Arterialized venous toenail flap was first reported in 1990. It is a free flap that includes the nail bed and matrix with a pedicle formed solely by the subcutaneous vein of the toe. The mechanism of survival of arterialized venous toenail flap remains unknown given its nonphysiologic circulation. We herein present 2 cases of nail reconstruction using arterialized venous toenail flap with a detailed analysis of their postoperative course.

**CASE 1**

A 47-year-old woman requested surgical correction of a nail deformity of her right middle finger, to which she had sustained trauma during childhood. We grafted the arterialized venous toenail flap from her right great toe. The flap was carefully designed and elevated. Vascular anastomosis was performed between the lateral subcutaneous vein of the great toe and digital artery at the ulnar side; and one venous valve was resected and anastomosed, and the communicating branch between the medial and lateral subcutaneous veins of the great toe was ligated, permitting skin closure and finishing the surgery.

The grafted nail survived the unstable circulation during the postoperative period. Detailed evaluation of the flap’s circulation post operation is shown in Table 1 and Figure 1. The nail bed was ischemic just after operation, then gradually improved and was stable 2 days post operation. The skin flap was also ischemic just after operation; however, it became congested from day 2 postoperative. The skin flap gradually improved and was stable 12 days post operation.

**CASE 2**

An 11-year-old girl requested surgical correction of congenital onychodysplasia of her left index finger. We grafted an arterialized venous toenail flap from her right great toe. The flap was carefully designed and elevated. No visible venous valve was found. One communicating branch between the medial and lateral subcutaneous veins of the great toe was ligated. Vascular anastomosis was performed between the medial subcutaneous vein of the great toe and the digital artery at the radial side; and between the lateral subcutaneous vein of the great toe and the subcutaneous digital vein, allowing for skin closure and finishing the surgery.

The grafted nail survived the unstable circulation during the postoperative period. Detailed evaluation of the flap’s circulation post operation is shown in Table 1. The nail bed was moderately ischemic just after operation, then improved between the medial subcutaneous vein of the great toe and the subcutaneous digital vein. One venous valve was resected and anastomosed, and the communicating branch between the medial and lateral subcutaneous veins of the great toe was ligated, permitting skin closure and finishing the surgery.

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to reach a stable state in 7 days post operation. The skin flap was mildly ischemic just after operation. It then became congested from postoperative day 2, followed by gradual improvement to reach a stable state 13 days post operation.

**DISCUSSION**

Arterialized venous toenail flap is a free flap that includes the nail bed and matrix, with a pedicle formed solely by the subcutaneous vein of the toe. This technique was reported to be less invasive and comparatively easier to perform than other techniques and had a high survival rate. However, only a few reports have replicated this technique.

Circulation of the arterialized venous toenail flap is nonphysiologic and is different from that of conventional free flap. Several authors reported the postoperative course of arterialized venous toenail flap, which included: ischemia: 1/3, congestion: 0/3; ischemia: 0/3, congestion: uncertain cases (the flap color was slightly reddish and stabilized 1 week post operation); and indication of unstable circulation in the postoperative period. However, there were no reports about the mechanism of survival with reference to detailed postoperative course, or about the separate circulation of each of the nail bed and the skin flap.

Regarding the flap survival process, it was assumed that the nonphysiologic circulation through the arteriovenous shunt will decrease with the development of neovascularization from the recipient bed. During the postoperative course of our cases, shown in Table 1, the nail bed was ischemic in the early postoperative period, then became congested from postoperative day 2, and it took 12 and 13 days in cases 1 and 2, respectively, to achieve an intact circulation. Just after operation, the inflow volume in the flap decreases as it reaches the more distal graft. The flap tends to be ischemic because the shunt and venous valves have large influence on its circulation. As the inflow volume in the flap increases with progression of the postoperative course, it can adequately reach the distal flap. If an imbalance occurs between inflow and outflow volumes, the flap becomes congested. Because of this, the congestion in our flaps was prolonged. Vascularization from the recipient bed helps to improve this imbalance, and we found that it took about 2 weeks for the flap’s circulation to achieve stability.

Survival of the arterialized venous toenail flap will not occur as a composite graft, but as a flap. In our cases, survival occurred as a result of both vascular anastomosis and vascularization from the recipient bed.

For this technique to achieve stable results, the circulation of the flap should be adequate through tailored vascular anastomosis and through obtaining more vascularization from the recipient’s bed.

Although findings obtained from only 2 patients cannot be generalized to the population, we believe that our report may serve as a guide for larger trials analyzing the mechanism of survival of arterialized venous toenail flap.

**CONCLUSIONS**

We presented 2 cases of nail reconstruction using arterialized venous toenail flap with a detailed...
analysis of their postoperative course, which enabled us to postulate on the mechanism of graft survival. In our cases, survival occurred as a result of both vascular anastomosis and vascularization from the recipient bed.

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