VALIDATION OF FGSI SEVERITY SCORE IN PATIENTS DIAGNOSED WITH FOURNIER'S GANGRENE - A RETROSPECTIVE STUDY

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Abstract

The Parisian venereologist Jean Alfred Fournier first described Fournier's gangrene in 1883. Fournier's Gangrene Severity Index (FGSI) represents a numerical score that indicates the severity of the disease. It represents a valuable tool for calculating patient outcomes and applying the proper treatment to avoid local complications and high mortality rates. We conducted a retrospective study from 2010 to 2021 that included all patients diagnosed and treated for Fournier Gangrene (FG) in Surgical Clinic I Emergency County Hospital Tg.Mures. The diagnosis is based on patient history, local clinical examination, and paraclinical tests. Fournier's Gangrene Severity Index (FGSI) was calculated, and we divided the patients based on the FGSI score. One group had scores <9 points, while the other group included patients with a score >9. We recorded a total number of 23 patients. The main risk comorbidities were ischemic cardiomyopathy at 56.54% (n=13) and typed II diabetes at 43.4% (n=10). The FGSI index score was calculated in all patients with an average of 8.6± 2. 12 patients received a score >9, while 11 patients were ≤9. The overall mortality rate was 56.26% (n=13), with the high-score FGSI group recording mortality of 100%. Fournier's disease remains rare, with high mortality and morbidity rates. Therefore, early treatment must be applied to ensure proper treatment and a good outcome. FGSI score can be applied in patients to assess the overall severity of the disease and indicate the morbidity and mortality outcomes.

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Introduction

The Parisian venereologist Jean Alfred Fournier first described Fournier's gangrene in 1883 [1,2]. The manuscripts described the disease as idiopathic with an abrupt onset and mainly involving gangrene of the scrotum and penile region based on a series of five cases [3]. Since then, advanced medical research has defined Fournie's gangrene as a rare necrotizing fasciitis of the perianal, perineal, and genital regions [1,3]. The disease is more prevalent in male patients with a mean age of 50.

The main risk factors for developing the disease are Type II diabetes, HIV infection or immune-deficiency diseases,

arterial hypertension, general peripheric arterial disease, excessive smoking, and alcoholism [4]. The bacterial infection source is polymicrobial, involving two or more pathogens with the most encountered Enterobacteriaceae and anaerobic like Clostridium and Bacillus fragilis [6].

The early disease involves pathology of the genital and perianal lesions: single and multiple untreated perianal and anal abscesses, urinary tract infections, and local urological surgical interventions. The bacteria quickly spread at the genital region from Buck's fascia to the subcutaneous tissue and the anterior abdominal fascia, with the primary mechanism represented by thrombosis of small subcutaneous vessels that lead to rapid necrosis and gangrene of the tissue [1-5].

Most cases are admitted to the emergency department with early clinical symptoms: swelling of the region, local progressive pain, fever, and systemic toxicity that led to septic shock with systemic inflammatory response syndrome (SIRS) [2-4]. Untreated, it can rapidly lead to multiple organ system failure (MOSF). With modern medical treatments, mortality rates are still over 50% percent reported in the literature, with a high comorbidity and local complications rate [6-8].

Fournier's Gangrene Severity Index (FGSI) represents a numerical score that indicates the severity of the disease. It represents a valuable tool for calculating patient outcomes and applying the proper treatment to avoid local complications and high mortality rates [9-11].

Materials and method

We conducted a retrospective study from 2010 to 2021 (10 years) that included all patients diagnosed and treated for Fournier Gangrene (FG) in Surgical Clinic I Emergency County Hospital Targu Mures.

The diagnosis is based on patient history, local clinical examination, and paraclinical tests. We evaluated clinical and laboratory (hemogram, electrolyte balance, bacteriological results, and antibiogram tests) findings, prognostic factors, and surgical interventions. Fever was defined as >380C; antibiotic treatment was registered with modification follow-ups based on antibiogram results.

Fournier's Gangrene Severity Index (FGSI) (Table 1) was calculated with the measurement of temperature (0ºC), heart rate, respiratory rate, serum sodium (mmol/l), serum potassium (mmol/l), serum creatinine (mg%), hematocrit (%), white blood cells (WBC/mm3x1000) and serum bicarbonate (mmol/l) that estimated the severity of the FG.

In addition, surgical treatments were recorded that included: local necrotomy with debridement, abscess evacuation, and in some cases, orchiectomy.

We divided the patients based on the FGSI score. One group had scores <9 points, while the other group included patients with a score >9. Statistical analysis was performed using Graph Pad Prism Version 9 and EasyMedStats© software.

Parameters of the cases were performed using Mann-Whitney U for continuous data and Fisher exact test for categorical data. Tests were performed to materiality $p = 0.05$, and statistical significance was considered for p values less than the threshold significance value of significance.

The hospital ethics committee approved the study and conducted it based on the Declaration of Helsinki (1964). The study aims to prove the validation of applying the FGSI score in patients diagnosed and treated for Fournier's gangrene.

Physiological Points	High abnormal value				Normal	Low abnormal value			
	+4	+3	+2	+1	0	+1	+2	+3	+4
Temperature (C^0)	>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%)	>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 (/mm3 X 1000)	>40	-	20-39.9	15-19.9	3-14.9	-	1-2.9	-	<1
Serum Bicarbonate (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 (FGSI) score

Results

We recorded a total number of 23 patients, all admitted to the emergency department of SCJU Tg.Mures. The average age of the patients was 52±12.5 ranging from 26 to 78 years. There was a male predominance of 82.6% (n=19). Diagnosis of Fournier's gangrene is based on history and clinical examination at the emergency department (UPU-SMURD SCJU Tg. Mures) (Figure 1). Descriptive analysis of the patient's paraclinical data indicates an average temperature of 38.8±1.6ºC, 108±22 heart rate, 15.6±1.5 respiratory rate, 138.217 ±18 serum Sodium (mmol/l), 5.3±1.2 serum Potassium (mmol/l), 1.192 ± 0.5 Creatinine (mg%), WBC 18,419 ±11, serum bicarbonate 42.8±11 and hematocrit 35.2 ±4 (%). Average admission days were 7.3 ± 4, ranging from 2 to 16 days. All patients were surgically treated (necrectomy and abscess evacuation) in emergency settings with an average of four major surgical reinterventions. Two orchiectomies were reported. In addition, daily local debridement and dressings were applied, with bacterial and antibiogram tests performed on every patient (Figure 2). The main risk comorbidities were represented by ischemic cardiomyopathy at 56.54% (n=13) and type II diabetes at 43.4% (n=10) (Table 2). The primary source of Fournie's gangrenes was untreated or complicated perianal abscesses 66% (n=14) and post-urological procedures 14.2% (n=3) with 19% (n=4) as a comprehensive unknown primary source of infection. Antibiotic treatments were applied to all patients with modifications based on antibiogram results. Cephalosporins and metronidazole i.v were applied initially for all patients with later modifications that

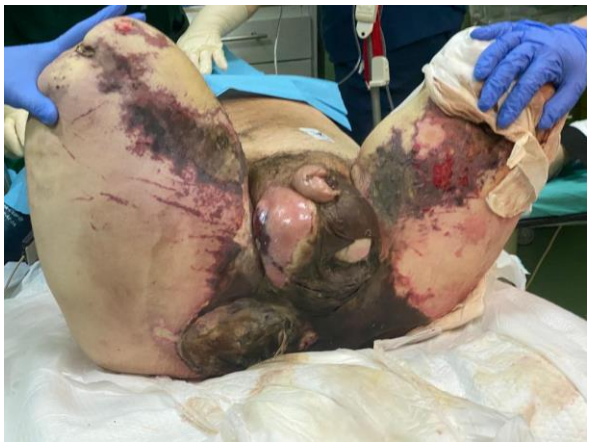

Figure 1 - Clinical Fournier's gangrene due to a history of multiple untreated perianal abscesses

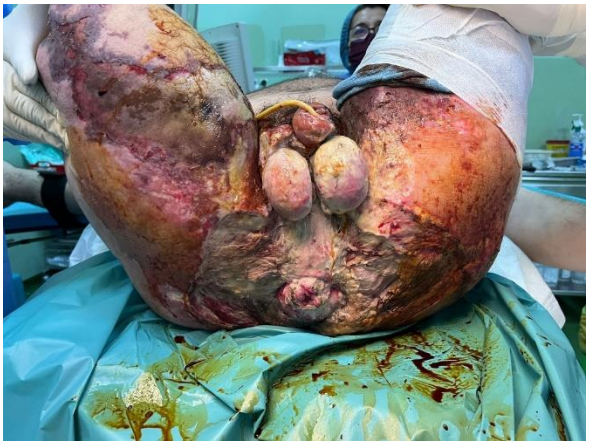

Figure 2 - Post-surgical necrectomy, abscess evacuation, and local debridement

included Gentamicin 34.85% (n=8) and Meropenem 39.13% (n=9). Antibiogram results revealed mainly a polymicrobial source of infection (Table 3): Escherichia coli + Klebsiella pneumoniae 47.8% (n=11), Escherichia coli+ Staphylococcus aureus 13.14% (n=3), Escherichia coli + Clostridium difficile 13.14% (n=3), Escherichia coli+ Streptococcus 8.7% (n=2) with four cases of multi-drug resistant Escherichia coli and Staphylococcus aureus.

The overall mortality rate was 56.26% (n=13). The FGSI index score was calculated in all patients with an average of 8.6± 2 points ranging from 3 to 12. 12 patients received a score >9, while 11 patients were ≤9 (Table 4). The average age was higher (57.5 vs. 46.91 years) in the high FGSI score group (p=0.046). Also, high values of creatinine (1.44 vs 0.926) (p=0.014) and WBC (22976.67 vs 13447) (p=0.021) were reported in the high FGSI group with no statistically significant difference when it comes to temperature, heart rate, respiratory rate, serum sodium, and bicarbonate.

Comorbidities	n (%)
Type II Diabetes	10 (43.3%)
Ischemic cardiopathy	13 (56.5%)
Arterial hypertension	7 (30.4%)
History of smoking	8 (34.7%)
Leucemia	1 (4.3%)
HIV infection	1 (4.3%)

Table 2 – Fournier's disease comorbidities risks

Bacterial source of infection	n (%)
Escherichia coli + Klebsiella pneumoniae	47.8% (n=11)
Escherichia coli+ Staphylococcus aureus	13.14% (n=3)
Escherichia coli + Clostridium difficile	13.14% (n=3)
Escherichia coli+ Streptococcus	8.7% (n=2)
Escherichia coli MDR	13.04% (n=3)
Staphylococcus aureus MDR	4.3% (n=1)

Table 3 -Microbial source of infection in Fournier's gangrene patients

Variable	FGSI >9 high N = 12	FGSI ≤9 low N = 11	*p-Value*
Age	57.5 (± 12.84) 95% CI: [49.34; 65.66]	46.91 (± 10.88) 95% CI: [39.6; 54.22]	***0.046***
Temperature (C^0)	39.22 (± 1.35) 95% CI: [38.36; 40.07]	38.46 (± 1.89) 95% CI: [37.19; 39.73]	*0.281*
Heart rate	115.5 (± 27.18) Range: (87.0; 180.0)	100.64 (± 13.55) Range: (88.0; 129.0)	*0.193*
Respiratory rate	13.67 (± 1.78) Range: (12.0; 17.0)	12.82 (± 1.4) Range: (11.0; 15.0)	*0.294*
Sodium mmol/l	142.5 (± 21.31) 95% CI: [128.96; 156.04]	133.55 (± 15.57) 95% CI: [123.09; 144.0]	*0.266*
Creatinine mg%	1.44 (± 0.519) Range: (0.79; 2.4)	0.926 (± 0.377) Range: (0.54; 1.84)	***0.014***
WBC count	22976.67 (± 12179.31)	13447.36 (± 8297.27)	***0.021***
Serum Bicarbonate mEq/L	45.5 (± 12.22) 95% CI: [37.73; 53.27]	39.91 (± 12.12) 95% CI: [31.77; 48.05]	*0.284*
Admission	5.42 (± 4.29) Range: (2.0; 16.0)	9.45 (± 2.88) Range: (5.0; 14.0)	***0.009***
Mortality			***<0.001***
Yes	12 (100.0%)	1 (9.09%)	
No	0 (0.0%)	10 (90.91%)	
Comorbidities			
Diabetes type II	7 (58.3%)	3 (27.2%)	***0.001***
Ischemic cardiopathy	8 (66%)	5 (45.5%)	*0.453*
Arterial hypertension	3 (25%)	4 (36.3%)	*0.234*
History of smoking	6 (50%)	2 (18.1%)	***0.001***
Leukemia	1 (8.3%)	-	**-**
HIV infection	1 (8.3%)	-	**-**

Table 4 -Microbial source of infection in Fournier's gangrene patients

On the other hand, average admission was higher for patients in the low FGSI group (5.42 vs. 9.45) (p=0.009), with a high mortality rate (100%) in the high FGSI score group. In addition, diabetes type II and smoking history were more encountered in the high FGSI score group.

Discussions

Fournier's gangrene represents a difficult medical and surgical challenge. In our study, the mortality rate was 56.2%, close to estimates provided by the medical literature.[4] Moreover, it mainly affected male patients with an average of 50 years.

The high mortality rate is due to the extensive nature of the disease and the presentation of the patients in the emergency department, with the majority associating untreated or poorly treated perianal pathology. In addition, 43.3 % presented under treatment or untreated diabetes type 2, which in most studies, authors consider the condition a high-risk factor in Fournier's gangrene. [5-6] Therefore, it is essential to recognize the disease in its early stages and pay attention to treating high-risk comorbidities.

Regarding the FGSI score: patients with a score above 9 points recorded a 100% mortality rate with high-risk comorbidities like diabetes type II and a history of smoking playing a pivotal role in their outcome. In addition, WBC and creatinine levels were more elevated, indicating a presence of SIRS that eventually led to MOFS, increasing the mortality and morbidity levels. The polymicrobial nature of the disease must be considered when applying early antibiotic treatments. Both anaerobic and aerobic infections must be treated with early significant spectrum antibiotics and change based on the result of the antibiogram. In our study, the most encountered combination was Escherichia coli + Klebsiella pneumonia. Paty and Smith [8] reported Escherichia coli, Bacteroides, and Streptococci as the most common organisms. Microbial source varies based on regional and initial infection sources.

Further studies are required to assess the outcome based on bacteria infection. Furthermore, we encountered four cases of multi-drug resistant (MDR) bacteria that made antibiotic treatment more difficult overall. FGSI was created by Laor et al. [9] and assigned a numerical score describing the disease's severity. A high FGSI score indicated an advanced disease in our study with high mortality rates compared to low FGSI patients. Therefore, modified versions of FGSI included more paraclinical data to be assessed [10-11]. Clinical outcomes and management strategies vary due to the disease's rarity and the high local and general complication levels.

Our study is limited by the low number of patients and ten years of retrospective analysis. In addition, surgical and medical treatments are a continuous change.

Conclusions

Fournier's disease remains a rare disease with high mortality and morbidity rates. Therefore, early treatment (surgical + medical) must be applied to ensure proper treatment and a good outcome. FGSI score can be applied in patients to assess the overall severity of the disease and indicate the morbidity and mortality outcomes.

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