

Modified Bilateral Medial Thigh Fasciocutaneous Flap for Perineoscrotal Reconstruction Following Fournier's Gangrene

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Abstract

A 62-year-old man presented with Fournier's gangrene following neglected scrotal hematoma, resulting in a large perineum defect. Traditional reconstruction methods such as skin grafts often result in limited durability and protection. To address these shortcomings, we adapted and refined Hirschowitz's thigh flap technique with two critical modifications: a rotation-advancement movement and secondary defect closure using posterior thigh triangular transposition flaps arranged in Z-plasty fashion. This approach addressed the dual challenges of donor-site tension and defect coverage in this complex perineoscrotal reconstruction. The modified flaps achieved complete sensate scrotal coverage with viable tissue, requiring only conservative management for minor edge breakdown. By postoperative week 3, the patient regained normal voiding function with excellent esthetic contour and no midline complications. Our technique builds on the reliable vascularity of medial thigh flaps which are the deep external pudendal artery, superficial femoral artery, and medial circumflex femoral artery pedicles while solving the tension limitations of primary closure, particularly valuable for patients who have completed family, nondiabetic, and nonsmoker. This option of perineoscrotal reconstruction offers a pragmatic single-stage solution that balances functional restoration and esthetic outcomes better than skin graft.

Keywords: Flap coverage, Fournier's gangrene, medial thigh flap, perineal wound, scrotal wound

INTRODUCTION

Fournier's gangrene is an acute, rapidly progressing, life-threatening necrotizing fasciitis of the genitalia and perineum and caused by a mixture of aerobic and anaerobic microorganisms.^[1] Susceptible patients include those who are immunocompromised, such as patients with diabetes mellitus, human immunodeficiency virus (HIV), and cancer.^[1-3] Debridement of necrotic tissues and coverage with a broad-spectrum antibiotic remains the mainstream management, which is often associated with variable extent of tissue loss over the perineoscrotal region.^[4] A major concern following debridement of Fournier's gangrene is coverage of the exposed testicles. The aims for perineoscrotal reconstruction following defects are to obtain durable coverage, protect testicular function, and restore the esthetic outcome of the perineum.^[4] We present a case of perineoscrotal reconstruction using a modified bilateral medial thigh fasciocutaneous flap following Fournier's gangrene debridement with a good outcome.

CASE REPORT

A 62-year-old Chinese man with no known medical history sustained a fall in the bathroom, resulting in a scrotal hematoma. The injury was initially neglected, leading to the development of Fournier's gangrene. Following multiple sessions of serial debridement, he was referred for evaluation and management of perineoscrotal wound.

On initial wound assessment, both testicles were exposed, and the shaft of the penis was partially exposed [Figure 1]. The

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wound measured 16 cm × 10 cm, extending anteriorly to the base of the penis and posteriorly toward the perianal region, with the wound edges located approximately 1 cm from the anal verge. Despite the extent of tissue loss, anal sphincter function remained intact. The bilateral medial thigh skin appeared healthy and unaffected by the infection.

The patient had a thin build with lax medial thigh skin and no prior history of surgery involving the bilateral inguinal or lower limb regions. After discussing various options including skin grafting and locoregional flaps for perineoscrotal reconstruction, he opted for a bilateral medial thigh fasciocutaneous flap procedure.

Anatomical considerations

The medial thigh perforators are organized into three transverse rows, each supplied by a major proximal vessel entering within 5 cm of the pubic tubercle-ischial spine line.^[5] The superior row derives from the deep external pudendal artery (DEPA), the middle row from superficial femoral artery (SFA) branches, and the inferior row from deep femoral artery (DFA) branches including the profunda femoris and its medial circumflex femoral artery (MCFA) continuation.^[5] Identification of these vessel perforators to the skin may be aided with the use of Doppler ultrasound, or intraoperative indocyanine green angiography, which uses a fluorescent dye to provide real-time perfusion mapping and guide optimal perforator selection.^[6,7]

The cutaneous supply of the medial thigh arises from an anastomotic network between the DEPA, septocutaneous perforators of the SFA, and the descending branch of the MCFA. The DEPA originates from the SFA, transitioning from deep to subcutaneous planes by piercing the adductor longus aponeurosis before coursing along its surface. At 4–6 cm from the pubic symphysis, it bifurcates into abdominal and perineal branches, with the latter supplying the proximal medial thigh skin.^[8] The superficial femoral artery (SFA), which originates from the common femoral artery, traverses the adductor canal

and continues distally as the popliteal artery.^[9] Cadaveric studies have demonstrated that it gives rise to septocutaneous and musculocutaneous perforators that predominantly supply the middle and distal anteromedial thigh skin.^[10] The MCFA originates from the profunda femoris artery, with its descending branch coursing 8–10 cm inferior to the pubic tubercle and emitting three or more terminal branches (>0.5 mm diameter) that traverse the medial fascia lata before terminating in the gracilis muscle belly.^[11] These musculocutaneous perforators supply the proximal third of the anteromedial thigh,^[10] with at least three high-caliber branches (~1 mm diameter) consistently identified in the adductor region.^[11]

Surgical techniques

The procedure was performed in the lithotomy position under spinal anesthesia. Bilateral fasciocutaneous medial thigh flaps were planned to reconstruct the entire scrotum [Figure 2].

A reference line was drawn from the pubic tubercle to the insertion of the semitendinosus tendon^[6] [Figure 2]. The pubic tubercle is palpated as a bony prominence at the superior border of the pubic symphysis. The semitendinosus tendon, which is part of the pes anserinus along with the sartorius and gracilis tendons, can be identified by flexing the patient's knee to around 90° while applying resistance against knee flexion. This maneuver tenses the tendon, making it more prominent at its insertion on the medial proximal tibia, just distal to the medial joint line. This anatomical reference helps define the anterior limit for flap dissection.

The base of the flap is positioned one centimeter anterior to this line, overlying the adductor longus muscle, as this region reliably includes perforators from the DEPA, along with contributions from the MCFA and the SFA.^[6,12] Care is taken to preserve the integrity of the sensory branches of the ilioinguinal and genitofemoral nerves, which contribute to postoperative flap sensation.^[13] Each flap was designed in a rectangular shape, measuring 9 cm × 9 cm, adjacent to the defect in the proximal medial thigh region [Figure 2].

The medial thigh flaps were elevated subfascially toward the base and then rotated and advanced medially to envelop both testicles. The flaps were sutured in the midline, reconstructing a neo-scrotum [Figure 3]. The elevation of the flaps resulted in triangular donor site defects [Figure 3], which posed a risk of excessive tension upon primary closure. To address this,



Figure 1: Preoperative photograph of the perineoscrotal region. The defect measured 16 cm × 10 cm, extended anteriorly toward the base of the penis and posteriorly to the perianal region, exposing both testicles



Figure 2: Intraoperative planning of bilateral fasciocutaneous medial thigh flaps for reconstruction of the scrotum

triangular transposition flaps were designed on the posterior thighs and elevated up to the fascial layer [Figure 3]. The flaps were then transposed into the secondary defects in a Z-plasty fashion [Figures 3 and 4]. This approach redistributes tension by altering the primary pull vector, rather than relying on direct linear closure. By leveraging adjacent tissue mobility from a different orientation, the flaps reduce localized tension at the repair site, optimizing wound closure mechanics while minimizing stress on the tissue edges. Redivac drains were placed bilaterally beneath the flaps to minimize seroma formation. They were removed as soon as the drainage was <20 ml for 2 consecutive days.

Postoperatively, the patient experienced minor wound dehiscence at the flap edges likely due to excessive tension over the points, which was managed conservatively with the midline neo-scrotal suture line remaining intact. The flaps remained viable, successfully contouring the testicles in a manner resembling the natural scrotum. Overall, the patient was satisfied with the esthetic and functional outcome [Figure 5].

DISCUSSION

The scrotal and perineal region plays a key role in urologic, sexual, and gastrointestinal function. Composed of specialized skin and dartos muscle, the scrotum regulates temperature for spermatogenesis and allows testicular mobility to minimize trauma.^[14] Disruption of this complex anatomy by trauma, infection, or oncological resection can significantly impair these functions. Perineoscrotal reconstruction aims to promote wound closure, obtain durable coverage, and restore functional and esthetic outcomes. Depending on the defect size and tissue availability, reconstructions often involve obliterating dead space with vascularized tissue, particularly after radical resection.

Several reconstructive techniques have been described for the management of superficial scrotal and perineal defects, including primary closure, skin grafting, thigh-based fasciocutaneous flaps, musculocutaneous flaps, and tissue expansion.^[15] The timing of reconstruction depends on the cause of the defect.^[14] For trauma or infection cases, reconstruction is typically delayed to allow for serial debridement until viable tissue is present. In contrast, oncologic resections may permit immediate reconstruction once tumor-free margins are confirmed.

For smaller scrotal defects, primary closure of the scrotal skin without undue tension is preferable. However, this approach is not feasible in larger scrotal and perineal defects. In such cases, allowing the wound to heal by secondary intention often results in scar contracture, scrotal deformity, and prolonged healing time. Many authors advocate the use of split-thickness skin grafting (STSG) as the next option for scrotal and perineal reconstruction.^[15,16] The procedure is technically simple and can be performed in a single stage with satisfactory outcomes.^[16] Wang *et al* reported that split-thickness skin grafts were used in younger patients wishing to preserve fertility, while flap reconstruction was favored for older patients and following Fournier's gangrene due to superior esthetic outcomes.^[17]

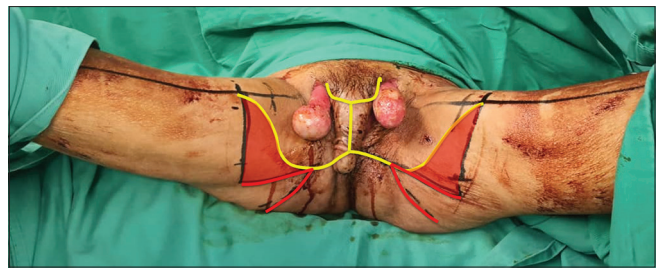


Figure 3: Intraoperative demonstration of bilateral medial thigh flaps (yellow line) elevated subfascially and rotated medially to envelop both testicles, forming a neo-scrotum. Secondary defects (red shaded areas) were closed using posterior thigh transposition flaps (red lines)



Figure 4: Immediate postoperative result



Figure 5: Early result 3 months after the surgery

Optimal spermatogenesis requires the testes to be maintained at a temperature approximately 2°C–6°C below core body temperature.^[18] Elevations in testicular temperature are known to impair spermatogenesis.^[18] Skin grafts, being thinner and less insulating, are more conducive to maintaining lower scrotal temperatures, supporting spermatogenesis.^[15] However, they offer less protection and do not provide the same durability as flaps.^[19] In contrast, flap coverage consisting of thick or bulky tissues can increase local testicular temperatures due to their insulating properties, potentially leading to impaired spermatogenesis, with varying evidence.^[19] To date, no formal studies have been conducted specifically assessing the impact of bilateral medial thigh flap reconstruction on long-term spermatogenesis outcomes.

The superomedial thigh flap has been regarded as one of the excellent options for the reconstruction of perineoscrotal wounds. It was first described by Hirschowitz in 1980,^[5] mainly for the reconstruction of anterior perineal defect following tumor excision, infection, and lymphedema surgery. The flap

is designed as an axial pattern flap, which received its main arterial blood supply based on the DEPA, SFA, and MCFA. The venous outflow can be found parallel to these arteries.^[5,6,20] These three vessels are interconnected via a longitudinal axis above the deep fascia of the medial thigh.^[6] Preserving the proximal afferent of each pedicle allows for safe elevation of a longitudinally oriented medial thigh fasciocutaneous flap. The flap that is raised from one side of the medial thigh creates an ipsilateral hemiscrotum. By performing this maneuver bilaterally and suturing both flaps in the midline, a neo-scrotum with a new midline raphe will be created.^[21] Preservation of the genital branch of the genitofemoral nerve and the ilioinguinal nerve gives the advantage of being a sensate flap.^[5] The classic medial thigh flap may have difficulty in closing the secondary defect. Lax thigh skin and smaller flap width may permit primary closure.^[5] In our case, a transposition flap in Z-plasty manner has been added as a modification of the original technique for the donor site closure.

This technique offers significant improvements over the traditional method in both flap movement and donor site closure. Regarding donor site management, the traditional dependence on primary closure often resulted in excessive tension, particularly for larger defects and lack of adjacent tissue laxity. Our modified approach addresses this limitation through incorporation of a triangular transposition flap from the posterior thigh to facilitate tension-free secondary defect closure in a Z-plasty manner, redistributing wound tension vectors. This technical modification yields several clinical advantages: reduced operative burden through single-stage reconstruction, decreased donor site morbidity via optimized wound closure mechanics, and improved esthetic outcomes through careful tension management. In contrast to traditional methods such as skin grafting or staged flaps, our approach provides robust, durable coverage with a superior protection and cosmetic outcome.^[22,23]

While the medial thigh fasciocutaneous flap offers several advantages, its application must be tailored to patient factors. In individuals with diabetes mellitus, the risk of postoperative complications such as flap necrosis and delayed wound healing is increased due to impaired peripheral perfusion and microvascular compromise with a higher susceptibility to infection. As such, this technique is reserved for nondiabetic individuals and nonsmokers.^[24]

In terms of flap dimensions, by preserving the proximal origin of the three main vascular pedicles, the medial fasciocutaneous thigh flap can be safely elevated in a longitudinal orientation. The longitudinal interconnections between the SPA, MCFA, and DEPA provide a reliable axial blood supply across the flap. This allows for distal extension of the flap and enables harvest of a longer fasciocutaneous flap extending toward the distal medial thigh, thus providing sufficient tissue coverage for larger perineoscrotal defects when necessary.^[6]

Given the patient's age and lack of need for future fertility, the surgical focus prioritized quality of life, comfort, and

esthetic outcomes over spermatogenesis preservation. Shared decision-making among the patient and surgeons led to the use of a fasciocutaneous flap in this case for a few reasons. The flap provides durable skin and coverage for large defects over the scrotum and perineum.^[25] Bilateral flaps coverage achieves a superior esthetic outcome, although a unilateral medial thigh flap can be performed, especially in partial scrotal tissue loss.^[26] The resultant midline scar after bilateral flap inset imitates the natural looking scrotal raphe.^[26] No additional sutures were applied on the flap to the wound bed to recreate the groin creases. The vacuum effect from the Redivac drains, which were kept for about 1 week, allowed the flap to adhere to the wound bed, recreating the natural groin creases. The groin was then supported by an undergarment for at least 2–3-month postoperative period. The surgical technique is straightforward, associated with minimal morbidity and can be performed in a single-stage procedure.^[27] In our quest to stimulate and restore the near-natural environment for the testicles, this technique provides sensate coverage and preserves functional and esthetic outcomes.^[27]

Postoperative complications such as scar contracture may raise concerns, particularly when they affect sitting or ambulation. In our case, the only complication observed was a minor wound breakdown measuring 2 cm × 2 cm at the posterior aspect of the transposition flap. This was likely caused by localized tension from the anterior advancement of the posterior triangular flap. The area healed secondarily with conservative management and did not result in any functional impairment or significant scar contracture during recovery. Studies have demonstrated that STSG over the perineoscrotal regions may not take well in patients with the absence of tunica vaginalis of the testis and be prone to contraction during healing,^[28] potentially resulting in functional limitations or distortion of perineal anatomy. On the other hand, medial thigh flaps provide more stable and pliable coverage that maintains contour with minimal contraction over time.^[29] While direct comparative studies between medial thigh flaps and STSG in this context remain limited, our outcome supports the flap's reliability in maintaining both testicular protection and comfort during postoperative recovery.

Other reported complications include flap necrosis, wound dehiscence, and donor-site issues like hematoma.^[15,16] In obese patients, flap bulk may elevate testicular temperature enough to impair spermatogenesis though this was not a concern here.^[15,16] These potential drawbacks were outweighed by the technique's proven benefits in our patient's specific case.

CONCLUSION

The modified medial thigh fasciocutaneous flap is a versatile way for perineoscrotal reconstruction following debridement of Fournier's gangrene. It is reliable, technically safe, and easy to perform with minimal morbidity. The modification of adding a transpositional flap at the donor site assists in closure and soft tissue redistribution to reduce skin tension and produce a better esthetic outcome.

Declaration of patient consent

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

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Conflicts of interest

There are no conflicts of interest.

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