

# COMPLICATIONS FOLLOWING METAL REMOVAL: A FOLLOW-UP OF SURGICALLY TREATED FOREARM FRACTURES

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## ABSTRACT

We undertook a retrospective study of 82 patients with 128 diaphyseal fractures of the forearm who had been operated at our institution for their initial injury and subsequently had implant removal when the fractures had healed. The majority of the patients (97.5%) had no major complications after the removal of implants but 2 patients sustained a re-fracture of the same bone within 6 months after plate removal. Both patients had suffered from open fracture at the initial injury and sustained re-fracture in the original fracture site after implant removal. These fractures were both treated conservatively in a cast and united without further problems. Another 20 patients (24.4%) had minor complications ranging from mild superficial wound infection to nerve injury.

**Keywords:** implant removal, forearm fractures, complications

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## INTRODUCTION

Dynamic compression plate fixation is presently the standard method for treating displaced diaphyseal fractures of the adult forearm<sup>(1)</sup>. Excellent results have been reported using the principles laid down by the AO group. In most cases, the 3.5mm dynamic compression plates are used for rigid fixation of these fractures. However, the presence of a rigid plate has been shown to result in an uneven distribution of stress along the bone, the plate acting as a 'stress protector', perhaps predisposing to future fracture<sup>(2)</sup>. Hence, initial recommendations suggest removal of forearm implants to alleviate this long-term problem.

The optimum time for plate removal in forearm is said to be 18 to 24 months after insertion. There is a transient reduction in bone strength following plate removal, so that restriction of activity is usually recommended or even a temporary splint as suggested by some authors. Despite this, there have been reports in the literature suggesting a 10% - 40% incidence of re-fracture after late removal of implants<sup>(3,4)</sup>.

We undertook a retrospective study of all patients who had removal of forearm implants over a 2-year period to determine the incidence of re-fracture and other complications after implant removal. All patients had their initial fracture fixation at our hospital and also had the implants removed here. All had at least one year follow-up after surgery for implants removal. This is because re-fracture of the healed bone have been reported to occur as long as 6 months after removal of implants.

## PATIENTS AND METHODS

The operative records of all patients who had routine removal of

forearm implants at our institution over a 2-year period were reviewed. Only patients who had their initial surgery in our institution were included in the study. All the patients in the study had at least one year follow-up as at outpatient or were recalled for a final review one year post-removal of implants.

There were 60 male and 22 female patients; their ages at the time of removal ranged from 10 to 63 years (average 26.7). There were 35 patients with injured left arm and 47 patients with injured right arm. The plate was removed from the ulna in 15 patients, the radius in 21 and from both bones in 46. Follow-up varied from 3 to 78 months (average 35.1) after implant removal and the plates were removed 5 to 84 months (average 23.7) after insertion.

In each case, the forearm plate was not removed until after the surgeon thought that the fracture had united clinically and radiologically. Thirty patients asked for the plates to be removed; the other 52 were advised by the surgeon or one of his staff to have the plates removed. Thirty patients admitted to having minor symptoms which they attributed to the plates; these symptoms were skin prominence due to the plates (8 patients), barometric pain (15 patients), and pain when the arm was knocked against something (7 patients). The rest of the patients had no symptoms.

At review, all the patients were questioned directly and the forearm was examined for appearance, range of movement and neurological status. In all patients, the radiographs and case notes were examined for record of any complications.

## COMPLICATIONS

In 22 patients (27%), a complication occurred as a result of the removal operation.

### Wound sepsis

Wound sepsis was defined as having occurred if the wound had a clinically and bacteriologically proven infection which required a full course of antibiotics. It occurred in four cases; in all four cases, the organism was *Staphylococcus aureus* which responded to oral antibiotics. There was no case of deep-seated sepsis or osteomyelitis. None of the patients was admitted for wound infection.

### Poor scar

Five patients were disappointed that the scar which followed plate removal was much wider and more noticeable than the original scar.

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### **Nerve damage**

In six patients, the plate removal was followed by sensory loss. These varied from local skin anaesthesia around the wound (3 cases), superficial branch of the radial nerve (2 cases) and one case of ulnar nerve injury.

In all cases, the neurological problem was associated with an anterior approach to the radius, especially if the fracture was in the middle or distal third of the bone.

### **Recovery**

The average time in hospital was two days. The average time off work or school was 3.4 weeks (range 2-8 weeks).

### **Refracture**

In two patients, the bone refractured after plate removal. In the first, a 30-year-old man, the refracture followed minimal trauma 15 days after plate removal. The plates had been removed nine months after injury; the refracture occurred through the side of the original injury to the radius. The second patient, a 27-year-old man, refractured five months after removal of plate, again with minimal trauma. In his case, the plate had not been removed until 24 months after the injury, but also refractured through the site of the original radial fracture. Both patients had sustained open fractures at their initial injury and had immediate debridement and plate fixation of the fracture. Bone grafting was not used but the fractures had united radiologically six months after plate fixation. Neither patient had been told specifically to restrict activity and neither had worn a protective splint after the operation. In both cases, the fracture had been considered united at the time of plate removal, and union was confirmed at operation.

Both patients were treated by cast application until radiological union was observed.

### **DISCUSSION**

Refracture is a well-known complication reported after plate removal<sup>(3-6)</sup>. However, the incidence of re-fracture has varied widely. Dodge and Cady<sup>(7)</sup> reported only one refracture in 40 cases in which plates had been removed at least 16 months after injury. However, Anderson et al<sup>(8)</sup> reported eight refractures after minor trauma in 20 patients whose plates had been removed after only a few months; the incidence was reduced when plates had been left in for 12 to 18 months, and when a protective splint was worn for up to six weeks. More recently, Hidaka and Gustilo<sup>(9)</sup> reported on seven cases of refracture in 23 patients where all but one of whom had had some form of protective immobilisation. The average time to refracture was three months, and four of these patients had had their plates removed before the recommended time of 18 to 24 months.

It is not known how long it takes a human radius to regain full strength after plate removal, but until that time, splintage or bracing cannot be relied upon to prevent refracture<sup>(3)</sup>. The AO group recommends normal use of the limb, but no athletic activity

for the first three months, and no extreme activity for six months. This seems to be a safe policy, because excessive bracing following plate removal could increase the osteoporotic effect of immobilisation.

In our series, only two cases (2.5%) had suffered from re-fractures after implant removal. This is low in comparison to the series reported above. In one case, we found that the early removal of the radial implants (9 months post-operation) exposed a healed radial fracture which was of suboptimal strength. In the second case, the patient had a compound (open) fracture of the radius with debridement and plating performed. There was some loss of cortex initially but this had united without the aid of bone grafting.

### **CONCLUSION**

This study has shown that elective removal of forearm plates carries a significant complication rate. Most patients do not have serious symptoms from the plates and unless they do, we feel that the plates should be left in position; moreover, they should not be removed for at least 18 months after being applied. Their removal should not be delegated to an inexperienced surgeon and the presence of an anterior scar demands special care to avoid nerve injury. After removal of a plate, restricted physical activity for up to three months is recommended in selected cases. This should be necessary in those patients who had open fractures of the forearm initially and those who had early implant removal (ie less than 18 months) for various reasons.

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