

## THE RADIAL FOREARM FLAP

P. A. VINOD KUMAR AND K. KESAVADEV

### SUMMARY

*The radial forearm osteocutaneous flap is a recently described single stage method for reconstruction of the thumb. The long term results of the two cases treated by us are being presented. The value of the procedure under Indian conditions has been discussed.*

(*Key Words* : Thumb, Flap—Radial forearm)

The reconstructed thumb should have sensibility, stability and mobility for opposition. It should have adequate length. It should be painless and pinch pressure should not cause the skin pad to shift. It should preferably be a single stage procedure. The toe-to-thumb transfer (Cobbett, 1969), the wrap-around flap (Morrison et al., 1980) and the radial forearm (Biemer and Stock, 1983) are all single stage procedures. The later procedure has the added advantage that a microvascular procedure is not essential and hence is more suitable for adoption under our working conditions. The long term results of our first two cases with this method would be presented.

### Operative Procedure

Pre-operatively an Allen's test is performed to ensure that the limb would survive on the ulnar artery. The courses of the radial artery and subcutaneous forearm veins are marked. A rectangular flap of skin of sufficient width is marked out in the middle third of the forearm (Fig. 1). The flap is raised along with the deep fascia, the radial artery and its venae comitantes. One subcutaneous vein and the lateral cutaneous nerve of the forearm are identified and dissected upto the elbow and taken along with the flap. A segment of bone, half the thickness of the radius is also included in the flap, carefully preserving its facial attachments. Distally the radial artery is dissected upto the wrist. The

radial artery is divided proximally and the flap turned on the distal pedicle and placed over the thumb defect. The bone is fixed by an interosseous wire. The lateral cutaneous nerve and the subcutaneous vein of the forearm is anastomosed to a digital nerve and a dorsal vein respectively. The flap is wrapped round the bone and sutured. The donor area is then skin grafted.

### Case Reports

*Case No. 1* : Mr. G, a 25 years old, right handed labourer lost his left thumb distal to the metacarpo-phalangeal joint due to a crush injury. He presented a year later after one unsuccessful attempt at reconstruction with an ulnar bone graft and a local neurovascular flap. In addition to the short thumb, he had an adduction contracture of the first web and minimal flexion contracture of the 2nd and 3rd digit. The thumb was reconstructed by a radial forearm osteocutaneous flap by the technique described. A 5 cm segment of radius was used. In addition, the 1st web was deepened by a Z-plasty. No vein anastomosis was performed. He had an uneventful post-operative recovery. The wound healed in two weeks. Bony union occurred in six weeks. He was assessed 12 months after surgery. He had full range of abduction, adduction, opposition and power-pinch (Fig. 2, 3 & 4). He had good protective sensations with a two point discrimination of

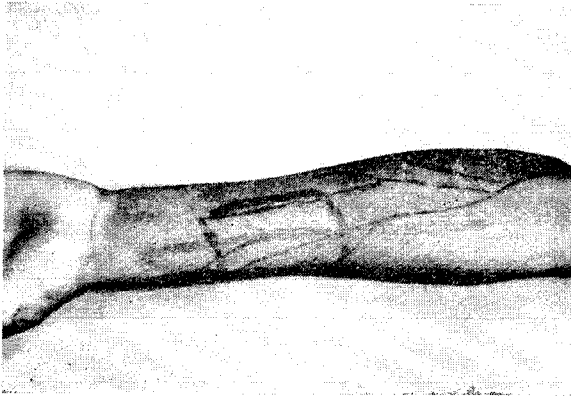


Fig. 1. Illustrates the pre-operative marking of the flap.

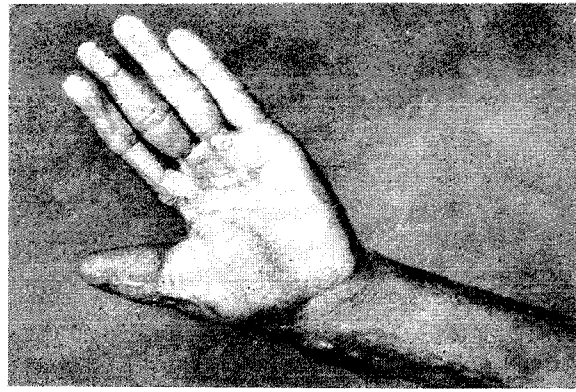


Fig. 2. Post-operative result of Case 1.

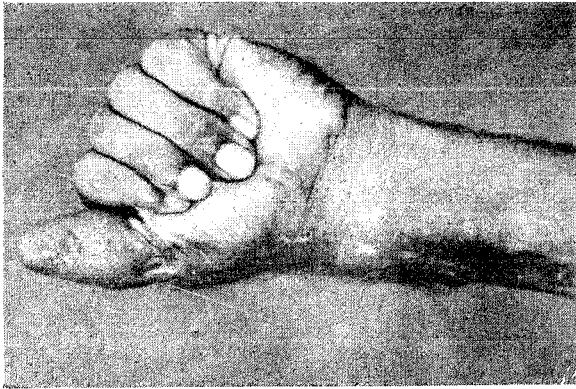


Fig. 3. Post-operative result of Case 1.

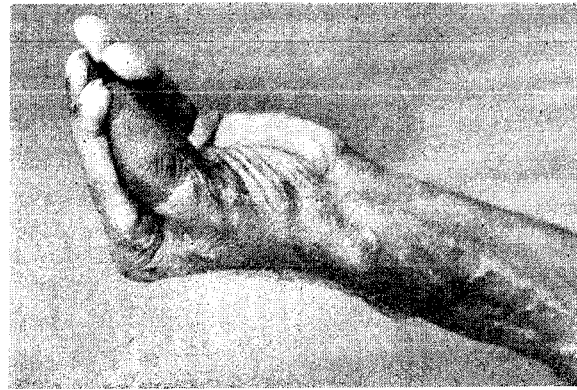


Fig. 4. Post-operative result of Case 1.

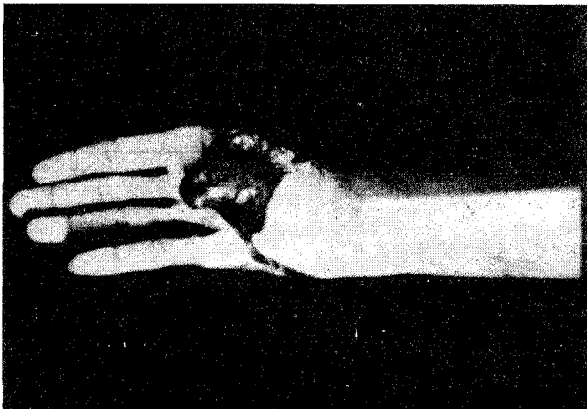


Fig. 5. Pre-operative deformity of Case 2.

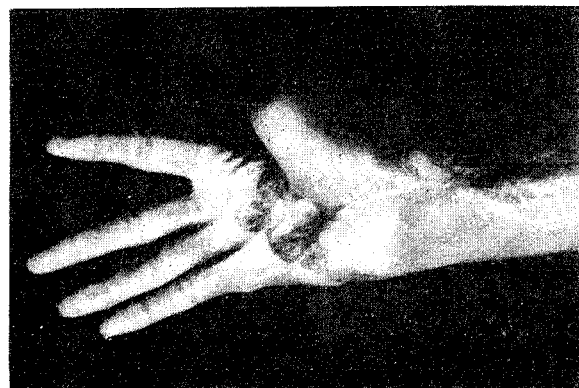


Fig. 6. Post-operative result of Cas 2.

12 mm. He was back to his original work as an agricultural labourer.

*Case No. 2* : Mr. G, a 19 years old, right handed labourer lost the distal phalanx of his right thumb, the skin of his palm and thumb in a crush injury. He had been treated elsewhere by split skin grafting. He presented with his thumb adducted, flexed and fixed to the palm. The 1st metacarpo-phalangeal joint was open and infected. There was flexion contracture of all the four fingers (Fig. 5). The contracture of the fingers were released and the defect split skin grafted. The old skin graft on the thumb was excised. The thumb was lengthened and resurfaced by a radial osteocutaneous flap. A micro-venous and micro-neural anastomosis was done. Staphylococcal infection resulted in the loss of the bone graft. Four months later release of the 1st web, ankylosis of the 1st metacarpo-phalangeal joint in functional position and reconstruction of the 1st web by a dorsal flap was done. At 7 months he had inadequate sensory recovery. Re-exploration of the nerve anastomosis and neurolysis was done. On assessment two years after the initial surgery, he had thumb of adequate length which was stable (Fig. 6). He had regained protective sensation (two point discrimination of 18 mm) and the functions of opposition, pinch and grasp were possible. He was working in a clerical job using the reconstructed thumb for writing.

### Discussion

The radial forearm flap is an osteoplastic method of reconstruction but it has advantages over the classical Nicoladonian method recon-

struction, because of its rich blood supply (Khashaba and McGregor, 1986). It can be safely used for single stage reconstruction and offers good sensory recovery as well. The bone graft is vascularized and therefore unites quickly. Bone resorption is uncommon. The flap being thin does not allow much skin pad shifting during pressure pinch.

In both our cases the functional result was good, with good recovery of protective sensation. One patient returned to his original occupation and the other took to a clerical job which involved the use of reconstructed thumb for writing. There was a loss of bone graft in one case, this was due to a technical error in which the vascular attachment was accidentally stripped off the bone graft. This case was also complicated by infection.

Emerson et al. (1985) observed that the venous return is poor in a distally based pedicled flap. We have also observed that there is increased edema when a venous anastomosis has not been performed. Jones et al. (1985) has observed limb ischaemia in one of their cases but we have not observed it. There has also been no donor site morbidity in contrast to the observations by Timmons et al. (1986). The cosmetic result was good in one case, in the other case in which the thenar area was also resurfaced, it was not so good. Cosmetically this method is inferior to the wrap around flap. It is however an easier method, requiring less operating time and could be done by a single surgeon. The functional results are excellent and in no way inferior to the other single stage methods available for subtotal reconstruction of the thumb.

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