Fournier Gangrene
A Series of 12 Patients

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Introduction: Fournier gangrene is a rare, rapidly progressive, necrotizing fasciitis of the external genitalia, the perineum, or the abdominal wall that is associated with high morbidity and mortality. In this series, we describe 12 patients with Fournier gangrene who had presented to our medical center.

Materials and Methods: Twelve men had been diagnosed with Fournier gangrene in Shohada-e- Tajrish hospital between March 2002 and September 2005. Their medical records were reviewed and the Fournier Gangrene Severity Index scores before and after the treatment were determined.

Results: Fifty percent of the patients were diabetic and their mean age was 58.2 ± 17.8 years. The mean delay between the onset of the disease and the admission was 4.9 days and the mortality rate was 16.6%. The median Fournier Gangrene Severity Index scores before the admission and at the time of discharge were 4.5 (range, 0 to 11) and 0 (range, 0 to 9), respectively ($P = .005$). One of the patients who died had the scores of 11 and 9, respectively. Split-thickness skin graft was performed for 5 patients (41.7%).

Conclusion: In Fournier gangrene, a rapid diagnosis and emergent surgical intervention is crucial. The Fournier Gangrene Severity Index seems to be an excellent tool for outcome prediction.

Keywords: Fournier gangrene, scrotum, split-thickness skin graft

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INTRODUCTION

Fournier gangrene, a disease that almost exclusively affects men, is a necrotizing fasciitis of the external genitalia and the perineal region. The cause is a polymicrobial infection in association with superficial traumas, urologic diseases, and surgical operations, as well as colorectal diseases. Diabetes mellitus, immunosuppression, alcoholism, and other severe illnesses are also frequent cofactors.[1] Due to potential severe complications, it is important to diagnose the disease as early as possible. Mortality rate of Fournier gangrene can be reduced by intensive care and appropriate antibiotic therapy with the coverage of aerobic gram-positive and gram-negative bacteria as well as anaerobic microorganisms combined with surgical treatment.[2]

We conducted this study to analyze the outcome and identify the associated risk factors and prognostic indicators of Fournier gangrene. To our knowledge, this is the first report from Iran and advocates the use of Fournier Gangrene Severity Index (FGSI).

MATERIALS AND METHODS

Between March 2002 and September

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2005, this study was carried out in Shohada-e-Tajrish hospital, a tertiary referral medical center. A total of 12 patients with Fournier gangrene were diagnosed, treated, and followed up in a multidisciplinary fashion. Following admission, correction of the fluid and electrolyte imbalance, and estimation of the extension and depth of the gangrenous area, we determined the FGSI scores using 9 parameters including the body temperature, heart rate, respiratory rate, hematocrit, white blood count, and serum levels of sodium, potassium, creatinine (× 2 for acute renal failure), and bicarbonate.[3] These parameters were measured and the degree of deviation (either positive or negative) from the normal values was graded from 0 to 4. The total value was considered as the FGSI.[3]

In addition, serum levels of calcium, and albumin, as well as fasting blood glucose and blood urea nitrogen (BUN) were measured. An interview was conducted with the patients and their relatives to evaluate their past medical and surgical history including diabetes mellitus, alcoholism, and previous trauma or surgery. Presence of concurrent illnesses including hypertension, urethral stricture or manipulation, malignancy, cerebrovascular accident, spinal cord injury, renal insufficiency, pneumonia, and other infections like perianal abscess were reviewed. The time between the onset of the disease and reference to the medical center and existence of the signs such as edema, erythema, necrosis, malodorous discharge, crepitation, and fluctuance were assessed. Plain radiography and ultrasonography were requested for all patients. Urine, blood, and tissue samples were taken for culture and antibiogram; however, a wide-spectrum antibiotic therapy had been initiated empirically before the results were obtained. This empiric therapy included the combination of a 3rd generation cephalosporin, an aminoglycoside, and metronidazole or clindamycin. Then, antibiotic therapy was changed according to the results of tissue culture and continued until the active infection was controlled.

We assessed the portal of entry for causative microorganisms and categorized them as colorectal, urologic, cutaneous, and unknown. Following extensive debridement, urinary diversion with suprapubic cystostomy was performed in patients with urethral trauma or extravasation. Colostomy was performed in cases with colonic or rectal perforation. Orchiectomy or penectomy was performed in patients with involvement of the tunica albuginea. One or two days after the initial operation, surgical exploration was performed in order to exclude further extension of the necrosis. Multiple re-explorations were continued until the infection was well controlled and the patients were prepared for grafting with at least a 2- to 3-week interval (Figure 1). The body surface area (BSA) involved by the infection was assessed using the burn index.[4]

After multiple episodes of debridement (if needed) and development of the granulation tissue, we evaluated the protection of the testis in

Figure 1. The wound 4 weeks after debridement in a 64-year-old patient (patient number 12 in the Tables)

Figure 2. Patient number 12. The testes were placed in the superficial thigh pouch and the suprapubic and penile areas were repaired with a meshed graft and a nonmeshed split-thickness skin graft, respectively.

a subcutaneous thigh pouch or making a skin graft. Our preferred integument for covering the penis was a thick, nonmeshed, split-thickness skin graft (STSG). In patients with skin loss in other sites, simple suture of wound or STSG was performed (Figure 2). When STSG were used, 0.010- to 0.015-inch grafts were harvested from the anterior thigh with a dermatome. In patients with scrotal skin loss involving less than 50% of the skin, we could close the wound successfully. Split-thickness skin graft meshed 2:1 was used for patients with total scrotal skin loss.

Achieving satisfactory cosmetic results, normal voiding, and established sexual function were our goals in follow-up. Three patients lost follow-up and 2 died. Seven patients were followed routinely for 3 to 30 months. The comparison of the FGSI scores before and after the treatment was performed using Wilcoxon signed rank test.

RESULTS

All of the patients were men. The mean age of the patients was 58.2 ± 17.8 years (range, 18 to 85 years). The mean delay between the onset of the symptoms and hospital admission was 4.9 days (range, 1 to 10 days). Five (41.7%), 6 (50%), and 5 (41.7 %) patients had colorectal, urologic, and cutaneous lesions, and 4 (33.3%) patients had 2 underlying causes. Table 1 shows the patients' demographic and clinical

Table 1. Demographic and Clinical Characteristics of 12 Patients with Fournier Gangrene

Patients	1	2	3	4	5	6	7	8	9	10	11	12
Age, y	82	63	57	68	47	64	57	34	74	70	18	64
Etiology												
Colorectal							+	+	+		+	+
Urologic	+	+		+		+				+	+	
Cutaneous		+	+		+	+						+
Predisposing conditions												
Diabetes mellitus		+			+	+	+		+	+		
Alcoholism							+					
Trauma							+				+	
Previous surgery	+			+							+	
Clinical signs												
Edema	+	+	+	+	+	+	+		+	+	+	+
Erythema			+	+	+		+	+	+	+	+	+
Necrosis	+	+	+		+			+	+	+		+
Discharge	+			+	+	+		+	+	+		+
Crepitance		+			+	+	+	+	+			+
Fluctuance		+			+		+	+				
Blood urea nitrogen, mg/dL	45	108	36	61	18	20	25	11	22	29	11	18
Location of lesions												
Penile shaft	+	+		+		+			+		+	+
Scrotum	+		+	+	+	+	+	+	+	+	+	+
Perineum	+						+	+	+		+	+
Suprapubic		+				+			+	+		
Inguinal					+	+			+	+	+	
Thigh					+			+			+	
Urethra						+						
BSA involved with infection, %*	2.5	3	1	2	4.5	5	1.5	4.5	6	4.5	6.5	3
Concurrent illnesses												
Hypertension				+	+	+			+	+		
Urethral stricture/manipulation	+			+								
Malignancy		+										
Cerebrovascular accident						+						
Septicemia						+						
Pneumonia	+			+								
Perianal abscess							+	+	+		+	+

*BSA indicates body surface area.

Table 2. Clinical course and outcome in 12 patients with Fournier gangrene*

Patients	1	2	3	4	5	6	7	8	9	10	11	12
Diversion	+	+		+		+	+	+	+		+	
Surgical procedures						PP		PO		TO		
Surgical debridement	2	2	3	1	2	3	4	1	3	2	3	4
Reconstructive surgery			Meshed-STSG		Meshed-STSG				STSG		STSG	STSG
Primary closure						+	+	+		+		
Superficial thigh pouch						+	+	+		+		+
Hospital stay, d	19	14	40	11	24	17	29	36	30	11	38	30
FGSI at admission	5	11	2	4	1	5	7	0	5	2	2	6
FGSI at discharge	0	9	0	0	0	5	0	0	2	0	2	2
Mortality		+		+								

*PP indicates partial penectomy; PO, partial orchiectomy; TO, total orchiectomy; STSG, split-thickness skin graft; and FGSI, Fournier Gangrene Severity Index.

characteristics. Six patients (50%) had type 2 diabetes mellitus for a mean period of 4.7 years (range, 1 to 8 years), one of whom had concurrent metastatic transitional cell carcinoma of the bladder. One patient (8.3%) was alcoholic. None of the patients immunocompromised. One patient (8.3%) had a history of the local trauma to perineum because of electric perineal massage. Hypocalcaemia was diagnosed in all cases (100%). Involvement of the corpus cavernosum, episodes of vomiting, dysuria, pain, and fever were detected in 1 (8.3%), 1 (8.3%), 6 (50%), 9 (75%), and 8 (66.7%) patients, respectively. No patient complained of diarrhea.

Urine culture was positive for bacteria in 5 (41.7%) patients demonstrating infections with *Escherichia coli* and *Enterococcus faecalis*. Bacteremia with *Staphylococcus aureus* was detected in 1 patient. Tissue culture was positive in all patients demonstrating mixed gram-negative enteric, gram-positive cocci, and anaerobic microorganisms.

We carried out total penectomy, partial orchiectomy, and total orchiectomy for 3 patients (25%).

Colostomy, suprapubic diversion, and a mixture of both techniques were performed in 1 (8.3%), 4 (33.3%), and 3 (25%) patients. No diversion was done for the remaining 4 patients (33.3%). For repairing the scrotum, we created a thigh pouch for 5 (41.7%) and used skin grafts for 2 (16.7%) patients. A simple closure of the scrotal skin was done in 1 patient. No surgical reconstruction was performed for the 3 patients with scrotal lesion. For repairing the lesions in the groin, perineum, penis and suprapubic area, we used skin grafts for 5 patients and simple closure for 3 patients (Table 2). We had no cases of postoperative surgical complications. However, gastrointestinal bleeding, deep vein thrombosis, and pulmonary emboli occurred in 1 patient who died. Additionally, renal dysfunction secondary to sepsis and pneumonia developed in another patient that was treated successfully. One patient (8.3%) experienced postoperative necrotizing pneumonia and died. The mortality rate in this series was 16.7% (2 out of 12). Both patients who died had BUN levels over 50 mg/dL at presentation. Table 2 shows the FGSI scores in detail before and after the admission. The median FGSI scores before the admission and at discharge were 4.5 (range, 0 to 11) and 0 (range, 0 to 9), respectively ($P = .005$).

DISCUSSION

The clinical signs and symptoms of Fournier gangrene in our patients were similar to that explained in the literature.[2,5] After a nondistinctive prodromal period consisting of local discomfort and fever, typical presentations including crepitus, swelling, and erythema developed. In patients with severe clinical presentations, progression of the gangrenous process leading to malodorous drainage and sloughing in affected sites were present and resulted in the deterioration of the patients' conditions. Considering rapidity of the spread of the gangrenous area that is reported to be up to 2 cm/h to 3 cm/h, prompt diagnosis and appropriate emergent management seems to be vital.[2]

Although Laor and colleagues claimed that the interval between the onset of the disease and the hospital admission does not play an important role

in the prognosis and clinical outcomes, the mortality rate may increase in patients with a significant delay before the reference to the medical center.[3,6]

Anemia due to the lack of the functioning erythrocyte mass secondary to thrombosis and sepsis, elevated serum creatinine level, and hyponatremia were common in our patients. Hypocalcaemia, diagnosed in all cases of our study, seems to be secondary to the destruction of triglycerides by bacterial lipases and release of the free fatty acids that are chelators of the ionized form of the calcium.[7]

Both patients who died in our series had a serum BUN level higher than 50 mg/dL at presentation. These patients had also a significant hypoalbuminemia in their first laboratory studies. Clayton and coworkers found that survival of patients with necrotizing fasciitis was associated significantly with a BUN level of less than 50 mg/dL at presentation.[8] It is also suggested that hypoalbuminemia might be a noticeable factor for the prediction of the mortality rate.[6,9]

The BSA of involvement and number of the episodes of the debridement were not important factors for predicting the outcome in this series. In addition, because of the limited number of the cases studied in this series, the comparison of FGSI score between the survivors and died patients was impossible. However, this index seems to be an outstanding prognostic factor for the assessment of the outcome.[3] Lin and colleagues and also Yeniyol and colleagues demonstrated that a cutoff point of 9 for FGSI is appropriate for the evaluation of the therapeutic options and prediction of the mortality rate.[10,11]

Multiple predisposing factors leading to Fournier gangrene have been described in the literature including diabetes mellitus, local trauma, paraphimosis, periurethral extravasation of the urine, perirectal or anal infections, and surgeries such as circumcision or herniorrhaphy.[12] Although the majority of the patients presented in this series had diabetes mellitus (50%), other predisposing factors including previous surgeries (25%), trauma (16.6%), and alcoholism (8.3%) were also present. Since 50% of the patients in this series were nondiabetic, diabetes mellitus seems not to be a necessary underlying disease for Fournier gangrene. There is still controversy as to whether the coexistence of diabetes mellitus influences prognosis.[13]

Some published series have emphasized that hyperbaric oxygen therapy can be helpful for the management of Fournier gangrene. Limitations in the availability and transfer of the patients to units offering this service restrict its application for the patients with Fournier gangrene.[14,15] Consequently, we did not utilize hyperbaric oxygen therapy for our patients.

While traditional teaching holds that the testes are rarely affected in Fournier gangrene because of their independent blood supply, testicular involvement is a recognized complication. The rate of patients requiring orchiectomy for nonviable testes is up to 21% in some series.[15,16]

CONCLUSION

Fournier gangrene is a life-threatening fasciitis of the external genitalia, the perineum, or the abdominal wall with noticeable morbidity and mortality rates. Based on our finding, we can conclude that FGSI score as well as serum levels of calcium, albumin and BUN might be good predictors of the outcome.

CONFLICT OF INTEREST

None declared.

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