

# Dorsal digital perforator flap. A Case Report

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Case Report

Plastic Surgery



## Background

It might be challenging to identify an acceptable soft-tissue grafting material to seal a cut on the dorsum of a finger. The absence of locally accessible tissue makes it difficult to repair after dorsal tissue loss and subsequent tendon or joint exposure. Since local flaps, such as transposition and advancement flaps with random vascularity, are only able to move a small quantity of tissue from the surrounding area, their usage may be restricted. The dorsal metacarpal artery perforator flap (DMCA) is a vascular island flap that originates from the dorsum of the hand and may be used in a variety of ways to repair soft-tissue abnormalities in the fingers. Defects on the index finger, middle finger, and little finger are commonly repaired with the DMCA perforator flap. When other flap alternatives are restricted, such as with dorsal finger deformities, the dorsal metacarpal artery (DMCA) flap is a useful tool in the reconstructive hand surgeon's arsenal. The flap is straightforward to harvest with minimum donor site morbidity and complies with most reconstructive concepts, such as "to replace like with like." The first dorsal metacarpal artery (FDMA) flap, in particular, is commonly utilized to repair damage to the thumb.

**Keywords:** Quaba flap, Dorsal hand flaps, Dorsal finger defects.

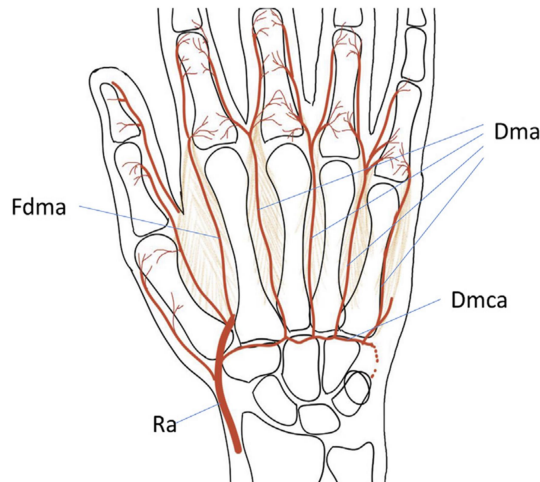
A vascular island flap called the dorsal metacarpal artery perforator flap is created on the dorsum of the hand to address soft-tissue abnormalities in the fingers. It was initially described by Quaba and Davison in 1990 as the distal-based hand flap. It is dependent on the distal cutaneous perforator of the dorsal metacarpal artery, which develops at the level of the metacarpal neck in the second to fourth intermetacarpal gaps. Additionally, two additional flaps taken from the dorsum of the hand have been documented. These flaps are known as the reverse dorsal metacarpal artery flap and the expanded reverse dorsal metacarpal artery flap. Other local alternatives that are available for the treatment of soft-tissue abnormalities in the fingers include transposition or rotation of the skin that is nearby, an adipose turnover flap, a cross-finger flap, or a vascular island flap from the same or adjacent fingers. When the incision is too big or there is a requirement for faster finger mobilization, a one-stage operation, or other similar circumstances, it is possible that an island flap taken from the dorsum will be the best option.

## Vascular anatomy of the hand in relation to flaps

At the level of the carpus, the forearm's arteries connect to make three dorsal arches and three palmar arches. The dorsal radiocarpal arch lies deep to

extensor tendons at the level of the radiocarpal joint and it is present in 80% of the population contributions from the radial artery, the ulnar artery, and a dorsal branch of the anterior interosseous artery in 67% of the population. The dorsal intercarpal arch is consistently seen in all dissections, and lies at the level of the midcarpal joint. The dorsal radiocarpal arch is deep to the extensor muscles at the level of the radiocarpal joint. It is found in 80% of the population and is supported by the radial artery, the ulnar artery, and a dorsal branch of the anterior interosseous artery in 67% of the population. The dorsal intercarpal arch is always found at the level of the midcarpal joint and can be seen in all dissections. When it comes into the hand, the dorsal branch of the radial artery goes between the two heads of the first dorsal interosseous muscle. Before it goes through this muscle, it gives rise to the first dorsal metacarpal artery and a cross branch that makes the dorsal arch of the carpus (the dorsal proximal metacarpal arch). The first dorsal metacarpal artery, is consistent and is the pedicle for the so-called "kite flap." This arch gives rise to the second, third, and fourth dorsal metacarpal arteries that supply the dorsal skin of the hand. The dorsal metacarpal arteries continue on the dorsal aspect of the proximal phalanges and communicate with the branches of palmar arteries at the level of the proximal interphalangeal joints. The other dorsal metacarpal arteries connect with the deep palmar

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**Figure 1.** Dorsal arterial system of the hand. Dma, dorsal metacarpal arteries. Dmca, dorsal metacarpal arch. Fdma, first dorsal metacarpal artery. Ra, radial artery.

network at the level of the metacarpal neck. These interosseous communications form the basis of the distally based dorsal hand flap or the Quaba flap.

**Surgical technique**

The perforator of the dorsal metacarpal artery is targeted for this flap since it is the closest to the lesion. If there is an injury near the selected perforator, a nearby perforator is selected instead. The intermetacarpal space is demarcated at the level of the metacarpal neck to indicate the location of the chosen perforator. The flap's hinge is at the point where the perforator was pierced. A dermoadiposal bridge section may be included in the flap's construction, or it may be entirely adipose tissue. Using a tourniquet, a plane of loose areolar tissue is created superficial to



**Figure 3.** First dorsal metacarpal artery perforator flap (FDMCA) final design.

the extensor tendon paratenon, and the flap is lifted proximally to distally along this plane. The perforator is born just distal to the tendon insertions. The dorsal metacarpal artery can be seen traveling from below the extensor tendon, under the juncturae, and into the web space as one approaches the perforator. Veins that drain blood from the perforator are located in the connective tissue around the artery and should not be cut away. The proximal interphalangeal and metacarpophalangeal joints are extended, and the flap is rotated into the defect before being secured loosely to the defect's margins. Extending the donor's wrist helps with primary wound closure. For one week, a volar splint is worn to hold the wrist and fingers in an extended position.



**Figure 2.** Volar injury index finger, left hand.



**Figure 4.** FDMCA perforator flap rotated



Figure 5. Final dorsal reconstruction flap.

### Discussion

The reconstructive options for dorsal finger defects are limited, and some include rotation, advancement, transposition flaps, and hatchet flaps for small defects; for moderate-sized defects, reverse cross finger flaps and adipofascial turnover flaps are an option. The most frequent DMCA flap, or Quaba flap, is a perforator flap based on the dominant communicating perforator between the DMCA and palmar artery system at the metacarpal neck. The vascular basis of the DMCA flaps has now been well established in Sherif's work as the most anatomically constant vessel in the whole DMCA. It is a perforator flap based on antegrade flow through the perforator and, even though the superficial veins are ligated, flow through the deep veins are undisturbed. The DMCA perforator flap is a flap that elevates from the hand dorsum and uses the DMCA as the pedicle to cover the defect in the finger. For covering soft-tissue abnormalities in the fingers, the hand dorsum is an excellent donor location with an appropriate color and tissue match; the dorsal skin is thin, pliable, and mobile to allow for unimpeded and gliding motion of underlying extensor tendons and joints. The DMCA FLAPs can be accomplished in a single stage, and the donor is usually capable of primary closure; early mobilization is also achievable following the procedure. Indications of the use of DMCA-based flaps and its variants include resurfacing dorsal finger defects up to the DIPJ, finger defects up to the distal phalanx (extended flap variant), and palmar defects proximal to the mid-middle phalanx. Venous congestion is another problem with the DMCA flaps due to twisting, kinking, or occlusion of the pedicle, especially the veins then it is crucial to avoid skeletonizing the pedicle during flap dissection and to

preserve a cuff of subcutaneous tissue around it to preserve venous outflow.

### Conclusion

When it comes to resurfacing dorsal finger and hand defects, the DMCA flaps and their variants provide the reconstructive hand surgeon with an additional dimension to work with. In addition to this, they are dependable, simple to harvest, and cause very little morbidity at the donor sites.

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### Conflicts of interest

The authors have reported no conflicts of interest.

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