A New Island Flap Transfer from the Dorsum of the Index to the Thumb

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A composite "kite" or island flap—sustained by the first dorsal interosseous artery, drained by one or two veins, and innervated through terminal branches of the radial nerve—can be transferred from the dorsum of the proximal phalanx of the index finger to the thumb. A knowledge of the regional neurovascular anatomy is essential for the transfer.

ANATOMY

Coleman and Anson,6 and Von Lang and Wachsmuth,22 have described the first dorsal metacarpal artery, but they did not make a clear distinction from the artery of the thumb. The best description is given by Paturet:37

This artery arises from the outer side of the radial artery between the crossing of the extensor pollicis longus and its penetration into the apex of the first interosseous space; it is frequently a large one, often the largest of the dorsal metacarpal arteries. It is very short and passes over the first interosseous muscle where it divides into two branches: a radial one, the internal dorsal artery of the thumb and an ulnar one, the external dorsal artery of the index finger...

Our arterial studies4 were done on 30 fresh hand specimens cleaned with Cialit and perfused with colored, opaque methyl-methacrylate. The first dorsal metacarpal artery was found in all 30 specimens to be arising from the radial artery (28/30), or from the dorsalis superficialis antebrachialis artery at the level of its penetration into the aponeurosis of the first interosseous muscle.

In only one case did it arise from the ulnar side of the radial artery in the anatomical "snuff box." The course of the artery is upon the aponeurosis—although some aponeurotic fibers often cross over the artery; this differentiates it from a constantly deeper artery which goes to the muscle. The external dorsal artery of the index finger always originates from the first dorsal metacarpal artery. Some other branches may also arise.

An internal dorsal artery for the thumb (3/30). In this case the artery is more radial.
A small perforating branch joining the deep palmar arch.

The external dorsal artery of the index is the constant terminal branch; it supplies the second metacarpophalangeal joint, the proximal (index) phalanx, and the dorsal skin over the first interosseous space.

One of us (G. F.) has injected 10 first dorsal metacarpal arteries in cadaver hands in an effort to delineate the skin supplied. It was found that the area reaches to the distal extension crease of the PIP joint.

In brief our vascular study proved (1) that the artery is a constant one, (2) that its course is on the aponeurosis, (3) that it has few collateral branches, and (4) that its terminal skin supply is the dorsal aspect of the proximal phalanx of the index finger.

Two other bundles are found in the same area, but more superficially; these are (1) one or two dorsal veins, and (2) radial nerve branches (sensory). The latter usually supply a dorsal area which terminates within the distal third of the proximal phalanx of the index.

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Fig. 1. Technique of raising the "kite" island flap from the dorsum of the proximal phalanx of the index finger, and transferring it to the thumb. Note the neurovascular pedicle composed of the first dorsal metacarpal artery (together with the perivascular fat and the adjacent part of the aponeurosis), one or two superficial veins, and the radial nerve branches to this area of skin. (Drawings by Dr. William Littler)

OPERATIVE TECHNIQUE OF RAISING THE FLAP FROM THE DORSUM OF THE INDEX

1. The first dorsal metacarpal artery is exposed at the level of its origin, going through a dorsal S-shaped incision over the first interosseous space (Fig. 1).

2. Then the aponeurosis, with the perivascular fat, is raised in the pedicle. Two veins, isolated more superficially, are chosen according to their course and also raised in the pedicle. The radial nerve branches are included in the island pedicle.

3. The radial edge of the skin flap is elevated next, because it is here that there is a hazard to the artery. Then the skin flap is carefully raised circumferentially from the peritenon of the extensor apparatus.

* This incision prevents using the skin as a cross-digit flap.

DISCUSSION

This dorsal island flap transfer has proved useful for the treatment of thumb injuries in primary cases (Figs. 2-4) and in secondary cases. It affords well-vascularized coverage with sensibility. Like the island flaps based on the digital artery (Moberg, Littler, and Sullivan), it can be used in the emergency case where no direct microvascular anastomosis can be done. It is also useful in the secondary treatment of an ulcer resulting from insufficient restoration of circulation to the thumb. Intolerance to cold is significantly relieved by enhancement of the arterial flow.

Venous return can also be increased by this