Case Report

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INTEGRATIVE MANAGEMENT OF A COMPROMISED SKIN GRAFT BY MEDICINAL LEECH THERAPY AS AN ADJUNCT TO STANDARD OPERATIVE CARE: A CASE REPORT

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ABSTRACT

Background: Venous congestion is an important postoperative complication of reconstructive flap surgery and may progress to ischemia and tissue necrosis. Medicinal leech therapy improves microcirculation and has been used as an adjunct in managing venous congestion in reconstructive surgery. This case highlights leech therapy as an adjunct to standard postoperative care in a compromised full-thickness propeller flap. Case Report: A 30-year-old male with a vascularly compromised full-thickness propeller flap following a medial tibial fracture showing marginal venous congestion with dusky-to-blackish discolouration of the distal one-third, serous discharge, absent distal pin-prick bleeding, and delayed proximal pin-prick bleeding was successfully managed with 2 sittings of medicinal leech therapy along with standard postoperative wound care. Result: Two sittings of medicinal leech therapy at 5-day intervals were performed along with standard postoperative wound care and antimicrobial therapy. After the first sitting, flap colour improved, and congestion decreased. After the second sitting, pin-prick bleeding progressively improved, and serous discharge decreased. Within 1 week, the flap regained normal colour and satisfactory pin-prick bleeding, with no progression to necrosis. At 14 days, complete flap viability was observed with 100% flap/graft take and no clinical evidence of infection or residual necrosis. Conclusion: This case demonstrates the potential utility of medicinal leech therapy as an adjunct to conventional postoperative management of a vascularly compromised propeller flap with clinical features suggestive of venous congestion. The favourable clinical outcome supports further evaluation of its role in reconstructive surgery.

Keywords: Compromised Skin Graft, Venous Congestion, Leech Therapy, Reconstructive surgery

INTRODUCTION

The management of extensive lower-limb wounds has progressively shifted from prolonged open-wound care to early definitive soft-tissue reconstruction.[1] The evolution of skin grafting and flap techniques has helped in the management of such difficult defects while facilitating earlier healing, functional recovery, and improved cosmetic outcome.[2] In the field of reconstructive surgery, split-thickness grafts offer greater versatility for resurfacing extensive defects, whereas full-thickness grafts provide superior tissue quality and aesthetic characteristics in major defects.[3] The choice of reconstructive technique is consequently determined by the dimensions and depth of the defect, vascularity of the recipient bed, availability of local tissue, and functional and cosmetic requirements.[4] In the lower limb, particularly around the ankle and distal leg, reconstruction may involve skin grafting, local or regional flaps, perforator-based propeller flaps, or free-tissue transfer, allowing coverage of defects that previously required prolonged wound care or more extensive reconstruction.[5]

Despite advances in reconstructive surgery, successful tissue coverage does not invariably translate into successful graft or flap survival and is often hampered by postoperative complications such as hematoma, seroma, infection, wound dehiscence, partial or complete tissue necrosis, arterial insufficiency, and venous congestion.[6] Among these, venous congestion represents a particularly time-sensitive threat to tissue viability, with the impairment causing increased capillary hydrostatic pressure and reducing the arteriovenous pressure gradient, which progressively compromises tissue oxygenation. If left untreated, it may progress to impaired capillary perfusion and lead to grave complications such as thrombosis, ischemia, and necrosis.[7] Consequently, management of a compromised flap or graft is directed toward early identification of the underlying vascular disturbance and restoration of effective local circulation.[8] Surgical approach remains the definitive treatment when a correctable mechanical or vascular cause is identified; however, adjunctive measures to temporarily decompress congested tissue and maintain perfusion may provide an opportunity for tissue survival while physiological microvascular pathways regenerate.[9, 10]

Ayurveda describes the concept of Raktamoksha (~Bloodletting) for managing disorders associated with vitiated blood.[11] Among the various techniques, Jalokavacharan (~Leech therapy) provides a localised and controlled form of therapeutic bloodletting.[12] Its clinical use has been described in classical texts for various wound and congestive vascular conditions such as diabetic wounds, venous insufficiency ulcers, external thrombosed haemorrhoids etc.[13-16] Similarly, in reconstructive

surgery, leech therapy has been used particularly for venous congestion of flaps, replanted tissues, and grafts when venous outflow is inadequate.[17] Systematic reviews and clinical reports have documented its application in compromised reconstructive tissues, although the available evidence is predominantly derived from case reports, case series, and retrospective clinical experience.[18]

In this case report, a vascularly compromised full-thickness propeller flap was successfully managed with medicinal leech therapy as an adjunct to standard postoperative wound care. The progressive resolution of congestion, restoration of perfusion, and complete flap and graft acceptance highlight the potential role of Leech therapy in contemporary reconstructive care.

Case Report

Patient Information

A 30-year-old male patient with a history of a road traffic accident involving a rickshaw on 15 December 2025 sustained a fracture of the right distal tibia with an associated medial malleolar fracture and an overlying raw wound. The patient initially underwent operative management at NMMC Hospital, Vashi, on 16 December 2025, with external fixation, titanium elastic nailing (TENS) of the fibula, and K-wire fixation. The patient was subsequently referred to and admitted under the Department of Plastic Surgery at D.Y. Patil Hospital on 9 January 2026 for further management of the persistent soft-tissue defect.

During admission, a raw wound measuring approximately 7 × 7 cm was noted over the medial malleolar region of the right lower limb and compressive Wound management was undertaken, with 3 sittings of negative-pressure wound therapy (~NPWT) were instituted along with standard antibiotic therapy. Furthermore, due to unsatisfactory wound healing and the need for definitive soft-tissue coverage, the patient subsequently underwent reconstructive surgery for a full-thickness propeller flap.

General and systemic examination

General examination showed that the patient was hemodynamically stable, conscious, and oriented. Systemic examination showed no abnormalities in the cardiovascular, respiratory, or central nervous systems. Table 1 presents the clinical findings from the general examination along with laboratory investigations.

Table 1: Clinical findings of general examination along with laboratory investigations

General Examination	Laboratory Investigations
Pulse – 82 bpm	Hb – 13.9 g%
BP – 128/76 mm Hg	TLC – 5250/mm^3
SpO_2 – 98% on Room Air	Platelet count – 2.70 Lakhs/mm^3
Respiratory Rate – 16/min	PT – 14.58
Weight – 60 Kg	INR – 1.02
GCS – 15/15	Serum Creatine – 0.73 mg/dL
Micturition – 5-6 times/day	Uric Acid – 4.6 mg/dL
	Total Protein – 7.9g/dL
	Total Bilirubin – 0.50mg/dL
	SGOT – 26.0 U/L
	SGPT – 48.0 U/L
	RBS – 111 mg/dL
	HbsAg – Negative
	HCV – non-reactive
	HIV 1& 2 Antibody – non-reactive

BP, Blood Pressure; SpO, Saturation of Peripheral Oxygen; GCS, Glasgow Comma Scale; Hb, Haemoglobin; TLC, Total Leucocyte Count; PT, Prothrombin Time; INR, International Normalized Ratio; SGOT, Serum Glutamic Oxaloacetic Transaminase; SGPT, Serum Glutamic Pyruvic Transaminase; RBS, Random Blood Sugar; HbsAg, Hepatitis B Surface Antigen; HCV, Hepatitis C Virus; HIV, Human Immunodeficiency Virus.

Local Examination

Clinical assessment revealed early signs of compromised flap viability. The flap demonstrated marginal venous congestion with dusky-to-blackish discolouration of the distal segment, associated with serous discharge from the graft margins. Pin-prick testing, performed as a bedside assessment of cutaneous perfusion, showed absent bleeding from the distal portion and delayed bleeding from the proximal portion, indicating impaired capillary perfusion. The presence of marginal congestion, progressive distal discolouration, and impaired pin-prick bleeding raised concern for compromised venous outflow and impending tissue necrosis. On examination, the dorsalis pedis pulse remained palpable, indicating preserved macroscopic arterial inflow, consistent with the preoperative arterial Doppler examination showing normal arterial flow to the affected limb.

Diagnostic assessment

Based on the history and clinical presentation suggestive of localised disturbance of flap microcirculation, predominantly affecting venous drainage, rather than an overt proximal arterial insufficiency, the patient was diagnosed as a case of congestive compromised flap and the patient was planned for adjunctive medicinal leech therapy along with standard post-operative wound care.

Timeline

The clinical events in the case are described in Table 2.

Table 2: Timeline of case

Date	Clinical event and intervention
December 15, 2025	Patient sustained a road traffic accident, resulting in a right distal tibial fracture with associated medial malleolar fracture and an overlying raw wound.
December 16, 2025	Underwent operative management at NMMC Hospital, Vashi. External fixation of the affected limb was performed, along with titanium elastic nailing (TENS) of the fibula and K-wire fixation.

January 9, 2026	Admitted under the Department of Plastic Surgery, D.Y. Patil Hospital, for further management of the persistent soft-tissue defect of approximately 7 × 7 cm over the right medial malleolar region.
January 9, 2026	Negative-pressure wound therapy (VAC) was initiated along with antibiotic therapy.
January 17, 2026	2nd VAC dressing performed.
January 23, 2026	3rd VAC dressing change performed. Despite ongoing wound management, satisfactory wound progression was not observed.
January 29, 2026	Patient underwent reconstructive surgery after Preoperative arterial Doppler establishing normal arterial flow to the Lower limb. A 360° rotated full-thickness propeller flap was used to cover the approximately 7 × 7 cm defect and secured with 6-0 Ethilon sutures. A split-thickness skin graft harvested from the left thigh was applied over the raw donor area of the flap, followed by sterile pressure dressing.
January 30, 2026	On postoperative day 1, the flap demonstrated marginal congestion, distal blackish discoloration, and serous discharge from the margins with Pin-prick testing showing absent bleeding distally and delayed bleeding proximally. The patient was referred to the Ayurvedic surgical unit for adjunctive medicinal leech therapy after being diagnosed as a case of congestive compromised flap.
January 30, 2026	First sitting of medicinal leech therapy followed by sterile dressing and Standard postoperative wound care and antibiotic therapy.
February 2, 2026	Second sitting of medicinal leech therapy followed by sterile dressing and Standard postoperative wound care and antibiotic therapy.
Approximately February 6, 2026	Progressive resolution of flap congestion and restoration of clinically evident tissue perfusion were observed approximately one week after initiation of leech therapy.
Approximately February 13, 2026	At approximately 14 days following initiation of leech therapy, the flap demonstrated complete acceptance, with resolution of congestion, restoration of normal skin colour, and clinically evident restoration of blood flow.
February 18, 2026	Patient was discharged after completion of inpatient management, with complete flap/graft acceptance and without any residual clinical evidence of congestion.

Postoperative Standard Care

Following reconstructive surgery, the patient was managed with standard postoperative wound care and antimicrobial therapy. Intravenous medications included amoxicillin–clavulanic acid 1.2 g twice daily, pantoprazole 40 mg twice daily, paracetamol 1 g three times daily, and tramadol 100 mg twice daily. Oral medications included vitamin C (Limcee 500 mg twice daily after food), Disperzyme once daily, Neurokind-LC once daily after food, and pentoxifylline (Trental 400 mg) thrice daily. The intravenous regimen was continued for 7 days, while oral medications were continued for 15 days postoperatively. Wound margins were cleaned routinely, followed by daily dressing with Bactigras tulle, containing 1% chlorhexidine, according to the prescribed wound-care protocol. We continued dressing and wound assessment under aseptic precautions until complete flap acceptance, after which the patient was discharged.

During postoperative assessment, the flap showed marginal congestion, distal blackish discolouration, and serous discharge from the margins, with Pin-prick testing showing absent distal bleeding and delayed proximal bleeding. Hence, two sittings of medicinal leech application (postoperative Day-1 and Day 5) predominantly over the congested distal one-third of the flap were performed, followed by sterile dressing and Standard postoperative wound care and antibiotic therapy.

Standard Operative Procedure for Medicinal Leech Therapy

Purva Karma (~pre-procedure)

The medicinal leeches were prepared and activated before application according to the established procedural protocol. The leeches were gently transferred to a clean container containing fresh water and assessed for adequate activity before use. The patient was positioned comfortably, and the flap was exposed under aseptic precautions.

Pradhana Karma (~main procedure)

Three medicinal leeches were applied to the congested portion of the flap, with preference given to the distal one-third, where discolouration and impaired pin-prick bleeding were most prominent. The leeches were allowed to attach spontaneously and were permitted to feed until spontaneous detachment. The duration of attachment was approximately 1 hour. During the procedure, the leeches were kept in a moist environment with sterile wet gauze to prevent desiccation and maintain attachment. Following spontaneous detachment, the bite sites were observed for continued bleeding. Post-detachment bleeding was allowed to continue for approximately 30 minutes to facilitate local blood drainage before application of the dressing.

Pashchat Karma (~post-procedure)

After leech removal, the bite sites were covered with sterile plain gauze dressing to allow continued local blood drainage while maintaining aseptic wound protection. No haemostatic agent was applied directly over the leech bite sites immediately after detachment. The flap was subsequently monitored clinically for changes in colour, congestion, and overall tissue viability.

The procedure was repeated after 4 days, with three medicinal leeches applied predominantly over the congested distal one-third of the flap. [19]

Follow-up and Outcomes

Periodic clinical assessment of flap viability was performed following the identification of vascular compromise and continued throughout the postoperative period. At the initial assessment on postoperative day 1, the flap showed marginal congestion with dusky-to-blackish discolouration predominantly involving the distal one-third. Serous discharge was present along the flap margins. Pin-prick testing demonstrated absent bleeding from the distal portion and delayed bleeding from the proximal portion, indicating compromised local tissue perfusion. Despite these findings, dorsalis pedis pulsation remained palpable, with no clinical evidence of infection.

At the assessment following the second sitting of leech therapy, clinical examination demonstrated a progressive improvement in flap colour and reduction in congestion. Pin-prick bleeding was markedly improved, indicating recovery of local perfusion, and the flap remained clinically viable. Discharge from the margins was minimal, with no clinical features suggestive of infection. The previously noted prominent congestion had substantially reduced, with improved colour of the distal flap and no clinically evident necrosis.

After approximately one week of leech therapy, the flap demonstrated marked resolution of the vascular changes. The distal discolouration had regressed, normal skin colour was progressively restored, and clinically evident blood flow had returned throughout the flap. Congestion was no longer appreciable, and pin-prick bleeding was restored. No further

tissue necrosis was observed, and the flap showed progressive acceptance.

After 14 days of leech therapy, the flap showed complete clinical acceptance. The flap showed normal skin colour, no congestion, restored tissue perfusion, and complete viability without residual necrosis or discharge. The final flap/graft take was assessed as 100%, with no clinical evidence of infection.

The observation charting during follow-up, based on these parameters, is shown in Table 3 and Figures 1-5.

Table 3: Progressive Clinical Assessment of Flap Viability

Clinical parameter[20, 21]	At onset of compromise / before leech therapy	After Second sitting of leech therapy	After 1 week of leech therapy	2 weeks after leech therapy /Final outcome
Flap colour	Dusky/blackish discoloration, predominantly distal one-third	Progressive improvement in colour	Normalization	Normal skin colour
Flap congestion	Marginal congestion with distal involvement	Reduced congestion	Minimal/absent congestion	Completely resolved
Pin-prick bleeding	Absent distally; delayed proximally	Bleeding progressively restored	Improved perfusion with satisfactory bleeding	Clinically restored
Serous discharge	Present at flap margins	Reduced	Minimal/absent	Absent
Tissue viability	Threatened distal tissue with concern for impending necrosis	Progressive recovery	Viable flap tissue	Complete flap viability
Flap/graft take	Compromised/threatened	Progressive acceptance	Near-complete acceptance	Complete acceptance
Clinical evidence of infection	No clinical evidence	No clinical evidence	No clinical evidence	No clinical evidence

Figure 1: Postoperative day 1, vascular compromise of the full-thickness propeller flap.

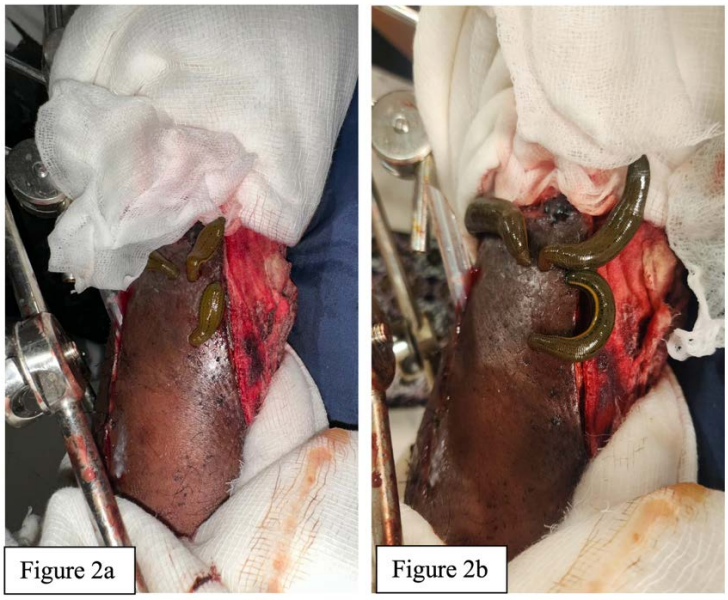

Figure 2: First sitting of medicinal leech therapy on January 30, 2026. (a) Attachment of three medicinal leeches predominantly over the congested distal one-third of the flap. (b) Leeches after feeding and spontaneous detachment.

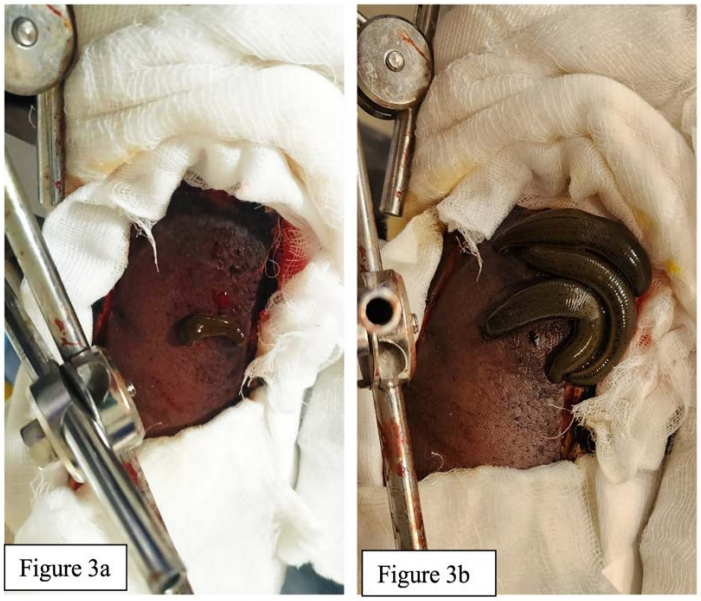

Figure 3: Second sitting of medicinal leech therapy on February 2, 2026. (a) Attachment of three medicinal leeches over the previously congested distal portion of the flap. (b) Leeches after feeding and spontaneous detachment.

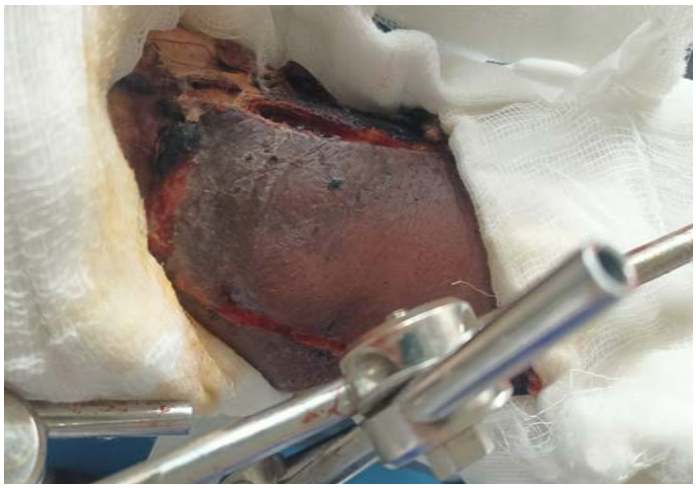

Figure 4: Clinical assessment of the flap, one week after initiation of medicinal leech therapy

Figure 5: Clinical assessment, two weeks after initiation of medicinal leech therapy, demonstrating complete flap acceptance with normal skin colour.

DISCUSSION

Postoperative venous congestion remains one of the most important threats to flap survival, because of venous pooling, tissue oedema, reduced microcirculatory perfusion, and progressive tissue hypoxia.[22] Early recognition and timely intervention are therefore critical to prevent potentially reversible congestion from progressing to irreversible necrosis. Medicinal leech therapy has been described in reconstructive surgery as an adjunctive method for managing venous congestion, particularly when arterial inflow remains preserved.[23]

In the present case, the flap showed marginal congestion with dusky-to-blackish discolouration predominantly affecting the distal one-third, accompanied by absent distal and delayed proximal pin-prick bleeding, which supported the possibility of impaired local venous drainage and microcirculatory perfusion, making local decongestive therapy a rational adjunct to the ongoing postoperative management. Medicinal leech therapy is incorporated as an adjunct to standard postoperative care to address local vascular compromise by providing a temporary route to remove stagnant blood and initiate microcirculatory angiogenesis.[24] In addition, salivary constituents of medicinal leeches, including hirudin and other bioactive molecules, possess anticoagulant, antiplatelet, and vasodilation properties that may facilitate local blood flow and prolong the decongestive effect.[25, 26] This combined effect became apparent by the second sitting of leech therapy, in which the pin-prick bleeding had improved, and the previously prominent distal congestion had substantially regressed. Approximately one week after initiating leech therapy, normal skin colour and clinically appreciable blood flow were restored, with no further progression of tissue necrosis. Complete flap acceptance was achieved about 14 days after initiating therapy, with 100% flap/graft take and no clinical evidence of infection.

From an Ayurvedic perspective, Raktamokshan (~bloodletting) represents an established therapeutic approach for removal of harmful metabolites in the circulatory system, with (~Leech therapy) providing a localised method of bloodletting particularly in conditions where localised blood stasis and impaired circulation are clinically evident.[27, 28] The present case illustrates the role of leech therapy as an adjunct along with established postoperative care, which helped in venous decongestion and complete flap acceptance. This case highlights the potential of integrating evidence-based traditional interventions with contemporary reconstructive surgery to bridge existing therapeutic gaps and provide additional options to improve outcomes in challenging surgical conditions.

CONCLUSION

This case highlights the potential role of medicinal leech therapy as an adjunct to standard care in the integrative management of a vascularly compromised skin graft by progressively reducing congestion, restoring local tissue perfusion, and ultimately achieving complete graft acceptance without infection or tissue necrosis. This case adds to the emerging clinical evidence supporting the integration of medicinal leech therapy with contemporary reconstructive care, warranting further systematic clinical evaluation to establish its efficacy, safety, and appropriate role within integrative reconstructive practice.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has consented to the journal reporting his images and other clinical information. 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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