NECROTIZING FASCIITIS OF THE MALE GENITAL REGION – A REVIEW OF THE LITERATURE

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ABSTRACT:
FOURNIER'S GANGRENE (FG) IS AN ACUTE AND RARE, RAPIDLY PROGRESSIVE AND LIFE-THREATENING FASCIITIS OF THE PERINEAL, GENITAL AND PERIANAL REGION WHICH CAN SPREAD TO THE ABDOMINAL WALL AND THIGHS WHICH COMMONLY AFFECTS MEN OVER 50 YEARS OLD. THE MOST FREQUENT RISK FACTORS INVOLVED IN FG PATHOGENESIS ARE: DIABETES MELLITUS (20-70%) AND CHRONIC ETHANOL ABUSE (25-50%). PRIMUM MOVENS OF THIS DISEASE IS THE TRAUMA (ACCIDENTAL OR IATROGENIC) TO THE ANORECTAL AREA, UROGENITAL APPARATUS OR THE PERINEAL AND GENITAL SKIN. DESPITE ADVANCED MANAGEMENT MORTALITY IS STILL HIGH AND AVERAGES 20–30%, THUS EARLY DIAGNOSIS REMAINS IMPERATIVE AS RAPID PROGRESSION CAN LEAD TO SEPSIS AND MULTIORGAN SYSTEM FAILURE. THE DIAGNOSIS IS MADE MAINLY CLINICAL, BUT IMAGING STUDIES CAN BE HELPFUL TO DESCRIBE THE EXTENT OF THE DISEASE AND SHOULD, UNDER NO CIRCUMSTANCES, DELAY THE SURGICAL DEBRIDEMENT. THE LABORATORY RISK INDICATOR FOR NECROTIZING FASCIITIS SCORE CAN BE USED TO STRATIFY PATIENTS INTO LOW, INTERMIDIATE AND HIGH RISK FOR DEVELOPING FG AND THE FOURNIER'S GANGRENE SEVERITY INDEX CAN BE USED TO DETERMINE THE MORTALITY RATE. THE GOLD-STANDARD TREATMENT IMPLIES EXTENSIVE SURGICAL DEBRIDEMENT AND BROAD SPECTRUM ANTIBIOTIC THERAPY ASSOCIATED WITH VITAL FUNCTION SUPPORT THERAPY. THESE PATIENTS ARE OFTEN BEST APPROACHED IN A MULTIDISCIPLINARY TEAM, DUE TO THE FACT THAT THEY MAY NEED RECONSTRUCTIVE PROCEDURES IN THE FUTURE.
THIS REVIEW AIMS TO BRING THIS FULMINATING DISEASE WITH A DEVASTATING IMPACT ON PATIENT'S LIFE INTO THE LIGHT AND TO UNDERLINE THE IMPORTANCE OF ITS PROMPT MANAGEMENT. FOR THIS A THOROUGH SEARCH WAS CONDUCTED ON THE PUBMED AND UPTODATE DATABASES FOR ALL APPLICABLE RESEARCH.

KEY WORDS: FOURNIER'S GANGRENE, NECROTIZING FASCIITIS, SURGICAL DEBRIDEMENT, CLINICAL FEATURES

INTRODUCTION

Necrotizing fasciitis is an infection of the deep soft tissues that results in progressive destruction of the muscle fascia and overlying subcutaneous fat, that typically spreads along the muscle fascia, due to its poor blood supply. Muscles are generally spared, because of the generous blood supply. Necrotizing fasciitis may be divided into two microbiologic categories: polymicrobial (type I) and monomicrobial infection (type II).

Fournier's gangrene (FG) is an acute, rapidly progressive, potentially fatal, type I necrotizing fasciitis of the perineal, perianal or genital areas, commonly affecting men. Even though Baurienne first described FG in 1764 as an idiopathic, fatal necrotizing process of the male genitalia, the French venereologist, Jean Alfred Fournier, is more commonly associated with this disease. In an 1883 manuscript he described a fulminant gangrene of the scrotum and penis, in a series of 5 young males, but since then our understanding of the etiology and physiopathology of this disease has grown to reveal a more indolent nature and identifiable cause in the majority of cases[10]. Several

[10] Fournier JA, Jean-Alfred Fournier 1832-1914. *Gangrene foudroyante de la verge (overwhelming gangrene). Sem Med 1883*. Dis Colon Rectum. 1988; 31:984-8

terms hve been used, over the years, to describe this disease such as: periurethral phlegmon, streptococcal scrotal gangrene, phagedena, synergistic necrotizing cellulitis[11].

FG is rare condition, representing less than 0,02% of hospital adimissions, with an incidence of 1,6 cases per 100000 males per year. Sorensen et al showed a peak in incidence past the age of 50 years old, the incidence beeing directly proportional with diabetes prevalence as well as with aging[12]. The male:female ratio is about 10:1[13]. In a retrospective study including 1726 cases, Eke et al reported that between 1989-1998 there were approximately 97 cases diagnosed with Fournier's gangrene per year, with an overall mortality rate of 16%[14].

MAIN TEXT

ETIOLOGY

At the time it was first described, FG was considered an idiopathic entity, but with thorough investigations an underlying cause can be found in most cases. The most frequent sites from where the necrotizing fasciitis originates are the anorectal area (30-50%), followed by the urogenital apparatus (20-40%) and the perineal and genital skin (20%). The trauma of these regions (accidental or iatrogenic) has been identified in most cases as the primum movens of necrotizing fasciitis[5]. Morua et al reported that Bartholin gland or vulvar abscess, episiotomy, hysterectomy and septic abortion can be sites of origin for necrotizing fasciitis in women[15].

The most frequent risk factors involved in FG pathogenesis are: diabetes mellitus (20-70%) and chronic ethanol abuse (25-50%). Other risk factors mentioned in literature were: HIV, neoplasms, lympho-proliferative diseases, chronic corticosteroid treatment, cytotoxic medication. The common feature of all these comorbidities is the compromised immunity of the host, thus creating a favorable environment to establish infection[16].

Hyperglycemia, due to its adverse effects on phagocyte activity, chemotaxis and cellular adherence, has an important impact on the immune system. The small vessel disease and defective

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[12] Koukouras D, Kallidonis P, Panagopoulos C, Al-Aown A, Athanasopoulos A, Rigopoulos C, Fokaefs E,Stolzenburg JU, Perimenis P, Liatsikos E. *Fournier's gangrene, a urologic and surgical emergency: presentation of a multi-institutional experience with 45 cases*. Urol Int 2011, 86, 167–172

[13] Eke N. *Fournier's gangrene: a review of 1726 cases*. Br J Surg 2000; 87:718-28

[14] Morua AG, Lopez JAA, Garcia JDG, Montelongo RM, Guerra LSG. *Fournier;s gangrene: our experience in 5 years, bibliography review and assessment of the Fournier's gangrene severity index*. Arch Esp Urol. (2009), 67: 532-540

[15] E. Morpurgo and S. Galandiuk, *Fournier's gangrene*. Surgical Clinics of North America, 2002, 82, no. 6, pp. 1213–1224

[16] Nisbet AA, Thompson IM. *Impact of diabetes mellitus on the presentation and outcomes of Fournier's gangrene*. Urology. 2002; 60:775-9; Constantinoiu S, Bârlă R, Iosif C, Cociu L, Gîndea C, Hoară P, Bratu O, Ruşitoru L. *Difficulties in diagnosis and surgical treatment of a giant retroperitoneal lipoma*. Chirurgia 2009;104(3): 363-367; Diaconescu D, Stoian Pantea A, Socea L, Stanescu AM, Iancu M, Socea B, Pituru S, Bratu O, Diaconu C. *Hepatorenal Syndrome: A Review*. Archives of the Balkan Medical Union, 2018, 53(2), pag. 239-245; Socea B, Nica A, Bratu O, Diaconu C, Smaranda A, Socea L, Bertesteanu S, Dimitriu M, Carap A, Constantin V. *Incidental finding of a sigmoid intussusception associated with rectal prolapse-a case report.* Archives of the Balkan Medical Union, 2018, 53(1), p. 143-146; Socea B, Nica A, Smaranda C, Carâp A, Socea L, Dimitriu M, Bratu O, Moculescu C, Bertești eanu Ș, Constantin V. *Solitary cecum diverticulitis – A surprising diagnosis*. Archives of the Balkan Medical Union, 2017, 52(4), p. 467-470

phagocytosis present in diabetic patients, diabetic neuropathy, immunosupression have all been shown to have an impact on the relatively high incidence of FG in patients with diabetes[17].

In very few cases Fournier's gangrene was reported to be the first manifestation of diabetes in an undiagnosed diabetes mellitus patient[18].

The appearance of HIV virus in epidemic proportions has put at risk for developing FG a large percentage of the population. Human immunodeficiency virus destroys the host's immune system by invading CD4+ cells, which are a very important part of the immune response system, therefore making these patients more prone to develop FG. Elem et al reported that 4% of FG patients included into the study were HIV positive[19]. In a study conducted by Chazan et al FG was the initial presentation of HIV infection in a handful of patients[20].

Although the association of this disease with the abovementioned comorbidities is well documented in the literature, the Fournier gangrene may occur in rare cases in apparently immunocompetent patients.

PATHOPHISIOLOGY AND MOST COMMON INVOLVED MICROORGANISMS

An infection is caused by the imbalance between the host immunity and the virulance of the involved microorganism. The patient's immunodeficiency creates favourable conditions to start the infection. Inflammatory response is triggered by the presence of the infection with secondary obliterative endarteritis of the neighboring blood vessels. Thrombosis of the nutrient vessels with secondary reduction in blood flow to the region involved leads to tissue ischaemia, promoting further anaerobic bacteria proliferation, that may produce enzymes which lead to digestion of fascial barriers. Some authors believe that the polymicrobial ethiology of this disease is necesary to create the synergy of enzyme production that promotes rapid multiplication and spread of the infection[21].

The microorganisms usually involved are commensals of perineal skin and genital organs such as: Clostridia, Klebsiella, Streptococci, Coliforms, Staphylococci, Bacteroides and Corynebacteria. The most frequent isolated aerobic bacteria are E. Coli, Klebsiella pneumoniae and Staphylococcus aureus, while the most commonly isolated anaerobic microorganism is Bacteroides fragilis[22]. The disease has a multi bacterial etiology, both aerobes and anaerobes microorganisms may be present, recent studies reported that wound cultures from patients with FG

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showed an average of 4 different microorganisms per case. In very rare cases, fungi such as Candida Albicans and Lactobacillus Gasseri have been identified[23].

The infection in FG usually spreads along the fascial planes, due to the low blood supply in this area. Infection of the superficial perineal Colles fascia may spread to the penis and scrotum via Buck and Dartos fascia, or to the anterior abdominal wall via Scarpa fascia, or vice versa. The perineal fascia inserts itself laterally to the pubic rami and fascia lata and posteriorly to the urogenital diaphragm, limiting the progression of the disease in this directions. Some studies report a rate of fascial necrosis as high as 2-3 cm/h[24].

The testicles are often left unaffected, due to their blood supply from the abdominal aorta their involvement suggesting a retroperitoneal or intra-abdominal origin or spread of infection[25].

Even though thrombosis of the corpora cavernosum and spongiosum has been described, penis involvement is rare in FG, corpora are usually spared, while the skin of the penis sloughs off[26].

ASSESSMENT AND DIAGNOSIS

CLINICAL MANIFESTATIONS

The diagnosis of FG is primarily clinical. The Fournier Gangrene can have a very heterogeneous clinical presentation, from insidious onset with slow progression to a fulminant evolution with sudden debut. The most common clinical signs include swelling and sudden pain in the scrotum, purulence, wound discharge, crepitation (a common feature due to the presence of gas forming bacteria), fluctuance, prostration, pallor and fever greater than 38. Frequently the infection starts as a cellulitis adjacent to the portal of entry, most common in the perineum or perineal region. As the subcutaneous inflammation worsens, necrotic patches start appearing over the affected region progressing to necrosis. The region involved is usually dusky, swollen, covered by macerated skin, having a characteristic fetid odor[27].

In their review of 43 cases with FG, Ferreira et al found that the most frequent clinical manifestations were scrotal swelling, fever and pain. The mean interval between initial symptoms and arrival at the hospital was 5.1± 3.1 days[28]. In another 70 cases review, Ersay and his colleagues

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[23] K. Johnin, M. Nakatoh, T. Kadowaki, M. Kushima, S. Koizumi, and Y. Okada. *Fournier's gangrene caused by Candida species as the primary organism*. Urology, vol. 56, no. 1, article 153, 2000; M. Tleyjeh, J. Routh, M. O. Qutub, G. Lischer, K. V. Liang, and L. M. Baddour. *Lactobacillus gasseri causing Fournier's gangrene*. Scandinavian Journal of Infectious Diseases, vol. 36, no. 6-7, pp. 501–503, 2004; M. Safioleas, M. Stamatakos, G. Mouzopoulos, A. Diab, K. Kontzoglou, and A. Papachristodoulou. *Fournier's gangrene: exists and it is still lethal*. International Urology and Nephrology, vol. 38, no. 3-4, pp. 653–657, 2006

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[25] J. A. Campos, J. A. Martos, R. Guti´ errez del Pozo, and P. Carretero. *Synchronous caverno-spongious thrombosis and Fournier's gangrene*. Archivos Espanoles de Urologia, vol. 43, no. 4, pp. 423–426, 1990

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[28] Ersay, G. Yilmaz, Y. Akgun, and Y. Celik. *Factors affecting mortality of Fournier's gangrene: review of 70 patients*. ANZ Journal of Surgery, vol. 77, no. 1-2, pp. 43–48, 2007

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found that usually patients were presenting with perineal/scrotal pain (79%), tachycardia (61%), purulent discharge (60%), crepitus (54%) and fever (41%)[29].

Patients can rapidly deteriorate due to sepsis and multiorgan failure, the most common cause of death in these cases. The presence of severe sepsis on admission has been associated with very high mortality, as well as the volume of necrosis. A patient with a gangrenous area less than 3% of the body surface rarely dies, whereas patients having gangrene in more than 5% of the body surface have worse prognosis[30].

LABORATORY STUDIES

Although the diagnosis of FG is most commonly made clinically, laboratory studies are invaluable in risk stratification and prediction of mortality. Usually the following studies are indicated in patients with FG: CBC with differential count, electrolytes, BUN, creatinine, blood glucose levels, acidosis with hyperglycemia or hypoglycemia may be present, ABG sampling for a more accurate assessment of acid/base disturbance, blood and urine cultures, disseminated intravascular coagulation (DIC) panel (coagulation studies, fibrinogen/fibrin degradation product levels) to find evidence of severe sepsis, cultures of any open wound and abscess.

Value	LRINEC score points
C reactive protein, mg/L	
<150	0
>150	4
WBC count, cells/mm³	
<15	0
15-25	1
>25	2
Haemoglobin level, g/dL	
>13.5	0
11-13.5	1
<11	2
Sodium level, mmol/L	
≥ 135	0
< 135	2
Creatinine level, mg/dL	
≤ 1.6	0
> 1.6	2
Glucose level, mg/dL	
≤ 180	0
> 180	1

Table I – The Laboratory Risk Indicator for Necrotizing Fasciitis

[29] Altarac S, Katusin D, Crnica S, Papes D, Rajkovic Z, Arslani N. *Fournier's Gangrene: etiology and outcome analysis of 41 patients*. Urol Int, 2012, 88: 289-293

[30] Janane A, Hajji F, Ismail T, Chafiqui J, Ghadouane M, Ameur A et al. *Hyperbaric oxygen therapy adjuctive to surgical debridement in management of Fournier's gangrene: usefulness of a severity index score in predicting disease gravity and patient survival*. Actas Urol Esp, 2011, 35: 332-338; Wong CH, Khin LW, Heng KS, et al. *The LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections*. Crit Care Med. 2004; 32:1535-41

The Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) (Table I) has been highlighted in the literature as a robust laboratory measurement score capable of differentiating necrotizing fasciitis from other soft tissue infections enabling early intervention, strifying patients into low, moderate or high risk for necrotizing soft tissue infections[31]. A LRINEC score of 6 should raise the suspicion of necrotizing fasciitis among patients with severe soft tissue infections, and a score of 8 or more is strongly predictive of this disease.

More specific to FG the Fournier's gangrene severity index (FGSI) (Table II) is a numerical scoring system put forward by Laor and his colleagues in 1995, to determine patients outcome and mortality. It was based on 9 physiological parameters recorded at admission (temperature, heart and respiratory rate, potassium, sodium, serum creatinine and bicarbonate, hematocrit and leucocytes) and the degree of derivation from normal is graded from 0 to 4. The individual values are summed to obtain the FGSI score. A score >9 has 75% of death and patients with a score <9 were associated with 78% of survival[32].

Physiologic Variables	*High Abnormal Values*				*Normal*	*Low Abnormal Values*			
	+4	*+3*	*+2*	*+1*	*0*	*+1*	*+2*	*+3*	*+4*
Temperature (c)	> 41	39-40.9		38.5-39	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	266-159	350-354	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		< 3.5
Serum Creatinine (mg/100/ml*2 for acute renal failure)	> 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 (Total/ mm*1000)	> 40		20-39.9	15-19.9	3-14.9		1-2.9		< 1
Serum Bicarbonate (Venous, mmol/l)	> 52	41-51.9		32-40.9	22-31.9		18-21.9	15-17.9	< 15

Table II - Fournier's gangrene severity index score

IMAGING STUDIES

Plain radiographs, ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI) may demonstrate air in the soft tissue planes as well as help determine the extent

[31] E. Laor, L. S. Palmer, B. M. Tolia, R. E. Reid, and H. I. Winter. *Outcome prediction in patients with Fournier's gangrene*. Journal of Urology, vol. 154, no. 1, pp. 89–92, 1995

[32] Smith GL, Bunker CB, Dinneen MD. *Fournier's gangrene*. Br J Urol. 1998; 81:347-55

of the disease. Under no circumstances should the use of imaging tools delay the surgical intervention[33].

Plain films can help to detect the presence of gas in the soft tissue overlying the scrotum or perineum, before clinical crepitus can be detected. Subcutaneous emphysema can extend from the perineum and external genitalia to the inguinal regions, thigh and anterior abdominal wall. Smith et al found that 90% of patients with Fournier's gangrene had subcutaneous emphysema. The presence of subcutaneous air is not pathognomic but should increase the index of suspicion for FG[34].

Ultrasonography (US) can detect thickened, edematous scrotal wall, with hyperechoic foci with a posterior acoustic shadow representing gas within the scrotal wall. Morrison and his colleagues stated that, with very high sensitivity, the diagnosis of Fournier's gangrene can be made with bedside ultrasound[35]. US is superior to radiography because it can differentiate a soft-tissue necrotizing infection from other scrotal pathology.

Computed tomography (CT) in FG can identify soft tissue thickening, inflammation and subcutaneous emphysema, along with fluid collections or abscess formation. The main role of CT in this disease is to identify the origin of the necrotizing fasciitis and to evaluate the extent of the disease to guide the surgical debridement[36].

Magnetic resonance imaging (MRI), even though it yields greater soft tissue detail than the other imaging modalities, it is less used because of its limited availability in many hospitals as well as longer scan time. MRI can show subcutaneous emphysema, scrotal wall thickening and fluid accumulation.

THERAPEUTICAL MANAGEMENT

The cornerstones of the management of this disease are urgent patient resuscitation (fluids, blood transfusions and albumin and vasopressors in patients who present with shock to improve hemodynamics), broad-spectrum antibiotic therapy and surgical debridement of all necrotic tissue[37].

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[33] Draghici T, Negreanu L, Bratu O, Tincu R, Socea B, Iancu M, Stanescu AM, Diaconu C. *Liver abnormalities in patients with heart failure*. Archives of the Balkan Medical Union, 2018, 53, (1), p. 76-81; Paraschiv B, Dediu G, Iancu A, Bratu O, Diaconu C. *Superior vena cava syndrome*. Archives of the Balkan Medical Union, 2017, 52(1), p. 39-43; Mititelu R, Bratu O. *Radionuclide Imaging. An Update on the Use of Dynamic Renal Scintigraphy*. Modern Medicine, 2017, 24(4), p. 199-203; Niculae A, Peride I, Vinereanu V, Rădulescu D, Bratu O, Geavlete B, Checheriță IA. *Nephrotic syndrome secondary to amyloidosis in a patient with monoclonal gammopathy with renal significance (MGRS)*. Rom J Morphol Embriol 2017;58(3): 1065-1068

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[35] Kabay S, Yucel M, Yaylak F, et al. *The clinical features of Fournier's gangrene and the predictivity of the Fournier's Gangrene Severity Index on the outcomes*. Int Urol Nephrol 2008; 40:997-1004

[36] Kabay S, Yucel M, Yaylak F, et al. *The clinical features of Fournier's gangrene and the predictivity of the Fournier's Gangrene Severity Index on the outcomes*. Int Urol Nephrol 2008; 40:997-1004

[37] Diaconu CC, Stănescu AMA, Pantea Stoian A, Tincu RC, Cobilinschi C, Dragomirescu RIF, Socea B, Spînu DA, Marcu D, Socea LI, Bratu OG. *Hyperkalemia and cardiovascular diseases: new molecules for the treatment*. Rev Chim (Bucharest) 2018, 69(6):1367-1370; Manea M, Marcu D, Pantea Stoian A, Gaman MA, Gaman AM, Socea B, Neagu TP, Stanescu AM, Bratu O, Diaconu C. *Heart failure with preserved ejection fraction and atrial fibrillation. A review*, Revista de chimie, 2018, 69(11): 4180-4184; Diaconu CC, Manea M., Iancu MA, Stanescu AMA, Socea B, Spinu DA, Marcu D, Bratu OG. *Hiponatremia in patients with heart failure: a prognostic marker*. Revista de Chimie.

Extensive surgical debridement

The early and radical removal of necrotic and devitalized tissue is the crucial step in halting progression of the infection. Kabay and his colleagues in their 72 cases retrospective study stated that a time delay in surgical debridement was associated with significant mortality[38]. Debridement of the deep fascia and underlying muscle is not neccesary, these structures rarely beeing involved. Strict observation of the wound and multiple debridements are necessary for a proper control of the infection. Chowla et al have shown that to control the infection, an average of 3.5 debriedements per patient are required[39]. Debridement should be stopped when separation of the skin and the subcutaneous is not perform easily. Although testicles are rarely involved, studies have found that 27% of the patients needed orchiectomy.

Broad-spectrum antibiotic coverage

Untill culture results empiric broadspectrum antibiotic therapy should be instituted as soon as possible. The antibiotic chosen should be active against staphylococci and streptococci, gram-negative, coliforms, pseudomonas, bacteroides and clostridium. Third generation cefalosporins or aminoglycosides, plus penicillin and metronidazole can be used, usually in the clasically triple therapy. Linezolide, daptomycine, and tigecycline can be used in cases with previous hospitalizations with prolonged antibiotic therapy which may lead to resistant bacteroides. The use of carbapenems and piperaciline-tazobactam is suggested in the new clinical guidelines, this drugs having a larger distribution and lesser renal toxicity in comparison to aminoglycosides. If there is a fungal etiology suspected then Amphotericin B will be associated[40].

Plastic reconstruction

Because of the extensive surgical debridement it can result in large scrotal, perineal and abdominal defects. The choice of surgical reconstruction is based on the characteristics of the defect, that is, the size, location and depth as well as the availability of local tissue[41]. The techniques that have been described are local skin flaps, split-thickness skin grafts, fasciocutaneous perforator flaps and myocutaneous flaps. Primary closure of the wound is the closest to the result of an ideal reconstructive technique, meaning a single procedure, yield optimal function, a natural appearance of the wound and minimal post-operative and donor site complications. The only disadvantage of the primary closure is that is only useful in small to medium sized lesions.

Scrotal advancement flaps are are suitable in small-medium sized defects, providing coverage from local scrotal tissue. Ferreira et al, in their recent review of 43 reconstructive cases

2018. 69; 5:1071-1074; Diaconu CC, Dragoi CM, Bratu OG, Neagu TP, Pantea Stoian A, Cobelschi PC, Nicolae AC, Iancu MA, Hainarosie R, Stanescu AMA, Socea B. *New approaches and perspectives for the pharmacological treatment of arterial hypertension*. Farmacia 2018, 66(3):408-415

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revealed the need for scrotal reconstruction in 93% of the cases[42]. Advancement flaps have been used to repair scrotal deficits up to 96 cm^2 [43]. The higher tension in the flap may compromise the blood supply leading to wound edge necrosis and flap failure.

Full-thickness skin grafts (FTSGs) are thought to provide better results than spli-thickness skin grafts (STSGs), however the later are preferred. Four cases of scrotal reconstruction by STSGs were described by Maguina et al, that showed efficiency and effectiveness of this method by the reduction in recovery time and excellent functional and aesthetic results. Bleeding, shearing and infection have been reported as postoperative complications of scrotal skin grafting. Chen et al applied STSG, with good clinical and cosmetic results, to nine patients, recommending this technique in scrotal defects with abdominal wall involvement[44].

In cases of radical debridement and deep pocket formation, especially in the perineal region, a muscle flap is the recommended reconstructive procedure. The close proximity of the gracillis muscle to the perineal region and its highly vascularized tissue providing a greater resistance to wound contamination, make the technique ideal for this region. Ioannovich et al and Tremp and his colleagues reported successful functional and esthetic outcomes after gracilis myocutaneous flap reconstruction of the scrotum and perineum[45].

Surgical adjuncts such as fecal and urinary diversion, where continuous contamination would affect wound healing, vacuum assisted closure, topical agents (sodium hypochloride solutions, povidone iodine dressings, fibrin glue) and hyperbaric oxygen therapy have all been used with great results.

CONCLUSION

The Fournier Gangrene (FG) is severe and rare necrotizing fasciitis of the external genitalia, perineal and perianal regions, which occurs primarily in diabetic and immunodepressed patients. It is an aggressive disease with a very high destructive potential and a high mortality rate of 20-30% through sepsis and multiple organ failure. It is a urological surgical emergency, whose diagnosis is mainly clinical and which, despite medical and surgical advances, remains with high mortality and morbidity rates. The aggressive nature and high destructive potential requires a rapid clinical diagnosis and promt extensive surgical debridement associated with broad spectrum antibiotic therapy. A multidisciplinary approach is often needed as these patients may require reconstructive procedures in the future.

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