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Fournier's Gangrene: Experience with 147 Patients From A Single Surgical Unit and Identification of the Prognostic Factors

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ABSTRACT

BACKGROUND: Many studies are available in the literature regarding Fournier's Gangrene but this is a prospective analysis of patients with Fournier's gangrene in 147 patients in a single surgical unit in a period of 14 years.

METHODS: A prospective study of all patient of Fournier's Gangrene admitted in one surgical unit in a period of 14 years in a University Hospital in North East part of India and the etiology, predisposing factors, management outcome and predictors of mortality were analyzed.

RESULTS: Of 147 patients, two were females. Mean age of presentation was 48.4 years Source of infection was identified as scrotal (36), anorectal (29) or urogenital (27), but in 55 patients, source could not be identified. The predisposing factor were diabetes in 51 , alcoholism in 28, immunosuppression in 10, renal failure in 5, malignancy in 2 and portal hypertension in 1. In 50 patients, no predisposing factor could be identified. In 80 patients, the infection was polymicrobial with two to three microbes. Mortality rate was 20.4% (n=30) & mean hospital stay was 36.5 days (Range 11 to 68 days). Leukocytosis, low hemoglobin , increased serum creatinine, diabetes and involvement of perineum and abdominal wall were associated with increased mortality.

CONCLUSIONS: Fournier's gangrene is usually associated with underlying systemic disorder and frequently underlying source of infection is present. Leukocytosis, high creatinine, low hemoglobin, diabetes and involvement of perineum and abdominal wall are associated with increased mortality.

KEYWORDS Fournier's Gangrene, Prognosis, Mortality, Necrotizing fasciitis,Gangrene

INTRODUCTION:

Fournier's gangrene is a polymicrobial necrotizing fasciitis of genital, perianal or perineal region[1-3]. It is a fulminating, rapidly spreading infection of scrotum that progresses to involve perineum and abdominal wall[4-5]. The infective process leads to thrombosis of subcutaneous and cutaneous blood vessels including perforating vessels[6-8] resulting in gangrene of the overlying skin. It affects all ages and has been reported in both sexes and various etiological factors have been noted. Histological findings are obliterative endarteritis and thrombosis of the subcutaneous vessels, fascial necrosis and leukocytic infiltration. The basic treatment involves prompt excision of all non-viable tissue, limitation and abolition of any infective process, antibiotics and coverage of the defect[4,9,10].

First description of Fournier's gangrene dates back to 1883 by Jean Alfred Fournier in five young men with scrotal gangrene[11]. Sudden onset in healthy young adults and rapid progression without a definite cause were cardinal points of initial description. Now a day, disease is no longer considered to occur only in young, but elderly as well as infants as well as females have been affected with Fournier's gangrene[12].

Necrotizing fasciitis may be monomicrobial (Type 2) or polymicrobial (Type 1), but Fournier's gangrene is always due to mixed aerobic and anaerobic bacteria. Three to four organisms are commonly associated with each case[2,13]. Most common isolated organism is usually Escherichia coli followed by anaerobes. Source of infection may be either urogenital, anorectal or cutaneous. Classical triad of pain, swelling and systemic sepsis is very commonly noted. Aggressive resuscitation and repeated debridement with antibiotics are determinants of outcome.

We report our experience regarding etiology, predisposing factors, management and outcome of Fournier's Gangrene in one surgical unit at our institute during last fourteen years.

MATERIAL AND METHODS:

We reviewed all cases of Fournier's gangrene treated in our surgical unit of Department of General Surgery of a teaching university hospital of Northern India during last 14 years from 2002 to 2015. Some of these patients were initially treated at other health centers and later on referred to our department. The hospital records of all these patients were well maintained and analyzed for etiology, predisposing factors, management and outcome.

A protocol of early, adequate and scheduled debridement was followed with adequate physiological and nutritional support. Empirical broad-spectrum antibiotics with analgesics were initially used in all patients but modification was done as soon as culture and sensitivity report of microbes isolated became available.

Etiological agents as well as predisposing factors were record-

ed in each case. Area of involvement was taken into consideration.

Physiological parameters on hospital admission included heart rate, respiration rate, blood pressure and temperature. Total leukocyte count, differential leukocyte count, hemoglobin, serum creatinine, serum electrolytes (Na, K), and blood sugar were estimated.

Swabs for isolation of microbes and their sensitivity were done in all cases. Empirical broad-spectrum antibiotic was started in form of triple antibiotic (Cephalosporin/Ciprofloxacin + Aminoglycoside + Metronidazole) and was switched to antibiotics according to sensitivity of microbes isolated. Microbial results were analyzed according to type of infection- monomicrobial or polymicrobial , species of organisms isolated and their sensitivity pattern. All the wounds were debrided after maintaining the vitals. Number of patients requiring intensive care therapy with multiple organ support was also considered. Outcome variables included length of hospital stay and mortality.

RESULTS:

During a period of fourteen years from 2002 to 2015, a total of 147 patients of Fournier's gangrene were treated. 145 patients were male with age ranging from 19 to 88 years (Mean 48.4 years) while only 2 patients were female of 42 and 46 years. The various predisposing factors are shown in table 1 with the outcome of these patients as survivors or non survivors. Diabetes was the commonest predisposing factor in 51 patients (34.7%). Alcoholism was predisposing factor in 28 patients (19%), while 10(6.9%) patients were immunosuppressed. Five (3.5%) patients had renal failure, 2 (1.4%) had malignancy and portal hypertension in one (0.7%). In a significant number of patients (50) (34%), no predisposing factors could be identified. More than one predisposing factors were also noticed. Mortality was statistically significantly high in diabetics. Mortality rate was low in patients with no predisposing factors isolated as compared to other groups.

Scrotum was involved in all 145 male patients. In two female patients, perineum with labia were involved. Other involved areas included penis (Fig. 1), perineum, and abdominal wall. Scrotal (Fig. 2)and penile involvement had lower mortality rate as compared to perineal or abdominal wall involvement as shown in table 1.

Etiology

Source of infection could be identified in 92 cases. Scrotal/ dermatological source was commonest identified group with 36 patients (24.5%) followed by anorectal with 29 patients (19.7%) and urological with 27 patients (18.4%). In 55 patients(37.4%), source of infection could not be identified and they were categorized under idiopathic (Table 2). In two female patients source was anorectal abscess.

Bacteriology

Majority of the culture grew more than one bacteria (n= 80). Usually both anaerobes and aerobes were isolated. Most common organism isolated was *Escherichia coli* in 87 patients (n=59.2%). Other organisms isolated were *bacteroides, proteus, staphylococcus, enterococcus, streptococcus, pseudomonas, klebsiella, clostridium* as shown in Table 3. In 8 patients, no bacteria could be grown probably these patients were on long term antibiotics. Total organisms isolated in this series were 347.

Physiologic and Biochemical Parameters

Physiologic and biochemical parameters at the time of hospital admission are shown in Table 4. Physiologic parameters included systolic blood pressure, heart rate, temperature and respiration rate. Although mean systolic blood pressure, mean heart rate and mean temperature and respiration rate were different in both survivors and non-survivors, they were not statistically significant as shown in Table 4.

Mean WBC count was significantly higher in non-survivors (20,200 x 10^3/□L vs. 14,200 x 10^3/□L;). Slight difference in serum sodium, potassium was noticed in survivors and non-survivors, but difference was statistically not significant. Serum creatinine was significantly high in non-survivors (3.2 mg/dl Vs 1.3 mg/dl). Hemoglobin was low among non-survivors (8.2 gm/dl Vs 12 gm/dl). (Table 4)

Treatment

Out of 147 patients admitted with Fournier's gangrene, 143 (97%) were operated upon. Four patients (2.7%) expired during resuscitation after admission and therefore no surgical intervention could be done on them but all the blood parameters and culture swab was sent in these patients also. The mean time from admission to first debridement(Fig.3) varied from 6-24 hours. Mean number of procedures performed was 3.1. (2.3 for non survivors and 3.3 for survivors; $p< 0.10$). Intensive care support was taken in 36 patients (24.5%), 21 among nonsurvivors and 15 among survivors needed intensive care support.

Triple antibiotic therapy was used (cephalosporins/ciprofloxacin + aminoglycosides + metronidazole) in all cases and after the sensitivity report, the antibiotic was changed. There was no significant association between antibiotic used and adverse outcome. Urinary diversion was done in 93 patients by placing per urethral catheter in 86 and suprapubic trocar cystostomy in 7 patients. Fecal diversion by sigmoid loop colostomy was done in 4 patients .

Scrotal advancement closure was done in 43 patients, split skin grafting in 30 patients , placement of testis in thigh pouches in 18 patients , unilateral orchidectomy in 8 patients and bilateral orchidectomy in one patient followed by Primary closure, thigh flap in 8 patients, Gracilis flap in 2 patients, and Rectus abdominis myocutaneous flap in 2 patients. Two patients needed thigh flap as well as skin grafting. Orchidectomy was usually considered in patients with extensive scrotal and perineal skin loss with moribund status and age ≥ 70 years. Five patients did not agree for any surgery and their wounds healed by secondary intention taking on an average 108 days. Two patients died in hospital after the surgical closure of the wound because of diabetic coma in one patient and myocardial infarction in other case.

Outcomes

The overall mortality rate was 20.4% (n=30) in our study. Early deaths within 72 hours occurred in majority of the patients (20 patients) (66.7%) while remainder 10 mortalities (33.3%) between days 4 and 48. Mean length of hospital stay for nonsurvivors was 7.2 days Vs 38.7 days for survivors ($p<0.001$).

DISCUSSION:

In our study , 145 patients were male while 2 patients were female. This was perhaps due to underreporting of Fournier's gangrene from gynecologists. In females, Fournier's Gangrene is ten times less common than males due to better and effective drainage of secretions through vagina. In our series, geographical variation superimposed on underreporting from gynecologists lead to such study where only 2 females with Fournier's gangrene were found. Female Fournier's gangrene is caused by vulval or bartholin's abscess involving vulva or perineum[15-17]. It may also complicate episiotomy, hysterectomy, septic abortion, cervical or pudendal nerve blocks[16-17]. But in our two female patients, the cause of Fournier gangrene was anorectal abscess.

Diagnosis of Fournier's gangrene is entirely clinical and usual presenting features are pain, erythema, and swelling of scrotum, often associated with fever[9]. In early stages when clinical manifestations are not overt, diagnosis may be delayed. But conditions predisposing to Fournier's gangrene should be marked for early diagnosis and management. In our series, 51 cases of Fournier's gangrene were diagnosed as diabetic. Usual duration of symptoms range from 2 to 7 days

prior to hospitalization[9]. Cyanosis, blistering, bronzing and induration of skin are early signs[18]. Crepitus may be present in 50-62% of cases[9]. Pain subsides after onset of gangrene in most cases and diminishes in some cases. Patients admitted with sepsis and shock has profound systemic derangements as compared to small scrotal skin involvement. Shock, ileus, drowsiness, delirium, coma with progression to single or multiple organ failure may occur and is the usual cause of death in patients who succumb[18]. Patients with hemodynamic instability at the time of admission are more likely to deteriorate and die. Our four patients died immediately after admission because of hemodynamic instability.

Fournier's gangrene requires investigations mainly for detecting source of infection. Most cases present with classical clinical signs and symptoms pointing towards the diagnosis of Fournier's gangrene. Source of infection e.g. scrotal, anorectal or genitourinary can be detected from history and clinical examination, so role of investigations e.g. Ultrasound, Plain X-ray, CT scan, MRI is very limited for clinical diagnosis and finding source of infection in Fournier's gangrene. USG, X-ray, CT or MRI usually reveals scrotal gas and small para testicular collections[19-20].

The original description of Fournier's gangrene was in 5 young men with scrotal gangrene of sudden onset, rapid progression and absence of definite cause[11]. This presentation is exceptional in modern practice. The condition has been reported from infancy to old age including females[12,15,21]. Mean ages of patients has increased from 40 years in cases reported before 1945 to 50 years in more recent series[9,22]. Most striking change observed now are association of systemic disorder in almost all cases. At times it may be presenting feature of underlying systemic disorder. In literature Fournier's gangrene has been reported as presenting feature of diabetes[23], immunosuppression[24] or HIV[25]. In this series, 51 patients were diagnosed diabetics and 4 HIV infected.

Out of 147 patients, 51 patients(34.7%) were diabetic and 28 (19%) were alcoholic. In earlier reports diabetes was seen in 40-60% and alcoholism in 25-50% cases[2,26]. In one case, scrotal varices in a case of portal hypertension because of Budd Chiari syndrome was predisposing factor[27]. Other predisposing factors in our study were immunosuppression (chemotherapy, renal transplantation, postsplenectomy). One notable observation was absence of predisposing factor in 50 patients (34.7%). Usually young patients (30 patients) were without any predisposing factors. Etiology of Fournier's gangrene in our series was from scrotal / dermatological source in 36 patients (24.5%). Anorectal source of infection was detected in 29 patients (19.7%), while urogenital source in 27 patients (18.4%). Source of infection could not be ascertained in 55 patients. In patients with multiple systemic pathologies it is difficult to ascertain the source of infection.

Polymicrobial isolation suggests that no organism can be blamed definitely for Fournier's gangrene. Total organisms isolated in this series were 347. An average two to three microbes were isolated for each case. Organisms isolated are usually commensals below pelvic diaphragm presenting as opportunistic infections[28]. Most common organism isolated was Escherichia coli followed by Bacteriodes in 87 and 77 patients respectively (59.2% and 52.4%). Only 8 cases did not reveal organisms in culture in spite of offensive and discharging gangrene similar to other reports of sterile cultures even from fetid, offensive, discharging gangrene[29].

Our treatment plan comprised basic triad of aggressive hemodynamic stabilization, parenteral broad-spectrum antibiotics and urgent surgical debridement. Our protocol was aggressive and complete debridement of necrotic as well as doubtful tissues rather than waiting and watching or placing drains instead of debridement, which is usually associated with high mortality[30]. Urinary diversion for wound healing was done in 93 patients (63.3%) by placing per urethral catheter in 86 and suprapubic trocar cystostomy in 7 patients. Fecal diversion by sigmoid loop colostomy was done in 4 patients. After debridement, close observation of wound and clean dressings were strictly followed. Repeated debridement as required was done. One to five procedures were required with a mean of 3.1-procedures per patient. Earlier reports are of two to four procedures per patient [2,31].

In 9 patients, orchidectomy was done in patients with non-viable testis and elderly moribund patient. Orchidectomy is rarely required in Fournier's gangrene, but case reports of orchidectomy in upto 21% for nonviable testis has been reported[9]. We did not use either hyperbaric oxygen as therapy with hyperbaric oxygen therapy delays surgical debridement unnecessarily. So it should be reserved for patients remaining toxic in spite of maximal debridement and antibiotic therapy as well as isolation of anaerobes[9]. Although some retrospective studies claim about efficacy of hyperbaric oxygen therapy in Fournier's gangrene[32], this specific schedule needs further studies to clear the picture. Further at our institute we did not have the facility for hyperbaric oxygen therapy. Few authors have used vacuum assisted devices for the early closure of the wound but perineal area is a difficult area to put such device[33].

Large scrotal, perineal, abdominal wall defects required closure by advancement flap and split skin grafting. Scrotal advancement(Fig.4) and split skin grafting are most commonly used techniques for closure of wound and for covering exposed testis[9-10]. Adequate supportive measures in the form of parenteral nutrition, blood transfusion, assisted ventilation, renal replacement therapy were used according to need during hospitalization. We preferred enteral nutrition over parenteral nutrition.

Mortality rates may vary from 0 to 80% in Fournier's gangrene[22]. Factors increasing mortality are usually advanced age[4], delay in treatment[34] and primary anorectal infections[34]. Median extent of body surface area involved is an important predictor of mortality[34]. Survival was better in patients with only scrotal involvement as compared to perineal and abdominal wall involvement in our study. Diabetes and number of surgical procedures performed do not affect mortality despite some dispute in earlier reports[2,9,26] but we found that patients with diabetes has a higher mortality. HIV does not diminish chances of recovery[35] as all our HIV positive cases recovered completely. Morbidity is significant among survivors due to debilitated condition of patient as well as prolonged hospitalization. Overall mortality in this study is 20.4%. Early death was more within 3 days of hospitalization in two third of the non-survivors. Mean hospitalization stay was 7.2 days in non-survivors and 38.7 days in survivors.

Though Laor in 1995[36] published Fournier's Gangrene severity index taking into consideration of Respiration rate, Pulse rate, Temperature, WBC count, Hematocrit, Serum Creatinine, Serum sodium, potassium and bicarbonate which was confirmed by further studies[37-40]. But as all these parameters were not available in our patients so we looked into Respiration rate, Pulse rate, Temperature, Systolic Blood Pressure, WBC count, Hb%, Serum Creatinine, Serum sodium and potassium, and Blood sugar. Statistically significant predictors of mortality in this series were, leukocytosis, low hemoglobin, raised serum creatinine, and diabetes. Further the patients who had involvement of perineum and abdominal wall had higher mortality than the patient who had limited their diseases to scrotum only. Other physiologic parameters e.g. heart rate, respiratory rate, temperature and systolic blood pressure were deranged but did not predict increased mortality rate. Mortality rate for Fournier's gangrene has reduced to less than half as compared to pre-antibiotic era. Survival benefit of effective antibiotic is being masked by increased patient age at presentation, associated comorbidities and delayed intervention. Usually septic load on the body with toxic manifestations leads to pathway of septic shock culminating into multiple organ failure and ultimately death.

CONCLUSION:

Fournier's gangrene requires prompt clinical diagnosis and a high index of suspicion for early, timely and aggressive management. Only early and aggressive management reduces morbidity and mortality. Deranged biochemical and physiologic parameters leads to increased mortality, but low hemoglobin, leukocytosis, raised creatinine and diabetes are predictors of higher mortality in Fournier's gangrene.

Table1. Characteristic of patients with Fournier's Gangrene

Parameter	No. of patients (Percentage)			P value
Predisposing factors	All patients (n=147)	Survivors (n=117)	Non-Survivors (n=30)	
Diabetes	51 (34.7)	37 (72.5%)	14 (27.4%)	0.09
Alcoholism	28 (19.0)	24 (85.7%)	4 (14.2%)	0.27
Immunosuppression	10 (6.9)	7(70%)	3(30%)	0.33
Renal failure	5 (3.4)	3(60%)	2 (40%)	0.27
Malignancy	2(1.4%)	1(50%)	1(50%)	0.37
Portal Hypertension	1(0.7%)	1(100%)	-	0.78
No factor identified	50 (34.7)	44(88%)	6(12%)	0.0517
Area involved				
Scrotum	46 (31.9)	43 (93.5%)	3 (6.5%)	0.0029
Scrotum, penis	31(21.1)	28 (90.3%)	3 (10.7%)	0.0668
Scrotum, perineum	26 (17.6)	16 (61.5%)	10 (38.5%)	0.0156
Scrotum, penis, perineum	27 (18.4)	19 (70.3%)	8 (29.6%)	0.15
Scrotum, abdominal wall	15 (10.2)	9 (60.0%)	6 (40.0%)	0.0562
Labia and Perineum	2 (1.4)	2(100%)	-	0.63

Table 2: Etiology of Fournier's Gangrene

Etiology	No. of patients (Percentage)
Scrotal/Dermatological Boils Trauma Insect bile Eczema □□□□□□Fungal infection □□□□□□Filariasis Scrotal Varices (Budd Chiari Syndrome)	36 (24.5) 13 (36.1) 9 (25) 5 (13.8) 3 (8.3) 3 (8.3) 2 (5.5) 1 (2.7)
Anorectal □Anal abscess □Fistula-in-ano □□Malignancy □Ischio-rectal abscess □Appendicitis	29 (19.7) 7 (24.1) 7 (24.1) 7 (24.1) 5 (17.2) 3 (10.3)
Genitourinary □□□□□Stricture urethra Urethral dilatation □ Catheterization □ Renal abscess □ Urethral stone □ Urinary tract infection	27 (18.4) 9 (33.3) 5 (18.5) 2 (7.4) 3 (11.1) 3 (11.1) 5 (18.5)
Idiopathic	55 (37.4)

Table 3: Microbes isolated in Fournier's Gangrene

Microbiologic Findings	No. of patients (%)
Escherichia	87 (59.2)
Bacteriodes	77 (52.3)
Proteus	56 (38.1)
Staphylococcus	35 (23.8)
Enterococcus	33 (22.5)
Streptococcus	24 (16.3)
Pseudomonas	20 (13.6)
Klebsiella	10 (6.8)
Clostridium	5 (3.4)

Table 4: Mean Physiologic and Biochemical Parameters of Fournier's Gangrene Cases

Variant	All patients (n=147)	Survivors (n=117)	Non survivors (n=30)	P value
Physiologic Mean□Heart rate / min □Mean Temperature (^{0}C) □Mean Respiratory rate/min □Mean Systolic blood pressure mmHg	106.1 37.1 20.2 117.6	104.2 37.0 18.1 121.4	109.2 37.3 21.3 111.5	0.92 0.88 0.70 0.82
Biochemical □Mean WBC count x 10^3/□l Mean Haemoglobin (gm/dl) □Mean Creatinine (mg/dl) Mean Serum sodium (meq/L) □Mean Serum potassium (meq/L)	19.1 8.0 2.1 132.0 3.6	17.6 8.1 1.3 131.6 3.5	30.2 5.2 2.6 132.1 3.6	0.003 0.05 0.002 0.68 0.90

Fig. 1 : Fournier Gangrene involving penis only

Fig. 2 : Fournier Gangrene involving penis and scrotum

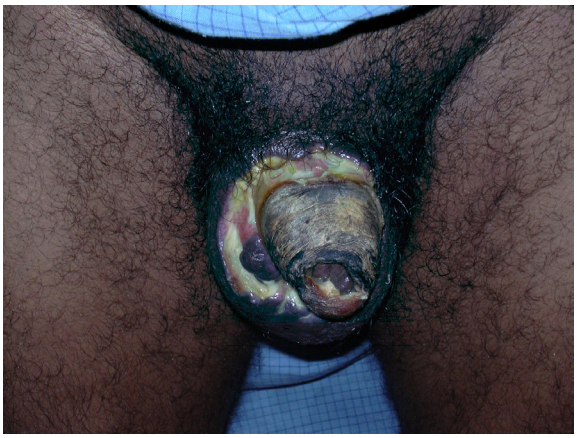

Fig. 3 : Bilateral hanging testis after debridement

Fig. 4 : Healthy granulation tissue ready for reconstruction

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