Fournier Gangrene Severity Index and Diabetes Mellitus: A Significance Correlation among Fournier Gangrene Patients in Single Center Hospital

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Abstract

BACKGROUND: Fournier gangrene (FG) is an urological emergency in the form of progressive necrotizing fascitis caused by polymicrobial infection which affects the perineum and external genitalia. FG that is not diagnosed and treated properly will result in severe morbidity and even mortality for the patient. The assessment of FG becomes clearer with the creation of a scoring system that predicts patient prognostic and therapeutic outcomes, known as the Fournier ganggreen severity index (FGSI). This FGSI includes clinical and laboratory examinations, namely, temperature, pulse, respiratory rate, levels of sodium, potassium, leukocytes, hematocrit, and blood serum bicarbonate.

AIM: We aimed to present descriptive retrospective study, which examined the relationship between age and DM with FGSI in FG patients at the Regional General Hospital.

METHODS: Data were taken from January 2017 to December 2020 at the Urology Department, dr. Moewardi Hospital Surakarta. There were 32 cases of FG patients, consisting of 20 patients with diabetes mellitus (DM) and 12 non-DM patients.

RESULTS: This study found that FG patients with an FGSI score <9 were 24 patients (75%), FG patients with an FGSI score of >9 were 8 patients (25%). Judging by the distribution of the FGSI score according to the age of the FG patient using the chi-square technique, the value p = 0.045. The p-value <0.05 means that at the 5% significance level the difference in the proportion of FGSI scores between age categories of FG patients is significant. The distribution of the FGSI score according to the DM comorbid showed that there were nine patients with an FGSI score of >9 (45.5%) with comorbid DM and no patients without the DM comorbid. Result of statistical test using the Chi-square technique was p = 0.036. The p-value < 0.05 means that at the 5% significance level the difference in the proportion of FGSI scores between patients with and without comorbid DM is significant.

CONCLUSION: Judging by the distribution of the FGSI score, it can be concluded that there is significant relationship between the age of the FG patient and the FGSI score and there is a significant relationship between the DM comorbid and the FGSI score in FG patients at dr. Moewardi Hospital Surakarta in the period January 2017 to December 2020.

Introduction

Fournier gangrene (FG) is one of the urology emergencies in the form of progressive necrotizing fascitis caused by polymicrobial infection which attacks the perineum and external genitalia. FG that is not diagnosed and treated properly will result in severe morbidity and even mortality for the patient. This disease affects older people who are mostly aged 50 and 60 years with various basic diseases, in which diabetes mellitus (DM) is the most comorbid (50–70%). Polymicrobials that cause the progression of this disease, necessitating aggressive, immediate surgery (debridement), and appropriate medical therapy.

It was reported that the incidence of FG in the general population was 1:7,500 and 1–2% were treated by a urologist at the hospital. A retrospective study in Korea found 1726 cases from 1950 to 1999 and an average of 97 cases per year were reported, from 1989 to 1998.

FG is more common in elderly male patients, ten percent can affect women (male to female ratio 10:1). The age of the FG patients was 30–60 years with a peak incidence of 5 and 6 years. In previous studies, it was reported that the mean age of FG patients in 1945 was 40.9 years, 1979 (Jones) was 51.3 years, Laor and colleagues were 61 years.

DM is the most comorbid in FG patients (50–70%) and is associated with poor outcome and increased mortality by 25% (3 of 12 patients) [1], [2].

The organisms that cause FG can be found in necrotic tissue, pus swabs, blood, or urine cultures. FG is caused by aerobic and anaerobic polymicrobial infection that causes vascular thrombosis and necrotic tissue, exacerbated by low body defense due to other underlying diseases.

The diagnosis of FG is made on the basis of clinical examination. There are complaints such as fever, weakness, nausea and vomiting, perineal discomfort, uncontrolled blood glucose. The period lasts from 2 to 9 days. The discomfort in the genitalia and perineal will get worse, along with pain, itching, burning sensation, erythema, swelling, and even skin necrosis. The wound can produce bad-smelling pus. The pain will subside when neuron damage has occurred. The presence of crepitus can be difficult to examine because of pain on palpation, but it is present in 50–60% of cases [1], [3], [4], [5].

The clinical picture of FG can be seen as follows (Figure 1).

Figure 1: Necrotic Area in Fournier Gangrene
(Source: Wein et al., Campbell Walsh Urology, Fournier Ganggrene, 10th edition, 2012)

Clinical signs such as elevated body temperature, tachycardia, tachipnea, ileus, uncontrolled blood sugar, and the discovery of vascular problems, but these are not always present, especially in patients with immunosuppressive disorders.

Once there is necrosis of the skin, there will be extensive necrosis. Complaints and clinical symptoms depend on the origin of the infection. History of complaints in the lower urinary tract, indicating urethral stricture. Anorectal complaints such as pain, fissure ani, or hemorrhoids indicate the source of FG infection is anorectal. Therefore we need a scoring system to predict the severity of the morbidity of FG so that there is no misssed or delay in diagnosis [1], [3], [4], [5].

Management of FG with aggressive synergistic resuscitation with anticipated surgery, airway management, administration of oxygen, intravenous access, administration of crystalloid fluids, especially patients with dehydration or signs of shock, and cardiological monitoring.

Administration of broad-spectrum antibiotics for gram-positive, negative, aerobic, and anaerobic bacteria, such as Ampicillin-sulbactam, Ticarcillin-Clavulanate, Piperacillin/tazobactam, Penicillinase, aminoglycosides, metronidazole, or clindamycin. Administration of Vancomycin, especially for MRSA [1], [4], [6].

Tetanus prophylaxis is administrated if soft tissue injury was indicated. Consultation with a surgeon is very important, especially to urologists and colorectal consultants [1], [4], [6].

Immediate and aggressive debridement has a positive effect on patient survival (reduces patient morbidity and mortality). This operative action should be performed under general anesthesia, where the actual wound is usually more severe than it appears. The patient is positioned in the dorsal lithotomy position. The goal of debridement is to remove the origin of the site of infection as well as to remove infected tissue. Surgeons should immediately prepare their patients for radical debridement [1], [3], [4], [7], [8].

Adequate debridement is shown in the Figure 2.

Figure 2: Adequate Debridement Results
(Source: Wein et al., Campbell Walsh Urology, Fournier Ganggrene, 10th edition, 2012)

FG assessment becomes clearer with the creation of a scoring system that predicts patient prognostic and therapeutic outcomes, known as the FG severity index (FGSI). This FGSI includes clinical and laboratory examinations, namely, temperature, pulse, respiratory rate, levels of sodium, potassium, leukocytes, hematocrit, and blood serum bicarbonate.

FGSI is used to predict the prognostic outcome of FG patients. Temperature, pulse, respiratory rate, and

leukocytes are the criteria for sepsis. Disorders of the balance of levels of sodium, potassium, serum bicarbonate and creatinine indicate metabolic disturbances, while hematocrit indicates an infection/inflammatory process. The infection process can result in sepsis and metabolic disorders of the body so that the FGSI parameter can predict the bad risk of FG patients [6], [9].

The Table 1 shows the FGSI parameters and their numerical scores, with normal values and abnormal values.

FGSI score assessment is done by adding up each score of each parameter. The total FGSI score is divided into 2 values, namely, an FGSI value of <9 and more than 9. FGSI above 9 is considered to have sensitivity and specificity to FG patient mortality. Sorensen *et al*. also reported that if the FGSI is above 9 then the probability of mortality is 75%, if it is below 9 the chance of survival is 78% with a mortality rate of 12.12% [6], [9], [10], [11].

Methods

This retrospective study was descriptive, which examined the relationship between age and DM with FGSI in FG patients at the Regional General Hospital dr. Moewardi Surakarta (RSDM) for the period January 2017 - December 2020.

Data was taken from January 2017 to December 2020 at the Urology department of the Regional General Hospital dr. Moewardi Surakarta. The study population was patients with a diagnosis of FG who were admitted to the surgical emergency department, consulted from other departments, or were treated in the Urology sub-section of the RSDM from January 2017 to December 2020. There were 32 cases of FG patients, consisting of 20 patients with DM and 12 non-DM patients.

Results

This study found a study population of 40 patients with a diagnosis of FG, but only 32 FG patients met the study inclusion criteria within 3 years from January 2017 to December 2020. The distribution of FG patients based on age, most of them were aged 50–59 years with 16 patients 50%), followed by the age of 60–69 years with 11 patients (34.37%), 2 patients less than 50 years of age (6.25%), 2 patients aged 70–79 years (6.25%) and more of 80 years 1 patient (3.13%).

In this study, the age distribution of FG patients with FGSI scores was divided into two groups, namely, scores <9 and scores more than 9, as shown in the following Tables 2 and 3, there were 24 patients with FGSI scores <9 (75%), whereas FG patients with an FGSI score of >9 were 8 patients (25%).

Patients with FGSI scores <9 were mostly at the age of 50–59 years, namely 12 patients (37.5%), followed by the group of patients aged 60–69 years and 70–79 years with a total of 4 patients each (12.25%), then in the age group <50 years and more than 80 years with a number of each of 2 patients (6.25%).

Patients with an FGSI score of more than 9 were found in the 50–59 years and 60–69 years age groupun with the number of each 5 patients (15.62%), followed by the age of <50 years, namely 2 patients (6.25%). Patients with an FGSI score >9 were absent in the age group over 70 years.

Distribution of FGSI scores according to age of FG patients. Patients with an FGSI score of more than 9 were 50% at <50 years old, 22.2% at 50–59 years old, 27.3% at 60–69 years old, and 0.0% or none at each. Aged 70–79 years and >80 years. This distribution is less able to indicate a certain trend.

Statistical test using the Chi-square technique resulted in the number p = 0.045. In other words, it can be concluded that there is a significant relationship between the age of the FG patient and the FGSI score.

There were 20 patients with comorbid DM (62.5%) while 12 patients (37.5%) had no comorbid DM. More DM co-morbidities (62.5%) than non-DM patients (37.5%).

Patients with DM comorbid had an FGSI score of <9 in 11 patients, an FGSI score of >9 there were nine patients. There were seven patients without DM comorbid who had an FGSI score of <9 and there were no patients with an FGSI score of >9.

The Table 3 shows the distribution of the FGSI score according to the DM comorbid. Patients with FGSI

Table 1: FGSI

Variable	Abnormally high value				Normal value	Abnormally low value			
Score	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
Pulse	>180	140–179	110–139	–	70–109	–	56–59	40–54	<39
Respiration rate	>50	35–49	–	25–34	12–24	10–11	6–9	–	<5
Sodium (mmol/L)	>180	160–179	155–159	150–154	130–149	–	120–129	110–119	<110
Potassium (mmol/L)	>7	6–6,9	–	5.5–5.9	3.5–5.4	3–3.4	2.5–2.9	–	<2.5
Creatinine (mg/100 mL)	>3.5	2–3.4	1.5–1.9	–	0.6–1.4	–	<0.6	–	–
Hematocrit (%)	>60	–	50–59.9	46–49	30–45.9	–	20–29.9	–	<20
Leukocytes (total/mm^2 × 1.000)	>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

FGSI: Fournier Gangrene Severity Index, Source: Kim: The Prognostic Factors and Validation of Severity Index in Fournier's Ganggrene, 2011.

Table 2: Distribution of FGSI scores by age

Age (years)	FGSI score (%)		p
	<9	More than 9	
<50	1 (50.0)	1 (50.0)	0.045
50–59	12 (75)	4 (25)	
60–69	8 (72.7)	3 (27.3)	
70–79	2 (100.0)	0 (0.0)	
>80	1 (100.0)	0 (0.0)	

FGSI: Fournier Gangrene Severity Index.

score of >9 were 45% in patients with DM comorbid and 0.0% or none in patients without DM comorbid. This distribution shows that patients with DM comorbid are more likely to have an FGSI score of >9 than patients without DM comorbid.

Table 3: Distribution of FGSI scores according to DM comorbid

Comorbid	FGSI score (%)		p
	<9	More than 9	
DM	11 (55)	9 (45)	0.036
Non DM	12 (100.0)	0 (0.0)	

FGSI: Fournier Gangrene Severity Index, DM: Diabetes mellitus.

Statistical test using the chi-square technique resulted in the number p = 0.036. In other words, it can be concluded that there is a significant relationship between the DM comorbid and the FGSI score.

Discussion

This retrospective study showed the distribution of FG patients based on age, most were aged 50–59 years with 9 patients (50%), 60–69 years old, 4 patients (22.22%), <50 years old, and 70–70 years old. 79 years with a total of 2 patients (11.11%) and more than 80 years, 1 patient (5.56%). Most of the ages of FG occurred at the age of 50–59 years with an average patient age of 60.5 years. This is consistent with some literature, which states that the peak incidence of FG is at the age of 5 and 6 years of age [9], [12], [13].

Old age is susceptible to FG because the immune system is starting to weaken and awareness of personal hygiene is low, so that local infections in a place, especially the urogenital area can become entry point spread of FG. Men aged 5 and 6 years also often receive invasive procedures in the field of urology, for example, insertion of catheters due to urinary retention due to prostate enlargement Benign Prostate Hyperplasia. The ages of 5 and 6 years are also often neglected sociocultural, so that the diagnosis of FG is often late and increases morbidity and even mortality for patients.

The FGSI variable, however, does not place age as a parameter. The clinical, laboratory, and comorbid conditions of FG patients at diagnosis have a greater role in influencing the FGSI score, not the patient's age, however, some literature still states that older FG patients have a lower life expectancy. Age is an independent risk factor for mortality in FG patients [9], [12], [13].

This study found that FG patients with an FGSI score <9 were 13 patients (72.23%), FG patients with an FGSI score of >9 were 5 patients (27.78%). Judging by the distribution of the FGSI score according to the age of the FG patient using the Chi-square technique, the value p = 0.045. The p-value <0.05 means that at the 5% significance level the difference in the proportion of FGSI scores between age categories of FG patients is significant.

This study found that there were 11 patients with FG with DM comorbid (61.11%) while there were 7 patients with no DM comorbid (38.89%). This is in accordance with the literature which states that the most comorbid in FG patients is DM (50–70%) [1], [2], [12]. The high incidence of diabetes in FG is due to tissue ischemia process due to small blood vessel abnormalities [1], [2], [12].

The distribution of patients in this study showed that patients with DM comorbid were more likely to have an FGSI score of >9 than patients without DM comorbid. Statistical test using the chi-square technique resulted in the number p = 0.036. The p-value <0.05 means that at the 5% significance level the difference in the proportion of FGSI scores between patients with and without DM comorbid is significant.

DM affects the prognostic effect of FG patients by increasing their mortality, which is in accordance with an FGSI value of >9 which affects the mortality of FG patients. In lethargy, it is stated that FGSI is above 9, the probability of mortality is 75%, if it is below 9 the possibility of survival is 78% with a mortality rate of 12.12% [6], [9], [11], [14], [15].

Conclusion

In this study, seen from the FGSI score statistical data, it can be concluded that there is a significant relationship between the age of the FG patient and the FGSI score and there is a significant relationship between the DM comorbid and the FGSI score.

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