# TRAUMATIC RADIO-ULNAR SYNOSTOSIS TREATED BY EXCISION AND A FREE FAT TRANSPLANT

## A REPORT OF TWO CASES

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**The operative technique and result of treatment of traumatic radio-ulnar synostosis in two patients are described. In both, the treatment was excision of the cross-union and interposition of a free non-vascularised fat transplant. The functional result was excellent, and there was no evidence of regrowth of the synostosis at two and three years respectively.**

This paper reports the results of treatment of traumatic radio-ulnar synostosis in two patients. In both, the treatment was excision of the cross-union and interposition of a free fat transplant, and the functional result was excellent. The operation is described in detail because any of several factors, other than the fat transplant, may possibly account for the successes.

### CASE REPORTS

**Case 1.** A 19-year-old labourer sustained a head injury and an isolated fracture of the left distal ulna in a motorcycle accident on July 3, 1978. On July 28, 1978, the ulnar fracture was fixed with a plate and screws. He developed a radio-ulnar synostosis in 30 degrees of pronation. On October 12, 1979, the plate and screws were removed, the synostosis was excised and a free non-vascularised fat transplant was placed between the radius and ulna. An above-elbow tourniquet was applied and care was taken to strip the bones of as little soft tissue as possible. Bone levers were not used. Neither the radius nor the ulna was stripped circumferentially. The bony bridge was excised by first making multiple drill holes in it followed by piecemeal removal with a rongeur and a dental burr. Subcutaneous fat without its overlying fascia, measuring 7.5 × 3 × 1 centimetres, was taken from the anterior abdominal wall and placed at the site of the removed synostosis. The fat transplant covered all raw bone surfaces and completely filled the dead space so that skin closure was just possible (Fig. 1). A suction tube drain was placed alongside the ulna away from contact with the fat transplant, and the skin incision was closed.

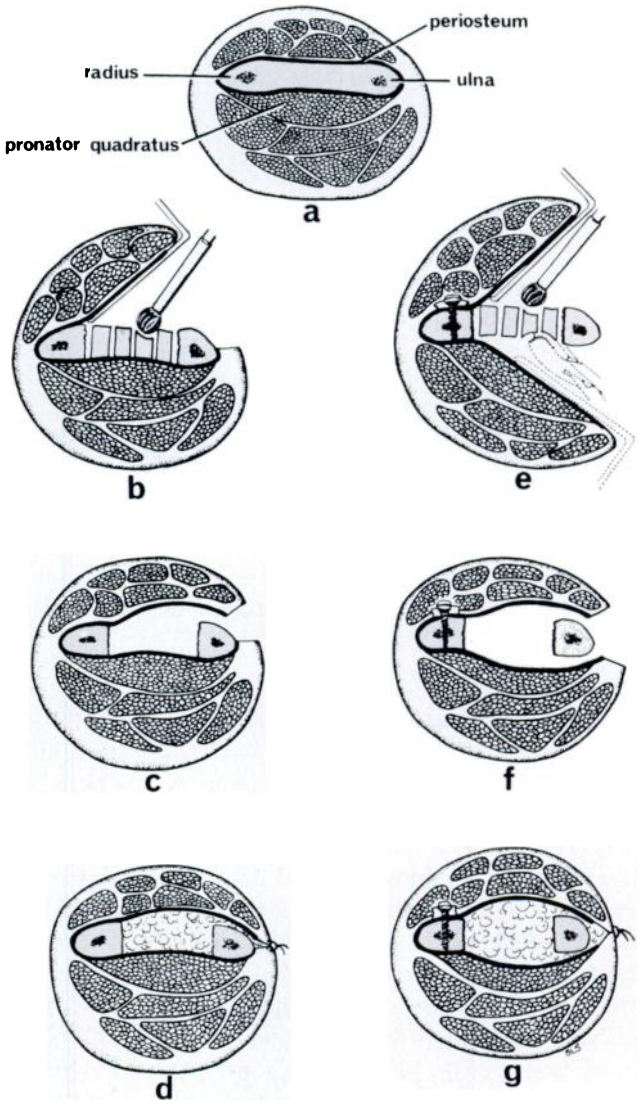


Fig. 1

The operative techniques used in the two cases: *b,c,d* in Case 1 and *e,f,g* in Case 2.

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The immediate passive range of movement under general anaesthesia was 30 degrees of supination and zero degrees of pronation. After operation, movement was encouraged from the first day and the drain was removed on the second day. Movement returned slowly and at 12 months the patient had full pronation but 15 degrees less supination compared with the uninjured side. This range was the same at his last follow-up on October 12, 1982. Radiographs showed no evidence of regrowth of the synostosis.

Computerised tomography was carried out two years after the free fat transplant. The scan showed an area at the site of the fat transplant which had an x-ray attenuation value that was in the range of fat and was similar to the value of the marrow in the medullary canal of the radius.

## DISCUSSION

This account of two cases seems to be the first report of treatment of traumatic radio-ulnar synostosis by excision and a free fat transplant. The functional results at three years and two years respectively are impressive when compared with the published results of other forms of treatment. The treatment of traumatic radio-ulnar synostosis is very different from the treatment of congenital radio-ulnar synostosis because in the latter the bony bridge is only part of the deformity. Two previous publications mentioned, without giving details, the unsuccessful use of fat transplants in the treatment of congenital radio-ulnar synostosis (Hansen and Anderson 1970; Mital 1976).

Although traumatic radio-ulnar synostosis is not a rare complication, there are few published accounts of

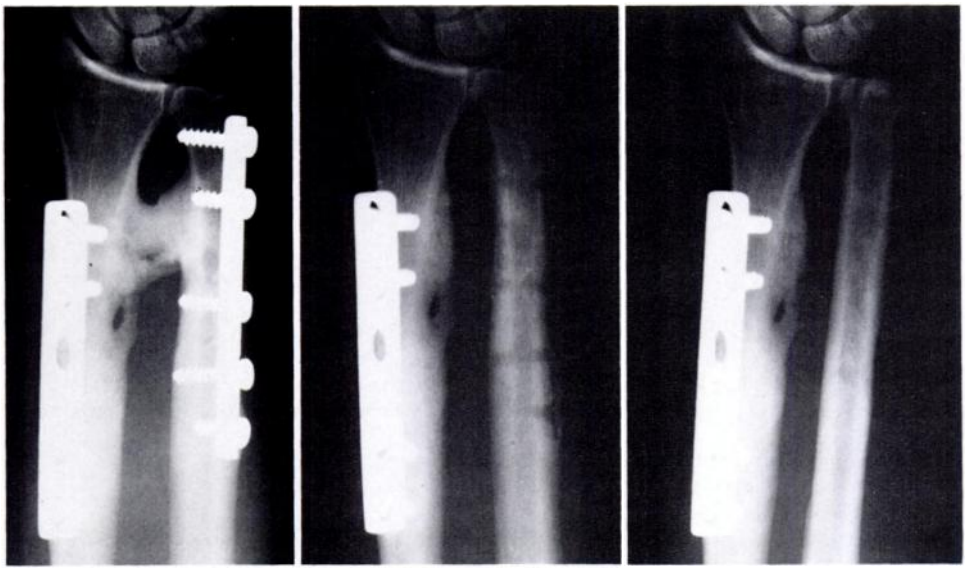

Fig. 2 Fig. 3 Fig. 4

Fig. 5

Fig. 6

Case 2. Figure 2—Traumatic radio-ulnar synostosis. Figure 3—Immediately after excision of the synostosis and insertion of the fat transplant. Figure 4—Two years later. Figure 5 and 6—Range of supination and pronation at two years after operation. The arrow indicates the donor site.

**Case 2.** A 19-year-old dental student fractured the left radius and ulna on August 6, 1979. On August 19, 1979, open reduction and internal fixation with plates and screws were carried out. He developed a radio-ulnar synostosis in neutral rotation. On September 2, 1980, the ulnar plate was removed, the radio-ulnar synostosis was excised and the defect was completely filled by a free non-vascularised fat transplant measuring $7.5 \times 7.5 \times 1.5$ centimetres. The operative procedure and after-care were the same as in Case 1 except that the ulna was stripped circumferentially of its soft tissues for the length of the bony bridge (Fig. 1). Passive movement under general anaesthesia was 30 degrees of supination and 20 degrees of pronation. On November 28, 1980, his range of movement was almost normal and it was the same at his last follow-up on September 28, 1982. It was decided not to remove the plate from the radius (Figs 2 to 6).

treated cases. This probably reflects the poor results of all forms of treatment. The correct time to operate is unknown but it is probably wise to wait 6 to 12 months (Smith 1980). The following operations have been used singly or in combination: rotation osteotomy to place the forearm in useful position; excision of the synostosis with simultaneous excision of the proximal end of the radius (for proximal cross-union) or distal end of the ulna (for distal cross-union) (Smith 1980); deliberate creation of a pseudarthrosis by excision of a segment of the radial shaft and, for example, the insertion of a stainless steel swivel in the place of the excised segment to improve rotation (Kelikian and Doumanian 1957); and excision of the synostosis and insertion of various artificial and natural materials between the forearm bones with the aim of preventing regrowth of the bony bridge. Brady and Jewett (1960) used a screw or threaded Kirschner

wire between the two bones to keep them apart. Dacron, silicone, fascia lata and local muscle have been used as interposition materials (Schneider and Leyva 1964; Carstam and Eiken 1971; Corless 1977; Tooms 1978; Watson and Eaton 1978; Freitag, Head and Lim 1981).

Fat has been used as a transplant either with a pedicle or as a free transplant. Pedicled fat transplants have been used to revascularise the ischaemic myocardium and to prevent the formation of postlaminectomy fibrosis (O'Shaughnessy 1936; Gill, Sakovich and Thompson 1979). A free vascularised omental fat transplant was anastomosed by microsurgical technique to fill the large bony defect which followed extensive saucerisation for chronic osteomyelitis of the tibia (Fitzgerald, personal communication 1982).

Kiviluoto (1976) reviewed the extensive literature on free non-vascularised fat transplants and the interested reader is referred to this excellent paper. Free fat transplants have been used in several ways: to fill defects in the face, brain, orbit, frontal sinus and long bones (Kiviluoto 1976); as an interposition material for arthroplasties, after excision of bony bridges from partially closed growth plates, and after resection of ectopic ossification following total hip replacement (Langenskiöld 1975; Kiviluoto 1976; Riska and Michelsson 1979); for breast augmentation (Peers 1956); to stem haemorrhage after operations on the liver, kidney and lung (Kiviluoto 1976); to prevent adhesions to nerves, tendons, muscles and dura (Kiviluoto 1976; Langenskiöld and Kiviluoto 1976; Yong-Hing *et al.* 1980); and as an adjunct to myocardial revascularisation with the internal mammary artery implant (Vineberg *et al.* 1965).

Several workers studied the differences between autogenous and homogenous fat transplants and the fate of these transplants (Peers 1956; Kiviluoto 1976). Yong-Hing *et al.* (1980) demonstrated the revascularisation of free fat transplants by an injection technique in dogs. In the present report, a computerised tomographic scan two years after the free fat transplant demonstrated much of the fat was still present in Case 1. A scan was not carried out in Case 2 because of the metal plate on the radius.

In summary, the treatment of traumatic radio-ulnar synostosis by excision and free fat transplant was successful in two cases and deserves further trial.

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