The THAI Journal of SURGERY 2017;38:59-63.
Official Publication of the Royal College of Surgeons of Thailand

Original Article

Usefulness of Fournier Gangrene Severity Index in Managing the Patients at Viet Duc Hospital

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Abstract

Purpose: **Fournier's gangrene is a life-threatening necrotizing infection of the perineal, perianal, and periurethral tissues that can disseminate even at the subcutaneous tissue of the thigh. In this study, we identified prognostic factors for survival and validated the accuracy of the Fournier's gangrene severity index (FGSI) in patients with Fournier's gangrene.**

Materials and Methods: **We retrospectively reviewed medical records of patients diagnosed with Fournier's gangrene between 2009 and 2014. FGSI scores were assessed using a receiver operating characteristic curve. An outcome variable of inpatient mortality, univariate analyses were performed by SPSS 18.0.**

Results: **A total of 27 patients (92.6% male, mean age 50.3 ± 14 years) diagnosed with Fournier's gangrene met the criteria for review. The overall mortality rate was 14.8% (4 patients). FGSI ≥ 9 was 14.8% vs < 9 was 85.2%. Survival of the group with FGSI ≥ 9 was only 1/4 (25%) versus 22/23 (95.7%) in the group with FGSI < 9. The mean FGSI score for survivors was 3.57 ± 2.57 versus 10.5 ± 2.6 for nonsurvivors ($p < 0.001$). Using a FGSI score threshold of 9 (sensitivity 71.4%, specificity 90%) there was a 96% survival rate in patients with FGSI of less than 9 and a 46% mortality rate in those with FGSI of 9 or greater (RR = 17.25).**

Conclusions and Recommendations: **The FGSI remains an objective and simple method to quantify the extent of metabolic aberration at presentation in patients with Fournier's gangrene. FGSI threshold value of 9 is sensitive and specific for predicting mortality in this patient population and could be used for the clinical managements of FG.**

Keywords: **Fournier's Gangrene, Fournier Gangrene Severity Index, Necrotizing tissues**

Introduction

Fournier's Gangrene (FG) is a fulminant infection, including necrotising fasciitis of the genital, perineal and/or perianal regions. This condition is potentially fatal, affects any age and gender, has been reported even in neonates, is characterised by rapid progression of infection in soft tissue, caused by the synergistic action of several agencies that extend along fascial planes, causing necrosis of these tissues and destruction. The most frequent concomitant diseases

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are diabetes mellitus (DM) which presents up to 60% of cases, alcoholism and cancer, among other immunosuppressive diseases. Mortality has been reported in different series to range from 16 to 40%[1-5].

Its clinical presentation is variable, but often presents with oedema, erythema, pain, fever and increased volume. It is a situation that warrants urgent radical surgical treatment (debridement), in addition to the use of antibiotics. The management ranges from emergency surgery (debridement), managing topically (sodium hypochlorite, hydrogen superoxide and even honey), and administering antibiotics, to hyperbaric oxygen[3,6,7].

The Fournier Gangrene Severity Index (FGSI) introduced by Laor et al. in 1995 has been used successfully as a predict factor in managing the disease[8]. However, there was not so many publications on the issue conducted in Vietnam in the last years. Aim of this paper is to evaluate the value of FGSI that has been used in managing the FG patients treated in Viet Duc Hospital, one of the biggest centers of surgery in the Northern part of Vietnam.

Materials and Methodology

This retrospective and prospective study identified the patients with FG, admitted from August 2009 to August 2014. The data were collected from the Department of Septic Surgery of Viet Duc Hospital. FG diagnosis was established on clinical basis. Patient's age, gender, infection source, predisposing factors, clinical findings, various surgical procedures, and laboratory results were analysed.

FGSI was calculated by evaluating nine hospital admission parameters: temperature, respiratory rate, heart rate, sodium, potassium, creatinine, serum bicarbonate, leukocyte count and haemocrit. Evaluation criteria were gauged from 0 to +4 as described by Laor et al.[8].

We excluded patients with periurethral and scrotal abscesses if there was no evidence of extension to soft-tissue or necrosis. In this study, we divided all FG patients into two categories: survivor group (A) and nonsurvivor group (B). Univariate analyses (Student's *t*-test) were used for comparisons. A *p*-value of < 0.001 was considered statistically significant. The data was analysed by SPSS18.0.

Results

Twenty seven cases diagnosed with Fournier from 2009 to 2014 were analysed. The overall mean age was 50.3 ± 14 (range 19-80) years. Most of the patients (92.6%) were male. There were only two female cases, accounting for 7.4%.

Medical history

DM was commonly present in 33.3%, alcoholism in 14.8%, previous surgeries in 9.2% and trauma in 4.6%, respectively.

Sites of infections

The site of infection origin was perineal in 33.3% (9 cases); extended to scrotum in 25.9% (7 cases). The most common site of perineal infection was scrotum, accounted for 40.7% (11 cases).

Table 1 Fournier gangrene severity index

Index	Maximum value			Average			Minimun value		
Variable	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 (rate /min)	>180	140-179	110-139	-	70-109	-	56-59	40-54	<39
Respiratory (b/min)	>50	35-49	-	25-34	12-24	10-11	6-9	-	<5
Serum Natri (mmol/L)	>180	160-179	155-159	150-154	130-149	-	120-129	110-119	<110
Serum Kali (mmol/L)	>7	6-6.9	-	5.5-5.9	3.5-5.4	3-3.4	2.5-2.9	-	<2.5
Serum Creatinin (mg/100ml)	>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
WBC (Total/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

Symptoms

The most common symptoms at the time of admission in the hospital were fever (85%), increased scrotal volume (84%) and perineal or genital pain (71%). The average time of the symptoms prior to referral to the treatment was 6.4 days (range 2-15 days).

Management

The surgical procedure performed was debridement in all the patients. Overall, cystostomy was done in 28.8%. Twenty percent of the patients had colostomy and 8% of the patients had bilateral orchidectomy. As far as extensive debridement was concerned, 86.7% was done in the first 8 hours of admission to the hospitals, 65.2% of the patients underwent large debridement twice or thrice overall, repeated debridements in 86,7%.

Bacteriology aspects

The most frequent bacteria were *Escherichia coli* in 51.8%, followed by *Enterococcus faecalis* in 28%. Polymicrobial infection was found in 62.5%.

Table 2 FGSI

FGSI scores	N	%
FGSI ≥ 9	4	14.8
FGSI < 9	23	85.2
Total	**27**	**100**

Table 3 Relationship between outcomes and FGSI

FGSI scores	Survivors	Non-Survivors	N
FGSI ≥ 9	1	3	4
FGSI < 9	22	1	23
Total	**23**	**4**	**27**

The mean FGSI score for survivors was 3.57 ± 2.57 vs 10.5 ± 2.6 for non-survivors ($p < 0.001$).

Table 4 Complications

Complications	N	%
Bleeding from wounds	2	7.4
Pneumonia	4	14.8
Urinary infection	2	7.4
Severe sepsis *	1	3.7

*The patient died on admission

Overall outcomes: Twenty-three patients were discharged, accounting for 85.2% and four patients died, so the mortality was 14.8%.

Discussions

FG was first described as a rapidly progressing idiopathic infection, includes any necrotising infection of the external genitals and perineum in both men and women. The FG is a rare infection, the rate is from 0.4/100,000 habitants to 1.6/100,000 habitants or 0.02% of all admissions to urology wards. It is usually a polymicrobial infection whose probable physiopathology is due to endarteritis obliterans of the small and superficial veins, resulting in gangrene. Despite aggressive wide-spectrum antibiotic treatment, aggressive surgical debridement, intensive care and anaesthesia, the mortality rates are as high as 43% in most reports, but vary greatly and range from 4 to 88%[1,9,10].

In the most present series *E. coli* was the predominant bacterium[1,2,6,11]. Anaerobic and aerobic organisms that have been isolated from the most common wounds in our study are: *E. coli* (51.8%), and Enterococcus faecalis (28%). Polymicrobial infection was found in 62.5%. In study by Morua et al., 58% had polymicorbial infection, *E. coli* was the most frequent (48%)[1].

There is no consensus on clinical variables for predicting FG results. Lower limb and abdominal wall involvement are associated with high mortality rate and most studies have shown that aggressive therapy, age, comorbidities and time of presentation do not affect prognosis. Many prognostic factors such as advanced age, primary anorectal infections, DM, delayed treatment, synergistic sepsis on admission, anaemia, and high FGSI score have been reported in literature for FG. Other predisposing factors include local trauma, paraphimosis, periurethral extravasation of the urine, perirectal or anal infections, and surgeries such as circumcision or herniorrhaphy[9,12-15].

In our study, we found that higher mortality was seen in the patients older than 50 years. Overall mortality was 14.8%. This was consistent with other series. Although the majority of the patients presented in this series had DM (33.3 %), other predisposing factors including previous surgeries (9.2%), trauma (4.6%) and alcoholism (14.8 %) were also present.

There is still controversy as to whether the coexistence of DM influences prognosis. But in our study, which is consistent with the report by Korkut et al.[16], DM was significant in the mortality group.

We found the presence of sepsis on admission also to be a prognostic factor for FG and its mortality, as reported by Unalp et al.[17]. In our series, one patient had severe sepsis and died on admission.

Treatment for FG must be started as early as possible[2,11,18,19]. Early and aggressive debridement and use of wide-spectrum antibiotics are the gold standard for decreasing the mortality and morbidity. Debridement must be repeated with the same aggressive approach when necessary. In this study, it was observed that if the time interval between the first symptom and surgical intervention is increased, the mortality is increased, which is consistent with other studies.

We performed an extensive emergency debridement in all patients: 86.7% was done in the first 8 hours of admission to the hospitals; 65.2% underwent large debridement twice or thrice overall. Repeated debridements was performed in 86.7% of the FG patients in our study.

Some published series have emphasised that hyperbaric oxygen therapy can be helpful for the management of FG[5,9,12]. Limitations in the availability and transfer of the patients to units offering this service restrict its application for the patients with FG. Consequently, we did not utilise hyperbaric oxygen therapy for our patients due to lack of facilities.

FGSI, which was developed by Laor et al. is a good prognostic tool for assessing the FG patients[8]. Four cases (14.8%) had FGSI score ≥ 9, survivor was only one. In the group of FGSI < 9, there were 22 survivors. We also found that FGSI score system is a good tool for predicting severity of the disease and mortality risk of the patients. In the study by Yong Kim Ik et al., the mean FGSI was 9.25 in patients who had died and 4.69 in patients who survived[20]. Of the factors affecting to the mortality, sepsis and FGSI of 9 points or over at the time of hospitalization were statistically significant. Tsung Yen et al. has found the patients who had FGSI 5.5 ± 2.7 survived, However, the patients who died had FGSI score 10.2 ± 4.6[13]. Similar to the study by Silvio et al., the mortality rate was 84.6% in the group of patients with FGSI > 9 and 14.3% in the group of patients with FGSI < 9[10].

FG is an infectious process that can lead to death in up to 40% of patients. Early diagnosis and aggressive surgical interventions, and intensive postoperative care have undoubtedly controlled the mortality rates. Understanding the physiopathology and predisposing factors is essential for early diagnosis and treatment. There is currently no level I evidence for the use of indices for predicting mortality[21-23].

In conclusion, we have found that older age, DM, anaemia, sepsis, delay in initial treatment and FGSI core ≥ 9 are the important predicting severity factors. According to Tsung-Yen et al. the simplified FGSI is easily applied, and is able to recognize the patients with poor prognosis and should make the suitable management as well[13].

Conclusions

The FGSI remains an objective and simple method to quantify the extent of metabolic aberration at presentation in patients with FG. Despite the intensive care, the mortality is now still relatively high. Since Laor et al. has introduced the FGSI in treating the Fournier patients with good results, it has been widely accepted. It remains a simple method for assessing severity of presentation and predicting outcome in the complex patients with FG. The study conducted at Viet Duc Hospital supports previous findings that a FGSI threshold of 9 is a sensitive and specific predictor of mortality during initial assessment. We found the predictive factors of mortality such as the patients over 60 years old, alcoholism, associated diseases especially diabetes mellitus and cardiovascular problems, wide variety pathogens isolated and antibiotic resistance, severity of necrotizing as well as its management or FGSI ≥ 9. A multidisciplinary approach should always be considered for the efficient management of the clinical condition, which can help to reduce the mortality.

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