

## V-Y Advancement Flap Usage at the Soft Tissue Defects of the Foot in the Patients with High Risk Factors

Elif SARI\*, Ali Teoman TELLİOĞLU\*\*

\* Polatlı Duatepe Hospital, Plastic, Aesthetic and Reconstructive Surgery Clinic, Ankara

\*\* Yıldırım Beyazıt University, Department of Plastic, Aesthetic and Reconstructive Surgery, Dışkapı Yıldırım Beyazıt Education and Research Hospital, Ankara

### Abstract

**Objective:** In this study we tried to present our results with V-Y advancement flap coverage of foot ulceration in patients considered at high risk for neuropathy and failure to heal because of medical comorbidities.

**Method:** Twelve patients with foot soft tissue defect were treated with V-Y advancement flap. Defects dimensions were between 3-6 cm. Patients age were between 16-80 years (mean 43,3 years). Nine patients were male, three patients were female. All of the patients had risk factors for delayed wound healing.

**Results:** Seventeen flaps were performed at fifteen tissue defects. All of the flaps that were elevated survived completely, with no marginal or partial necrosis.

**Conclusion:** V-Y advancement flap closure of foot soft tissue defects maintains safe, simple and minimally invasive foot coverage in patients with medical comorbidities.

**Key words:** V-Y advancement flap, foot ulcers

### Yüksek Riskli Hastaların Yumuşak Doku Defektlerinde V-Y İlerletme Flebinin Kullanılması

#### Özet

**Amaç:** Bu çalışmada, yara iyileşmesini önleyen ek sistemik rahatsızlıklar ve nöropatiden dolayı yüksek riskli olarak kabul edilen hastalardaki ayak ülserlerinin V-Y ilerletme flebi ile kapatıldığı vaka serimizi sunmaya çalıştık.

**Metot:** Ayakta yumuşak doku defekti olan on iki hasta V-Y ilerletme flebi ile tedavi edildi. Defektlerin boyutları 3-6 cm arasında idi. Hastalar 16-80 yaşlar arasındaydı (ortalama 43,3). Hastaların dokuzu erkek, üçü kadın idi. Her hastada yara iyileşmesini engelleyici risk faktörleri vardı.

**Bulgular:** On beş doku defektine on yedi flep uygulandı. Eleve edilen tüm flepler kısmi ya da tam nekroza uğramadan tamamen iyileştirildi.

**Sonuç:** V-Y ilerletme flebi medikal riskleri bulunan hastalarda ayak yumuşak doku defektlerinin kapatılmasında güvenilir, basit ve minimal invaziv bir doku kapatma yöntemidir.

**Anahtar kelimeler:** V-Y ilerletme flebi, ayak ülserleri

#### Introduction

Full-thickness defects to the surface of the foot present a challenge to the reconstructive surgeon. Skin grafts and a variety of flap procedures have been described to resurface this site, but very few of them created natural foot structure and normal foot function. The “reconstructive pathway” provides a brief list of the options available to build soft tissue closure. These include, from least to most invasive: 1) delayed primary closure with or without continuous tension devices or tissue expansion; 2) split-thickness or full-thickness skin grafting; 3) adjacent tissue rearrangement or random-pattern local flaps; 4) distant (pedicled) composite flaps; and 5) free tissue transfer<sup>1</sup>. Various procedures have been described for foot reconstruction: adipofascial flaps for dorsal foot and ankle soft tissue defects<sup>2</sup>; combined pedicled toe fillet flaps for lesions at the metatarsophalangeal joint (MTP)<sup>3</sup>; retrograde-flow medial plantar island flaps for plantar defects<sup>4-6</sup>; retrograde dorsalis pedis<sup>7</sup> or first dorsal metatarsal artery flaps<sup>8</sup>; and distally based

first web flaps using the dorsal communicating artery<sup>9</sup>. To this end, V-Y fasciocutaneous advancement flap coverage of soft tissue defects about the foot has been advocated because it uses adjacent native tissue with a consistent vascular supply, is relatively simple to perform, produces reliable results, and is minimally invasive<sup>10</sup>. In this report, we present our results with V-Y advancement flap coverage of foot ulceration in patients considered at high risk for cutaneous compromise and failure to heal because of medical comorbidities and neuropathy.

#### Material and Method

A series of twelve patients with tissue defects at their feet were treated surgically at Dışkapı Yıldırım Beyazıt Education and Research Hospital and Kirikkale Faculty of Medicine. The average age of patients was 43,3(16 to 80 years). Table 1 shows the clinical and surgical data of the patients.

**Table 1:** Clinical and surgical data of atients

Patient	Age (Years)	Sex (M: male, F: female)	Ulcer size (cm)	Cause of injury	Foot	Bilateral or unilateral V-Y	Fallow time (months)
1	24	M	1x1/ 1x2	Sequelae of meningitis	Right- plantar area	Bilateral V-Y(2)	1
2	54	M	3x3	Sequelae of trauma +neuropathic	Right and left heels	Unilateral V-Y(2)	3
3	33	F	3x6	Diabetes mellitus	Right heel	Unilateral V-Y	6
4	80	M	5x5	Hip arthroplasty + diabetes mellitus	Right heel	Unilateral V-Y	2
5	44	F	3x3	Sequelae of trauma + neuropathic	Right heel	Unilateral V-Y	1
6	26	M	5x5	Sequelae of trauma + diabetes mellitus	Left heel	Unilateral V-Y	3
7	16	M	3x4	Vertebral anomaly +neuropathic	Right heel	Unilateral V-Y	12
8	56	M	3x4	Diabetes mellitus	Left heel	Unilateral V-Y	1
9	50	F	1x1	Diabetes mellitus	Left heel	Bilateral V-Y	25
10	62	M	4x4	Diabetes mellitus	Left heel	Unilateral V-Y	33
11	40	M	2x2	Diabetes mellitus	Right plantar area	Bilateral V-Y	22
12	35	M	3x2	Sequels of trauma +neuropathic	Right and left heels	Unilateral V-Y(2)	3

### Surgical Procedure

Preoperatively we performed a detailed examination of all the patients' feet. We confirmed the presence of distal arterial flow of the feet. The

patients placed in ventral decubitus position. After surgical marking, the debridements of all unhealthy tissue were done (**Figure 1a, 2a**).



Figure 1a: Intraoperative debridement of the ulcer and planning the flap



Figure 2a: Intraoperative debridement of the ulcer

The dissection was performed at the periphery of the flaps, incising the skin and the distal fascial extensions of the plantar aponeurosis (Figure 1b).

After covering the defects, classical primer suturation was performed for adaptation of the flap (Figure2b).

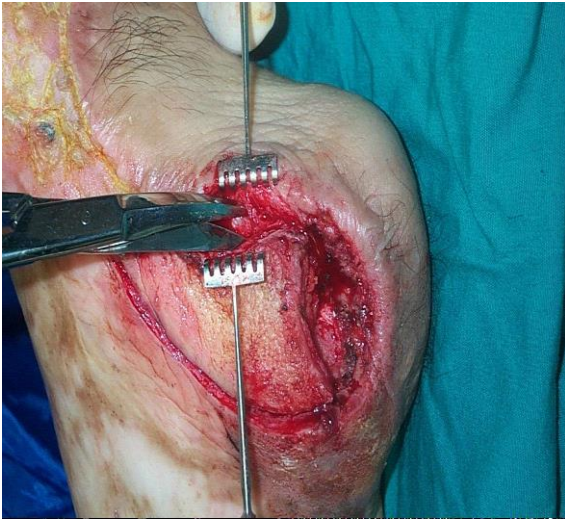


Figure 1b: Separating the fascial extensions for mobilizing the flap



Figure 2b: Closure of the defect

Postoperatively, the patients are advised about nonweight-bearing ambulation for 3 weeks until complete healing of the surgical wounds. Patients are instructed to clean the wounds with saline solution once a day and to apply antibiotic ointment three times a day.

### Results

Reconstruction of fifteen foot ulcers was successfully performed in a series of twelve patients aged 16 to 80 years (mean 43,3 years). All

of the patients, nine were male, three were female. Nine right and six left feet ulcers were reconstructed with V-Y advancement flap. From seventeen flaps, four of them were performed bilateral; thirteen of them performed unilateral design. Defects size were between 3-6 cm. Follow-up time was from 1 month to 33 months, with an average of 9,3 months. All of the flaps that were elevated survived completely, with no marginal or partial necrosis (Figure 1c, 2c, 2d).



Figure 1c: Postoperative 30 days of the patient



Figure 2c: Postoperative 33 months of the patient



Figure 2d: Postoperative 33 months of the patient

### Discussion

A variety of techniques have developed for reconstructing defects of the plantar surface of the foot. Skin grafts had limited achievement and can lead to problems such as skin dehiscence and hyperkeratosis, although thicker grafts may be more convenient<sup>11-13</sup>. Small areas of tissue loss can be covered by innervated local random pattern suprafascial transposition or rotation flaps but poor tissue laxity in this area limits their size<sup>14, 15</sup>. Barron and Emmett first described V-Y skin flaps, and these have since been used with modifications in almost all parts of the body, including the sole of the foot<sup>15, 16</sup>. An important reference for V-Y plantar flaps about reconstruction of the forefoot was published by Colen et al. in 1988, associating simple or paired V-Y plantar flaps being longitudinal and parallel over the long axis of the intermetatarsal spaces<sup>17</sup>. The modified V-Y advancement described by Heywood and Quaba in 1989 and the extended V-Y flap described by Pribaz et al. in 1992<sup>18, 19</sup>.

Our aim was to recover this weight-bearing area with permanent, thick skin and subcutan tissue to achieve gait and weight distribution that were as near normal as possible. Proximally, over the heel, the reduced density of perforators limits the usefulness of the flaps already mentioned. Fillet flaps of the toes or neurovascular islanded flaps from the lateral side of the hallux are useful but they are inadequate to reach the heel and are of limited size. The crossinstep flap, the cross-foot flap and the cross-leg flap are options but require serious immobilization postoperatively. Larger high-energy injuries require free tissue transfer with either muscle or fasciocutaneous flaps. At the heel,

local pedicled muscle flaps are available, but fasciocutaneous flaps are more suitable because they do not damage the muscle layer and may become more adherent to the periosteum of the bone, so preventing any shearing between the layers<sup>20-23</sup>.

In brief we chose V-Y advancement flap because; 1) skin grafts are not load-bearing structures at weight-bearing areas of foot, 2)V-Y flap's blood supply comes from the large floor, so this makes the flap safe, 3) it is a suitable flap for vertical motion plan of the plantar area of the foot, 4) we do not sacrifice the muscles of the plantar foot or adjacent soft tissue, 5) the wound healing is quick with immobilization, 6) it is also safe in patients with medical problems such as neuropathy, peripheral vascular diseases.

Finally results show, as mentioned in this report, V-Y advancement flap closure of plantar soft tissue defects maintain a safe, simple and minimally invasive plantar coverage in patients with medical comorbidities.

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**Corresponding Author:**

Elif Sari, MD

Fethibey Sok. 21/12, Kavacık

Subayevleri- ANKARA- TURKEY

Telephone number: +90 506 381 37 03

Fax number: +90 312 318 66 90

E-mail: drelifsanli@hotmail.com