

The free radial forearm flap—the management of the secondary defect

A. D. McGREGOR

Regional Plastic and Jaw Surgery Centre, Mount Vernon Hospital, Northwood, Middlesex

Summary—The secondary defect of the radial forearm flap is usually reconstructed with a split skin graft. This is applied to the visceral paratenon of several tendons in addition to muscle but early movement of the hand is often followed by breakdown, infection, delayed healing and reduced function. A technique for obtaining both full primary healing and full function is described which has produced good results in 16 patients.

Although the free radial forearm flap (Mühlbauer *et al.*, 1981) has quickly become established as one of the most popular techniques for reconstruction, particularly of intra-oral defects (Soutar *et al.*, 1983), it leaves a secondary defect with a reputation for poor healing and functional loss. When movement is allowed too soon the tendons shear from the overlying skin graft commonly used for recon-

struction, giving rise to the all-too-familiar picture (Fig. 1A) of ulceration and breakdown of the graft over the tendon of flexor carpi radialis and healing taking several months, with resultant marked contracture of the secondary defect (Fig. 1B and C) and consequent loss of function. We have developed a technique of grafting the donor site which has avoided these problems.

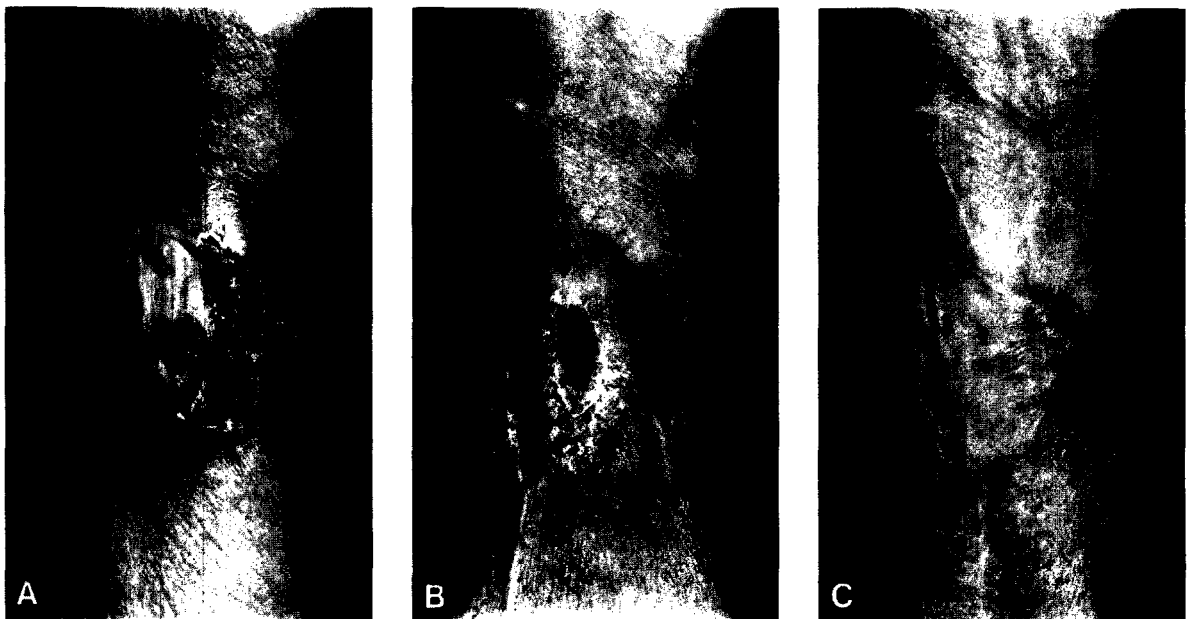


Fig. 1

Figure 1 Failure of skin graft on the secondary defect. (A) ulceration and infection 3 weeks post-operatively. (B) healing by secondary intention 3 months post-operatively. (C) healed, appearance after 1 year.

Material and methods

We have used the following technique on 16 patients. The graft is applied intra-operatively with the wrist extended and the gutter between flexor carpi radialis and brachioradialis is carefully packed to ensure good contact with tendons and muscle. The rest of the wound is dressed and the entire hand and forearm are immobilised in a circumferential plaster from elbow to fingertips with the wrist, thumb and fingers completely immobilised in the position of function with the wrist fully extended.

On the tenth post-operative day, the plaster is split and the graft inspected. Take is usually complete though the flexor carpi radialis tendon can still be seen through the graft. Mobilisation at this stage could still shear the graft from the tendon so the volar part of the plaster is replaced as a splint after dressing the graft and is only removed after a further 10 days. At this stage the flexor carpi radialis tendon can no longer be seen through the graft. The patient is allowed free movement and can usually obtain a full range immediately (Fig. 2), though a short period of physiotherapy may be required.

Results

In 14 of the 16 patients in whom this method was used, graft take was complete. The other two patients had 80% and 90% take of the grafts—both healed with conservative management without ulceration of any tendons. All patients obtained a full range of motion with no functional impairment.

Discussion

Some attention has been directed towards improvement of healing of the secondary defect by Fenton and Roberts (1985) who sutured the muscle bellies of flexor digitorum superficialis and flexor pollicis longus over the flexor carpi radialis tendon before applying a skin graft with the wrist held in flexion over a 2 week period. They claim improved function but application of a graft as described seems likely to anchor skin and muscle, thus blocking full wrist extension and still limiting function to some degree.

The keys to function are flexor carpi radialis and wrist extension. When the flap is raised, the flexor

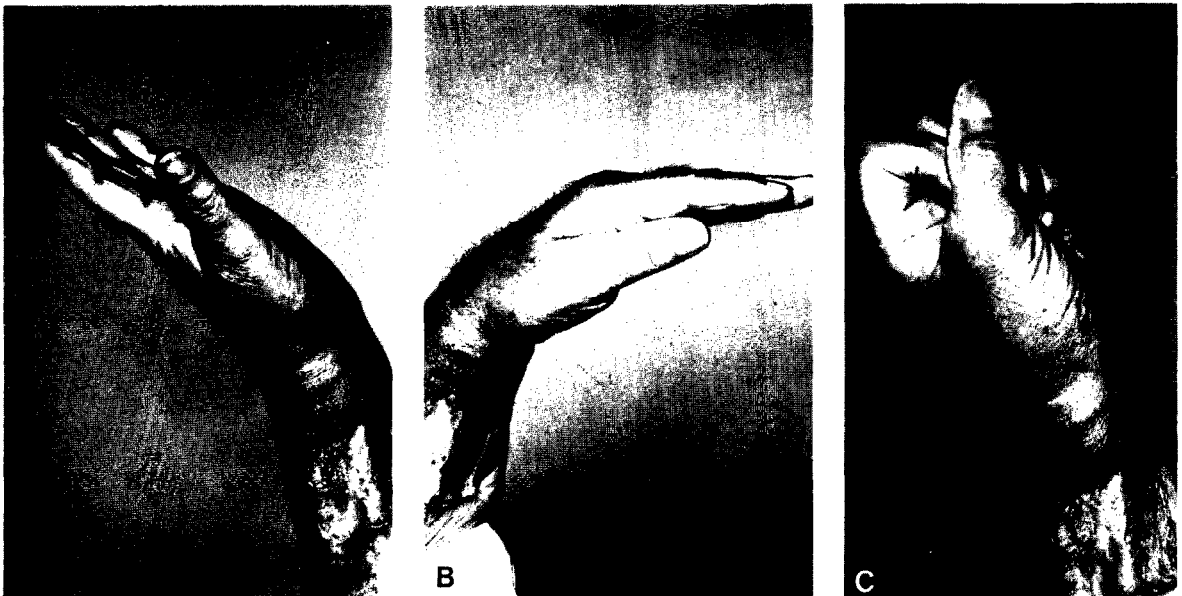


Fig. 2

Figure 2—Range of movement after removal of plaster at 3 weeks

(A) limit of wrist extension

(B) limit of wrist flexion

(C) full fist closure.

Note that the skin graft has healed completely.

carpi radialis tendon becomes detached from adjacent structures and tends to bowstring on wrist flexion. Removal of the radial vascular bundle creates a gutter between brachioradialis and flexor carpi radialis. If the wrist is extended, the flexor carpi radialis tendon lies flat on flexor pollicis longus, the depth of the gutter is reduced and the dead space is obliterated.

If the graft takes with the wrist in flexion or in neutral position, it will act as a brake on wrist extension by not allowing the flexor carpi radialis tendon to "pay out" as the muscle relaxes synergistically. The result is reduction in the range of finger flexion and power of grip. If the graft is applied with the wrist extended, the range of wrist flexion may be reduced but grip and finger movements will remain normal. Function should therefore be unimpaired and has proved to be so.

It has been suggested by some (Harrison, 1985, personal communication) that the simplest method of overcoming the problem of the donor site is to excise the tendon of flexor carpi radialis before applying the graft. This is a powerful wrist flexor, however, and it seems unnecessary to resort to such drastic measures when the tendon can be preserved with full function at little extra effort and no added morbidity.

It is therefore recommended that the technique

described here be used in the management of the secondary defect of the free radial forearm flap.

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The Author

A. D. McGregor, MB, ChB, FRCS, Senior Registrar, Regional Plastic and Jaw Surgery Centre, Mount Vernon Hospital, Northwood, Middlesex HA6 2RN.

Requests for reprints to the author.