

The Distally Based Posterior Interosseous Artery Flap for Hand and Wrist Reconstruction: A Clinical Case Series and Technical Considerations

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ABSTRACT

Background: Soft-tissue defects of the hand and wrist represent a reconstructive challenge due to the need for thin, pliable coverage that preserves function and aesthetics. The distally based posterior interosseous artery (PIA) flap offers a reliable regional option without sacrificing a major arterial axis.

Objective: To evaluate clinical outcomes, complications, and technical refinements associated with the use of the distally based posterior interosseous artery flap for reconstruction of hand and wrist defects.

Methods: A retrospective review was conducted on patients who underwent reconstruction with a distally based PIA flap for traumatic or post-surgical defects of the hand and wrist. Demographic data, defect characteristics, flap dimensions, survival rates, and postoperative complications were analyzed.

Results: The flap demonstrated a high rate of complete survival, with partial distal necrosis occurring in a minority of early cases. Mild venous congestion was observed initially but did not compromise final outcomes. Incorporation of additional subcutaneous tissue and superficial venous structures appeared to reduce venous complications. Donor-site morbidity was low, although split-thickness skin grafting occasionally resulted in aesthetic dissatisfaction.

Conclusions: The distally based posterior interosseous artery flap is a dependable and versatile option for coverage of selected hand and wrist defects. Proper preoperative planning and meticulous dissection are essential to minimize complications, particularly venous congestion and issues related to anatomical variation.

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INTRODUCTION

Reconstruction of soft-tissue defects involving the hand and wrist demands a balance between adequate coverage and preservation of function. Exposure of tendons, joints, or bone typically necessitates flap coverage rather than skin grafting alone. While free tissue transfer remains a powerful option, regional flaps continue to play an important role by reducing

operative time, technical complexity, and donor-site morbidity.

The posterior interosseous artery flap, first described in the mid-1980s, has gained acceptance as a reliable fasciocutaneous flap for dorsal hand, wrist, and first web space reconstruction. Its principal advantage lies in

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preserving the radial and ulnar arteries while providing thin, well-matched tissue suitable for hand coverage.

This study presents a clinical experience with the distally based PIA flap, emphasizing outcomes, common pitfalls, and technical nuances that may enhance flap reliability.

MATERIALS AND METHODS

A retrospective review was performed on consecutive patients treated with a distally based posterior interosseous artery flap for soft-tissue defects of the hand, wrist, or first web space. Indications included acute traumatic wounds, chronic scar contractures, and post-debridement defects.

Collected variables included:

Patient age and sex

Etiology and location of the defect

Flap dimensions

Donor-site management

Flap survival and postoperative complications

Flap viability and venous congestion were assessed clinically during the postoperative period. Follow-up focused on functional outcome, need for secondary procedures, and patient-reported satisfaction.

Surgical Technique (Overview)

Flap planning was performed with the forearm in pronation, identifying the axis between the lateral epicondyle and the

distal radioulnar joint. Doppler ultrasound was routinely used to confirm the presence of the distal perforator.

Dissection began distally to verify the integrity of the anastomosis between the anterior and posterior interosseous arteries. The flap was elevated in a subfascial plane, preserving a generous cuff of subcutaneous tissue around the pedicle to optimize venous outflow. Care was taken to avoid injury to the posterior interosseous nerve.

A wide subcutaneous tunnel was created to prevent pedicle compression. Donor sites were closed primarily when feasible or covered with split-thickness skin grafts when necessary.

RESULTS

Most flaps achieved complete survival. Partial distal flap necrosis occurred in a small number of early cases and resolved without major sequelae. Mild to moderate venous congestion was observed initially but diminished with experience and refinement of technique.

Inclusion of additional subcutaneous tissue and superficial veins appeared to correlate with improved venous drainage. Donor-site morbidity was minimal, although patients who required skin grafting occasionally reported cosmetic concerns. Secondary debulking procedures were rarely required.



Figure 1. Posterior interosseous flap (*vascular pedicle: posterior interosseous artery, a branch of the common interosseous artery*).

DISCUSSION

The posterior interosseous artery flap represents a valuable alternative to radial forearm flaps and free tissue transfer in appropriately selected patients. Its reliability depends heavily on anatomical consistency, although variations in the posterior interosseous system have been well documented and may preclude flap elevation in rare cases.

Venous congestion remains the most common complication associated with reverse-flow flaps. Previous anatomical and radiographic studies suggest that venous drainage occurs through indirect pathways, emphasizing the importance of preserving perivascular tissue and avoiding pedicle skeletonization. Technical modifications, including wider pedicles and careful tunneling, may significantly reduce this risk.

Compared with free flaps, the PIA flap offers shorter operative times and avoids microsurgical anastomosis, making it particularly attractive in patients with intact forearm vascular axes.

<i>Term</i>	<i>Description</i>
<i>Posterior interosseous flap</i>	Fasciocutaneous flap used for hand and wrist reconstruction
<i>Vascular pedicle</i>	Vascular supply that maintains flap perfusion
<i>Posterior interosseous artery</i>	Primary artery supplying the flap
<i>Branch of the common interosseous artery</i>	Anatomical origin of the posterior interosseous artery

CONCLUSIONS

The distally based posterior interosseous artery flap is a reliable and effective option for reconstruction of selected hand and wrist defects. With appropriate patient selection and meticulous surgical technique, high flap survival rates and satisfactory functional outcomes can be achieved. Awareness of anatomical variations and strategies to optimize venous drainage are critical to minimizing complications.

Level of Evidence

Level V – Therapeutic study.

Ethical Considerations

All procedures were conducted in accordance with institutional ethical standards and the principles of the Declaration of Helsinki. Informed consent was obtained from all patients.

Conflicts of Interest

The authors declare no conflicts of interest related to this study.

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