

Coverage of External Genitalia and Perineal Defects after the Fournier's Gangrene

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ABSTRACT

Introduction: We report the experience of the National Center of Burns and Plastic Surgery of Ibn Rochd University Hospital of Casablanca in the coverage of defects secondary to Fournier's gangrene.

Materials and Methods: We retrospectively collected and analyzed clinical, therapeutic, and scalable data of patients referred for perineal coverage after Fournier's gangrene, during a period of 3 years (from January 2018 to December 2020), including age, gender, medical background, Charlson comorbidities index; cause, period of coverage, Performance Status score, the extent of the defect and affected sites, Anesthesia, Surgical technique, and post-operative suites.

Results: 46 patients were identified: 43 males (93%) and 3 females (7%); mean age was 53 years. Diabetes was the most common comorbidity (58%). The major cause was proctologic (60.9%). The average consultation time was 44.15 days. The patients presented with defects measuring between 4 cm² and 800 cm², mostly affecting the scrotum (80%). Several surgical techniques have been employed and added together, depending on the extent and topography of the defect. 20 were treated by suturing due to sufficient skin laxity, 13 were covered by skin grafting of the penis and/or for an extensive and/or oozing defect. 20 were covered by a scrotal advancement flap for a defect not exceeding half of the scrotum. The fascio-cutaneous flaps, namely the VY advancement flap was performed in 14 patients (uni or bilateral), and the medial thigh flap which was performed in 3 patients, for defects involving the perineum and/or more than half of the scrotum. Seven patients (15.21%) presented coverage technique complications.

Conclusion: Adequate coverage of the perineum and external genitalia after the Fournier's gangrene prevents functional sequelae and reduces aesthetic sequelae.

Keywords: Coverage, flap, Fournier's Gangrene, graft, suture.

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I. INTRODUCTION

Fournier's gangrene (FG) is a rapidly evolving necrotizing fasciitis, involving the soft parts of the perineum and external genitalia, resulting from a polymicrobial infection whose source may be genitourinary, colorectal, or cutaneous, and which is potentially lethal [1]-[3]. It mainly affects men of all ages, exceptionally women [4], [5]. It is a medico-surgical emergency, initially treated by antibiotics and debridement of necrotic tissue [1], [5]. Its surgical debridement leaves more or less extensive defects (perineum, scrotum, penis, thigh, abdominal wall, etc.),

which subsequently require skin coverage [1], [2], [6]. FG is the most common cause of genital skin defects [8].

The objective of the coverage is to restore an environment that does not compromise the quality of sexual intercourse, as well as the reproductive function of the testicles, and finally to have an acceptable aesthetic appearance [6]. There are multiple choices of a therapeutic procedure, guided by the clinic and the experience of the surgical department [5], [7].

Our study aims to report the experience of the National Center of Burns and Plastic Surgery of Ibn Rochd University Hospital of Casablanca in the coverage of defects

following FG by different means (directed wound healing (DWH), sutures, skin graft (SG), flap).

II. MATERIALS AND METHODS

This is a retrospective study over a period of 3 years (from January 2018 to December 2020), during which we received 46 patients, having been initially treated for FG by urologists and/or visceral surgeons, and referred after the septic phase, for perineal coverage, to the department of plastic and reconstructive surgery of Ibn Rochd University Hospital of Casablanca. These patients had skin and/or soft tissue defects or testicular exposure that could not heal by DWH. All means of coverage were used and combined for most of our patients (suture, SG, scrotal advancement flap, fasciocutaneous pudendal thigh flap, and anterolateral thigh flap). Myocutaneous flap was not performed due to lack of indication.

We included in the study, all patients who had been referred to the plastic surgery department for FG of any cause after having passed the septic phase, patients of all ages, all sexes, regardless of the therapeutic methods used, and whose records are usable. Patients lost to follow-up were not included in our study.

Data collection is done using medical records and operating room logs on an operating sheet including the various data:

- Clinical data: including gender, age, medical background, Charlson comorbidities index; cause of FG, period of coverage, Performance Status score, extent of the defect, and affected sites (cm²);

- Data related to the surgical procedure:

- Anesthesia;
- Surgical technique: suture, DWH, SG, flap;
- Post-operative follow-up: complications, Clavien-Diend classification;

All data were collected and analyzed using Microsoft Excel® for Mac 2017, version 11.3 (20E232).

III. RESULTS

46 patients were identified: The male gender largely dominated our series (93%) with a sex ratio of 14M/1F. The mean age was 53 years with extremes ranging from 30 to 76 years. 27 patients (58%) had diabetes, which was the most common comorbidity. The other comorbidities were mainly represented by cardiovascular diseases. The average Charlson index in our series was 2.

The major cause of FG was proctologic (anal suppurations, hemorrhoids) (60.9%), urological and dermatological causes were found in 30.4% and 8.7% of cases, respectively. The consultation time between the septic phase and the covering procedure varied between 21 and 90 days with an average of 44.15 days. The average Performance Status was 2 with extremes ranging from 1 to 3.

Patients had skin and/or soft tissue defects or testicular exposure that could not heal by DWH. The patients presented with defects generated by the infectious process and by the debridement. The defects measured between 4

cm² and 800 cm², mostly affecting the scrotum (80%). Other sites affected: penis, perineum, groin and pubic region, pubis, and the inner thighs.

All patients benefited from a regular follow-up by DWH allowing them to have a clean wound with a granulation tissue barely flush with the skin edges.

Anesthesia was locoregional in 73% of cases, general in 8% of cases, and local in 17% of cases.

Several surgical techniques have been employed and added together, depending on the extent and topography of the defect.

20 were treated by suturing due to sufficient skin laxity, 13 were covered by skin grafting of the penis and/or for an extensive and/or oozing defect. 20 were covered by a scrotal advancement flap -where we buried the testicles in their remaining scrotal pockets- for a defect not exceeding half of the scrotum. The fascio-cutaneous flaps, namely the VY advancement flap was performed in 14 patients (uni or bilateral), and the medial thigh flap which was performed in 3 patients, for defects involving the perineum and/or more than half of the scrotum. It should be noted that the same patient can benefit from several techniques in the same operating time, (Fig. 1) which explains that the total is more than the number of patients.

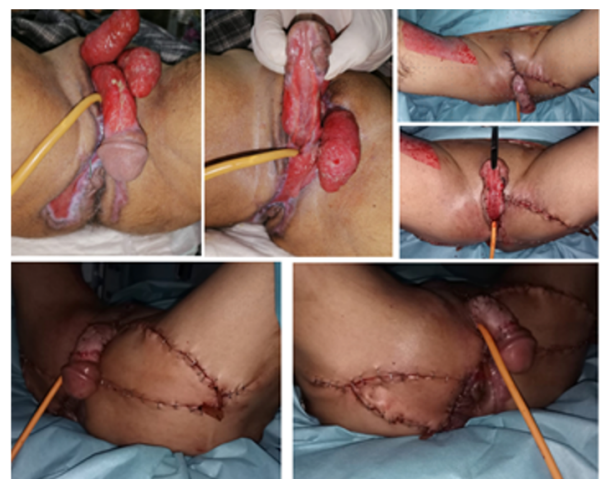


Fig. 1. Complex defects of the anterior surface of the penis reaching to the urethra, perineum, testicles, and in para-anal defects covered by double VY advancement flap, scrotal advancement flap in the right side for the scrotal defect. And at the pubic region: suture. A later covering was proposed to cover the anterior surface of the penis with a McGregor flap and the urethral mucosa with a labial mucosa.

The final outcome was acceptable for most of our patients, with no major functional and/or aesthetic sequelae. Short-term complications were reported in 7 patients or 15.21%, as shown in Table I.

TABLE I: SHORT-TERM COMPLICATIONS AND MANAGEMENT

Type of complication	Number of patients / (%)	Clavien Diendo classification	Treatment
Graft maceration	1 (2.17%)	II	Directed wound healing
Suture disunion	4 (8.69%)	IIIa	Resuture
Hemorrhage + Suture dehiscence	1 (2.17%)	IIIb	Hemostasis + resuture
Partial flap necrosis	1 (2.17%)	IIIb	Necrosectomy + NPT + SG
Total	7 (15.21%)	---	---

IV. DISCUSSION

FG is an almost exclusively male pathology, male sex being a contributing factor, which has been confirmed in most studies [3], [5], [9], [10], including our series (43 men vs 3 women). This difference can be explained by better drainage of the perineal region in women through vaginal secretions [3].

Advanced age does not appear to be a risk factor. Indeed, all age groups can be affected, even in some extreme cases, children [3], [5], [11]. The average age in our series was 53 years. North African, Western, and Japanese authors report an average age of 55 to 59 years [3], [10], [13], [14]. In the elderly, FG is associated with higher mortality and morbidity, factors predisposing them to infection include decreased immunity, underlying comorbidities, and physiological changes that accompany aging [15].

Field analysis of patients presenting with FG most often finds comorbidities that would favor the infection [3], [16]. Diabetes is a pathology that causes significant microvascular manifestations. FG can be the result of a similar process and can be exacerbated by a state of relative immunosuppression [17]. Present in 58% of cases in our series, diabetics represented 65% of patients in Jarboui's series [18], other studies had lower figures (30%) [18], [19]. The other comorbidities were essentially represented by cardiovascular diseases, which can be incriminated in the genesis of FG since it's a result of an alteration of the vascular framework [16]. In our series, cardiovascular pathologies represented 32% of the cases.

FG can be of urogenital, colorectal, or dermatological origin. In Ghnam's series [19], the most common cause was proctological (54% of cases) comparable to our series (60.9%). In Borki's series [12], the most common etiology was urogenital (40%). FG described as being idiopathic (Fournier's disease) in the old studies appears more and more today in almost all recent studies to be gangrene predominantly secondary to a urogenital, anorectal, or dermatological cause [13], [14], [16].

The average consultation time between the septic phase and the covering gesture was 44.15 days. And this, after controlling the infectious process both generally and locally. The timing of coverage is valuable. It largely depends on general and local evolution. Thus, any coverage cannot be conceived during the septic phase [1].

The general condition of the patient must be assessed, and any disorder must be treated to allow healing [20]. The average Performance Status in our patients was 2 with extremes ranging from 1 to 3.

The defect caused by necrosis and debridement becomes one of the major issues of management [1]. The goal of coverage is to avoid functional sequelae (restoring an environment that does not compromise the quality of sexual intercourse, as well as the reproductive function of the testicles) and to decrease cosmetic sequelae [2], [4].

Different means can be proposed and associated, depending on the topography and the extent of the defect (DWH, suture, SG, flaps, etc.) [21]. These techniques can only be considered after obtaining a clean wound with a granulation tissue of the debrided areas [1], [2], [4]. (Fig. 1) (Table II)

DWH, which consists of directing the phases of healing

by alternating pro and anti-inflammatory dressings, can be used as a standby solution (preparation for a coverage); which was the case for all our patients; or as a definitive solution [1], [2], [7]. It can be assisted by negative pressure therapy (NPT). It allows, through its continuous suction system, the elimination of infectious elements from the wound and promotes healing by allowing the rapid formation of granulation tissue [1], [2], [6]-[8]. Similarly, hyperbaric oxygen therapy can be discussed for its pro-healing and anti-infectious action against anaerobic bacteria [5], [7].

Sutures are indicated in limited defects with sufficient skin laxity [4]. (Fig. 2) In our series, 43.47% of our patients had defects that could be sutured after reviving the edges. In Dekou's series [4], 64.29% healed following suture without the tension of the scrotal skin.



Fig. 2. A para-anal defect covered by sutures.

Thin or semi-thick skin grafting, generally taken from the inner surface of the thigh, is indicated in extensive defect and/or the sheath of the penis. The latter must be covered by a non-expanded skin graft placed in a helix to avoid any problem of retraction [1], [2], [4], [7], [21]. The testicles can be grafted if their vaginal is intact [2]. In our series, 28.26% of our patients were covered by SG for extended defects, of which 19.56% were grafting the penis. (Fig. 3, 4) In the series of [21], 31.25% of patients were treated by SG (Table II). In Dekou's series, 14.28% had healed after a skin graft for an extensive perineopenoscrotal wound, on the one hand, and, on the other, for complete loss of the penile sheath [4].



Fig. 3. Testicular burial in the remaining scrotal pouch, and skin grafting of the penis.



Fig. 4. Bilateral VY fascio-cutaneous flap for perineoscrotal defect, complicated by distal lysis of the 2 flaps followed by DWH then SG.

43.47% of our patients were treated by scrotal advancement flap where we buried the testicles in their remaining scrotal pockets (Fig. 2, 3). The scrotal advancement flap allows coverage of the testicles but without affecting the extensibility of the scrotal skin, indicated for a defect not exceeding 50% of the total scrotal skin [2], [21]. In Shih-Yi Chen's series, 34.37% had sufficient laxity to perform a scrotal advancement flap [21]. (Table II) Reference [22] reported that a defect with 30% residual scrotal skin could be expanded to cover the entire scrotal surface. Burying testicles when it's possible in the remaining scrotal pouch or the inner thighs is an alternative for patients who do not express a surgical aptitude for reconstruction [3], [6].

Fasciocutaneous flaps (VY advancement flap, transposition flap of the medial aspect of the thigh, Mac-Gregor flap) provide less thick and/or extensive coverage than that of musculocutaneous or distant flaps and make it possible to recreate the median raphe if the flap is made bilaterally [2], [7], [21]. 36.95% of patients were covered by locoregional fasciocutaneous flaps for defects exceeding half of the scrotal skin and/or associated with perineal defects (Fig. 4, 5, 6). In [21], 25% of patients were treated with fasciocutaneous flaps for defects exceeding half of the scrotal skin.

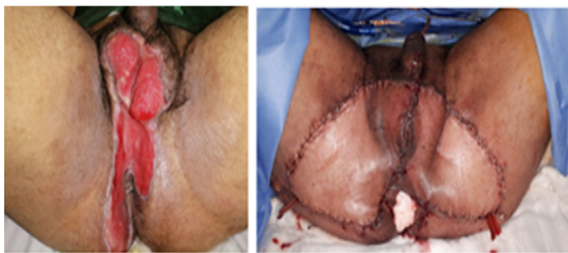


Fig 5. Bilateral VY fascio-cutaneous flap for coverage of a perineoscrotal defect and recreation of the medial raphe by joining the 2 flaps.

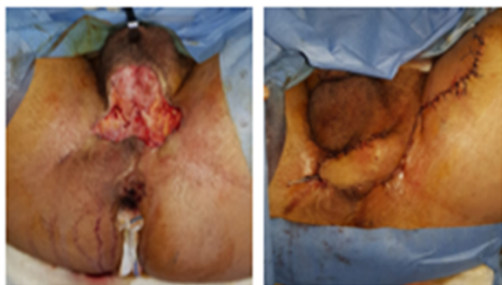


Fig. 6. Medial thigh fasciocutaneous flap for a perineoscrotal defect

Musculocutaneous flaps using gracilis, or rectus abdominis muscle with a skin paddle allow early coverage while reducing postoperative complications (seromas, hematomas) and limiting septic extension by providing well-vascularized tissue, resistance to infection, and allowing the diffusion of antibiotics [1], [2], [6]. In Shih-Yi Chen's series [21], 9.37% were treated with a Gracilis musculocutaneous flap for defects with dead space in the perineal region (Table II). Distant or free flaps are used exceptionally (complex defects) [7].

Regarding operative complications, [21] reported a rate of 11% partial lysis of thin SG, i.e. 5 times our figures (2.1%). This technique has the advantage of being simple and rapid, but the major complication of which is necrosis, which may be of ischemic origin (insufficient vascularization of the basement) and/or infectious [1], [2], [6], [7], [21]. Reference [23] support the use of a thin GC despite its possible complications, which are acceptable given the simplicity and low morbidity of the donor site.

It is known that flap coverage is more complex and more prone to donor and recipient site complications such as seroma, hematoma, wound dehiscence, and partial or total flap loss [24].

TABLE II: COMPARISON OF STUDIES ON MEANS OF COVERAGE OF PERINEO-SCROTAL DEFECTS FOLLOWING FOURNIER'S GANGRENE

Authors	Number of cases	Average size defects (cm ²)	Means of coverage	Complication (nb/%)
[21]	31	86	Skin graft, Scrotal advancement flap, Fasciocutaneous flap, Gracilis musculocutaneous flap.	5 (16%)
[24]	15	Not available	Skin graft, Local skin flap, Fasciocutaneous flap.	6 (40%)
[25]	8	311	Gracilis musculocutaneous flap.	2 (25%)
[26]	43	Not available	Skin graft, Local advancement flap, Fasciocutaneous flap, Gracilis musculocutaneous flap.	Not available
[27]	10	Not available	Fasciocutaneous flap of the thigh.	Not available
[28]	67	Not available	Skin graft, Cutaneous flap.	7 (10%)
[29]	3	Not available	Locoregional adipofascial flap then skin graft.	0
Our serie	46	105	Suture, Skin graft, Scrotal advancement flap, Fasciocutaneous flap.	7 (15.21%)

V. CONCLUSION

Adequate coverage of the perineum and external genitalia after the Fournier's gangrene prevents functional sequelae (erectile and reproductive) and reduces aesthetic sequelae, allowing patients a better quality of life.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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