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Clinical applications of free arterialized venous flaps

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Summary Venous flaps are flaps by which tissue perfusion is accessed through the venous network. Despite originally being questioned due to potential perfusion problems, as the dynamics of tissue perfusion have been more fully comprehended, venous flaps appear to have a far wider range of application than first thought. In our study, we analyzed the clinical results of the applications of free arterialized venous flaps along with the factors that can affect flap survival.

Forty-one flaps were assessed retrospectively. Type of the trauma, traumatized area, the time duration between trauma and application of the flap, donor area, type and count of the anastomosis, encountered complications, and flap survival rates were analyzed. Regression and classification trees were used to study the relationship between flap surface area, anastomosis count, and flap survival.

Circulatory abnormalities such as early congestion and edema were seen in 53.6% of the applied flaps. A total of four flaps (9.7%) developed necrosis which presented as full thickness in three flaps and partial thickness in one flap. It can be said that there was a weak but positive correlation between the size of the flap area and the number of anastomosis.

Although the results of arterialized venous flaps are inconsistent in the literature, those flaps can be preferred as an alternative treatment option in single finger defects where tissue compatibility and cosmetic results are quite impressive. In the meantime, syndactylized venous flaps are the preferred method regarding multiple finger soft-tissue defects.

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Introduction

Venous flaps are defined as flaps whose blood flow is supplied by afferent and efferent veins. Circulation within the flap is maintained by the venous network.[1] It has found many application fields since it was first experimentally described in 1981.[2] Due to perfusion problems, in the beginning it was used primarily for small defects. But, as the dynamics of tissue perfusion have become more clearly understood, the range of their applications has widened.[3–8] Venous flaps can be raised from any area in the superficial venous system. Volar forearm, medial surface of arm, dorsum of the hand, medial thigh, medial cruris, dorsal side of the foot, and thenar and hypothenar areas can all be considered as possible donor sites.[9–13]

Venous flaps are thin in appearance. There are numerous superficial veins which are easy to locate. Dissection involves only superficial tissues so the flap can be dissected quickly. Afferent and efferent veins can be harvested in various lengths. Since the flap does not contain deep arterial structures, donor site morbidity is low. Despite all these advantages venous flaps still cannot be used safely. The primary reasons for this are: not completely understanding the flap circulation physiology, venous congestion, ischemia, and frequent loss of flaps.[13,14]

In our study survival rates of our venous flaps and postoperative microsurgical problems were analyzed retrospectively. Relationships between surface dimensions of the flap, number of anastomosis, and necrosis rate were studied statistically.

Patients and methods

Forty-one arterialized venous flaps in 40 patients performed between the years 1992 and 2011 were included in our study. Operations were performed by attending hand surgeons with at least 5 years of experience.

Venous flaps were used in following indications:

(a) In fingertip tissue lost where the defect exceeds dimensions of conventional homodigital or heterodigital flaps.
(b) In amputations involving segmental soft-tissue defects, as flow-through flaps in revascularization/replantation.
(c) Soft-tissue defects on adjacent fingers directly related to multiple finger injuries.
(d) For stump closure after unsuccessful revascularization or replantation in multiple finger injuries (as a temporary syndactylized flap involving multiple fingers) (Figure 1).
(e) As salvage operations after unsuccessful local/free flap application attempts.
(f) Circumferential or large longitudinal (volar/dorsal) tissue loss in single finger injury.

Hospital records, nurse clinical observation records, and photographs were analyzed retrospectively. Venous flap type, defect and donor site localization, flap sizes, early follow-up problems, complications, secondary surgeries, and partial and full flap losses were also noted.

Figure 1 Images of the patient with right hand second and third finger injuries. A- Preoperative dorsal views. B- Preoperative dorsal view. C- Rectangular-shaped venous flap harvested from volar forearm with long afferent and efferent veins. Second and third fingers syndactylized by flap inset. Afferent vein anastomosed to digital artery at proximal phalanx level in volar side. Efferent veins anastomosed to superficial veins at metacarpal level on dorsal side. D- Dorsal view of the hand before separation of the digits in the fifth week. E- Dorsal view after separation.