



COMPARATIVE OUTCOMES OF SECONDARY SUTURING, GRACILIS FLAP RECONSTRUCTION AND TESTICULAR THIGH RELOCATION IN PERINEAL AND GENITAL AREA DEFECTS FOLLOWING FOURNIER'S GANGRENE POST-DEBRIDEMENT.

General Surgery

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ABSTRACT

Background: Fournier's gangrene is a rapidly progressive necrotising infection of the perineum, genital and perianal area. Surgical debridement, while life-saving, leaves extensive tissue defects that require reconstruction. The choice of technique directly impacts wound healing, occurrence of complications, cosmetic appearance and functional outcomes. **Aim:** To compare the outcomes of three reconstructive options post debridement—secondary suturing, gracilis flap, and testicular thigh relocation—in patients with perineal and genital area defects following Fournier's gangrene. **Methods:** A prospective study was conducted at Vedantaa Institute of Medical Sciences, Dahanu, Palghar, Maharashtra, India, from September 2024 to June 2025 including 3 months of follow up period. Thirty patients were equally divided into three groups: Group A (gracilis flap), Group B (secondary suturing), and Group C (testicular thigh relocation). Outcomes assessed included wound healing time, complications, cosmetic appearance, testicular viability, and patient satisfaction. Statistical analysis was performed using ANOVA and chi-square tests, with significance at $p < 0.05$. **Results:** Secondary suturing demonstrated the shortest mean healing time, lowest complication rates, highest patient satisfaction scores and better cosmetic appearance. Gracilis flap reconstruction was associated with longer healing time and higher complication rates, while testicular thigh relocation showed the poorest overall outcomes. **Conclusion:** Secondary suturing is superior to gracilis flap reconstruction and testicular thigh relocation for perineal and genital area defects following Fournier's gangrene, offering faster healing, fewer complications, greater patient satisfaction, and improved overall recovery.

KEYWORDS

Fournier's Gangrene; Perineal And Genital Area Reconstruction Post Debridement; Gracilis Flap; Secondary Suturing; Testicular Thigh Relocation

BACKGROUND

Fournier's gangrene (FG) is a rapidly progressive necrotising infection of the perineal, genital, and perianal regions with high mortality if left untreated. It was first described by Jean Alfred Fournier in 1883 and remains a surgical emergency, most commonly affecting men, although cases in women are reported.[1] The infection is typically polymicrobial, involving a combination of aerobic and anaerobic organisms, and is strongly associated with co-morbidities such as diabetes mellitus, alcoholism and immunosuppression.[2,3] The standard of care includes aggressive resuscitation, broad-spectrum antibiotic therapy, and radical surgical debridement, which, while lifesaving, often leaves behind large and complex perineal and genital area defects.[4] These defects not only pose challenges cosmetically but also in restoring vital functions such as urination, defecation, and sexual activity. Therefore, reconstructive strategies are integral to the comprehensive management of Fournier's gangrene survivors.

Several techniques have been employed for reconstruction, including secondary intention healing, skin grafting, advancement flaps, regional muscle flaps, and testicular transposition into the thigh.[5] Among these, secondary suturing, performed once healthy granulation tissue develops, represents a simple and effective approach. It avoids the morbidity associated with donor-site harvest, requires shorter operative time, and allows natural wound contraction and epithelialisation, leading to satisfactory cosmetic and functional outcomes.[6] In contrast, gracilis muscle flaps, though reliable, demand greater surgical expertise, longer hospital stay, and are associated with donor-site morbidity.[7] Testicular relocation, while useful in extensive scrotal loss, is limited by poor cosmetic acceptance and risk of testicular atrophy.[8]

Although multiple techniques have been described, comparative evidence on their relative outcomes remains limited. Therefore, it is of interest to evaluate the effectiveness of secondary suturing against gracilis flap reconstruction and testicular thigh relocation in managing perineal and genital area defects post debridement following Fournier's gangrene.

MATERIALS AND METHODS

Study Design and Setting

This prospective, comparative, observational study was conducted in the Department of General Surgery at Vedantaa Institute of Medical

Sciences, Dahanu, Palghar, Maharashtra, India. The study was carried out over ten months including 3 months of post operative period, from September 2024 to June 2025. Prior approval was obtained from the Institutional Ethics Committee, and all participants provided written informed consent before inclusion in the study.

Study Population and Sample Size

A total of 30 male patients diagnosed with Fournier's gangrene and requiring reconstructive procedures for perineal and genital area defects following surgical debridement were enrolled. The sample size was determined based on patient availability during the study period. Patients were divided into three equal groups of ten each according to the reconstructive technique undertaken. Group A consisted of patients managed with gracilis muscle flap reconstruction, Group B included patients who underwent secondary suturing after developing adequate granulation tissue and Group C comprised those who temporarily relocated the testes into subcutaneous thigh pouches.

Inclusion and Exclusion Criteria

All male patients aged between 18 and 70 years who presented with Fournier's gangrene requiring perineal and genital area reconstruction following debridement and who were hemodynamically stable were included. Patients with uncontrolled systemic sepsis at the time of reconstruction, those with severe co-morbidities rendering them unfit for anesthesia or surgery, and those who had previously undergone reconstructive procedures in the perineal and genital area region were excluded. Patients who declined to participate in the study were also not considered.

Surgical Techniques

Group A- In patients allocated to the gracilis flap group, the gracilis muscle was harvested from the medial thigh through a longitudinal incision while carefully preserving the neuro vascular pedicle. The flap was tunnelled and transposed into the perineal and genital area defect to provide vascularised tissue coverage.

Group B-Reconstruction was delayed in the secondary suturing group until the wound demonstrated healthy granulation and was free from necrotic tissue and infection. The edges were approximated using interrupted sutures placed in a tension-free manner.

Group C-In patients who underwent testicular thigh relocation,

subcutaneous pockets were created in the medial thighs through small incisions, and the testes were relocated into these pouches temporarily to ensure viability and prevent further trauma or infection until definitive reconstruction could be considered.

Outcome Measures

The primary outcome measure was wound healing time, defined as the interval in days between the reconstructive procedure and complete epithelialisation or closure of the wound. Secondary outcome measures included postoperative complications such as wound infection, dehiscence, flap necrosis, and donor site morbidity. Additional outcomes recorded were cosmetic results assessed by the surgical team and patients, functional outcomes in testicular viability and sexual function, length of hospital stay, and overall patient satisfaction measured using a five-point Likert scale.

Follow-Up Protocol

Patients were monitored daily during their hospital stay for wound progress, testicular viability, and occurrence of complications. Following discharge, patients were reviewed at two weeks, one month, and two months postoperatively. The wound condition, cosmetic appearance, and functional outcomes were assessed and documented at each follow-up visit.

Statistical Analysis

All data were entered and analysed using Microsoft Excel and SPSS software (version 25.0, IBM Corp., Armonk, NY, USA). Continuous variables such as wound healing time and hospital stay were expressed as mean ± standard deviation and compared across the three groups using one-way analysis of variance (ANOVA). Categorical variables, including complication rates and testicular viability, were analysed using the appropriate chi-square or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 30 patients with perineal and genital area defects following Fournier's gangrene post debridement were included in the study. Patients were distributed equally among the three groups: gracilis flap reconstruction (Group A), secondary suturing (Group B) and testicular thigh relocation (Group C). The demographic profile was comparable across the groups, with no statistically significant differences in age, co-morbidities, or extent of debridement. Clinical outcomes, wound healing times, complication rates, functional assessments, and patient satisfaction were analysed systematically.

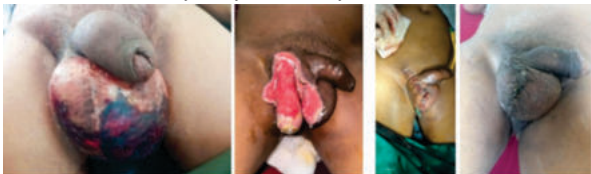


Figure 1. A) Fournier's gangrene of perineal and genital area. B) Clinical images showing (left) extensive perineal and genital area defect following surgical debridement for Fournier's gangrene. C) (right) successful wound closure achieved by secondary suturing with satisfactory cosmetic outcome. D) Post-debridement scrotal wound with secondary suturing showing satisfactory wound approximation and healing.

Table 1. Demographic Characteristics of Study Population

Parameter	Group A (Gracilis Flap)	Group B (Secondary Suturing)	Group C (Thigh Relocation)	p-value
Mean Age (years)	52.1 ± 7.4	50.6 ± 6.9	51.7 ± 8.1	0.82
Diabetes (%)	4 (40%)	5 (50%)	4 (40%)	0.87
Hypertension (%)	3 (30%)	2 (20%)	3 (30%)	0.88
Mean extent of debridement (cm²)	78.5 ± 12.6	76.8 ± 11.9	80.2 ± 13.4	0.77

Table 2. Mean Wound Healing Time (Days) Across Groups

Group	Mean Healing Time (days)	Standard Deviation	Range (days)
Secondary Suturing	21.4	3.2	18–27
Gracilis Flap	28.7	4.1	23–36
Thigh Relocation	33.1	5.5	26–42
p-value	<0.01		

Table 3. Postoperative Complications

Complication	Group A (n=10)	Group B (n=10)	Group C (n=10)	p- value
Wound Infection	2 (20%)	1 (10%)	3 (30%)	0.32
Wound Dehiscence	1 (10%)	0	2 (20%)	0.28
Flap Necrosis/Failure	1 (10%)	—	—	—
Testicular Atrophy	—	—	2 (20%)	—
Total Complication Rate	40%	20%	50%	0.04

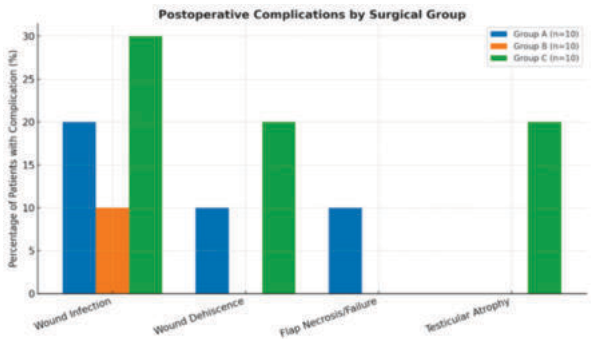


Figure 1. Distribution of Postoperative Complications Across Surgical Groups

Table 4. Functional Outcomes and Patient Satisfaction

Parameter	Group A (Gracilis Flap)	Group B (Secondary Suturing)	Group C (Thigh Relocation)	p-value
Testicular viability (%)	10 (100%)	10 (100%)	8 (80%)	0.08
Return to sexual activity (%)	6 (60%)	8 (80%)	5 (50%)	0.21
Mean patient satisfaction score (1–5)	3.6 ± 0.7	4.5 ± 0.5	3.0 ± 0.8	<0.01

Table 5. Hospital Stays and Need for Re-operation

Outcome	Group A (Gracilis Flap)	Group B (Secondary Suturing)	Group C (Thigh Relocation)	p-value
Mean hospital stay (days)	13.4 ± 2.6	10.2 ± 2.1	15.1 ± 3.2	<0.01
Re-operation required (%)	2 (20%)	1 (10%)	3 (30%)	0.31

DISCUSSION

Fournier's gangrene remains a life-threatening necrotising fasciitis of the perineum and genitals, carrying mortality rates of 20–40% despite advances in medical and surgical care.[9] The radical debridement required to eradicate infection leaves extensive perineal and genital area defects, which demand timely reconstruction to restore both form and function.[10] While muscle flaps such as the gracilis have been widely advocated for their vascularity and tissue coverage[11], the present study demonstrates that secondary suturing after healthy granulation provides superior outcomes compared to gracilis flap reconstruction and testicular thigh relocation.

The superiority of secondary suturing in this series was evident in terms of shorter wound healing time, lower complication rates, higher patient satisfaction, and reduced hospital stay and better cosmetic outcome. These findings are consistent with principles of delayed primary closure, which recommend approximation of wound edges once infection has resolved and robust granulation has developed.[12] This approach minimises tension, decreases risk of dehiscence, and avoids additional donor-site morbidity, limitations often observed in flap reconstructions.[13] Moreover, patient-reported outcomes were more favourable, with greater satisfaction and earlier return to sexual activity, underscoring the value of a simple yet effective technique in improving quality of life.

Gracilis flap reconstruction, though reliable in extensive tissue loss, is associated with longer operative time, flap necrosis, and donor-site complications [8,9].

Testicular thigh relocation, traditionally used as a salvage option, was linked to discomfort, cosmetic dissatisfaction, and testicular atrophy, consistent with previous reports.[14]

In contrast, secondary suturing is cost-effective, less invasive, and particularly advantageous in resource-limited settings where Fournier's gangrene is more prevalent.[15] While larger multi-centre studies with longer follow-up are warranted, these findings support secondary suturing as the preferred primary approach whenever feasible.

CONCLUSION

Secondary suturing proved to be the most effective reconstructive technique for perineal and genital defects following Fournier's gangrene post debridement, offering the shortest healing time, lowest complication rates, highest patient satisfaction, better cosmetic outcome and reduced hospital stay compared to gracilis flap and testicular thigh relocation. Its simplicity, cost-effectiveness, and absence of donor site morbidity support its use as the preferred primary option in suitable patients.

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