

Role of Keystone Designed Flap in Management of Venous Leg Ulcer

¹Diwash Koirala, ²Ravi Kumar Chittoria, ³Padmalakshmi Bharathi Mohan,
⁴Shijina Koliyath, ⁵Imran Pathan

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Author's Affiliations: ¹Junior Resident, General Surgery, ²Professor & Registrar (Academic), Head of IT Wing and Telemedicine, ³⁻⁵Senior Resident, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605006, India.

Corresponding Author: Ravi Kumar Chittoria, Professor, Department of General Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605006, India.

Email: drchittoria@yahoo.com

Abstract

The purpose of this case report is introducing keystone design perforator based island flap (KDPIF) as a therapeutic method for management of venous leg ulcer (VLU).

Keywords: Venous leg ulcer (VLU); Keystone design perforator based island flap (KDPIF).

Introduction

Venous reflux arises due to failure of venous valves in the saphenous veins, which results in retrograde flow and stasis, or pooling of venous blood in the branches of the saphenous veins, that can translate into elevated ambulatory venous pressure and can produce associated symptoms, including dilated visible veins at the skin surface (varicose veins, reticular veins, and telangiectasias), swelling, aching, heaviness, skin discoloration, and potential ulcer formation. A poor calf pump mechanism may even worsen venous reflux.^{1,2}

VLU is a late indicator of chronic venous insufficiency and venous hypertension. In normal conditions, calf muscle contraction and intraluminal valves promote the prograde flow, preventing blood reflux. However, when retrograde flow, obstruction, or both exist, will result in chronic venous hypertension that is responsible for the dermatologic and vascular complications that result in the formation of a VLU.³⁻⁵ The prevalence of VLU is between 0.18% and 1%.⁶ Over the age of 65, the prevalence increases to 4%. On an average 33-60% of these ulcers persist for more than 6 weeks and are therefore referred to as chronic VLU. These ulcers represent most advanced form of chronic venous disorders like varicose veins and lipodermatosclerosis.

Materials and Methods

This study was conducted in Plastic surgery department in a tertiary care center in the month of August-September-October 2021. Written informed consent was taken from the patient. The study subject was a 54 years gentleman, tea stall worker by profession, known case of bilateral varicose veins and chronic liver disease, and chronic alcoholic and chronic smoking with 30 pack year history, presented with complaints of swelling over the left foot and leg on prolonged standing with dull aching pain and swelling associated with non-healing ulcer over the dorsum of left foot. He had no complaints of trauma resulting in present complaints, pain on walking or exertion, similar illness in the past, or past surgeries for similar complaints.

On evaluation of left lower limb, inspecting in both lying down and standing position, raw area of size 7 X 4cm was present over the dorsum of left foot extending from the tarso-metatarsal joint level to metatarsophalangeal joint overlying the third and fourth toes and surrounding skin was scaly and hyper pigmented (figure 1). Pitting pedal edema was present, with hyperpigmentation of left front and lower leg with

atrophy of the distal leg. Dilated tortuous veins were present over the great saphenous vein territory. Saphenofemoral junction was competent, but multiple incompetent perforators were present. Palpation was done for confirmation of the inspected findings. Tenderness was present over the foot with local raise of temperature. Base of both the ulcers were formed by bone. Digital sensations and distal pulses were intact. He had no restrictions in joint movement and all lower limb muscles were having normal power.

Wound bed preparation was done with wound debridement and dressing. The raw area was covered by type I Keystone Flap (Figure 2a and 2b). Incompetent perforators were located in left lower limb which were ligated (figure 3.1 and 3.2). Flap was healthy. Wounds healed well (figure 4).



Fig. 1: Wound on the dorsum of left foot.



Fig. 2a: Keystone Flap marking.



Fig.2b: Keystone Flap done for the raw area.



Fig. 3.1: Incompetent perforator ligation.



Fig. 3.1: Incompetent perforator ligation.



Fig. 4: Healed wound.

Results

Postoperative period was uneventful and patient was discharged with the varicose stockings.

Discussion

KDPIF is widely used for loco-regional reconstruction and is simple with better aesthetic results with stable coverage. It was initially described for lower extremity defects.

Four subtypes are:

Type I: The standard flap design and closure is used for defects of different shapes over most areas of body up to 2 cm in width.

Type IIA: Used for larger areas of reconstruction, mostly located over the muscular compartments, the deep fascia over the muscular compartment is divided along the outer curvature of the KF for its further mobilization.

Type IIB: With split skin graft to secondary defect Where excess tension exists, the secondary defect may be skin grafted

Type III: Double KF Used for larger defects (5-10 cm), a double keystone design can be done to exploit maximum laxity of the surrounding tissues.

Type IV: Rotational KF Occasionally to facilitate rotation across a joint contractures or compound fractures with exposed bone, the KF is raised with undermining up to 50% of the flap subfascial and the perforator support is derived from the attached part of the flap.

Type 1 KF was used in our study The limitation of the study includes that it is a case report with a single centre study with no statistical analysis. Further randomised controlled studies are required to validate the efficacy, physiology of intake and complications of KF.

Conclusions

In our study we found that KDPIF was useful in management of venous ulcer and can be added to armamentarium of plastic surgeons for management of venous ulcer.

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