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Diogo Conduto
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Diogo Branco
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Catarina Gouveia
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Afonso Almeida
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Carlos Pinheiro
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Ana Rita Gomes
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Corresponding Author:
Diogo Conduto
Department of Plastic and Reconstructive Surgery, Hospital Santa Maria-ULSSM, Portugal

Spare parts surgery in hand trauma: Dual reconstruction with split digital fillet flap: A case report

Diogo Conduto, Diogo Branco, Catarina Gouveia, Afonso Almeida, Carlos Pinheiro and Ana Rita Gomes

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Abstract
Introduction: Fillet flaps are axial-pattern composite flaps harvested from unsalvageable parts, providing coverage without additional donor-site morbidity. Their application in the hand allows functional reconstruction with minimal sequelae.
Case Presentation: A 30-year-old man sustained a hand injury with dorsal avulsion and distal phalanx loss of the middle finger, preserving a viable volar fillet flap; and a dorsal defect with bone exposure on the ring finger. The distal fillet flap was split longitudinally: the radial half covered the middle finger stump, and the ulnar half was inset as a cross- finger flap to ring finger. Division occurred at three weeks, and full motion was regained by three months.
Discussion: Compared with reverse cross-finger, thenar, or homodigital reverse-flow flaps, each associated with flexion immobilization or donor-site morbidity, the split fillet flap minimized functional impairment.
Conclusion: This case highlights the versatility of the spare-part principle, enabling dual defect coverage with excellent outcomes.

Keywords: Spare parts, hand surgery, fillet flap, cross-finger flap, hand trauma

Introduction
Lipomas are the most common fatty tumours of soft tissues [1]. They are called “giant” when the excised piece exceeds 5 cm in diameter [2]. They are rare in hand and constitute only 1 to 3.8% of benign tumours of the latter [3]. This observation concerned a palmar localization of a giant lipoma in a 55-year-old right-handed patient.

Clinical case
Fillet flaps are axial-pattern composite-tissue flaps harvested from unsalvageable parts [1]. They are traditionally used for extensive limb reconstruction, but the underlying spare- part principle remains highly relevant in the hand, where functional preservation is essential. Spare-part surgery emphasizes using non-viable or redundant tissues to optimize outcomes [2], enabling surgeons to maintain stump length, provide stable coverage, and reduce donor-site morbidity. Although often associated with major composite injuries, tissue scavenging can also offer elegant solutions for more localized defects.
Cross-fillet flaps apply this concept by filleting an unsalvageable digit and transferring the tissue to an adjacent finger, functioning similarly to a cross-finger flap [3]. This adaptability underscores the broader reconstructive utility of fillet flaps, a principle illustrated by the presented case

Case Report
A 30-year-old right-hand dominant manual worker presented after a wood-cutting machine accident causing severe injury to the left hand. Examination revealed a crush injury of the middle finger with complete dorsal skin and distal phalanx avulsion, while the volar soft tissue remained viable as a fillet flap. The ring finger showed dorsal soft-tissue loss with a 5 x 10 mm area of bony exposure and nail plate avulsion, though distal interphalangeal motion was preserved (Figure 1A). Radiographs confirmed complete amputation of the distal phalanx of the middle finger without additional fractures (Figure 2).
Under locoregional anesthesia, the fillet flap was explored, vascular pedicles confirmed, and the flap divided longitudinally into two halves (Figure 1B): the radial portion used to cover

the middle-finger stump and the ulnar half inset as a cross-finger flap to the ring finger (Figure 1C). Both digits were immobilized in extension.

At three weeks, the cross-finger fillet flap was divided. A transient 20° flexion deficit of the ring finger resolved fully after three months of physiotherapy (Figure 3). The patient regained full function, returned to work, and was highly satisfied with the functional and aesthetic outcomes.

Discussion

Fillet flaps, functioning as composite transfers, align with the principles of spare-part surgery to optimize reconstruction while minimizing donor morbidity [1, 2]. In this case, several alternatives were considered.

The homodigital reverse-flow flap offers sensate glabrous tissue and is effective for volar or fingertip injuries [4, 5]. However, it sacrifices a digital artery, increases donor-site morbidity, and carries risks of venous congestion, partial necrosis, cold intolerance, and stiffness [6, 7]. It also requires immobilization in flexion, increasing the likelihood of contractures, unfavorable compared with the extension positioning allowed by a split fillet flap.

The reverse cross-finger flap is reliable for dorsal defects [8], but requires immobilization in flexion and may result in longer rehabilitation and less favorable aesthetics [9]. The split fillet flap, in contrast, avoids morbidity to adjacent digits.

The thenar flap is simple and effective for distal defects [10], but postoperative immobilization with the finger flexed to the palm is problematic in adults, leading to stiffness and prolonged recovery. Thus, in this case, it was less advantageous.

Overall, while established options remain valuable, each involves trade-offs related to donor morbidity, sensory mismatch for dorsal defects, or immobilization requirements. The split fillet flap avoided these limitations, provided dual coverage, and facilitated early rehabilitation.

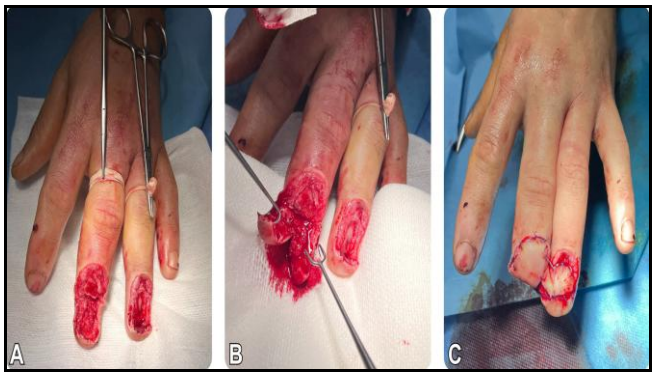

Fig 1: Pre and Intra-operative Images. 1A: Inicial Defect with intact vascular pedicles; 1B: Division of flap into two halfs; 1C: Cross-finger flap

Fig 2: Pre-Operative Hand Radiography

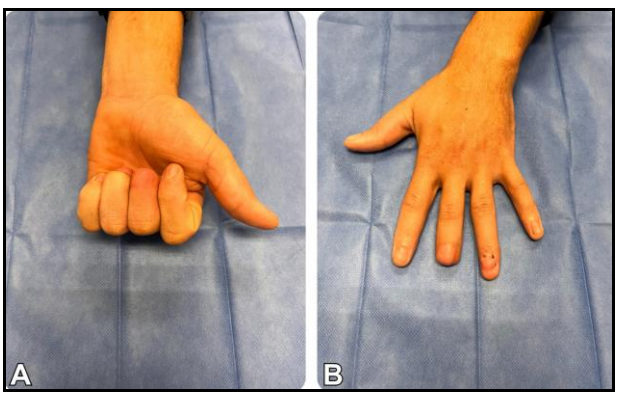

Fig 3: Post-operative Images after three months

Conclusion

This case highlights the versatility of the spare-part principle in hand reconstruction, showing how a split fillet flap from an unsalvageable digit can provide dual defect coverage with minimal morbidity and excellent functional recovery. Fillet flaps should be considered for major and localized hand injuries, offering practical and innovative reconstructive options.

Declarations

Ethical Approval: Not required for single case reports according to institutional policy.

Consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Conflict of Interest Statement: The authors declare no conflict of Interest.

Declaration of Generative AI and AI-assisted technologies in the writing process: During the preparation of this work the author used ChatGPT 5 in order to review text and improve language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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