39.1 \pm 3.1\%$ vs. $33 \pm 6.3\%$, $p=0.001$, respectively) (Table 4). Among the 35 patients included in this study, four (11.4%) patients died.

DISCUSSION

Fournier's gangrene is characterized by a rapidly progressive, potentially fatal necrotizing infection of the external genitalia and perineum. This necrosis contributes to the growth of anaerobic bacteria that arises from vascular obliteration, causing edema, micro-thromboses and hypoxia. Early diagnosis is crucial for successful treatment and a favorable prognosis.^[7]

Table 3. Patients' characteristics concerning recurrence

	Recurrence		p
	Absent (n=23)	Present (n=12)	
Age	59.87±12.37	54.83±13.21	0.272
Gender			
Male	21 (91.30%)	10 (83.33%)	0.594
Female	2 (8.70%)	2 (16.67%)	
Weight (kg)	79.89±21.42	88.75±11.30	0.299
Height (cm)	172.17±14.08	174.71±4.72	0.687
Body mass index (kg/m ²)	24.43±4.30	28.35±2.69	0.070
Time from symptom onset to the application (days)	4 (2–14)	4 (3–14)	0.979
Other surgery history	6 (26.09%)	6 (50.00%)	0.261
Perianal surgery history	10 (43.48%)	6 (50.00%)	0.992
Length of stay in the hospital (day)	19 (3–73)	21 (11–42)	0.611
Stoma	9 (39.13%)	3 (25.00%)	0.476
Need for additional debridement	15 (65.22%)	9 (75.00%)	0.709
Vacuum-assisted closure	1 (4.35%)	1 (8.33%)	1.000
Hyperbaric oxygen treatment	1 (4.35%)	1 (8.33%)	1.000
Need for reconstructive surgery	18 (78.26%)	10 (83.33%)	1.000
Need for urologic surgery	5 (21.74%)	4 (33.33%)	0.685
Stay in the intensive care unit	10 (43.48%)	2 (16.67%)	0.149
Exitus	4 (17.39%)	0 (0.00%)	0.275
Fournier Gangrene Index Score	2.5 (0–14)	1.5 (0–6)	0.235
Uludağ Fournier Gangrene's Severity Index	4.5 (1–16)	3.5 (1–9)	0.140

Data given as mean±standard deviation or median (minimum–maximum) for continuous variables regarding normality and frequency (percentage) for categorical variables.

Table 4. Patients' characteristics concerning intensive care unit admittance

	Need for intensive care unit		p
	Absent (n=23)	Present (n=12)	
Age	54.39±11.79	65.33±11.63	0.013
Gender			
Male	21 (91.30%)	10 (83.33%)	0.594
Female	2 (8.70%)	2 (16.67%)	
Weight (kg)	88.08±15.77	71±18.46	0.088
Height (cm)	176.56±4.90	166.75±15.13	0.288
Body mass index (kg/m ²)	27.06±3.75	25.37±4.67	0.498
Time from symptom onset to the application (days)	4 (3–7)	5.5 (2–14)	0.414
Other surgery history	8 (34.78%)	4 (33.33%)	1.000
Smokers	11 (47.83%)	6 (50.00%)	1.000
Diabetes mellitus	12 (52.17%)	8 (66.67%)	0.644
Other chronic diseases	15 (65.22%)	9 (75.00%)	0.709
Perianal surgery history	11 (47.83%)	5 (41.67%)	1.000
Length of stay in hospital (day)	19 (3–73)	27 (5–55)	0.384
Stoma	7 (30.43%)	5 (41.67%)	0.709
Need for additional debridement	17 (73.91%)	7 (58.33%)	0.451
Vacuum-assisted closure	1 (4.35%)	1 (8.33%)	1.000
Hyperbaric oxygen treatment	2 (8.70%)	0 (0.00%)	0.536
Need for reconstructive surgery	17 (73.91%)	11 (91.67%)	0.380
Need for urologic surgery	6 (26.09%)	3 (25.00%)	1.000
Recurrence	10 (43.48%)	2 (16.67%)	0.149
Exitus	2 (8.70%)	2 (16.67%)	0.594
Fournier Gangrene Index Score	2 (0–9)	4 (2–14)	0.025
Uludağ Fournier Gangrene's Severity Index	3 (1–10)	6 (4–16)	0.002

Data given as mean±standard deviation or median (minimum–maximum) for continuous variables regarding normality and frequency (percentage) for categorical variables.

Radiological techniques (e.g., ultrasonography, computed tomography, and magnetic resonance imaging) aid physicians in the assessment of the condition, while physical examination and anamnesis are crucial for the diagnosis of FG.^[8–11] The most common symptoms of FG include scrotal pain, swelling and erythema. Systemic symptoms, such as fever, rigor and tachycardia, are often present. Rarely, subcutaneous gas with crepitation may be present. The definite diagnosis of FG is still accepted to be reliant on surgical examination.^[3,12] Fournier's gangrene was diagnosed by performing a physical examination and anamnesis in our study. The most common symptoms were pain (60%) and swelling (57.1%). Edema, necrosis and fluctuations were also frequently noted on physical examinations (Table 5).

Fournier's gangrene is known to be a rapid onset disease, but studies have shown that application to the hospital is delayed by an average of one week after initial symptoms have presented.^[13] In our study, the median time from symptom

Table 5. Frequency of the symptoms

	n	%
Pain	21	60.00
Swelling	20	57.14
Bad wound smell	1	2.86
Bleeding	1	2.86
Flix	7	20.00
Open wound	4	11.43
Rubor	13	37.14
Necrosis	2	5.71
Temperature increase	1	2.86
Fecaluria	1	2.86
Fever	2	5.71
Weakness	1	2.86
Abscess	2	5.71

onset to hospital application was four (2–14) days. Immediate diagnosis and treatment of FG are known to affect prognosis.^[4] Thus, these intervals have a significant impact on diagnosis and the success of treatment.

Infections, diabetes mellitus, alcoholism, atherosclerosis, peripheral arterial disease, Raynaud's phenomenon, malnutrition, immunosuppression (e.g., chemotherapy, steroids, and malignancy), HIV infection, leukemia and liver diseases are the most important predisposing factors for FG.^[1] The underlying common ground of all these factors is the disruption of host immunity, which creates a favorable environment for infectious agents. In patients with DM, hyperglycemia has been shown to have destructive effects on host immunity via its effects on cellular adherence, chemotaxis and phagocyte activity. Diabetes has been frequently indicated as a predisposing factor in cases of Fournier's gangrene (32% to 66% of the cases).^[14,15] Glycemic control has been shown to be directly related to the extent of the disease and patient prognosis.^[15] Therefore, diabetic patients may require more aggressive wound care and extensive debridement due to the likelihood of worse prognosis.^[1] In our study, 57.1% of the patients had DM. There was no statistically significant difference between the laboratory, clinical and surgical results of patients with and without DM.

In our study, twelve of the patients (34.2%) required ICU hospitalization. Significant relationships were found between length of ICU stay and parameters, such as age, hematocrit level, and FGSI and UFGSI scores. There are only a few studies that have assessed patients with FG in terms of factors related to their length of stay (LoS) in the ICU. In previous studies, mean LoS in ICU durations were reported as 36, 26 and 27.4 days. However, we found that several factors were affecting LoS in the ICU and we believe these results provide valuable data that require further comparative studies.

Methods, such as VAC and HBO, can be utilized in patients with FG in an attempt to increase the speed of wound recovery. There are studies reporting that VAC treatment decreases debridement requirements and also eliminates the need for ostomy in select cases.^[16,17] However, the possibility of brain and lung complications with HBO and high costs limit their use. HBO therapy, which has a physiological rationale, has not yet been shown to be effective for routine use in clinical trials. We utilized these treatment modalities in only four patients (two patients had HBO, two patients had VAC. However, others have suggested that VAC is a clinically effective treatment modality for the management of large wounds.^[16–19] The only reliable way to evaluate this treatment in comparison with conventional dressings is to conduct prospective randomized studies. However, these are virtually impossible to conduct due to the rarity of FG and its high mortality rate, which may cause ethical limitations considering the nature of randomization.

In our study, recurrence occurred in 12 patients. Except for one of these patients, full recovery was achieved. Partial re-

covery was achieved in one patient. In many studies, it has been stated that the important factor affecting the clinical outcome is timing and adequate surgical debridement.^[1,2] In this context, we think that debridement and abscess drainage was insufficient in cases where recurrence developed in our study.

Limitations of the present study include its retrospective, single-center design and the limited number of patients. However, FG is rather rare, and long-term follow up studies such as ours are few.

Conclusion

Fournier's gangrene is a fulminant infection with a high mortality rate. Early suspicion and diagnosis, followed by prompt surgical and systemic treatment are the only measures that have been shown to reduce mortality. Accurate physical examination and anamnesis are crucial for diagnosis. Age, hematocrit level, FGSI and UFGSI scores were found to significantly influence LoS in ICU. Thus, we believe further studies are required to validate these interesting results.

Ethics Committee Approval: Approved by the local ethics committee.

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ORİJİNAL ÇALIŞMA - ÖZET

Fournier gangreni: Türkiye'deki tek bir merkezden beş yıllık deneyimlerimiz

Dr. Engin Hatipoğlu, Dr. Süleyman Demiryas, Dr. Osman Şimşek, Dr. Kaya Sarıbeyoğlu, Dr. Salih Pekmezci

İstanbul Üniversitesi-Cerrahpaşa Cerrahpaşa Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, İstanbul

AMAÇ: Bu çalışmanın amacı, İstanbul'daki üçüncü basamak bir hastaneye başvuran Fournier gangreni hastalarının demografik, klinik ve cerrahi verilerini analiz etmektir.

GEREÇ VE YÖNTEM: Çalışmaya Ocak 2010–Ocak 2015 tarihleri arasında İstanbul Üniversitesi-Cerrahpaşa Cerrahpaşa Tıp Fakültesi Genel Cerrahi, Plastik Cerrahi ve Üroloji Anabilim Dalları tarafından takip edilen Fournier gangrenli 35 hasta dahil edildi. Cinsiyet, yaş, yatış süresi, altta yatan neden(ler), debridman sayısı, predispozan faktörler ve 10 yıllık bir süre içinde cerrahi ile ilgili veriler geriye dönük olarak değerlendirildi ve analiz edildi.

BULGULAR: Otuz beş hastanın yaş ortalaması 58.14 ± 12.71 idi. Otuz beş hastanın 20'sinde (%57.1) diabetes mellitus (DM) mevcuttu. Hastaların 12'si (%34.2) yoğun bakım ünitesinde (YBÜ) yatırıldı. YBÜ'de kalma süresinin yaş, hematokrit seviyesi, FGSI ve UFGSI'den anlamlı derecede etkilendiği bulundu (sırasıyla, $p=0.013$, $p=0.030$ $p=0.025$ ve $p=0.002$).

TARTIŞMA: Fournier gangreni, mortalite oranı yüksek fulminan bir enfeksiyondür. FG tanısı için fizik muayene ve öykü oldukça önemlidir. En sık görülen komorbidite DM'dir. Yaş, hematokrit seviyesi, FGSI ve UFGSI skorları hastaların YBÜ'de kalış sürelerini etkilediği bulunmuştur.

Anahtar sözcükler: Cerrahi debridman; Fournier gangren; prognoz; tedavi.

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