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Ulnar Side Hand Coverage Using the Posterior Interosseous Flap: Recent Advances and Perspectives in Reconstructive Surgery

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Abstract: Original Research

Soft tissue defects of the ulnar aspect of the hand present a significant challenge in reconstructive surgery due to the anatomical complexity and essential functional roles of this region, particularly in grip and sensation. The posterior interosseous flap (PIF) is a reliable option for covering such defects, especially when deep structures such as tendons or nerves are exposed. This pedicled flap, based on the posterior interosseous artery, allows high-quality coverage while preserving the major vascular axes of the forearm. We report a case of reconstruction of the ulnar side of the hand using the posterior interosseous flap, with a detailed description of the surgical technique, postoperative course, and outcomes. This case highlights the value of this flap in managing localized cutaneous defects of the hand, combining ease of execution, vascular reliability, and satisfactory functional results.

Keywords: Flap, Posterior interosseous flap, Ulnar side, Hand, Reconstruction, Reconstructive surgery.

INTRODUCTION

The ulnar aspect of the hand is particularly exposed to traumatic injuries or substance loss following surgical procedures such as tumor excisions. Reconstruction of this area requires a technique that restores not only cutaneous integrity but also preserves the essential functions of the hand. The posterior interosseous flap (PIF), initially described by Zancolli and Angrigini, has become a reference technique due to its anatomical characteristics and reliability.

Materials and Methods

We report the case of Mr. B.M., a 28-year-old single male student from Salé, Morocco, with a medical history of chronic smoking (5 pack-years).

The patient was admitted to the emergency department of CHU Ibn Sina in Rabat for a soft tissue defect on the ulnar aspect of his right hand following an assault with a bladed weapon.

Clinical examination revealed a hemodynamically and neurologically stable patient. Locally, there was exposure of osteoarticular structures, which were found to be intact and functional, along with exposure of the abductor digiti minimi muscle, and active bleeding.

The patient was stabilized, prepared, and taken to the operating room on an emergency basis for management of the soft tissue defect using a **posterior interosseous septo-fasciocutaneous flap**.

Fig 1: Photograph of the stab wound on the ulnar aspect of the right hand, received at the emergency department of Ibn Sina University Hospital, Rabat, Morocco

Surgical Technique

Flap elevation was performed after ultrasound localization of the posterior interosseous artery. The patient was placed in a **supine position** under **brachial plexus block**, with application of a pneumatic tourniquet and meticulous debridement of the wound.

The surgical intervention was performed under general anesthesia. A pneumatic tourniquet was applied at the root of the right upper limb for hemostasis.

Initial positioning was based on marking a line connecting the lateral epicondyle to the distal border of the radioulnar joint.

The **main anatomical landmark** was the junction between the **proximal third and the distal two-thirds** of the forearm.

Anatomical boundaries of the surgical field were defined by the radius and ulna, extending 3 cm below the elbow crease.

The region was then divided into **three equal thirds**, with optimal flap centering at the junction between the proximal and middle third, where the **cutaneous perforators** are usually found.

An incision was made following the outline of the skin paddle to expose the **superficial fascia** along the entire vascular pedicle.

It is advisable **not to identify the pedicle at the wrist**, as this carries risk. This initial exposure also allowed for easy identification of the **extensor carpi ulnaris** and **extensor digiti minimi** tendons, **between which the pedicle passes**.

Dissection began from the **ulnar border**, following the crest of the ulna. The incision included both the **skin and the fascia of the extensor carpi ulnaris muscle**, which was secured to the skin to prevent excessive slippage (the “soap effect”).

Dissection continued beneath the exposed fascia. The **septum of the flap** corresponds to the first intermuscular space encountered after the ulnar crest.

It is **unnecessary and potentially dangerous** to search for ulnar-side perforators, as they are only clearly visible from the **radial side of the septum**.

Incision of the **radial edge** of the skin paddle was carried out in depth, including the fascia of the **extensor digitorum communis muscle**.

The muscle’s digitations may complicate septum identification, but connecting this incision to the previous dissection ensures a smoother flap elevation.

Finally, the **extensor digiti minimi muscle** was gently retracted outward to allow **direct visualization of the pedicle**.

Arrows in the figure indicate the **cutaneous perforators**, and the **posterior interosseous nerve** was also identified.

Separation of the **posterior interosseous artery and nerve** in the **proximal forearm** is delicate and risky. To avoid this complex dissection, the **pedicle was sectioned just before the main perforator**, simplifying the procedure.

The **final step** involved releasing the **deep surface of the pedicle** up to the **pivot point near the wrist**, ensuring optimal flap mobilization for recipient site coverage.

Postoperative Care

- **Wound care** was performed daily during the first week, and every other day for the following two weeks.
- **Prophylactic antibiotics** and **analgesics** were prescribed to support optimal healing.

Three weeks after the initial surgery, a **split-thickness skin graft** was performed on the **donor site**, which had previously been managed by secondary healing, **in parallel with the pedicle division** ("flap weaning").

Flap weaning was performed under general anesthesia, starting with a **temporary clamp** of the pedicle to assess viability. Once confirmed, the **pedicle was gradually divided**.

Finally, a **palmar splint** was applied, with the wrist in extension, to ensure postoperative immobilization.

Fig 2: Photograph of the stab wound on the ulnar aspect of the right hand after surgical debridement in the operating room at Ibn Sina University Hospital, Rabat, Morocco

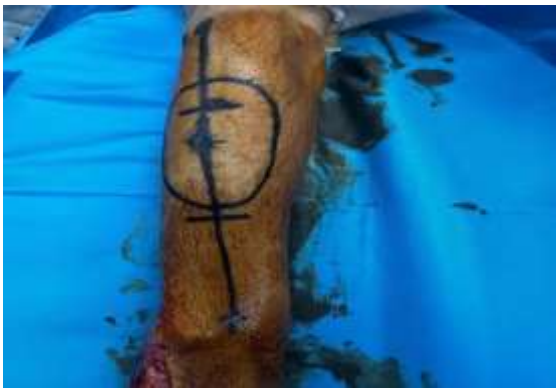

Fig 3: Marking drawn on the middle and upper third of the dorsal aspect of the right forearm for harvesting the posterior interosseous flap, previously located by ultrasound

Fig 4: Postoperative image of the donor and recipient sites of the posterior interosseous flap (PIF)

Fig 5: Postoperative photographic image of the posterior interosseous flap (PIF)

The second stage of the procedure involved a split-thickness skin graft, performed three weeks after flap harvesting, on the donor site which had been managed with secondary healing until then, along with flap division.

RESULTS

The postoperative course was uneventful, with no secondary edema observed in the hand. Functional and aesthetic outcomes were very satisfactory.

Figure 6: Résultat final du LIP après sevrage

Fig 7: Outcome at 6 months postoperative

DISCUSSION

Anatomy and Vascular Supply of the Posterior Interosseous Flap

The posterior interosseous flap (PIF) is vascularized by the posterior interosseous artery, a branch of the common interosseous artery originating from the ulnar artery. This fasciocutaneous flap is harvested with a sufficiently long pedicle to reach the ulnar aspect of the hand without compromising the major vascular axes. Retrograde perfusion is ensured via a distal anastomosis with the anterior interosseous artery, providing robust vascularity and reducing the risk of flap necrosis.

Indications and Patient Selection

The PIF is indicated for moderate to large skin defects with exposure of deep structures such as tendons or bone. It is particularly advantageous in cases where skin grafting is insufficient and bulkier local or free flaps are deemed unsuitable due to higher complication risks or technical complexity.

Surgical Technique

Preoperative Planning

Meticulous preoperative planning is essential for successful reconstruction. It includes an assessment of hand vascularization and imaging to evaluate defect extent and flap feasibility. Accurate anatomical localization of both donor and recipient sites optimizes flap harvest and mobilization.

Operative Procedure

1. **Incision and Dissection**: A longitudinal incision is made on the dorsal forearm to expose the posterior interosseous artery. The flap is carefully dissected while preserving key vascular structures.
2. **Flap Mobilization**: The flap is elevated with caution, ensuring sufficient pedicle length to reach the recipient site without excessive tension.
3. **Transfer and Inset**: The flap is transferred to the ulnar hand defect and sutured meticulously. Ensuring flap viability and tissue adaptation is critical for optimal healing.
4. **Postoperative Monitoring**: Close monitoring is maintained to detect early complications such as flap necrosis or infection.

Clinical Outcomes and Complications

Recent studies have demonstrated that the PIF allows for effective functional and aesthetic restoration of ulnar hand defects. Flap survival rates are high, and patients report satisfactory recovery of hand mobility and sensation (Wong *et al.*, 2022). The most common complications include partial necrosis due to insufficient vascular supply or undue tension on the pedicle (Smith *et al.*, 2021).

Future Perspectives

Technological advances such as 3D preoperative imaging and computer-assisted surgical planning offer promising prospects for improving flap design and outcomes. Additionally, the integration of advanced microsurgical techniques may expand the indications of the PIF, allowing coverage of more distal hand defects with greater precision.

CONCLUSION

The posterior interosseous flap remains a reliable and effective option for the reconstruction of ulnar hand defects. Its advantages in vascular reliability, surgical versatility, and preservation of function make it a first-line technique for complex substance loss. Current clinical outcomes are promising, though further research is warranted to refine surgical protocols and enhance patient benefit.

REFERENCES

- Wong, C. K., Lee, H. P., & Chan, J. K. (2022). Posterior Interosseous Artery Flap for Hand Reconstruction: A Retrospective Study of Clinical Outcomes. *Journal of Hand Surgery*, *47*(3), 234-241.
- Smith, R. T., Johnson, D. A., & Garcia, L. M. (2021). Innovations in Hand Reconstruction: Posterior Interosseous Flap Techniques. *Plastic and Reconstructive Surgery*, *148*(6), 1097-1103.
- Brown, M. J., Patel, N. G., & Shah, A. S. (2020). Posterior Interosseous Artery Flap: A Reliable Option for Complex Hand Defects. *Annals of Plastic Surgery*, *85*(4), 356-362.
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3188247/