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PEDICLED LOWER EXTREMITY FILLET FLAP FOR RECONSTRUCTION OF EXTENSIVE PRESSURE INJURIES

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Summary
Pressure injuries in paraplegic patients with multiple comorbidities are challenging to manage, particularly when ulcers are extensive, recurrent, and associated with osteomyelitis and sepsis. Conventional regional flaps may prove insufficient after previous reconstructions or when multiple pressure areas coexist. We report the case of a 52-year-old man with paraplegia secondary to myelomeningocele, multiple grade IV pressure injuries, bilateral septic arthritis of the hips, and sacral osteomyelitis. Following clinical optimisation and bilateral Girdlestone procedures with sacral and ischial ostectomy, a pedicled lower extremity fillet flap from the right leg, harvested at the supramalleolar level and including the entire limb, was used to reconstruct sacral and bilateral ischial-gluteal defects. Postoperative evolution was favourable, with resolution of sepsis, stable coverage of all reconstructed areas, and improved comfort and ease of care. A brief review of the literature identified 105 reported lower limb fillet flaps, of which only a small subset originated at the ankle level. The pedicled lower extremity fillet flap represents a salvage option when local reconstructive alternatives are exhausted, with the potential to improve quality of life in carefully selected non-ambulatory patients.

Key words: pressure injury, pedicled fillet flap, lower extremity, reconstructive surgery, plastic surgery

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INTRODUCTION

Pressure injuries are ischaemic lesions of the skin and underlying tissues that typically occur over bony prominences and are common in patients with spinal cord injury. In paraplegic patients, extensive and recurrent grade IV pressure injuries represent a major reconstructive challenge, as they are frequently associated with deep infection, osteomyelitis, septic arthritis and a marked deterioration in quality of life [1-3].
Small or moderate pressure injuries are usually managed with local gluteal or thigh flaps. However, when ulcers are multiple or recurrent, these conventional options may be insufficient or unavailable due to previous reconstructions. In such complex scenarios, the concept of “spare-part surgery” has been described, using tissue from a non-functioning limb

to reconstruct anatomically and functionally critical areas [4]. Fillet flaps are composite axial-pattern flaps that provide large volumes of well-vascularised tissue and may be transferred as free or pedicled flaps [5]. Although their use has been reported in tumour resection, diabetic foot salvage and recurrent pressure injuries, their indication must be carefully considered, as they require limb sacrifice [5,6]. Pedicled fillet flaps of the lower extremity remain a rarely reported salvage option, particularly when harvested from the ankle level [4].

This article describes the use of a pedicled fillet flap of the entire lower extremity for reconstruction of multiple high-grade pressure injuries in a paraplegic patient and contextualizes this approach within the existing literature.

MATERIALS AND METHODS

This study is a descriptive case report supported by a focused narrative review to contextualize the use of pedicled lower extremity fillet flaps for extensive pressure injury reconstruction. A targeted search of PubMed, Scopus, Web of Science, and MEDLINE (1956-2024) was performed using relevant keywords. Reports describing pedicled lower extremity fillet flaps in grade IV pressure injuries were included, while free flaps and studies without technical detail were excluded. Written informed consent was obtained for treatment, data collection, and publication of anonymized clinical information, images, and supplementary video material (Supplementary video 1. Intraoperative and clinical course of the case, illustrating the surgical technique and postoperative evolution).

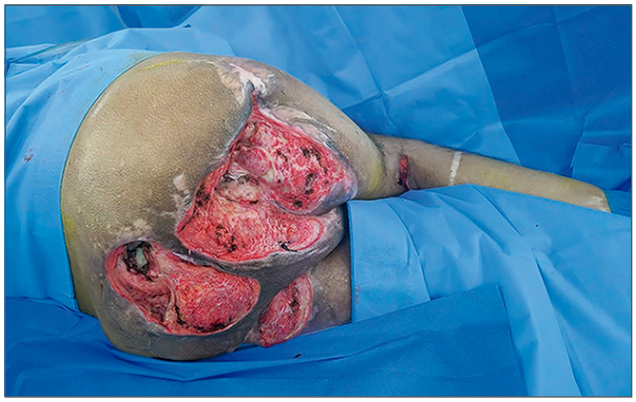


Figure 1. Preoperative extensive pressure injuries. Large right gluteal-ischial, sacral-gluteal, and ischial pressure injuries prior to reconstruction. An additional left trochanteric ulcer was present but is not visible in this image. This figure illustrates the extent of soft-tissue loss before flap reconstruction.

RESULTS

Case description and surgical outcome

A 52-year-old man with spastic paraplegia secondary to myelomeningocele presented with multiple recurrent grade IV pressure injuries and sepsis. Relevant comorbidities included hypertension, neurogenic bladder, colostomy and depression. He had previously undergone reconstruction of sacral and left trochanteric pressure injuries with local flaps.

At admission, multiple high-grade pressure injuries involved the sacral, bilateral ischial and trochanteric regions, the left gluteal area and distal lower extremities. Imaging and intraoperative findings confirmed bilateral septic arthritis of the hips and sacral osteomyelitis. Following multidisciplinary assessment and optimization, bilateral Girdlestone procedures with sacral and ischial ostectomy were performed, together with targeted antibiotic therapy.

Due to widespread pelvic infection, poor local tissue quality and non-functional lower limbs, reconstruction was planned using a pedicled fillet flap of the right lower extremity.

With the patient in left lateral decubitus, a fillet flap of the entire right lower limb was harvested from the supramalleolar level. The defects to be reconstructed included right gluteal-ischial, sacral-gluteal and left ischial–trochanteric ulcers, with an estimated total volume of approximately 660 cm^3 (Fig. 1).

Surgical technique

The flap was designed as a pedicled total lower extremity fillet flap based on preserved proximal vascular inflow. A supramalleolar level was deliberately selected to maximise available soft tissue volume while reducing distal ischaemic risk and facilitating safe flap rotation. Subperiosteal dissection of the femur, tibia, and fibula was performed to allow complete skeletal removal while preserving muscular envelopes, vascular pedicles, and the interosseous membrane. This approach was specifically intended to protect venous outflow, minimise torsion, and reduce the risk of venous congestion during flap mobilisation. The flap was subsequently rotated to achieve simultaneous coverage of bilateral ischial and sacral defects with a single limb-based reconstruction.

The procedure was initiated with a longitudinal lateral incision along the thigh between the anterior and posterior compartments, allowing rapid exposure of the femur. After subperiosteal dissection, the femur was sectioned at its mid-shaft and removed proximally and distally (Fig. 2). A circumferential supramalleolar amputation was performed. A lateral thigh approach was initially used to access the femur between the



Figure 2. Intraoperative composite pelvic defects and flap positioning. Multiple pressure injuries unified into two large defects: a right ischial-gluteal defect and a left sacral-gluteal-ischial defect, with preservation of the anal opening. The pedicled total lower extremity fillet flap from the right ankle level is shown intraoperatively, with two surgical drains in situ.



Figure 3. Postoperative flap inset and final defect coverage. Final rotation and inset of the pedicled fillet flap achieving complete coverage of all defects. The thigh component reconstructs the right gluteal-ischial region, while the leg and ankle components reconstruct the left ischial-gluteal and sacral areas

anterior and posterior compartments. The incision was then extended distally to the knee, curved medially in a suprapatellar fashion and continued along the anterior border of the tibia to the ankle. Subperiosteal dissection allowed removal of the femur, tibia and fibula while preserving the interosseous membrane, surrounding musculature and vascular supply. The patella, quadriceps tendon, ligaments, menisci and bursae were excised en bloc together with the distal femur and tibia. The fibula was removed by subperiosteal tunnelling without disruption of the interosseous membrane. This sequential approach enabled complete removal of the skeletal components of the limb while preserving the soft-tissue envelope and its vascular pedicle. The defects were unified and reconstructed with a rotated pedicled fillet flap, preserving the perianal region. The thigh covered the right gluteal-ischial area, while the leg and ankle reconstructed the left ischial-gluteal and sacral regions (Figs. 2-3, Supplementary Video). Although the procedure was prolonged, with an operative time of approximately 11 hours and the need for intraoperative blood transfusion, the patient did not experience postoperative haemodynamic instability. He was managed in an intermediate care unit during the initial postoperative period and did not require supplemental oxygen.

Postoperatively, the patient developed significant oedema and a limited perineal dehiscence, which was managed successfully with a local scrotal flap. The remaining left trochanteric defect was later reconstructed with a gluteal and fasciocutaneous flap. Complete flap survival was achieved, with no evidence of partial or total necrosis, and postoperative inflammatory markers progressively normalised. At 6 months of follow-up, no recurrence of pressure injuries or infection was observed. The patient demonstrated improved sitting tolerance and facilitated daily care.

Literature review

The literature on pedicled lower extremity fillet flaps for pressure injury reconstruction is limited. Nineteen relevant publications were identified [3-4,6,7,9-23], reporting a total of 105 flaps in 79 patients, most of which involved total thigh fillet flaps (Tab. I) [6-23].

Reports describing pedicled fillet flaps harvested from the ankle level are exceptional, accounting for approximately 17 cases worldwide [3,4,10,13,22,23]. The majority of these cases originate from North America, with only isolated European reports describing alternative lower leg fillet flap techniques, rather than complete ankle-level fillet flaps [5,21].

To our knowledge, this case represents the first reported ankle-level pedicled total lower extremity fillet flap from Chile and one of the very few reported experiences from Latin America [23].

DISCUSSION

Pedicled lower extremity fillet flaps for pressure injury reconstruction are rare, and ankle-level pedicled fillet flaps have been reported only exceptionally in the literature.

Although this represents the first reported case in our country, the main novelty of this report lies not in its geographic origin, but in the use of an ankle-level pedicled total lower extremity fillet flap to achieve simultaneous coverage of bilateral ischial and sacral defects using a single limb, representing an extreme yet effective reconstructive strategy in a non-ambulatory patient [4,23].

Although associated with prolonged operative time and significant physiological stress, limb sacrifice in non-ambulatory patients may represent an ethically acceptable option when weighed against recurrent sepsis, failure of

Table I. Description of reported lower extremity fillet flaps by different authors, grouped by number of patients, number of flaps and type.

Year	Author	No. of patients		No. of flaps	Flap type
1956	Georgiade, N (7)	1	-	1	TTFP
1961	Berkas, E (9)	4	-	2	TTFP
			-	1	TTFP
			-	1	TTFP
			-	2	TTFP-L and TTFP-R + 5 cm below the knee
1963	Spira, M (11)	5	-	2	TTFP + half leg
			-	2	TTFP + half leg
			-	2	TTFP + half leg
			-	2	TTFP + half leg
			-	2	TTFP + half leg
1968	Steiger, R (12)	1	-	1	Disarticulation and TTFP
1968	Weeks, P (10)	4	-	1	TTLFFP up to the metatarsal level as an island flap
			-	1	TTLFFP up to the metatarsal level as an island flap
			-	1	TTLFFP up to the metatarsal level as an island flap
			-	1	TTLFFP up to the metatarsal level as an island flap
1969	Royer, J (6)	28	13 pts.	2	TTFP
			15 pts.	1	TTFP
1972	Burkhardt, B (13)	3	-	2	TTLFP 7 cm above the ankle and TTFP
			-	2	TTLFP 7 cm above the ankle TTLFFP up to the metatarsal level
			-	2	TTFP and TTLFP 7 cm above the ankle
1972	Menzoian, JO (14)	1	-	2	TTFP with hip disarticulation
1987	Lawton R (15)	3	-	1	TTFP
			-	1	TTFP
			-	1	TTFP
1989	El Faki, HMA (16)	1	-	1	TTLFP 10 cm above the ankle
1994	Berger, S (17)	1	-	1	TTFP according to the SFA and DFA
1995	Fraulin, F (18)	9		10	TTFP, some up to the ankle without specification
2002	Butler, C (19)	1	-	1	Pedicled TTFP of the entire leg
2006	Nthumba, PM (20)	1	-	2	TTFP
2009	Jandali, S (4)	4	-	1	TTLFP up to the ankle
			-	1	TTLFP up to the ankle
			-	1	TTLFP up to the ankle
			-	1	TTLFP up to the ankle
2014	Verveld, CJ (21)	5	-	1	Tunneled island flap of leg and foot
			-	1	Tunneled island flap of leg and foot
			-	1	Tunneled island flap of leg and foot
			-	1	Tunneled island flap of leg and foot
			-	1	Tunneled island flap of leg and foot
2016	McCarthy, JE (3)	4	-	1	TTLFP 2 cm above the ankle
			-	2	TTLFP 2 cm above the ankle
			-	1	TTLFP 2 cm above the ankle
			-	1	TTLFP 2 cm above the ankle
2019	Georgiou, I (22)	1	-	1	TTLFP (posterior approach) up to the ankle
2020	Caracheo, R (23)	1	-	1	TTLFP up to the ankle
2025	Obaíd, M	1	-	1	TTLFP up to the ankle

TTFP: total thigh fillet flap; TTLFP: total thigh-leg fillet flap; TTLFFP: total thigh-leg-foot fillet flap; TTFP-L: left total thigh fillet flap; TTFP-R: right total thigh fillet flap; SFA: superficial femoral artery; DFA: deep femoral artery; PI: pressure injury.

local reconstruction and life-threatening conditions. In this case, the decision was made following multidisciplinary discussion and informed patient consent.

Spare-part surgery using pedicled fillet flaps provides large volumes of well-vascularised tissue for obliterating dead space in contaminated fields [4-6]. Although historically limited to total thigh flaps, extension to the ankle level maximises reconstructive potential in extreme cases. Despite high morbidity, they remain a reliable salvage option in carefully selected non-ambulatory patients [3,6,18,21].

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Conflict of interest statement

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Declaration of AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT (OpenAI) to improve language clarity and enhance readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

No professional medical writer was involved in the preparation of this manuscript. All writing, editing, and final decisions were made by the authors.

Author contributions

MLO: A, D, DT, W
RGEFS: A, D, W
MV: D, DT, W
BG: A, W
PV: D, DT, W

Abbreviations

A: conceived and designed the analysis
D: collected the data
DT: contributed data or analysis tool
S: performed the analysis
W: wrote the paper

Ethical considerations

This manuscript reports a single clinical case managed as part of routine medical care in a tertiary public hospital. The surgical procedure was performed on the basis of a clear clinical indication, as a salvage option in a life-threatening and otherwise non-reconstructable condition, and was not undertaken as part of an experimental research protocol.

According to local institutional policies, formal ethics committee approval is not required for the publication of isolated case reports, provided that no experimental intervention is involved and that patient confidentiality is fully preserved.

Written informed consent was obtained from the patient for the surgical treatment, data collection, and publication of anonymised clinical information, images, and supplementary video material.

All procedures were conducted in accordance with institutional ethical standards and with the principles of the Declaration of Helsinki.

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