

## Reversed First Dorsal Metatarsal Artery Island Flap for First Ray Defects



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### ABSTRACT

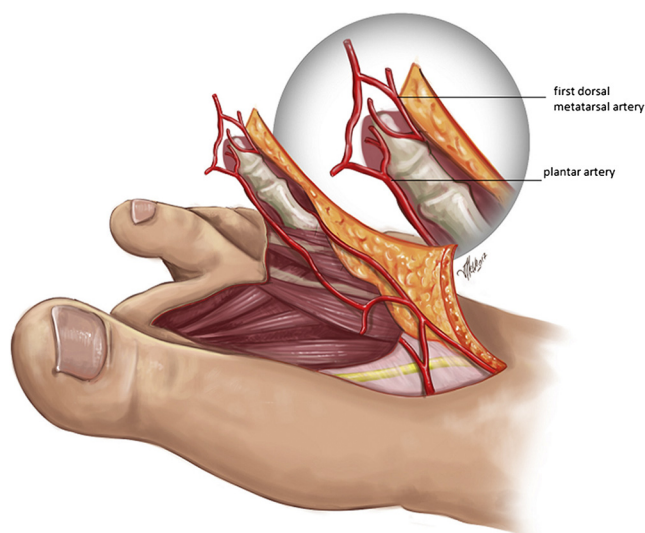
Reconstruction of the first ray is challenging because of poor skin laxity, bone and tendon exposure, and limited local flap options. Repair using full- or split-thickness skin grafts is generally not an option because of the bone and tendon exposure. Reconstructive options using local flaps from the distal foot area are restricted owing to insufficient soft tissue. Many reconstructive options have been described to overcome these difficult situations. We present 2 cases in which the great toe and first ray defect were repaired using a reversed first dorsal metatarsal artery island flap. The findings from these clinical cases and anatomic studies have shown that the reversed first dorsal metatarsal artery island flap is an alternative and suitable option for reconstruction of soft tissue defect of the distal foot, especially first and second ray defects, because it is thin and simple, has anatomic characteristics similar to those at the recipient site, and results in minimal donor site morbidity.

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The distal foot is the main weightbearing part of the foot, and soft tissue reconstruction of this area, especially the toes, is a difficult problem in reconstructive surgery. Defects in this area can occur secondary to various etiologies, such as trauma, tumor excision, diabetes mellitus, burns, and frostbite (1,2). Different reconstructive methods have been described to cover these defects. Skin grafts, random flaps, pedicled flaps, and free flaps have been the choice for reconstruction for many years. The defects are usually complicated by exposed tendons or bones even if the defects are small. In such cases, it is not possible to cover the defect with a skin graft (3–5). The ideal flap should have a dependable vascular supply, provide an acceptable functional and aesthetic result, and cause minimal donor site morbidity (4,6). In addition, soft tissue reconstruction of the distal foot should provide a good contour with thin and pliable tissue to allow for the wearing of a shoe (4).

The anterior tibial artery is the main arterial supply of the dorsum of the foot and terminates as the dorsalis pedis artery at the level of the first intermetatarsal space. The dorsalis pedis artery branches off to the first dorsal metatarsal artery, arcuate artery (which gives off 2 to 4 metatarsal arteries), and lateral and medial tarsal artery (7,8). The first dorsal metatarsal artery (FDMA) runs above the first intermetatarsal space inside of the first dorsal interosseous muscle. It then forms the first and second digital arteries. The reversed first dorsal metatarsal

artery flap has a dependable arterial supply because the first dorsal metatarsal artery gives off numerous cutaneous branches to provide enough arterial supply to the intermetatarsal skin and it communicates with the plantar arterial network via the distal communicating branches (8,9) (Fig. 1). Some variations exist of first dorsal metatarsal arterial branches that do not anastomose with the plantar arterial



**Fig. 1.** Illustration of the first dorsal metatarsal arterial course and communication with the plantar artery. Courtesy of Merve Evren, PhD Candidate, Department of Biotechnology, Ege University Natural and Applied Sciences.

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**Fig. 2.** (A) Preoperative view of our 25-year-old male with necrosis of the toes due to frostbite. (B) Intraoperative view of the patient after reconstruction using the reversed first dorsal metatarsal artery flap. Postoperative first-year view of the (C) dorsal and (D) plantar surface of the foot.

network, which is important for the viability of the distally based FDMA flap and to avoid venous failure. Therefore, the dorsalis pedis artery should not be divided and ligated before verifying a sufficient arterial supply by clamping the proximal pedicle (10,11).

In the present study, we report the use of reversed first dorsal metatarsal artery island flap for soft tissue reconstruction of the big toe and first ray defect with technical details provided in [Supplementary Video S1](#).

## Case Report

### Case 1

A 25 year-old male was admitted to our hospital with necrosis of all the tips of the toes on the left foot, which had started 2 months previously after he had walked in the snow. He had no medical comorbidities. On physical examination, necrosis was

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