ORIGINAL PROF-709

RADIAL ARTERY FOREARM ISLAND FLAP

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ABSTRACT ... The radial artery supplies a large part of the skin of the forearm. An axial vascular flap including this artery can be constructed to provide tissue replacement in certain cases of complex loss of substance affecting the hand. The skin supplied by the radial artery forms a territory extending from the wrist to the elbow. The mean dimension is 16 by 8 cm. It accounts for two-thirds of the palmar surface of the forearm and at least its radial boundary. **Objective:** Evaluation of the role of Chinese forearm island flap for soft tissue coverage in hand. **Design:** Prospective study. **Setting:** Orthopaedic Unit Bahawal Victoria Hospital Bahawalpur. **Period:** Oct. 1994 to Dec. 1998. **Materials and Methods:** The procedure has been employed in 12 patients, 11 males and 1 female of age ranging from 25-50 year. **Results:** Good results in 12 patients. **Conclusion:** Radial forearm island flap is recommended to cover the soft tissue defect over the volar and dorsal aspect of the hand and especially over the thumb.

INTRODUCTION

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 hand. Small defects can be covered by the local flaps but large ones required the use of distant flaps until the description of the radial forearm flap[1]. First it was used for the reconstruction of the face and neck and for intraoral tissue defects[2,3,4,5]. Then this flap was also used as a pedicle flap raised on distal pedical of the radial vessels on the same side for the reconstruction of skin and soft tissue defects of the hand. The flap modified to include one cortical surface of the radius and convert it into an osteocutaneous flap[3,4,6]. It was used for intraoral reconstruction and for one stage reconstruction of the terminal defect of the thumb after traumatic amputation[3,4,6]. This flap is a good source of pedicular bone graft for reconstruction of bone and skin defects in the hand[7].

The flap is used for reconstruction of intercalated osteocutaneous defects of the thumb and index finger metacarpal[8]. Radial forearm island flap depends upon the presence of good flow through the ulnar artery and the palmar arches into the radial artery. The precaution that should be taken before raising a forearm flap is a timed Allen test to ensure that flow is adequately present through both vessels. This is a fascio-cutaneous flap which includes the volar forearm skin, the underlying antebrachial fascia and the intermuscular fascia which contains the radial artery and cutancous branches. The flap may include cutaneous nerves, flexor tendons and bone, so making it more versatile.

Indications of Chinese flap include:

1. Flap is used to cover dorsum and palmer aspects of hand.
2. As osteoplastic reconstruction of thumb.
3. For facial reconstruction involving soft tissue defects with or without mandibular bone loss.
4. In intra oral reconstruction for oral lining in mucosal defects with or without mandibular bone loss.
5. In lower limbs for resurfacing weight bearing areas.
6. For penile reconstruction with sensory forearm flap.
7. For reconstructing pharyngoesphageal defects using a tubed forearm flap.

Disadvantages of the flap are as follows,

1. It sacrifices the radial artery.
2. Visible scar at the donar site.

AIMS & OBJECTIVES

The purpose of this study is to describe our experience with the use of Chinese island flap as a method of reconstruction of hand in a series of 12 cases and to evaluate the results.

MATERIALS & METHODS

Radial forearm (Chinese) Island flap was performed in twelve cases, eleven males and one female, of 25-50 years of age.

Mechanism of injury included traffic accidents in two (16.6%) patients, post burn contracture of mid-palm in one (8.3%), failure of groin flap in one (8.3%), degloving of thumb in two (16.6%), loss of thumb in five cases and post burn scar on dorsum of hand in one case (8.3%). Four patients (33.3%) had loss of tissue over the dorsum of hand and one patient (8.3%) had loss of tissue over the volar aspect of the hand.

Seven patients (58.3%) required thumb reconstruction. Among these seven, five patients underwent osteo-cutaneous sensory reconstruction and in two patients skin flap was required.

Right hand (dominant) was involved in 9 cases and the left hand (non-dominant) in 3. The associated injuries found in these cases included amputation of the distal phalanx of the thumb at distal interphalangeal joint in one case (8.3%) amputation of index finger of right hand at M.P. joint in one case (8.3%). Associated injuries were treated on their own merit. Contamination was found in four cases. In these cases secondary reconstruction was performed. Primary reconstruction was performed in eight cases.

Surgical technique

The radial forearm (Chinese) Island flap is based on radial artery preoperatively, the Allen test should be performed to confirm the presence of a functional ulnar artery. Flap dissection should begin by finding the radial artery proximal and distal to the flap. The flap is then dissected from the ulnar side, taking care to elevate the deep fascia with the flap.

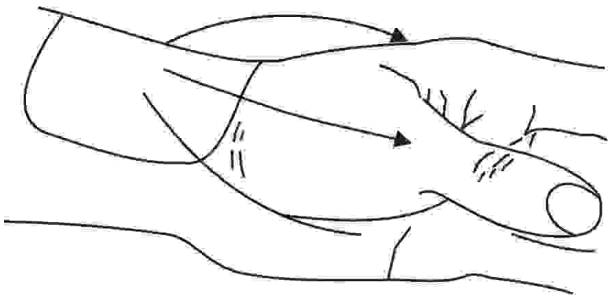


Figure-1. Two-third of the flap is taken from the volar aspect of the forearm

At the radial border of the flexor carpi radialis, the dissection must go deep to the radial artery. Similar sub-fascial dissection is performed from the radial side, plunging deep at the ulnar border of brachioradialis. The tourniquet is released to assess the vascularity of the hand before the artery is divided split thickness skin graft is applied to the donor sites Fig(1-3).

The Chinese flap is very versatile. It may be used as pedicled or a free flap, and may include nerve, tendon and bone as well as skin and fascia. Complications may include failure of the skin graft and hand swelling or stiffness. Ligation if the radial artery carries the risk of ischemic complications but these have not been reported.

RESULTS

In this study 12 cases of radial forearm (Chinese) island flaps were included who presented at Orthopaedic unit Bahawal Victoria Hospital, Bahawalpur. Mechanism of injury and loss of soft tissue was variable. Primary reconstruction was made in clear cases. Contamination was found in four cases who were washed with plenty of isotonic saline, debrided and secondary reconstruction was done in these cases. The results were categorized according to the following criteria;

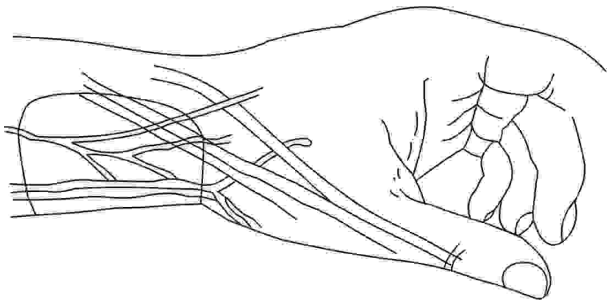


Figure-2. Outline of the radial forearm flap centered on the radial artery

Good 100% survival of flap without complication

Satisfactory Marginal or superficial necrosis of the flap but no secondary procedure had to be performed.

Poor Failure of survival of the flap and secondary procedure had to be performed.

In our series of 12 Chinese flaps all the patients had good results.(photo 1-6, Table- I)

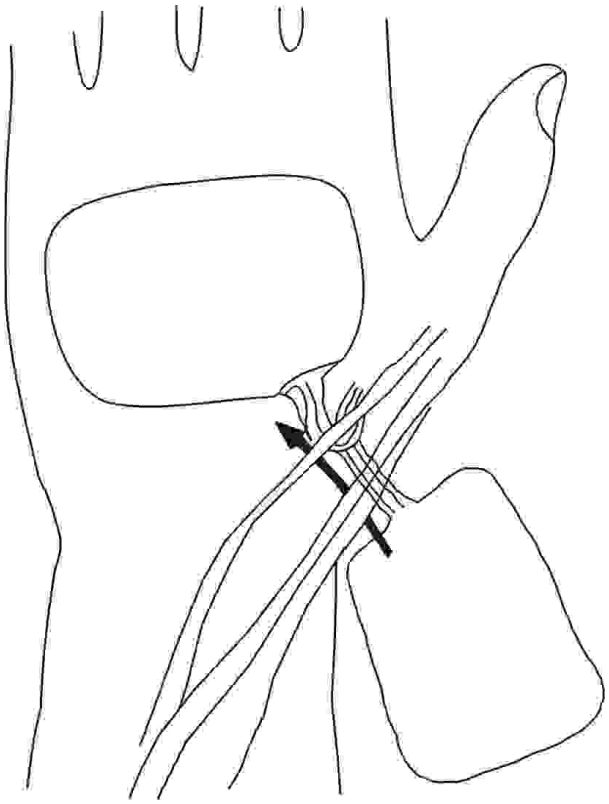
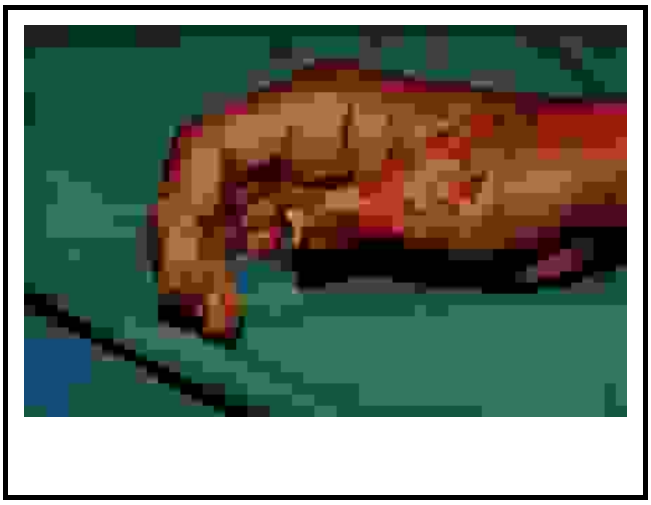


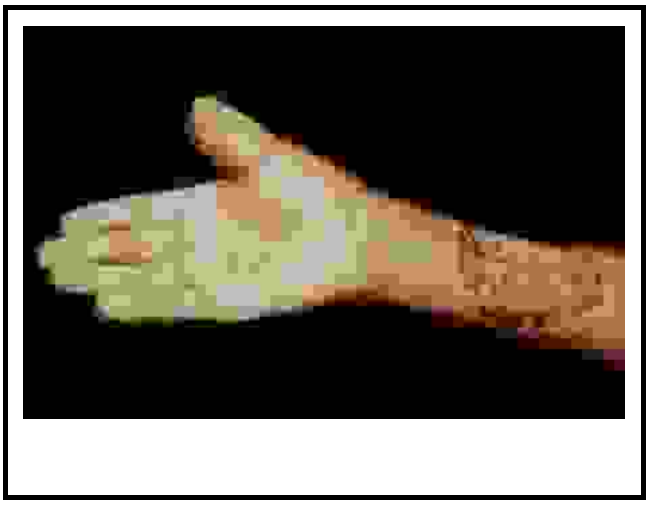
Figure-3. The flap can also be used to cover the dorsum of the hand

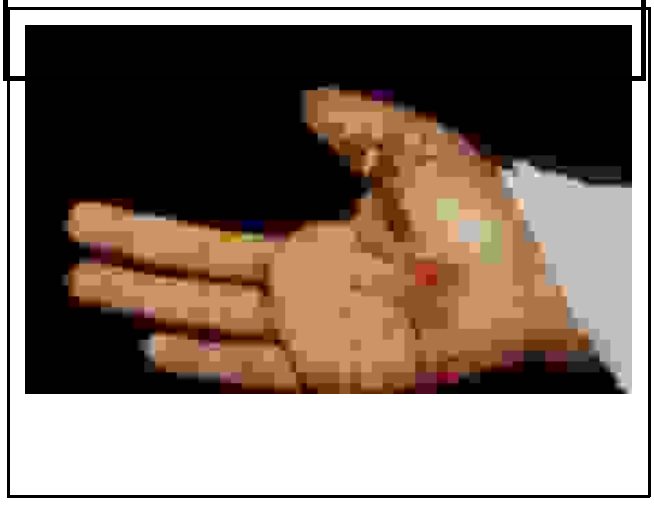
Results in Radial Forearm Island Flap		
Results	**No. of Patients**	**%age**
Good	12	100%
Satisfactory	Nil	Nil
Poor	Nil	Nil

DISCUSSION

The radial artery forearm flap (Chinese) is a remarkable and extremely versatile flap as it provides a large donor site, a good quality of skin texture, small amount of sub-cutaneous tissue and, above all, it can be carried out as a one stage procedure. The presence of cutaneous nerves in the donor flap area and excellent rich vascular connections between the flap, radius and forearm tendons allows its use as a







composite flap[4,9]. Initial use of forearm flaps in the early 1980s was as a free tissue transfer for intra oral reconstruction following tumor surgery and was then extended to the upper limb for reconstruction of severe burn contractures.

The flap elevation has to be meticulous. The fine areolar vascular mesentery with its network of vascular connections between the fascia and dermis must not be disrupted. This technique is safe and reliable and presents the major advantage of providing tissue where the deficiency is great. The most precarious flaps are those small flaps that lie over a portion of the brachioradialis muscle belly. Prior to development of this technique, various dorsal rotation and transposition techniques for coverage of hand had disappointing results.

They had certain disadvantages including an extended dissection over the dorsum of the hand, unsightly scars, a lack of available tissue particularly for the palmar surface of the web space and a high rate of recurrence of the contracture. Forearm flaps have eliminated all of these problems.

Their major disadvantages include a long forearm scar and the delicate dissection needed during flap elevation. These flaps can be designed to fill any defect. The size of each flap can be modified according to the recipient site for coverage.

The precise configuration will vary for each patient. We have found that dorsal rotation or advancement flaps provide sufficient tissue for mild to moderate contractures. The radial forearm flap has been used for local hand and forearm coverage when local tissue was unavailable e.g. therapeutic injection sloughs, tumor excision and mutilating injuries[10].

It was also important for its use when skin grafting was deemed inadvisable e.g. as in thumb reconstruction naked tendons or bones. We have used this flap for the coverage of dorsal aspect of the hand (4 patients), volar aspect of hand (1 patient) and for thumb reconstruction as osteo-cutaneous sensory reconstruction (5 Patients) and skin flap(2 patients). The functional improvement of the patient has been remarkable.

CONCLUSION

The Chinese flap surgery can be performed as a single stage operation with minimal morbidity, well accepted by the patients due to shorter hospital stay, optimally beneficial and with good cosmesis by experienced surgeon. So we recommend the use of radial forearm flap (Chinese) for soft tissue coverage in hand in appropriate settings.

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