Reusing of the Failing Free Flap “Nutrient Flap” as Salvage Procedure

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Summary: A 26-year-old woman sustained a traffic accident injury to her left medial malleolus. A soft-tissue defect 15 × 7 cm with exposure of bone was found and underwent free anterolateral thigh flap to cover it. On the second postoperative day, venous congestion occurred and re-exploration was performed. Re-anastomosis of the vein was done after the thrombectomy; unfortunately, the flap did not recover. We found there was a good granulation bed under the failing flap and thinned the failing flap and used it as a full-thickness skin graft. The graft survived completely; 9 months later, the graft site was softer and of good texture. The patient can wear the same size shoes without a debulking procedure. The free flap provided nutrients to the raw surface and nurtured a good granulation bed while it survived for 50 hours; as a result, it was used as “the nutrient flap.” Reuse of the failing free flap as “the nutrient flap” is useful as an alternative backup procedure. (Plast Reconstr Surg Glob Open 2014;2:e93; doi: 10.1097/GOX.0000000000000026; Published online 3 January 2014)

Sucess in free flap transfer for the reconstruction of extensive and complex tissue defects provides distinct advantages. The success rate of elective microsurgery ranged from 91% to 99% in recent reports.1,2 A common complication of free flap procedures is venous failure of the anastomosis, which demands immediate revision surgery involving clot removal and anticoagulation therapy.1,3–5 The salvage rate of free flaps with surgical intervention is about 70%.1–5 But after the first attempt, when facing venous insufficiency with a failing flap, we usually discard the previous failing flap and reconstruct with other free flaps or use vacuum-assisted closure (VAC) and secondary skin grafts. We report a case of a woman who had 2 episodes of venous insufficiency in the early postoperative period. She underwent a full-thickness skin graft taken from the previous failing flap on the granulation tissue that provided nutrients from the failing free flap as a salvage procedure.

CASE REPORT

A 26-year-old woman sustained a full-thickness skin avulsion injury of the left ankle with a medial malleolar open fracture due to a traffic accident. She initially underwent debridements and open reduction and fixation with Kirschner wires at a previous hospital. She was referred to our department. However, her injured skin necrotized and infected. Three weeks after initial injury, the surgical procedure was performed. After adequate debridements, a soft-tissue defect 15 × 7 cm with exposure of bone was found (Fig. 1). An anterolateral thigh flap including 2 perforators was harvested from the ipsilateral side and used to cover the defect area. An end-to-end anastomosis was performed to the anterior tibial vessels of...
the affected side (Fig. 2). Twenty-four hours after the operation, venous congestion was noted; a surgical re-exploration was performed. Severe venous thrombosis was found (Fig. 3); therefore, re-anastomosis of the vein was done after a thrombectomy. However, venous insufficiency developed shortly after the first attempt at reoperation. She was taken back to the operating room again, 50 hours after first surgery. Although there had been only a short period of nutrition by the artery-only flap, we found there was a good granulation bed at the fracture site (Fig. 4). We thinned the failing flap and used it as a full-thickness skin graft. We employed a tie-over dressing and external immobilization. Two weeks after the second reoperation, the skin graft had survived completely. Nine months after the operation, the grafted site was softer and of good texture (Fig. 5). The patient can wear the same size shoes without a debulking procedure.

DISCUSSION

Numerous clinical reports revealed that venous thrombosis is a more common complication than arterial occlusion in free tissue transfer.1,3–5 Various tech-
niques in the management of failing free flaps have been advocated for salvage of these flaps. Early detection of the vessel compromise and re-exploration are crucial for salvaging a failing flap. However, if surgical reoperation for the compromised flap fails, then exsanguination treatment can be chosen. This will prolong flap viability by increasing the perfusion of the compromised flap until the neovascularization occurs. Some authors report successful results of finger replantation, using leeching or dripping a heparinized saline solution. However, Han et al described that it took at least 5.5 days for even small tissue like the finger to obtain neovascularization.

In 1968, Millard described using a pedicle flap as an engineering crane to lift and transport subcutaneous tissue under “the crane principle.” In the crane principle, Millard suggested that the pedicle flap is used to cover the raw surface including exposed bone and tendon temporarily. After 1 week, the undersurface of the flap (one fourth thickness) was shaved off and a split-thickness skin graft was used on it. The flap was returned to the original donor site. Additionally, Millard summarized that the undersurface of the flap had obtained enough vascularity in 7 days to allow for sufficient progress.

In 1988, Mimoun et al described that “the nutrient flap” provided a new capillary bed to the ischemic zone, furthermore salvaged arteriosclerotic lower limbs. In the nutrient flap concept, they described use of the free flap as a bridge formation from the popliteal artery to an ischemic lower limb. In this article, postoperative angiography showed the progressive development of a new distal capillary bed that was provided by the free flap in the ischemic area.

In our case, we believe that the free flap provided nutrients to the raw surface and nurtured a good granulation bed while it survived for 50 hours; as a result, it was used as “the nutrient flap.” In the crane principle, this “50 hours” was not an adequate duration to obtain a good condition, but we found good granulation tissue under the failing free flap. Some reports suggested that hypoxia encouraged neovascularization in ischemic tissue, and Weng et al established it using the mimic hypoxia. In 2007, Chang et al suggested that advancing hypoxia decreased the potential for neovascularization in ischemic tissue. We surmise that the vein thrombosis with relative ischemia and the patient’s young age enhanced neovascularization of the recipient site.

Another possible option for salvaging the failing flap is the use of a vacuum-assisted device (VAC). In 2001, DeFranzo et al described the use of VAC to treat lower extremity wounds with exposed bone and tendon. They succeeded in coverage in 71 of 75 patients; however, they required several weeks to obtain an adequate bed for the secondary procedure.

SUMMARY

We reused a failing free flap as a donor site for skin grafting. It is not necessary to sacrifice an additional donor site. Timing of the decision is important because the flap has to be reused while some of the skin is still viable. Another advantage is that it does not require additional debulking procedures. Reusing of the failing free flap as “the nutrient flap” is worth attempting in these situations.

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