ORIGINAL PROF-708

SOFT TISSUE COVERAGE IN HAND;
ROLE OF FOUCHER ISLAND FLAP

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A B S T R A C T

The foucher flap is a cutaneous island with a pedicle that has the triple advantages of arterial, venous, and neural connections. The foucher flap can cover a defect within a radius equal to the length of its pedicle. It can be used in an emergency to preserve a distal thumb fragment whose vascular repair by micro-surgical means is not possible. Objective: Evaluation of the role of foucher island. Design: Prospective study Setting: Orthopaedic unit Bahawal Victoria Hospital Bahawalpur. Period: Oct 1994 to Dec 1998. Materials & Method: The procedure has been employed in four patients. All male patients of ranging age from 6-40 years. Results: Good results in all four cases regarding to our criteria. Conclusion: Foucher island flap is recommended to coverage the soft tissue defects over the volar and dorsal aspect of the hand and especially over the distal thumb.

INTRODUCTION

Adequate skin cover in a severely traumatized limb is important in promoting early wound healing, preventing post-operative wound infection and facilitating rehabilitation for early return of limb function.

A free skin graft is a safe and reliable method of achieving desired skin cover. It is the choice for resurfacing a superficial or partial subcutaneous tissue loss with a good vascular bed. When under-lying structures such as bone, joint, tendons and nerves are exposed, a skin flap is indicated when a flap is raised near the injured extremity, great care must be taken to avoid creating circumferential skin loss on the injured limb that may impair lymphatic and venous drainage. Injuries to the hands occur in all industries.

Although lacerations, crushes and burns of the hand can occur in wool textile industry. The injury is commonly to the dorsum of the hand and is always more severe than is at first apparent[21]. Reliable axial pattern flaps based on the first and second dorsal metacarpal arteries have been described and have been shown to have a role in reconstructive hand surgery[23].

Limited emphasis has been given to the dorsal metacarpal arteries in reconstructive hand surgery, though the constant anatomy of these vessels has been demonstrated in various anatomical dissections for thumb reconstruction[6,10,8,13]. However, the greater potential of this flap both in thumb reconstruction and elsewhere in the hand has not been developed, despite there being a relative paucity of versatile and reliable local flaps in hand surgery. Many others have described a number of variations utilizing the dorsal skin of the index finger as a cross-finger flap[25,1,3,24] a technique, which limited its area of transfer as well as conferring the considerable disadvantages of a two stage procedure[2].

OBJECTIVES

The purpose of the present study is to describe our experience with the use of foucher island flap as a method of

reconstruction of the hand in a series of 4 cases and to evaluate the results.

MATERIALS & METHODS

We have used a foucher island flap in four cases, all were male of ranging age 6-40 years. Regarding mechanism of injury in four cases; one case of electric constructure (25%) one case of crush injury (25%) one case of post-traumatic degloving injury (25%) and one case of adduction deformity (25%) of the thumb.

One patient (25%) had loss of tissue over dorsal aspect and two patients (50%) had loss of tissue over volar aspect of the hand. One patient (25%) had loss of soft tissue due to adduction contracture release. Right hand (dominant) was involved in two cases and the left (non-dominant) in two cases. The associated injury was loss of soft tissue over the middle finger dorsolaterally which was treated with cross finger flap on its own merits in one case.

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

To provide skin coverage over the dorsum of the metacarpophalangial, wrist and carpal joint, and the palmer aspect of the proximal phalanx of thumb, thenar area and most areas of the palm[9].

SURGICAL TECHNIQUE

First dorsal metacarpal artery is a constant branch from radial artery arising just proximal to the point at which the latter pierces the two heads of the 1st dorsal interosseous muscle. The flap is designed over the proximal phalanx avoiding the knuckle area. The skin flap is elevated in sub-dermal plane preserving the sub-cutaneous veins. The radial border of the 2nd metacarpal bone must be exposed and dissecting close to the periosteum of the shaft the dissection is depended to the fascial layer of 1st dorsal interosseous muscle. The fascia is radially separated from the muscle in radial dissection and at this level the 1st dorsal metacarpal artery should be looked for just superficial to this layer of fascia. Dissection proceeds distally to the head of 2nd metacarpal carefully ligating the nutrient artery at this level. The skin flap is next dissected at the level of well defined periteaon/peritononeum over the extensor tendon and proceeding proximally the pedicle is dissected off the tendon of the first dorsal interosseous muscle to complete the dissection (fig-1).

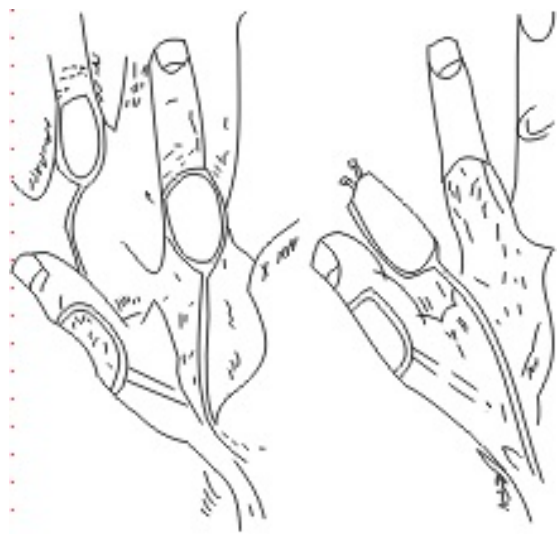


Fig-1. Technique for constructing the first dorsal metacarpal artery island flap (Foucher Flap)

RESULTS

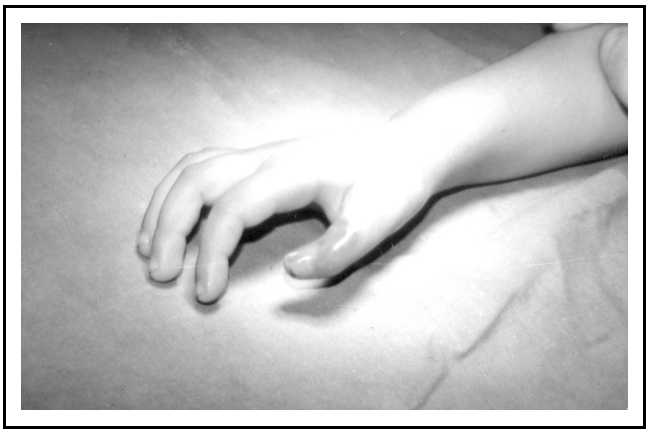
In this study four cases of Foucher Island flaps were included who presented in Orthopaedic Unit Bahawal Victoria Hospital Bahawalpur. Mechanism of injury and loss of soft tissue was variable. Primary reconstruction was made in clean cases. Contamination was found in certain cases who were washed with plenty of isotonic saline, debrided and secondary reconstruction was done in these cases. The results were categorized into the following criteria:

Table-I. Results mean 100% survival of the flap without complication. (Good)

Results	No. of Pts	%age
Good	4	100%
Satisfactory	Nil	Nil
Poor	Nil	Nil

SATISFACTORY

Results mean marginal superficial necrosis of the 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. (Fig-2-6)

DISCUSSION

There is agreement in the literature that the longitudinal dorsal digital arteries in the fingers described by some anatomists[11] do not exist and the main trunk of the dorsal metacarpal artery terminates at the level of the metacarpophalangeal joint[15,14].

Distally the dorsal metacarpal artery ramifies at the level of the metacarpal heads and its branches can be identified distal to the metacarpophalangeal joint traveling to the dorsal proximal phalangeal skin of the fingers where they anastomose with the dorsal branches of the palmar digital arteries. The 4th and 5th metacarpal arteries may be absent in 17-30% of dissections[6] so, to predict the presence of these arteries, preoperative angiography or doppler study is advisable.

Early and Milner[9] reported the use of skin island flaps from the dorsum of the finger and web spaces nourished by the 1st and 2nd dorsal metacarpal vessels. Making use of the same principle as applied to the distally based forearm flap[2] and other distally based flap[8,7], we have based our flap on the 1st dorsal metacarpal artery.

This flap has two broad applications in reconstructive hand surgery; it is useful where full thickness cover is required and it has a role as a sensory flap in thumb reconstruction. A pedicle length of upto 7cm in the adult allows a wide arc of rotation.

This flap can therefore, be employed for covering defects on the dorsum of the hand and wrist, although a similar flap

based on the second dorsal metacarpal artery[9] could be similarly used in these areas.

This first dorsal metacarpal artery flap can readily be transposed into the first web and we would regard it as the method of choice for reconstruction of a severely contracted first web space. If the flap is raised distally as far as the proximal interphalangeal joint, then it will reach the tip of the thumb in most individuals. Following injury, however, there is frequently associated shortening of the thumb skeleton which further facilitates transfer to this area.

Currently, sensory resurfacing of the thumb is achieved by either a Littler island flap[18] or a partial great toe transfer[24,4,22]. Compared with the Littler flap, the first dorsal metacarpal artery flap possesses a number of advantages. It is an easier dissection compared to the extensive digital and palmar dissection of Littler's flap. The venous drainage of the first dorsal metacarpal artery flap is extremely reliable, whereas the venous drainage of Littler's flap depends on the flimsy venae commitantes of the digital artery. Furthermore, the size of the first dorsal metacarpal artery flap is the size greater than can reasonably be taken in a Littler's flap and despite this donor site of the former flap is still more acceptable and situated in a less vulnerable position. With one exception the donor sites in this series were completely free of problems. This contrasts with the variety of problems reported with the Littler flap donor site[12].

Compared to the various tissue transfers from the great toe for thumb reconstruction, the first dorsal metacarpal artery flap is clearly technically easier to dissect and transfer. As with the little flap, cold intolerance frequently affects the donor site on the great toe[17].

Sterling Bunnell[5,19] both stated that tissue adjacent to the thumb was most appropriate when reconstructing that digit and that the dorsal skin of the index finger displayed good "wear resistance" when transferred to the volar surface of the thumb.

We fully agree that the 1st dorsal metacarpal artery flap displays excellent ability to withstand wear and tear on the working surface of the hand and possesses distinct advantages for the provision of sensory resurfacing of the thumb.

We have found that this flap is both reliable and versatile. Its ease of dissection and long pedicle should make it a popular choice for covering defects around the hand and wrist. The provision of good or excellent tactilegnosis with a trouble free donor site makes it attractive for sensory resurfacing in the thumb.

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