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CASE REPORT

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Mid-lateral approach for revascularization of an amputated second toe: A case report

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Abstract

The plantar or dorsal approach has been previously reported for the replantation or revascularization of a completely or incompletely amputated lesser toe. However, no reports exist describing an alternative approach for the replantation or revascularization of an amputated lesser toe, either complete or incomplete. We encountered a rare case of revascularization of an incompletely amputated second toe using a mid-lateral approach. The purpose of this case report was to describe the mid-lateral approach, which is novel in its nature for the replantation or revascularization of a completely or incompletely amputated lesser toe. A 43-year-old male was involved in a motor vehicle accident and had incomplete crush amputation of a second toe at the base of the nail, along with open dislocation of the distal interphalangeal (DIP) joint in the third toe. We performed artery-only revascularization of the second toe using a mid-lateral approach, with the patient in the supine position with his hip in flexion and external rotation. The postoperative course was uneventful, and the second toe was deemed viable. The Japanese Society for Surgery of the Foot (JSSF) standard rating system of the lesser toe was rated 90 and the Self-Administered Foot Evaluation Questionnaire (SAFE-Q) scored 100 in all the mentioned categories. The mid-lateral approach could be an option for the replantation or revascularization of an amputated lesser toe distal to the proximal interphalangeal (PIP) joint.

KEYWORDS

amputation, amputation, case study, distal interphalangeal joint, mid-lateral approach, revascularization, toe replantation

1 | INTRODUCTION

Although the plantar or dorsal approach has been reported previously for the replantation or revascularization of a completely or incompletely amputated lesser toe, only a few reports exist on the different operative approaches for toe replantation and revascularization.

Nishi[1] et al reported that among the 11 cases they encountered, the dorsal approach was used in six cases; the plantar approach, in four cases; and a combination

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approach, in one case. In other studies with 17 and 20 cases of great toe replantation, respectively,[2,3] the approaches used were not mentioned. However, the interposition of a vein graft has been recommended.[3,4] Importantly, as has been mentioned, there is no gold -standard approach. Exposure, preparation, and anastomosis of the plantar artery and, sometimes, the dorsal vein can be challenging irrespective of whether the surgeon chooses the dorsal or planter approach. There are multiple points of view to consider, making the decision on an approach difficult; therefore, the best operative approach is still debatable.

Alternative approaches for the replantation or revascularization of an amputated lesser toe other than the dorsal or plantar aspect have not been described in the literature. The purpose of this article is to report the mid-lateral approach, a novel approach, for the replantation or revascularization of an amputated lesser toe.

2 | CASE REPORT DESCRIPTION

A 43-year-old male patient was injured in a motor vehicle accident. The patient's right foot toes were caught and crushed in a lift gate; thereafter, he was brought to the hospital by ambulance. The patient had no relevant past medical history, except a smoking history of half a pack of cigarettes per day for 20 years. Socially, he was employed in the construction industry and had no sports-related hobbies.

The results of the physical examination were as follows:

An incomplete crush amputation was found at the base of the nail of the second toe. The plantar aspect skin was interrupted but still attached; however, the distal stump of the toe was pale. On the dorsal aspect, a deep open wound was observed at the nail base of the third toe but the blood supply in that area was intact. Initial radiography revealed a distal phalangeal fracture of the second toe and dislocation of the DIP joint of the third toe. The amputated distal stump fragment of the second toe overlapped with the third toe (Figure 1). A diagnosis of an incomplete crush amputation at the base of the nail of the second toe was made, along with open dislocation of the DIP joint of the third toe.

Revascularization of the second toe was performed with the informed consent of the patient. The operation was performed with the patient in the supine position with hip flexion and external rotation. The big toe was flexed to the limit using surgical tape.

We performed artery-only revascularization of the second toe. During surgery, we initially identified the distal end of the plantar artery and marked it. Furthermore, we made a mid-lateral skin incision at the proximal end and dissected deeper to locate the plantar artery, thereby identifying it easily (Figure 2). After bone shortening and DIP arthrodesis, we performed end-to-end anastomosis of the medial plantar digital artery since the operative field was superficial. Figure 3 illustrates the foot appearance immediately postoperation, with blood circulation in the second toe showing improvement. The surgical time was 2 h 37 min with minimal blood loss, with a total ischemic time of 6 h 50 min.

Postoperative radiography showed K-wire fixation of the second toe and reduction in the DIP joint of the third toe. Sixth months postsurgery, the foot appeared healed (Figure 4) and the patient reported no limitations in daily activities along with pain-free physical exercise. The JSSF standard rating system score of the lesser toe[5,6] was calculated at 90 and with the Self-Administered Foot Evaluation

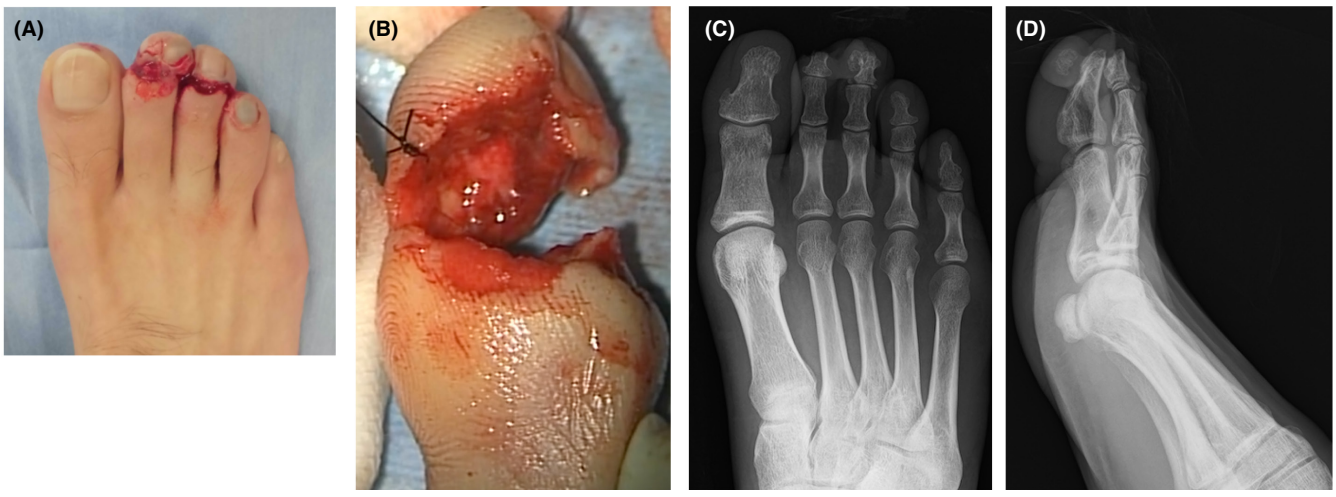

FIGURE 1 Initial presentation. (A) Incomplete crush amputation at the base of the nail. (B) Lateral visual examination showed plantar skin interruption, but still attached. (C) Initial anteroposterior radiograph of the forefoot. (D) Initial lateral radiograph of the forefoot.

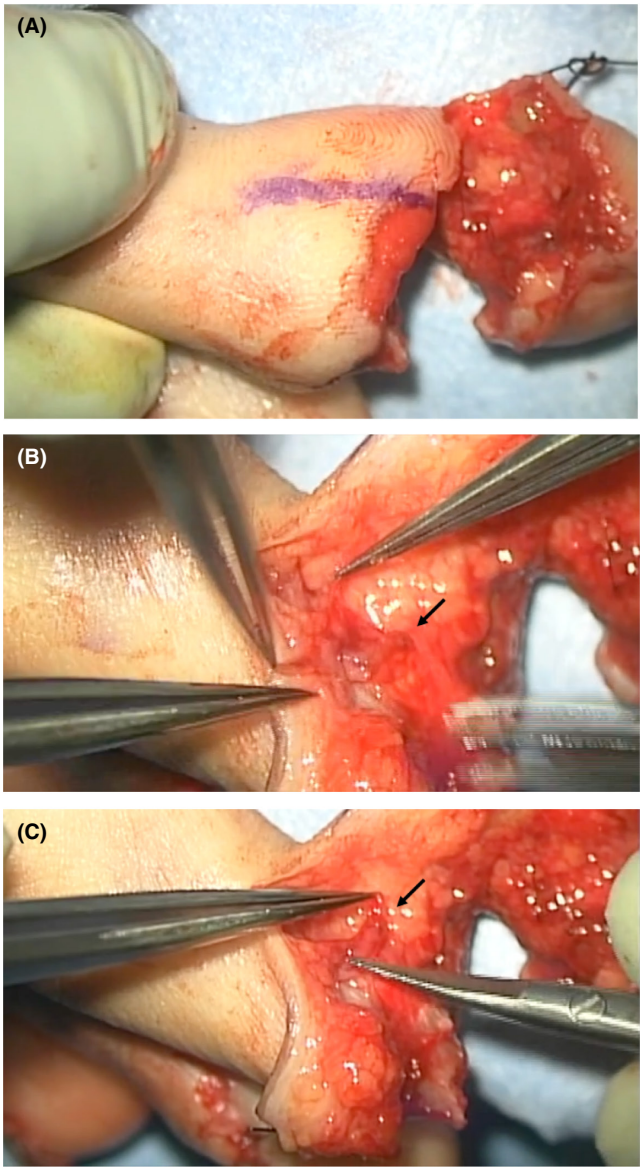

FIGURE 2 (A) Mid-lateral skin incision at the proximal stump. (B) Deeper dissection was performed and the plantar artery identified, thereby approaching it easily. (C) Dissection of the plantar artery before anastomosis.

Questionnaire (SAFE-Q),[7] our patient scored 100 for the pain and pain-related, physical functioning and daily living, social functioning, shoe-related category, and general health and well-being categories.

3 | DISCUSSION

The mid-lateral approach used in this case has several advantages. Firstly, the surgeon can approach and identify the artery easily. Secondly, arterial anastomosis can be performed effortlessly because the operating field is superficial. Finally, the surgeon can perform

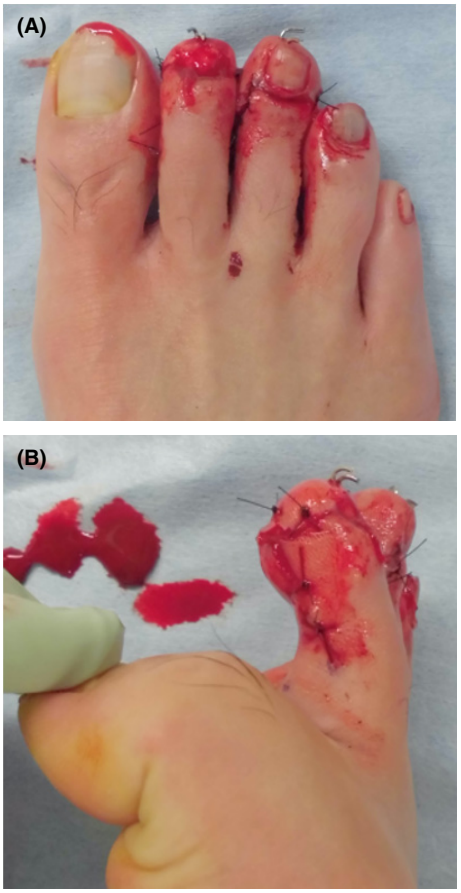

FIGURE 3 (A) The fore foot appearance immediately postoperation. (B) The lateral appearance of the second toe immediately postoperation.

this procedure with the patient in the supine position. Conversely, the mid-lateral approach also has a few disadvantages. This approach cannot be used proximal to the PIP but this can be connected to a dorsal skin incision proximally.

We discuss what we consider the advantages and disadvantages of each operative approach are as follows: with the dorsal approach, the surgeon can operate with the patient in the supine position, but the operating field is deep. Considering the plantar approach, surgeons can encounter several disadvantages: firstly, the soft tissue is thick, leading to difficulty in dissection; secondly, the toe tends to tilt, making replantation difficult; and finally, it is more difficult to operate on the vein with the patient in the prone position.

In conclusion, we report a mid-lateral approach for revascularization of an amputated second toe. Considering the advantages and disadvantages, the mid-lateral approach could be an option for cases of toe amputation. However, more research is required to establish the indications for this specific approach.

FIGURE 4 The foot appearance sixth months postoperation. (A) Dorsal. (B) Plantar.

AUTHOR CONTRIBUTIONS

Ken Nishimura: Conceptualization; investigation; methodology; project administration; resources; validation; visualization; writing – original draft. **Katsuyasu Fukasawa:** Writing – review and editing. **Runa Sugawara:** Conceptualization; resources. **Koichi Kobayashi:** Project administration; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the present study are available from the corresponding author upon reasonable request.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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