

Scrotal Defect Reconstruction using the Anterolateral Thigh Perforator Flap: A Case Series

PRASHANT BAHIRANI¹, DURGA KARKI², R CHANDAN KUMAR³, SUNIL SHARMA⁴, US VARSHETHA⁵



ABSTRACT

Infection, trauma, and burns are significant causes of large peno-scrotal defects. Peno-scrotal defects resulting from these causes may pose a major challenge for management and reconstruction. During treatment, multiple debridements may be required, often resulting in significant soft-tissue loss that requires reconstruction. In this case series, 10 patients underwent reconstruction of large penoscrotal defects using a perforator-based Anterolateral Thigh (ALT) flap. All flaps survived well without any major complications. All patients had satisfactory aesthetic outcomes on follow-up. Three patients experienced complications: two had venous congestion managed with leech therapy, and one had wound dehiscence managed with secondary suturing. The pedicled perforator-based ALT flap appears to be a reliable option for reconstruction of large scrotal defects, providing satisfactory aesthetic outcomes with acceptable donor-site morbidity.

Keywords: Flap, Fournier’s gangrene, Graft, Scrotum, Trauma

INTRODUCTION

The reconstruction of large peno-scrotal defects remains a difficult task for reconstructive surgeons. Trauma, infection, and burn injuries are the primary causes of peno-scrotal defects, with infectious causes like Fournier’s gangrene being the most prevalent among them. Fournier’s gangrene is a type of necrotising fasciitis that can involve the scrotum, penis, perineum, inner thighs, and lower abdomen [1,2]. Predisposing factors include the following: diabetes mellitus, alcoholism, obesity, local trauma, perineal and perirectal infections, and surgical interventions [1,3].

Several reconstruction options are available, including healing by secondary intention, primary closure, skin grafts, and flaps. However, there is no consensus on which technique is the most effective. Considering that these are often high-risk patients with significant comorbidities, reconstruction with technically simple and single-stage procedures is typically preferred [4].

The perforator-based Anterolateral Thigh (ALT) flap is a versatile option for extensive scrotal defects. Initially described for limb reconstruction, the ALT flap has been successfully adapted for perineal and scrotal reconstruction because it provides a large area of vascularised tissue [5]. The flap is based on the descending branch of the lateral circumflex femoral artery, which gives musculocutaneous and septocutaneous perforators. This allows the ALT flap to be tailored to the specific requirements of each defect, providing adequate bulk to protect exposed testicles while maintaining flexibility for contouring [6].

CASE SERIES

A total of 10 patients who underwent reconstruction by perforator-based ALT flaps were included in the series.

The patients with post-infective scrotal defects were initially managed in the Department of General Surgery by broad-spectrum antibiotics and serial debridement. Once the patients were stable and the wound was fit for coverage, patients were planned for a reconstructive procedure.

Perioperative and postoperative complications such as wound dehiscence, infection, haematoma, flap congestion, or graft loss over the donor site were documented. The aesthetic outcomes were assessed at the final follow-up visit after a minimum follow-up

of six months (range, 6-10 months) using a 20-point Likert scale [Table/Fig-1] [7].

Criteria	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Colour	1	2	3	4	5
Symmetry	1	2	3	4	5
Contour	1	2	3	4	5
Donor site scar	1	2	3	4	5

[Table/Fig-1]: Likert scale (Min, 4; Max, 20) classified as follows : Each parameter was scored on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). The total aesthetic score was obtained by summing the four domain scores (minimum 4, maximum 20) and was classified as poor (4-6), bad (7-9), regular (10-13), good (14-16), and very good (17-20).

Likert Scale for Assessment of Aesthetic Outcome

Operative Technique

With the patient in the supine position, a line was drawn from the anterior superior iliac spine to the superolateral border of the patella [Table/Fig-2]. A 3-cm radius circle was marked at the midpoint to identify the expected location of perforators from the descending branch of the lateral circumflex femoral artery, which were confirmed using handheld Doppler ultrasonography. An elliptical skin paddle was designed over the perforators. Following the anterior incision, subfascial dissection was performed to identify and trace the perforators to the descending branch of the lateral circumflex femoral artery. Intramuscular perforators were harvested with a



[Table/Fig-2]: Marking of Anterolateral Thigh (ALT) flap.

small cuff of vastus lateralis muscle when required. A posterolateral incision completed the flap elevation, which was then inset into the defect. The donor site was closed in layers with drain placement.

The mean age of the patients was 47.1±11.5 years (range, 24-60 years). All flaps survived completely. Two patients developed venous congestion, which was managed successfully with medicinal leech therapy. Leeches were applied directly over the congested flap until improvement in flap colour, capillary refill, and venous drainage was observed, as shown in [Table/Fig-3]. Both flaps recovered completely without requiring additional surgical intervention. One patient had wound dehiscence, which was managed with secondary suturing. In all patients, the donor site of the flap was covered with skin graft and healed well.



[Table/Fig-3]: Leech therapy for congested flap.

The patients’ demographic and clinical characteristics, including age, aetiology, defect size, comorbidities, and complications, are summarised in [Table/Fig-4]. The operative details are presented in [Table/Fig-5], while the postoperative outcomes are summarised in [Table/Fig-6].

Aesthetic outcomes were assessed at the final follow-up visit after a minimum follow-up of six months (range, 6-10 months) using a 20-point Likert scale. The mean scores for colour, symmetry, contour, and donor-site scar were 4.78±0.24, 4.44±0.53, 4.83±0.18, and 4.00±0.67, respectively. The mean total aesthetic score was 18.04±0.72 out of a maximum possible score of 20, indicating an overall very good aesthetic outcome.

Case No.	Age (years)	Cause	Size of defect	Defect location	Size of flap	Comorbidities	Complications
1	50	Fournier’s Gangrene	14×10 cm	Total Scrotal defect with exposed B/L testicles	15×11 cm	DM II, HTN	Nil
2	44	Trauma	13×11 cm	Total Scrotal defect with exposed B/L testicles	14×12 cm	Nil	Nil
3	32	Fournier’s Gangrene	15×12 cm	Total Scrotal defect with exposed B/L testicles	16×13 cm	DM II	Nil
4	54	Fournier’s Gangrene	16×14 cm	Total Scrotal defect with exposed B/L testicles	17×15 cm	DM II	Flap congestion
5	24	Fournier’s Gangrene	15×11 cm	Total Scrotal defect with exposed B/L testicles	16×12 cm	Nil	Nil
6	48	Fournier’s Gangrene	13×12 cm	Total Scrotal defect with exposed B/L testicles	14×13 cm	DM II	Nil
7	60	Fournier’s Gangrene	18×16 cm	Left Scrotal defect with exposed left testicles	19×17 cm	DM II	Flap Congestion
8	45	Burn	14×11 cm	Total Scrotal defect with exposed B/L testicles	15×12 cm	HTN	Nil
9	58	Fournier’s Gangrene	17×14 cm	Total Scrotal defect with exposed B/L testicles	18×15 cm	DM II, HTN	Wound dehiscence
10	56	Fournier’s Gangrene	15×13 cm	Total Scrotal defect with exposed B/L testicles	16×14 cm	DM II, HTN	Nil

[Table/Fig-4]: Patient data (DM II: Type 2 Diabetes mellitus; HTN: Hypertension)

Case	Number of Perforators Included	Operative Time (min)	Donor Site Closure	Blood Loss
1	1	150	Split-thickness skin graft	70 mL
2	1	170	Split-thickness skin graft	50 mL
3	2	165	Split-thickness skin graft	30 mL
4	1	180	Split-thickness skin graft	60 mL
5	2	175	Split-thickness skin graft	80 mL
6	1	185	Split-thickness skin graft	90 mL
7	1	210	Split-thickness skin graft	100 mL
8	2	205	Split-thickness skin graft	70 mL
9	2	160	Split-thickness skin graft	50 mL
10	1	155	Split-thickness skin graft	90 mL

[Table/Fig-5]: Operative details of the patients.

Case	Flap survival	Hospital stay (days)	Time to ambulation (days)	Reoperation required	Follow-up duration (months)
1	Complete	10	3	No	6
2	Complete	12	2	No	7
3	Complete	11	3	No	9
4	Complete	20	3	No	8
5	Complete	13	3	No	6
6	Complete	15	2	No	9
7	Complete	22	4	No	10
8	Complete	17	2	No	7
9	Complete	24	4	Yes (Secondary suturing)	8
10	Complete	18	3	No	9

[Table/Fig-6]: Postoperative outcomes.

Representative Cases

A 32-year-old man with a history of type 2 diabetes mellitus presented with pain, swelling, redness, and purulent discharge from the scrotum for three days. The patient underwent resuscitation and debridement, which resulted in large penoscrotal defects measuring 15×12 cm with both testicles exposed. The patient underwent reconstruction of scrotal defects with perforator-based ALT flaps of size 16×13 cm with uneventful postoperative recovery as depicted in [Table/Fig-7].

A 24-year-old male with no known comorbidities presented with a 5-day history of scrotal pain, swelling, erythema, and purulent discharge, with involvement of the anterior abdominal wall. Patient



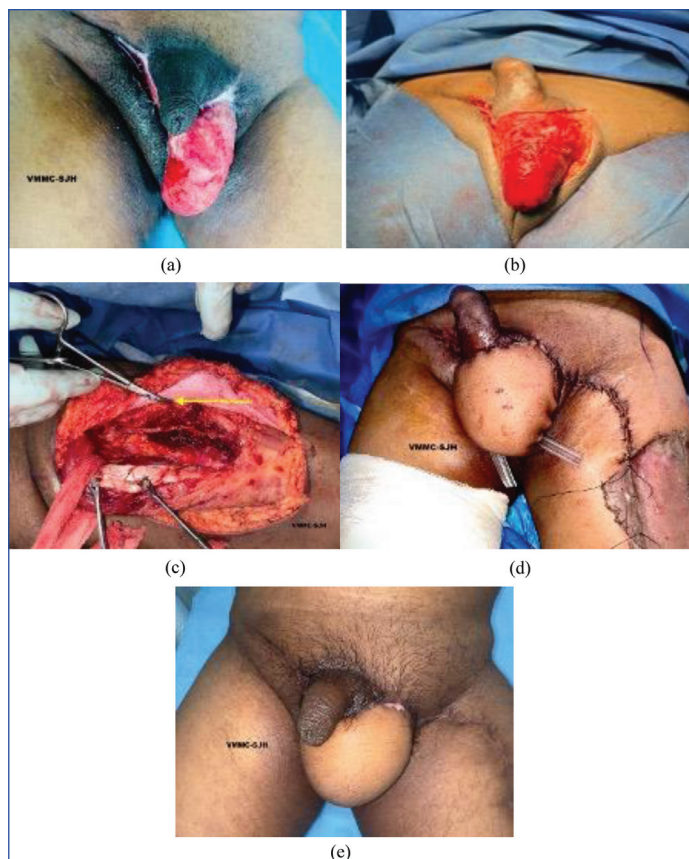
[Table/Fig-7]: (a) Pre-operative: Peno-scrotal defect with bilateral exposed testicles; (b) Post debridement; (c) Marking of ALT flap; (d) Intra-op: Flap islanded on perforator; (e) Follow-up at 6 months.

underwent resuscitation and debridement, which resulted in total scrotal defects of size 15×11 cm with exposed both testicles and raw area over abdomen. Patient underwent reconstruction of scrotal defects with perforator-based ALT flaps and closure of abdominal wound with uneventful postoperative recovery as depicted in [Table/Fig-8].



[Table/Fig-8]: (a) Pre-operative: Scrotal defect with bilateral exposed testicles and raw area over abdomen; (b) Inset of flap over the defect; (c) Follow-up at 6 months.

A 56-year-old male with a history of type 2 diabetes mellitus and hypertension presented with a post-infective scrotal defect following Fournier's gangrene. The patient was initially managed in the department of general surgery, where he underwent debridement and right orchidectomy. Later he was referred to our department for coverage. He underwent reconstruction by ALT perforator flap as depicted in [Table/Fig-9]. Postoperative period was uneventful.



[Table/Fig-9]: (a) Pre-operative: Scrotal defect with exposed testicle; (b) Post debridement; (c) Flap elevated on perforator; (d) Flap inset over the defect; (e) Follow-up at 6 months.

DISCUSSION

Several reconstructive techniques have been described for scrotal defects, including split-thickness skin grafts, local flaps, fasciocutaneous flaps, muscle flaps, and perforator flaps [8]. Although skin grafting is technically straightforward, it may be associated with graft contracture, poor durability, and inadequate protection of the testes [9]. Muscle flaps provide well-vascularised tissue and are useful in contaminated wounds; however, their bulkiness can compromise cosmetic appearance and may adversely affect testicular function by increasing local temperature [10].

The pedicled ALT perforator flap has become a valuable option for reconstruction of extensive perineoscrotal defects because of its consistent vascular anatomy, long pedicle, large skin paddle, and versatility [5].

In our case series, all ten patients underwent successful reconstruction using pedicled ALT perforator flaps. Complete flap survival was achieved in every patient. Our findings are comparable with those reported by Lin CT et al., who also demonstrated reliable soft-tissue coverage and satisfactory cosmetic outcomes using pedicled ALT perforator flaps for large perineoscrotal defects [11]. Similarly, Chen SY et al., reported low complication rates with individualised reconstruction for Fournier's gangrene, including successful use of pedicled ALT flaps in selected patients [12]. Rossi SA et al., further reported favourable long-term quality of life and sexual function following perineal reconstruction with pedicled ALT flaps, highlighting the potential functional benefits of this reconstructive option [13].

Based on our experience, the pedicled ALT perforator flap is particularly useful for large scrotal defects where local tissue is inadequate. The present case series is limited by its small sample size and the absence of a comparison group. In addition, the heterogeneity of defect size and underlying pathology may have influenced the outcomes.

CONCLUSION(S)

The pedicled perforator-based ALT flap appears to be a reliable and versatile option for reconstruction of extensive scrotal defects. In this

case series, it provided durable soft-tissue coverage with complete flap survival, acceptable donor-site morbidity, and satisfactory aesthetic outcomes.

REFERENCES

- [1] Kiliç A, Aksoy Y, Kiliç L. Fournier's gangrene: Etiology, treatment, and complications. *Ann Plast Surg.* 2001;47(5):523-27. Doi: 10.1097/0000637-200111000-00009. PMID: 11716264.
- [2] Morpurgo E, Galandiuk S. Fournier's gangrene. *Surg Clin North Am.* 2002;82:1213-24.
- [3] Vick R, Carson CC III. Fournier's disease. *Urol Clin North Am.* 1999;26:841-49.
- [4] Karian LS, Chung SY, Lee ES. Reconstruction of defects after Fournier gangrene: A systematic review. *Eplasty.* 2015;15:e18.
- [5] Song Yg, Chen Gz, Song Yl. The free thigh flap: A new free flap concept based on the septocutaneous artery. *Br J Plast Surg.* 1984;37:149-59. Doi: 10.1016/0007-1226(84)90002-X.
- [6] Cormack GC, Lamberty B. *The arterial anatomy of skin flaps.* 2nd ed. Edinburgh: Churchill Livingstone; 1994.
- [7] Likert R. A technique for the measurement of attitudes. *Arch Psychol.* 1932;140(Suppl 472):1-55.
- [8] Yu P, Sanger JR, Matloub HS, Gosain A, Larson D. Anterolateral thigh fasciocutaneous island flaps in perineoscrotal reconstruction. *Plast Reconstr Surg.* 2002;109:610-16, discussion 617-18.
- [9] Atik B, Tan O, Ceylan K, Etlik O, Demir C. Reconstruction of wide scrotal defect using superthin groin flap. *Urology.* 2006;68:419-22.
- [10] Wang D, Zheng H, Deng F. Spermatogenesis after scrotal reconstruction. *Br J Plast Surg.* 2003;56:484-88.
- [11] Lin CT, Chang SC, Chen SG, Tzeng YS. Reconstruction of perineoscrotal defects in Fournier's gangrene with pedicle anterolateral thigh perforator flap. *ANZ J Surg.* 2016;86:1052-55.
- [12] Chen SY, Fu JP, Chen TM, Chen SG. Reconstruction of scrotal and perineal defects in Fournier's gangrene. *J Plast Reconstr Aesthet Surg.* 2011;64(4):528-34.
- [13] Rossi SA, de Schoulepnikoff C, Guillier D, Raffoul W, di Summa PG. Quality of life and sexual health after perineal reconstruction in Fournier gangrene using pedicled anterolateral thigh flaps. *Front Surg.* 2022;9:994936.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Burns and Plastic Surgery, Command Hospital Airforce Bangalore, Bangalore, Karnataka, India.
2. Director Professor, Department of Burns and Plastic Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, Delhi, India.
3. Senior Resident, Department of Burns and Plastic Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, Delhi, India.
4. Director Professor, Department of Burns and Plastic Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, Delhi, India.
5. Senior Resident, Department of Burns and Plastic Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, Delhi, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Prashant Bahirani,
Department of Surgery, Command Hospital Airforce,
Bengaluru (Bangalore)-560007, Karnataka, India.
E-mail: prashant.bahirani@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: May 07, 2026
- Manual Googling: Aug 05, 2026
- iThenticate Software: Aug 08, 2026 (10%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 14, 2026**

Date of Peer Review: **Jul 06, 2026**

Date of Acceptance: **Aug 11, 2026**

Date of Publishing: **Nov 01, 2026**