



BIPEDICLED FLAPS FOR SOFT TISSUE COVERAGE OF LEG DEFECTS – A CASE SERIES

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Abstract

Soft tissue defects of the leg exposing tendon or bone are a challenge to the reconstructive surgeon. The bipediced fasciocutaneous flap is a reliable flap for coverage these defects especially in elderly patients and those with vascular compromise. Bipediced flaps are local flaps which have a random blood supply from two pedicles. They are easy to harvest in a short operative time with early recovery which are of great benefit to patients. Here, we present three cases of soft tissue defects of the leg resurfaced with bipediced flaps.

Keywords: Bipediced, Faciocutaneous, Leg defects, No Morbidity

Introduction

Soft tissue defects of the leg occur due to trauma, infection, avascularly or malignancy. These defects pose a challenge to the reconstructive surgeon, especially in elderly patients and patients with vascular compromise. Skin grafts are not an option as they do not take on bone, cartilage or tendon devoid of periosteum, perichondrium or paratenon, respectively. Hence, the ideal procedure will need a local flap for soft tissue cover. The bipediced fasciocutaneous flap provides adequate soft tissue for cover of small to medium sized defects, with good vascularity, simple and easy elevation with a minimal acceptable donor-site morbidity.¹

Case 1

38-year-old male presented with two chronic non-healing ulcers over the left leg since past 2 years following a road traffic accident. The patient was a diabetic for past 6 years on oral hypoglycaemic agents. On examination, two ulcers of size 3 x 3 cm and 3 x 2 cm were present over the middle 3rd of the left leg. The edges were sloping with surrounding hyperkeratoses. (**Fig. 1**) A diagnosis of post traumatic raw area was diagnosed and planned for debridement with a good quality skin cover in the form of a bipediced flap. Under spinal anaesthesia, thorough debridement was done and the two raw areas were made into one defect with underlying tibia exposed devoid of periosteum. (**Fig. 2**) A

bipedicled flap was marked and executed. Inset was given with 2-0 nylon sutures over Segmuller drains. The secondary raw area was resurfaced with a split thickness skin graft anchored with staples and dressed with a tie-over bolster dressing. On the 5th post-operative day the dressings were removed and flap was inspected. The flap was well settled with a 100% skin graft take and the patient was followed up for 6 months. (**Fig. 3**)



Fig. 1 – Clinical picture showing the two ulcers over middle 3rd of left leg



Fig. 2 – Intra-operative photograph showing the defect after debridement



Fig. 3 – 6 month follow-up picture showing a well settled flap and skin graft

Case 2

48-year-old male presented with a raw area over the middle 3rd of right leg for 2 months. He gives a history of a fall of heavy object onto the right leg 5 months ago. Initially, he developed a small ulcer and gradually had progressed to the present size. The X-ray showed features of tibial osteomyelitis. On examination, there was a chronic non-healing ulcer of size 3 x 2 x 1 cm with surrounding induration and hyperpigmentation. The underlying tibia was seen devoid of periosteum. (**Fig. 4**) A diagnosis of post traumatic post infective raw area was made and was planned for debridement with flap cover.

Under spinal anesthesia, the ulcer was debrided and the longitudinal defect was recreated after orthopaedician team debrided and saucerised the involved part of the tibia. A bipedicled flap was marked and elevated. Inset was given with 2-0 nylon sutures and the secondary raw area was skin grafted. Post-operative was uneventful with the flap and the skin graft well settled. (Fig. 5)



Fig. 4 – Clinical photograph showing the chronic non-healing ulcer middle 3rd right leg



Fig. 5 – Post-operative photograph showing the well settled flap and split skin graft

Case 3

25-year-old male presented with a post-traumatic wound over the middle 3rd right leg past 15 days following a road traffic accident. He had a tibial fracture for which an external fixator was placed. On examination, a raw area of size 4 x 3cm was present over the middle 3rd of the right leg. The underlying tibia was exposed. (Fig. 6) We planned for debridement with bipedicled flap cover. Under spinal anaesthesia, debridement of the raw area was done and then resurfaced with a bipedicled flap. The secondary defect was covered with a split skin graft. The flap and skin graft settled well.



Fig. 6 – Clinical photograph of the raw area middle 3rd right leg



Fig. 7 – Post-operative picture showing the flap and skin graft well settled

Discussion

Bipedicled flaps have been successfully used for wound closure in a variety of anatomical sites. In the head and neck, Von Langenbeck in 1859 first reported a technique in which bipedicle mucoperiosteal flaps were advanced medially to close a cleft palate defect.² Tripier in 1889 described a musculocutaneous flap from the upper eyelid for the cover of lower eyelid defects.³ Many authors have used various other anatomical sites for bipediced flaps as Yanai et al in microtia reconstruction, Dias used it for post burn contracture release of the cubital region and Yii and Elliott for dorsal digital defects, distal to the metacarpophalangeal joints.⁴⁻⁶ The incision is made parallel to the wound being twice the length of the defect and the width being about half the length of the defect. This preserves adequate blood supply to retain its vascularity thereby preventing necrosis and also minimizes tension. The longitudinal incision preserves axial cutaneous perforators and parallels the orientation of the most widely used incisions for tendon repair, avoiding additional trauma.¹ The disadvantage of the bipediced flap in the region of the lower third of leg and foot is that the skin of foot region is very tight and the arc of rotation of the flap is limited.⁷ Crawford used a 'double pedicle' flap for cover of defects in the lower limb whereas Stenstrom advocated the use of 'tumbler flaps' as a three-staged procedure, to be used as an alternative to cross-leg flaps or tube pedicles.^{8,9} Schwabegger et al refined these bipedicle procedures of then lower limb to a single stage after studying the anatomy and physiology of blood supply of the integument.¹⁰ He adhered to the principles of random pattern flap design in which length to breadth ratios at the outside of the flap should not exceed twice of 2:1, i.e. 4:1 and also advocated preservation of perforators where possible as long as they did not interfere with the movement of the flap¹⁰. On the contrary, Hallock outlined flaps on the lower limb over the known territory of a source vessel, included deep fascia and not identifying any discrete perforators and did not exceed a length to width ratio of 4: 1.¹¹ The inclusion of the deep fascia maintained the dominant horizontal axis of vessels which accompanies the cutaneous nerves hence ensuring preservation of sensation. Salibian and Menick described the design and indications of the bipedicle gastrocnemius musculocutaneous flaps for cover of defects in the distal third of the leg.¹² The dual blood supply provides a more robust flap, with the sensation preserved and a better cosmetic result than most transposition or rotation flaps by avoidance of 'dog ears'.¹³ The advantages of bipedicle fasciocutaneous flaps over free tissue transfer is the shorter operating time, limitation of scarring to one site, reconstruction of defects with tissue of similar quality and preservation of local sensation.

Conclusion

Bipedicled flap is a reliable technique for difficult soft tissue defects of the leg particularly in the elderly patients. This flap is also useful in vascular compromise patients as it has two pedicles. It is fast and simple to perform providing good quality soft tissue cover with acceptable functional and aesthetic results with minimal morbidity.

References

1. Makhlof MV, Obermeyer Z. Bipedicle flap for wounds following achilles tendon repair. *Plast Reconstr Surg* 2008;121:235e-6.
2. Von Langenbeck B. Bhttrdge Zur osteoplastik. *Deutsche Klin* 1859; 2: 471.
3. Tripiet L. Lambeau musculo-cutane en forme de pont Applique a la restauration des paupieres. *Gaz Hop (Paris)* 1889; 62: 1124.
4. Yanai A, Fukuda O, Nagata S, Tanaka H. A new method utilizing the bipedicle flap for reconstruction of the external auditory canal in microtia. *Plast Reconstr Surg* 1985; 76: 4648.
5. Dias AD. A bipedicle flap in the correction of burn contractures. *Br J Plast Surg* 1983; 36: 56-9.
6. Yii NW, Elliot, D. Longitudinal Bipedicle Flaps in Dorsal Homodigital Reconstruction (British Association of Plastic Surgeons: Leicester) 1996.
7. Peter AB, Jonathan JK. Local random flaps for soft tissue coverage of the diabetic foot. In: Thomas Z, editor. *Surgical Reconstruction of the Diabetic Foot and Ankle*. 1st ed. Philadelphia: Wolters Kluwer; 2009. p. 140-66.
8. Crawford, B. S. The repair of defects of the lower limb, using a local flap. *Br J Plast Surg* 1957; 10: 32-5.
9. Stenstrom, S. 'Tumbler flaps'. A clinical study together with an experimental investigation of the circulation in plane and tubed flaps. *Acta Chir Stand* 1956; 213 (suppl): 42556.
10. Schwabegger A, Ninkovic M. Wechselberger G, Anderl H. The bipedicle flap on the lower leg, a valuable old method? Its indications and limitations in 12 cases. *Stand J Plast Reconstr Surg* 1996; 30: 187-93.
11. Hallock GG. Bipedicled fasciocutaneous flaps in the lower extremity. *Ann Plast Surg* 1992; 29: 397-401
12. Salibian AH, Menick FJ. Biuedicle eastrocnemius musculocutaneous flap for defects df the distal one-third of the leg. *Plast Reconstr Surg* 1982; 70: 17-23.
13. Hallock GG. Local fasciocutaneous flaps for cutaneous coverage of lower extremity wounds. *J Trauma* 1989; 29: 12404.