The features and aetiology of Fournier's gangrene

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Summary: This paper reports a clinical study of 20 cases of gangrenous ulcers of the scrotum and/or of the penis (Fournier's gangrene) and a review of previous publications. Even though found mostly in elderly male patients, the disease spares no age group and can involve the external genitalia in neonates and women as well. The disease is a necrotising fasciitis of infective origin and always has a portal of entry of the infecting organisms even though it may be so trivial as to be undetected. The commonest portals of entry of infection are periurethral sepsis, groin wound sepsis, anorectal sepsis, prostatic sepsis and trauma. The infecting organisms comprise both aerobic and anaerobic organisms such as *Escherichia coli*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Proteus mirabilis*, enterococci, *Bacteroides fragilis* and anaerobic streptococcus. Fournier's gangrene is probably the same disease as necrotizing fasciitis occurring in other parts of the body, but modified by the peculiar anatomy of the genitoperineum.

Introduction

In 1843 and 1844 Alfred Jean Fournier described cases of scrotal gangrene in France.^{1,2} He called the condition idiopathic scrotal gangrene since he could not determine the aetiology. Rather than searching diligently for the aetiology, clinicians have been content in also calling it idiopathic scrotal gangrene or Fournier's gangrene.^{3–5} Those who attempt to search for the aetiology are told that those for which the aetiology can be found are not Fournier's gangrene or simply that gangrenous conditions of the scrotum are not Fournier's gangrene.

This prospective study of 20 consecutive cases of Fournier's gangrene and literature review is aimed at resolving some of the controversy, and defining the features and aetiology of Fournier's gangrene.

Patients and methods

Twenty consecutive cases of gangrenous ulcers of the scrotum and/or of the penis (Fournier's gangrene) managed by the author from January 1983 to June 1991 are the subject of this prospective study. The patients' age and sex, and the site, extent and

origin of the ulcers were sought and documented. The patients' social class, nutritional status, associated illness and constitutional disturbance were also investigated. Foci of infection in their perineum and anorectal regions were sought. Blood was taken for fasting sugar, haemoglobin, white cell total and differential counts and from 1988 human immunodeficiency virus (HIV) serological status was determined.

Results

A total of 20 cases was studied. The patients' ages ranged from one month to 80 years and all were males. The patients were all from the lowest socioeconomic group. They were either malnourished or had borderline nutritional status. Apart from one patient who had congestive cardiac failure, there was no evidence of systemic illnesses such as diabetes mellitus or chronic renal failure, and none had any major constitutional disturbance. Those tested for HIV antibodies were negative. Their haemoglobin concentrations ranged from 7–10 g/dl. White blood cell counts ranged between 6 and 16 × 10⁹/l.

Sixteen cases had gangrene involving the scrotum alone, two cases involved both the scrotum and the penis, while two cases involved the penis alone. The aetiological factors elicited were groin wound sepsis in eight cases (40%), lower obstructive uropathy in six cases (30%), filarial penoscrotal lymphoedema in four cases (20%) and trauma in two cases (10%) (Table I).

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This paper was read at the 25th Biennial Congress of the International College of Surgeons in Cairo in November 1992.

Accepted: 28 February 1994

Table I The aetiology of 20 cases of Fournier's gangrene in Calabar

Aetiology	No. of cases
<i>Lower obstructive uropathy</i>	
Urethral stricture	3
Urethral stricture + watering can scrotum	2
Traumatic urethral catheterisation	1
<i>Groin wound sepsis</i>	
Strangulated inguinoscrotal hernia	4
Strangulated Richter's hernia + faecal fistula	1
Infected suprapubic cystostomy	3
<i>Filarial penoscrotal lymphoedema</i>	
Onchocerciasis	3
? Bancroftian	1
<i>Trauma</i>	
Scratching of the scrotum (congestive cardiac failure)	1
Corrugated-rubber drain applied to scrotum	1

The organisms cultured were *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, enterococci, *Streptococcus pyogenes* and *Staphylococcus aureus*. Some organisms were cultured from more than one patient while some patients grew a mixture of organisms. Only in a few instances were single organisms cultured.

Discussion

Fournier's gangrene and necrotizing fasciitis are one and the same disease. Whereas Fournier in 1843 and 1844 described it as idiopathic and in relation to the scrotum, many authors described the disease with various other names and in relation to various parts of the body.⁵⁻²⁷ Hence Meleney in 1924 described it in relation to haemolytic streptococcus^{28,29} and Cullen in 1924 also described it in relation to bacteria acting in synergism on post-operative abdominal wound infection.²⁹ It was not until 1952 that Wilson eventually introduced the term necrotizing fasciitis³⁰ that the true nature of this disease became apparent. It is an infective gangrene which involves the subcutaneous fascia and part of the deep fascia and may involve any part of the body, even though it tends to have a predilection for the genitoperineum, lower abdominal wall and upper thigh. Various organisms are involved and these depend on the patient and the part of the world. Both aerobic and anaerobic organisms are involved and tend to act in synergism.¹⁸

At the outset there is pain, oedema and redness of the skin, and later dusky discoloration and then

Table II The aetiology of Fournier's gangrene

Idiopathic	Reference
Undetermined origin	Fournier ^{1,2} Mair ³ Thomas ^{4,5}
<i>Infection</i>	
Urethral and perianal sepsis	Fahal ⁶ , Wholach ⁷
Urogenital sepsis	Octavio ⁸
Anorectal sepsis	Hirn ⁹
Intersphincteric abscess	Jaimieson ¹⁰
Prostatic massage	Sengoku ¹¹
Gram-negative synergistic organisms	Leenen ¹²
Pyoderma gangrenosum	Baskin ¹³
Perirectal abscess	Lamb ¹⁴
<i>Mechanical lower obstructive uropathy</i>	
Advanced periurethral extravasation	Gray ¹⁵
Urethral stricture	Bahlmann ¹⁶
Urethral calculus	Walker ¹⁷
Urethral lithiasis	Campos ¹⁸
<i>Trauma</i>	
Scrotal trauma	Hirn ⁹
Male sterilization	Pryor ¹⁹
Traumatic urethral catheterization	Conn ²⁰
<i>Vascular pathology</i>	
Hypersensitivity vasculitis	Sohn ²¹
Thrombosis of penile vessels	Campos ¹⁸
Thrombosis	Edington ²²
Arteritis nodosa	Efem ²³
<i>Metabolic disorders</i>	
Diabetes mellitus	Lok ²⁴ , Aasen ²⁵ , Octavio ⁸
Alcohol abuse	Aasen, ²⁵ Wolach ⁷
<i>Lymphatic obstruction</i>	
Filarial lymphoedema	Edington ²² , Davey ²⁵
<i>Strangulated groin hernia</i>	
Strangulated Richter's hernia	Efem ²³

blistering before ulceration. Even before ulceration there is subcutaneous necrosis and severe toxæmia requiring aggressive antibiotic therapy, incision, drainage and debridement. On account of lack of subcutaneous fat in the scrotum, necrosis of fascia containing the Dartos leads of exposure of the testis which may be coated with a thick layer of creamy pus. The testes are usually spared by the fact that the blood supply is intact, being derived from the abdominal aorta at the level of the second lumbar vertebra. The muscle layer of the penis is also usually spared, thus the skin sloughs off leaving the muscles. However, Campos *et al.*¹⁸ described a case of Fournier's gangrene following synchronous cavernosopigous thrombosis secondary to urethral lithiasis.

The disease is common in the older age group

and uncommon in children and adolescents. It has, however, been described in neonates and infants.^{31,32} Even though rare it occurs in females and it usually involves the labia majora.³³

Fournier's gangrene is primarily an infective condition and has several predisposing comorbid and aetiological factors, and several portals of entry of the infecting organisms. These organisms include *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, enterococci, *Bacteroides fragilis*, anaerobic streptococcus and others.^{6,7,18} These are identical to the organisms isolated in this study. The usual predisposing aetiological factors are diabetes mellitus, alcohol overindulgence, thrombosis, urethral obstruction and various causes^{22,23} of perineal sepsis (Table II). The usual portals of entry include urethral sepsis, genital sepsis, prostatic sepsis, perianal sepsis, ischiorectal abscesses, trauma, perianal wound sepsis, etc.⁶⁻¹⁸

The incident leading to the inoculation of organism that leads to this rapidly fatal condition may be so trivial that the patient or even the attending clinician fails to notice it. For example, scratching of the scrotum enlarged and stretched by onchocerciasis may inoculate organisms into the skin which leads to cellulitis which progresses to

Fournier's gangrene. Other examples of causes are urethral catheterization,²⁰ prostatic massage²¹ and vasectomy.¹⁹

Similarly, Lamb and Juler in California were able to identify all the portals of entry in all the 12 cases of Fournier's gangrene seen in their hospital: in five cases infection originated from perirectal infection, four from surgical procedures and three from urethral sepsis.¹⁴ Again, Asfar *et al.* in their description of 16 cases of necrotizing fasciitis, eight of which were Fournier's gangrene, identified all the predisposing comorbid and aetiological factors, namely, diabetes mellitus (six cases), perianal abscess (three cases), chronic renal failure (three cases), balanitis, perforated adenocarcinoma of the sigmoid colon and ischaemia of both legs (one case each).³⁴

In conclusion, Fournier's gangrene is a necrotising fasciitis of the genito-perineum of infective origin and is essentially the same disease as necrotising fasciitis in any other part of the body, its peculiarity being determined by the anatomy of the region. It is never idiopathic. When the aetiology is not found, it only means that the clinician is unable to determine the aetiology by virtue of the fact that the portal of entry may have been so trivial as to be overlooked.

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