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Management of Fournier's Gangrene Defects: A Retrospective Surgical Case Series of 23 Patients and review of Surgical Strategies

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Abstract

Fournier's Gangrene (FG) is a fulminant necrotizing fasciitis that necessitates immediate, aggressive surgical debridement to ensure patient survival. This life-saving measure often results in extensive soft-tissue defects of the genitoperineal region, posing a significant reconstructive challenge. This study reviews the surgical strategies and outcomes for reconstructing these complex defects in a high-risk patient cohort. A retrospective study was conducted on 23 consecutive patients (22 men, 1 woman) who underwent reconstruction for FG defects at the plastic and reconstructive surgery department in Tangier, Morocco, from March 2021 to October 2025. We analyzed patient demographics, comorbidities, defect characteristics, timing of reconstruction, and the surgical techniques employed. The mean patient age was 58.1 years. Diabetes mellitus was the most prevalent comorbidity, affecting 15 patients (65.2%). Patients required a mean of 2.8 debridement's, and the mean time from final debridement to reconstruction was 35.5 days. The most common defects involved the scrotum and perineum (43.5%). Split-Thickness Skin Grafts (STSG) were the most frequently used reconstructive method (14 patients, 60.9%), followed by healing by secondary intention (7 patients, 30.5%) and scrotal advancement flaps (2 patients, 9.6%). The overall postoperative complication rate was 17.4% (4 patients) and included minor issues such as partial graft loss and partial flap necrosis, which were managed successfully. Successful reconstruction of Fournier's Gangrene defects relies on a flexible, defect-based algorithm rather than a single "best" technique. Our findings confirm that STSG is a safe, reliable, and effective modality for covering large defects, particularly in comorbid patients. Scrotal advancement flaps remain a viable option for smaller defects limited to scrotum. This individualized approach is essential for minimizing morbidity and achieving durable wound coverage.

Keywords: Fournier's Gangrene; Surgical Reconstruction; Split-Thickness Skin Graft (STSG); Scrotal Defects; Reconstructive Ladder

1. Introduction

Fournier's Gangrene (FG) is a fulminant and potentially lethal form of necrotizing fasciitis that targets the external genitalia, perineum, and occasionally the abdominal wall. The infectious process, driven by polymicrobial synergy, causes vascular thrombosis, leading to rapid tissue loss and skin necrosis. [1] Given the high mortality rate associated with systemic spread, the first phase of management is an immediate surgical emergency. Survival hinges on prompt diagnosis, aggressive fluid support, broad-spectrum antibiotics, and timely, extensive surgical debridement to remove all necrotic tissue. [2]While aggressive initial care saves lives, it often results in significant soft-tissue defects, exposing underlying structures like the testes and leaving challenging wounds over the genitoperineal region. Once the infection is controlled and the patient is clinically stable, the surgical focus shifts to the second, reconstructive phase. [3] The

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principal aims of this stage are twofold: to secure durable, protective coverage for the exposed areas and to restore acceptable form and function. The selection of a reconstructive strategy is complex and patient-specific, governed by the size and location of the defect, the quality of the surrounding tissue, and the patient's comorbidities most notably diabetes mellitus. [1, 4] Options range across the reconstructive ladder, from simple split-thickness skin grafts (STSG) to various local and regional fascio cutaneous and myo cutaneous flaps. [5]This choice must provide optimal coverage while minimizing morbidity in a population often burdened by advanced age and underlying illness.

2. Material and methods

This retrospective study will analyze the surgical management of 23 consecutive patients admitted between March 2021 and October 2025 in the plastic and reconstructive surgery department of tangier Morocco and who presented with soft-tissue defects following the initial, emergency debridement of Fournier's gangrene performed by the Department of Colorectal Surgery or the department of Urology. Our primary objective is to review the patient's demographic data, common comorbidities (notably diabetes mellitus), and the characteristics of the resulting defects, which are often large and complex. The focus is on the reconstructive strategies employed by our department, documenting the choice of procedure (such as scrotal advancement flaps, split-thickness skin grafts (STSG), and secondary wound healing), the mean time to definitive reconstruction, and the subsequent postoperative outcomes and complications. By analyzing these patient outcomes, the study aims to refine our strategic algorithm for defect coverage, which must be individualized based on the defect size, location, and the patient's overall general condition.

3. Results

A total of 23 patients who underwent definitive reconstruction for defects resulting from Fournier's gangrene (FG) were included in this retrospective study. The cohort was predominantly male, consisting of 22 men and 1 woman. Patient ages ranged from 21 to 89 years, with a mean age of 58.1 years. A high burden of comorbidity was noted among the patients, consistent with the literature on FG. Diabetes mellitus (DM) was the most prevalent predisposing factor, present in 15 patients (65.2%). Other significant comorbidities included Colorectal diseases or infection (4 patients, 17.4%), alcoholism (3 patients, 13.0%), and Paraplegia (2 patients, 8.7%). The mean duration from the onset of symptoms to the first surgical debridement was 4.1days. All 23 patients required at least two surgical debridement's, with a mean of 2.8 debridement procedures per patient before the wound bed was deemed suitable for reconstruction. The mean time from the final debridement to the first reconstructive procedure (time to reconstruction) was 35.5 days. The soft-tissue defects were highly variable in size and anatomical location (table1), requiring individualized reconstructive planning.

Table 1 Anatomical location of the Fournier gangrene

Defect Location	Number of Patients (n=23)	Percentage
Scrotum Only	8	34.8%
Scrotum + Perineum	10	43.5%
Scrotum + Perineum + Abdominal Wall	5	21.7%

A reconstructive procedure was considered for patients presenting healthy granulation tissue formation on the wound base. The reconstructive methods used adhered to the principle of matching the complexity of the defect to the appropriate technique on the reconstructive ladder. (table 2)

Figure 1 Split-Thickness Skin Graft of a scrotal Fournier gangrene defect

Table 2 Reconstructive technique in Fournier gangrene

Reconstructive Technique	Number of Patients (n=23)	Percentage
Scrotal Advancement Flap	2	9.6%
Secondary intention healing	7	30.5%
Split-Thickness Skin Graft (STSG)	14	60.9%

Split-Thickness Skin Graft (STSG) were the most frequently used method in all types of defects but especially for the largest, predominantly flat defects extending to the abdominal wall and it were performed in 14 patients. Scrotal Advancement flap was reserved primarily for defects confined to le 50% of the scrotum. 7 patients were healing Spontaneously by secondary intention. No Regional fascio cutaneous flaps were applied for scrotal defects or combined scrotal/perineal defects in our study. One patient presenting with a symptomatic urethral fistula has successfully undergone a surgical procedure for complete urethral reconstruction to correct the abnormal connection.

Figure 2 Scrotal Advancement Flap to cover hemi scrotal defect

The mean hospital stay after the reconstructive procedure was 10.3 days. A total of 4 patients (17.4%) experienced postoperative complications:

Partial Flap Necrosis: One patient undergoing a scrotal advancement flap developed partial necrosis due to tension, which required a subsequent small local advancement flap for salvage after debridement of the necrosis under local anesthesia.

Wound Edge Necrosis/Dehiscence: one patient (with scrotal advancement flap) developed minor wound-edge necrosis/dehiscence that resolved with conservative wound care

Partial Graft Loss: two patients with a large STSG to the abdominal wall experienced partial graft lysis, which was managed successfully by secondary intention healing.

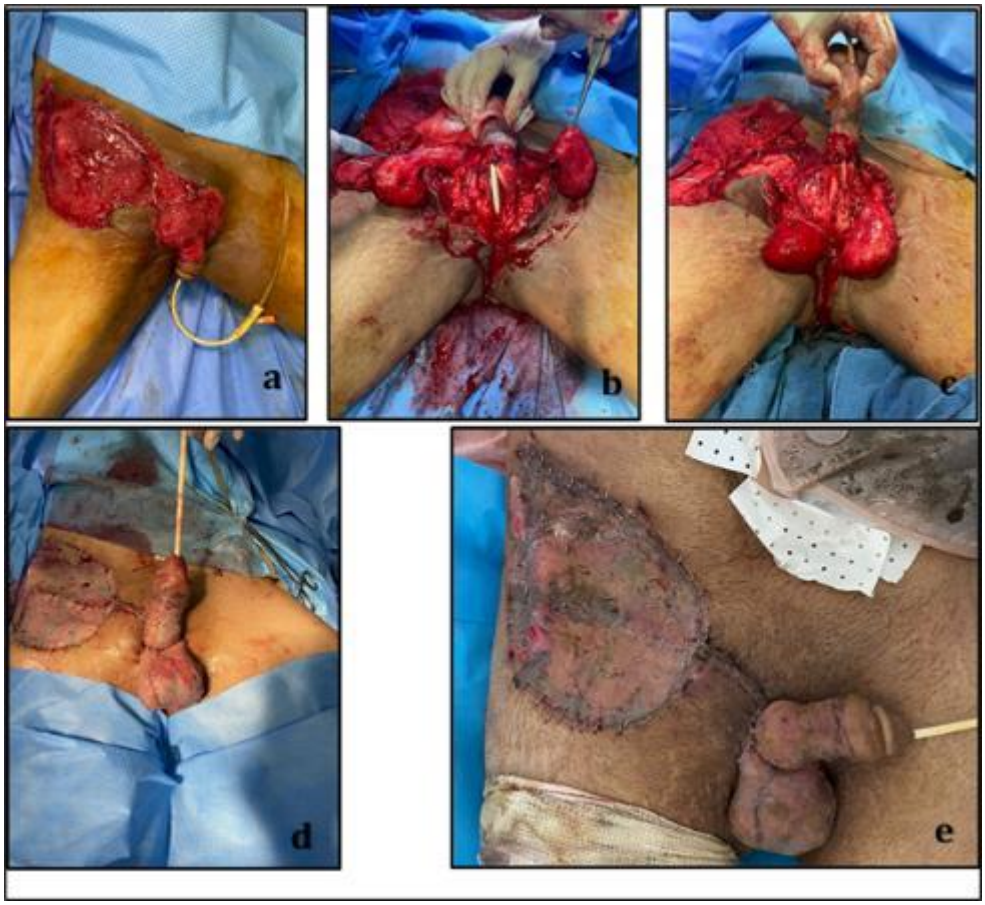

Figure 1 Reconstruction of a large defect a: initial defect; b: dissection and highlighting the urethral fistula; c:urethroplasty; d: FTSG for the penile defects and STSG for the rest; e: 5days after surgery

4. Discussion

The management of Fournier's gangrene (FG) is a demanding two-stage process: first, immediate eradication of the infection, and second, definitive reconstruction of the resultant soft-tissue defect. Our study of 23 patients, predominantly older males with a high prevalence of diabetes mellitus (65.2%), underscores that FG remains a disease of significant morbidity in a high-risk cohort, consistent with findings across multiple series [6]. The mean time from the final debridement to definitive reconstruction (35.5 days) in our series reflects the necessary period for aggressive, iterative debridement and wound conditioning, ensuring a clean, granulating bed essential for successful coverage. This delayed approach is critical for minimizing complications and achieving reliable tissue integration. [3]

A central tenet of plastic surgery matches the reconstructive technique to the complexity of the defect, an approach validated by the array of methods employed in our cohort [6]. We found the scrotal advancement flap to be a common technique, primarily indicated for small to medium defects confined to the scrotum. This technique aligns with the "replace like with like" principle and exploits the exceptional elasticity of the remaining scrotal skin, providing superior functional and aesthetic results with minimal donor site morbidity [7]. However, surgeons must apply this flap cautiously for defects larger than half the scrotal surface area, as high tension increases the risk of wound-edge necrosis or flap loss [8].

For larger defects and those extending beyond the scrotum, the strategy necessarily shifted towards more robust tissue transfer. Large defects that involved the abdominal wall were successfully managed with Split-Thickness Skin Grafts (STSG) (60.9%) [6]. STSG remains a valuable, straightforward, and time-efficient option for large area coverage [3]. This method is particularly crucial for high-risk, comorbid patients to minimize general anesthesia time. However, we recognize the inherent drawbacks of STSG, namely the potential for scar contraction, which can be unsightly, and the

less durable protection offered compared to vascularized flaps [9]. The single instance of partial graft loss in our series reinforces the need for meticulous wound bed preparation before grafting. When penile defects were encountered, the literature recommends the use of Full-Thickness Skin Grafts (FTSG) where possible to prevent secondary contracture and the need for revision surgery [10].

Where maximum durability, bulk, and vascularity were paramount particularly for complex scrotal and perineal losses regional fascio cutaneous flaps (Pudendal, SMTF) were utilized [8]. The Pudendal thigh flap is noted for its reliable blood supply, relative simplicity, and minimal donor site morbidity, making it an excellent option for defects larger than half the scrotum or combined scrotal/perineal defects [11]. Similarly, the Superomedial Thigh Flap (SMTF) is recommended for its ease of technique and reliable vascular feeding, especially for total or near-total scrotal defects [12, 13].

The specialized application of the Gracilis muscle/myo cutaneous flap was strategically reserved for deep, uneven perineal defects (8.7%). This choice is justified by the muscle tissue's enhanced resistance to bacterial inoculum and its ability to provide significant volume to effectively obliterate dead space a critical consideration in the deep perineal area. [14] This tailored approach aligns perfectly with the recommended algorithm for managing perineal defects presenting with dead space. [15]

Our overall complication rate (17.4%), which range from the complications observed, were predominantly minor and managed conservatively, including partial flap necrosis and minor wound dehiscence [16]. Crucially, the mean post-reconstruction hospital stays (10.3 days) highlights that achieving prompt, successful coverage significantly shortens the patient's overall hospitalization and facilitates their transition to rehabilitation [13]. The low morbidity associated with our selected techniques demonstrates the feasibility of performing definitive single-stage reconstructions even in this high-risk population.

The main limitation of this study remains its retrospective nature and the small sample size (n=23), which restricts robust statistical comparison between the different reconstructive modalities. However, the data strongly supports the conclusion that there is no single optimal technique for FG reconstruction. [17] Instead, successful long-term management relies on a thoughtful, multidisciplinary approach during the acute phase, followed by a flexible, defect-driven reconstructive strategy that prioritizes the simplest, most durable solution capable of achieving tension-free coverage and protecting the underlying organs, tailored specifically to the patient's physiological status and defect complexity [18].

In recent publications demonstrating the reconstructive methods for defects caused by Fournier's gangrene. There appears to be no 'best' or 'optimal' method for reconstruction of these defects, and the choice of reconstructive procedure should be decided by the characteristics of the defects. The recommended choice of reconstructive procedure, according to the location and size of the defect, is presented as an algorithm. [8, 19]

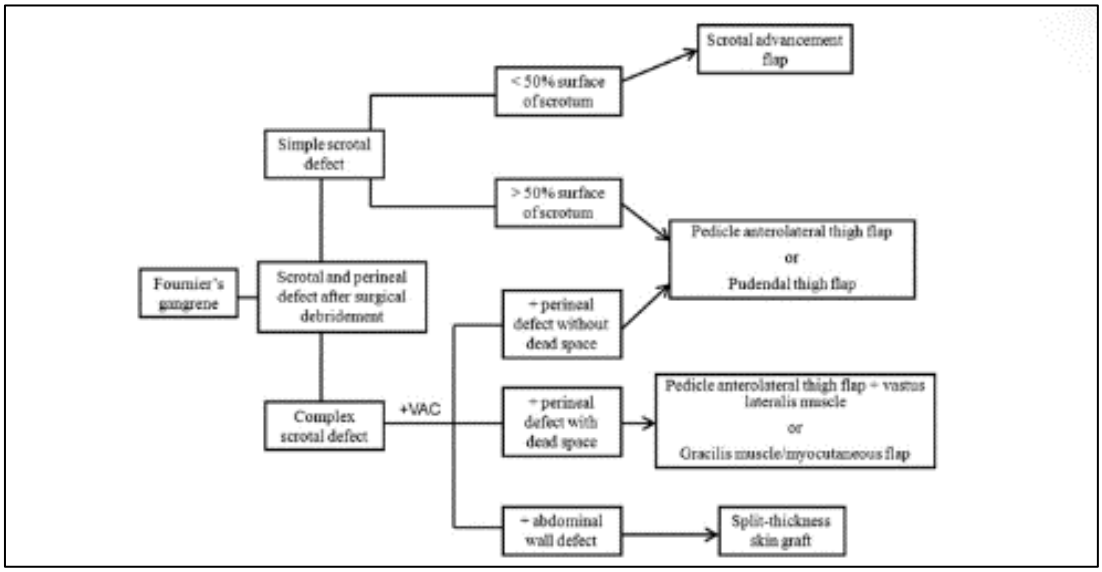

Figure 2 The algorithm for the choice of reconstructive procedures for scrotal and perineal defects resulting from Fournier's gangrene [8]

5. Conclusion

Fournier's gangrene is a fulminant necrotizing infection requiring aggressive, early surgical debridement to ensure patient survival. There is no single ideal method applicable to all patients. A successful outcome relies on a versatile, defect-based algorithm, where the surgeon must consider the patient's age, expectations, general condition, the defect's specific characteristics, and their own experience to determine the ideal method. Key take-home messages from this analysis are that a high proportion of defects can be effectively reconstructed using Split-Thickness Skin Grafts (SSG) to minimize operative time and donor site morbidity. For penile defects, Full-Thickness Skin Grafts (FTSG) should be applied where possible to prevent secondary contracture and the need for revision surgery. Ultimately, the choice of technique must be based on the characteristics of the defect, and early reconstructive surgery to achieve wound coverage is mandatory to improve the patient's quality of life.

Compliance with ethical standards

Disclosure of conflict of interest

There are no conflicts of interest

Statement of informed consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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