

Hand Reconstruction with Posterior Interosseous Flap. A Review

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ABSTRACT

For the greatest functional outcome, hand reconstruction with soft tissue abnormalities requires an early, single-stage, well-vascularized cover. Since important tissues including tendons, bones, and joints are exposed, a full thickness graft is typically needed, and subsequent repair is frequently necessary. Reverse flow flaps in the posterior interosseous artery provide a flexible and dependable means of covering intricate soft tissue abnormalities in the hand in full thickness.

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INTRODUCTION

In order to prevent infection, facilitate early mobilization, shorten hospital stays, and ultimately achieve satisfactory functional results, reconstruction of soft tissue abnormalities of the hand must be completed early using a single stage surgery. Regional flaps must be employed if local flaps are not adequate to satisfy the need. Reconstruction of soft tissue abnormalities on the dorsum of the hand, wrist, and first web space is frequently achieved with the use of a septocutaneous island flap, initially reported by Zancolli and Angrigiani in 1985. This flap is based on the posterior interosseous artery elevated from the posterior part of the forearm. Compared to other flaps on the market, this one has the benefit of not requiring the sacrifice of any vessels that are necessary for hand perfusion^{1,2}.

HAND RECONSTRUCTION

A single stage technique that can deliver well-vascularized flap covering as soon as feasible is the best option for reconstructing hand lesions with significant skin loss. This approach also reduces scarring, fibrosis, and hospital stays while improving functional outcomes. For covering significant hand abnormalities, the distally based radial artery forearm flap is the gold standard. Large skin paddle with

dependable reversed perfusion is one of its benefits. However, other authors have suggested that the flap can be raised in such circumstances provided the pivot point is retained 5 cm proximal to the wrist crease. That being said, this flap should not be employed in severely damaged hands because the further loss of the radial artery could threaten hand viability. The main drawback of the ulnar artery-based flap is that it sacrifices the ulnar artery, which is the main artery supplying the hand. Based on the ascending branch of the dorso ulnar artery, the dorso ulnar flap is a distally based flap with a restricted rotational pedicle. Defects are limited to the proximal palm and ulnar-dorsal side of the hand. Skin, tendon, muscle, and bone of the distal radius can be obtained through the anterior interosseous flap with its skin paddle on the dorso radial side; however, dissection is difficult and involves delicate and anatomically changeable veins. Reconstruction of moderate to large cutaneous deformities in the hand requires distant flaps. A sufficient quantity of tissue is provided for covering by the reverse volar forearm flap. But a major blood supply source to the hand is cut off, and in order to avoid edema and to make draining easier, a second venous anastomosis is often advised^{3,4}.

The skin on the posterior portion of the forearm receives a steady blood supply from the posterior interosseous vessels,

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and the hand's vascularity is not negatively impacted by the vessel's sacrifice. An additional benefit is that the flap's retrograde flow is anatomically based on the anastomosis between the posterior and anterior interosseous arteries; as a result, it may be utilized even in cases where the palmar arches, radial or ulnar arteries, or both are damaged. The distally pedicled posterior interosseous artery flap can supply vascular skin to the thumb's proximal phalanx and the first web space in the dorsal part of the hand. In the case of thumb reconstruction, it can also be elevated as an osteofasciocutaneous unit, complete with a vascularized bone segment from the ulna. The flap can be positioned proximally to fix elbow-related abnormalities and have direct blood flow via the posterior interosseous artery. One benefit of this flap over others is that, unlike other forearm flaps (ulnar or radial), which are situated volarly, it does not obstruct the hand's lymphatic drainage because it is based on the dorsal portion of the forearm⁵.



Figure 1. Hand reconstruction with posterior interosseous flap

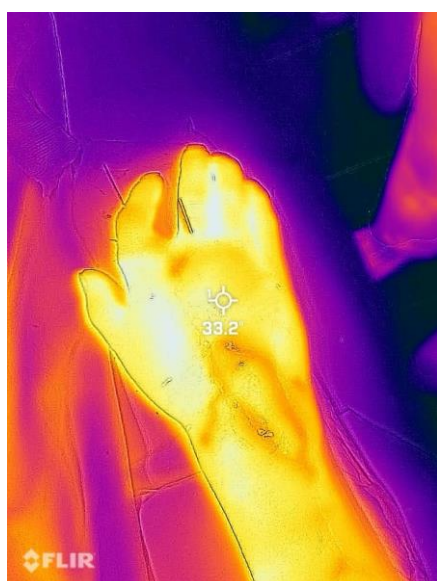


Figure 2. Viability of the flap

Instead of running in a septum between the extensor carpi ulnaris and the extensor digiti minimi and then continuing proximally in the septum between the extensor digiti minimi and the extensor digitorum communis, it has been observed in certain series that the main vessel of the posterior interosseous artery dipped below the extensor digiti minimi in the mid forearm level. As a result, in order to harvest the flap, the vessel and a fringe of the extensor digit muscle had to be removed. In a different instance, the authors discovered that the flap had partial necrosis and that the main vascular and the primary perforator in the midforearm were of incredibly tiny caliber, necessitating careful dissection. Numerous authors have reported similar variations in vascularity and have suggested further preoperative Doppler evaluation of the interosseous arteries perforating branches in the proximal and middle third of the forearm in order to facilitate the raising of a distal flap that is pedicled either on the anterior or posterior interosseous artery. Other scientists, however, have not discovered any obvious structural differences in these patients. This makes the flap very trustworthy, as other writers have shown⁶.

PEARLS AND PITFALLS

Before Operation

Performing a surgical plan for reconstruction requires a thorough clinical assessment of the affected limb and the detection of perforators using a Doppler probe. If bone fixation is required, a plan is devised with the orthopedic surgeon. The necessary incision and dissection for fixing are extensively addressed so as not to impede the intended flap region⁷.

DURING OPERATION

The tourniquet is elevated without exsanguation to start the surgery if adequate Doppler signals are seen during the preoperative evaluation. Even though there is a lot of blood in the field in the initial seconds, this greatly facilitates the identification of perforators during dissection. Dissection from the ulnar side facilitates quick and simple septum identification while cutting down on operating time. It is preferable to have many perforators in the pedicle rather than just one. This is contingent upon the trauma scenario and tension-free flap insert. For the flap's survival, several perforators serve as a lifeboat. Constant irrigation of the perforator with a 10% xylocain spray protects against perforator spasm. Adrenaline (1/100.000) soaked gauze greatly aids in the acceptance of the skin transplant⁷.

Following surgery

Reducing hospital stay and protecting the flap from oedema and congestion can be achieved by elevating the hand and avoiding pressure on it. In conclusion, the use of the flap can be dependable and safe with more understanding of the reversed posterior interosseous flap entity and improvements in surgical procedures⁸.

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CONCLUSION

Reverse flow flaps in the posterior interosseous artery provide a flexible and dependable means of covering intricate soft tissue abnormalities in the hand in full thickness.

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