



ORIGINAL

PROF-619

ROLE OF BECKER ISLAND FLAP FOR SOFT TISSUE COVERAGE IN HAND

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ABSTRACT

Becker flap is a fasciocutaneous flap located on the anteromedial side of the distal forearms. It was originally described to provide coverage for the median nerve in cases of revision carpal tunnel surgery where skin and subcutaneous tissue were inadequate for closure. **OBJECTIVE:** Evaluation of the role of Becker's Island flap for soft tissue coverage in hand. **DESIGN:** Prospective study. **SETTING:** Orthopaedic Unit Bahawal Victoria Hospital Bahawalpur. **PERIOD:** Oct. 1994 to Dec. 1998. **MATERIAL & METHODS:** The procedure has been employed in eleven patients, nine males and 2 females of ranging age from 6-40 years. **RESULTS:** Good results in ten patients, satisfactory in nil and one with poor results regarding to our criteria. **CONCLUSION:** Becker island flap is recommended to cover the soft tissue defects over the volar and dorsal aspect of the wrist and hand.

INTRODUCTION

Hand surgery comprises a body of knowledge that is relatively new. It is developed and has been disseminated through the work and contributions of many great individuals who stem from a variety of disciplines. The hand is the most frequently injured part of the body due to trauma and demand for better care. Now a days, the trend is toward total care of hand by highly trained regional specialists who combine not only appropriate surgical skills drawn from traditional plastic, orthopaedic and neurologic surgery but also knowledge for directing the critical post operative therapeutic programs essential to optimal care. Soft tissue reconstruction of the hand remains a challenge for the plastic and reconstructive surgeon, who must choose whether to use a local flap, a distant flap or a free flap. Local flaps derived from tissue immediately adjacent to the primary defect are the first choice¹.

Several types of local flaps have recently been described that may be used to cover large areas of soft

tissue deficit in the hand. These have subsequently reduced the need to utilize distant flaps. Unfortunately many of those flaps, sacrifice, a major arterial axis of the upper limb. However, the ulnar flap does not carry this disadvantage because it is based upon a collateral branch of the ulnar artery. Immediate resurfacing of a major soft tissue defect of the hand with exposed tendon or bone by a flap coverage is essential to achieve a good functioning hand⁵.

The clinical use of the radial and the ulnar forearm flaps, has given a different concept in the treatment of acute hand trauma involving exposure or loss of tendon, nerve or bone, as well as later reconstruction^{4,5,6,7,8}. Several types of local flaps have recently been described that may be used to cover large areas of soft tissue deficit in the hand. These have subsequently reduced the need to utilize distant flaps.

OBJECTIVE

The purpose of the present study is to describe our

experience with the use of Becker island flap as a method of reconstruction of hand in a series of eleven cases and to evaluate the results.

MATERIAL & METHODS

Becker island flap was performed in eleven cases, nine males and two females of ranging age 6-40 years. Regarding mechanism of injury in eleven cases, post burn contracture was in four cases (36.3%), crush injury in two cases (18.1%).

Seven patients (63.7%) had loss of tissue over volar aspect of the hand, three patients (27.2%) had loss of tissue over dorsal aspect of the hand and one patient (9%) had 1st web space loss. Right hand (dominant) was involved in 3 cases and left hand (non dominant) in 8 cases.

Anaesthesia: General anaesthesia was used in all cases.

Tourniquet: A light rubber roller about 2 inches wide, most reliable as a tourniquet and to exsanguinate the part was used in all cases.

Indications of the flap

1. Reconstruction of a large area of soft tissue loss on the dorsum of hand.
2. Surgical excision of a hand tumor.
3. Correction of a dorsal contracture of the wrist.
4. Coverage of median nerve after repeated neurolysis or nerve graft.
5. Skin defects over hypothenar eminence.
6. Revision carpal tunnel surgery.

DISADVANTAGE

1. Small arc of rotation.

Surgical Technique

The flap is drawn on the dorso-ulnar aspect of the forearm. A dorsal incision is made first. It is necessary to design the length of the flap in relation to the axis of rotation, which is approximately 2cm proximal to the pisiform. The artery does not need to be dissected, but when the flap is raised, care must be exercised as the dissection approaches the pisiform so that the pedicle of

the flap is not damaged. The fascia need not to be included with the flap because the course of the artery is entirely subcutaneous. Next the distal pedicle of the flap is raised and may be rotated anteriorly or posteriorly on the wrist. A complete rotation of 180° degree is possible. The cutaneous pedicle should be divided, preserving only the vascular pedicle to allow rotation of the flap.

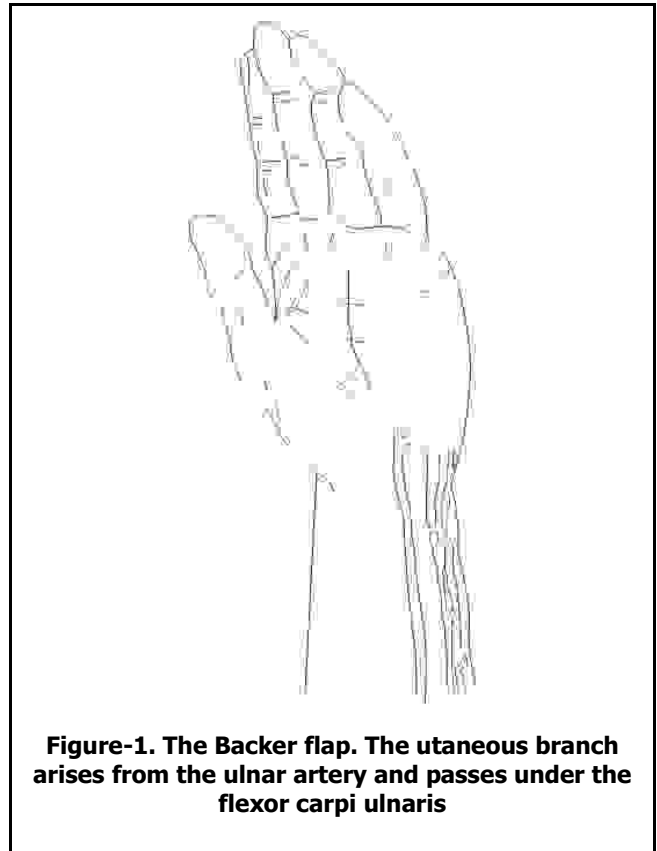


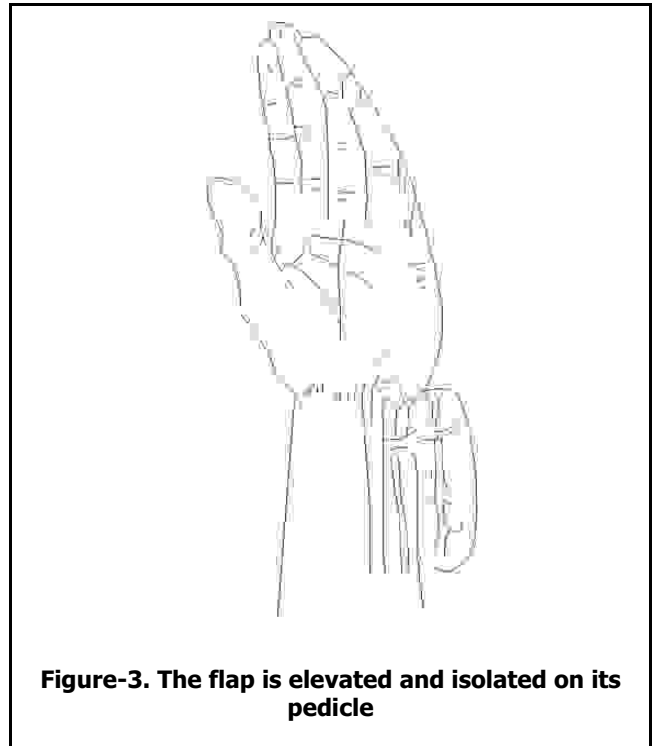
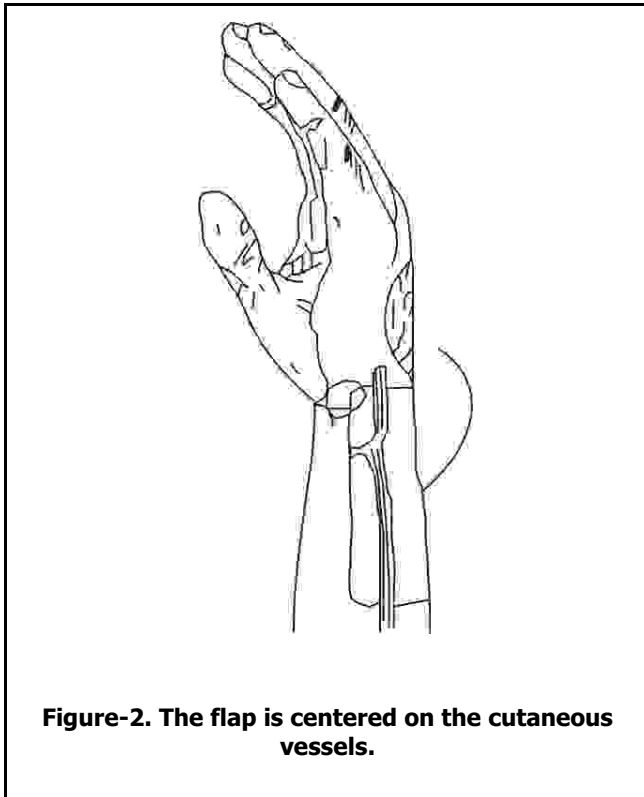
Figure-1. The Becker flap. The cutaneous branch arises from the ulnar artery and passes under the flexor carpi ulnaris

The donor defect may be closed primarily if the width of the flap does not exceed 3 or 4 cm otherwise, it is necessary to cover the defect with a split skin graft (Fig 1-4).

RESULTS

In this study eleven cases of becker island flap were included who presented in orthopaedic unit Bahawal Victoria Hospital Bahawalpur. Mechanism of injury and loss of soft tissue was variable. Primary reconstruction was made in clean cases. Contamination was found in certain cases who were washed with plenty of isotonic saline, debrided and secondary reconstruction was done

in these cases. The results were categorized into the following;

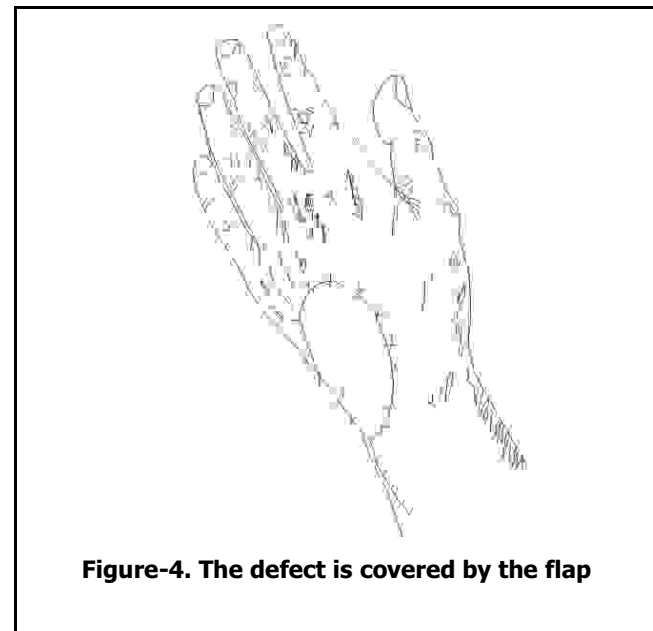


CRITERIA

Good: Results mean 100% survival of the flap without complication.

Results in Becker island flaps		
Results	No of patients	%age
Good	10	90.0
Satisfactory	-	-
Poor	1	9.09

Satisfactory: Results mean Marginal or superficial necrosis of this flap but no secondary procedure had to be performed. Poor; Results mean failure of survival of the flap and secondary procedure had to be performed.



DISCUSSION

Injuries to the hand are extremely important. The single most fundamental principle of managing injuries of the hand is that primary treatment

determines a high degree the ultimate recovery.

Parallel to the clinical development of microsurgical flaps, anatomical work completely altered our understanding of the vascular anatomy of the integument of the limbs and research directed at discovering new free flaps defined arterial pedicle flaps that might be locally transposed as island flaps. More progress was made when it was discovered that in certain circumstances, a flap could survive perfectly well with retrograde flow. The radial "Chinese" flap provided the proof well for this idea, and opened the door to a series of anatomical discoveries that were once again to alter the surgical indications for free flaps, introducing simplest procedures and removing the necessity for vascular anastomosis.

Island fasciocutaneous flaps in the forearm have dramatically changed the surgical approach towards soft tissue and compound defects of the hand. They offer the possibility of a single staged tissue transfer, early physiotherapy and mobilization with better resolution of oedema and well vascularised tissue which contribute to the vascularity of the hand. The most widely used is the radical forearm flap. The versatility of this flap is great, it has been described to provide skin cover^{2,11}, vascularised bone for thumb reconstruction¹ and vascularised tendons⁹.

Also, a sensate flap has been reported, using the lateral or medial antebrachial cutaneous nerves for neural anastomosis, although with poor return of sensation or at best only a protective type of sensation³. Both the radial and ulnar forearm flaps have a well known disadvantage, which is the destruction of a major arterial supply to the hand. Acute ischaemia of the hand has been reported from elevation of a radial forearm flap⁵.

Also, complications of the donor area have been reported particularly related to the radial forearm flap¹³. Such as delayed healing because of skin graft failure over exposed tendons, swollen hand and / or

wrist, stiffness of the hand and / or wrist, elbow and / or shoulder stiffness reduce hand and / or wrist strength, reduced or abnormal sensation in all or part of radial nerve distribution, cold induced symptoms, and fracture of radius.

The Becker's flap can be used to cover on the hypothenar eminence dorsal aspect of the hand as well as for revision carpal tunnel surgery. It can, in the later case, be wrapped around the median nerve. Advantages of the flap include the relative ease of dissection, large flap with minimal donor site morbidity, good blood supply and the fact that no major arterial axes are sacrificed.

The disadvantage of this technique is the nature and length of time required to understand the dissection, it must be elegant, delicate and steady dissection. Another feature is that flap having a short pedicle (causing small arc of rotation) and non innervated skin.

Holevich et al⁴ reported two cases with Becker flap. Authors included one of the superficial veins together with respective sub-dermal band besides the ascending branch of the artery and the vanae comitants to increase the venous draining of the flap which decreased the stasis of the blood in the flap and increased the survival of the flap.

In our study we performed Becker Island flap in eleven patients including three patients with loss of tissue over dorsal aspect of the hand, seven patient with loss of tissue over volar aspect of the hand and one patient had 1st web space loss. We used septocutaneous ulnar vessel for pedicle. No major vessel was sacrificed and did not include any additional superficial vein to increase the venous drainage of the flap but used only arterial pedicle with its vena comitants in the pedicle of the flap.

The donor area was covered with split thickness skin graft. The results were good in 10 patients and poor in one patient vessel for pedicel. No major vessel was sacrificed.

CONCLUSION

Keeping in mind the concept of indications and limitations of becker island flap, the soft tissue coverage can be performed by experienced surgeon with good results. So the becker island flap is recommended to cover the soft tissue defects of the hand in appropriate settings.

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