Fractures of the distal third of the humerus with palsy of the radial nerve

MANAGEMENT USING MINIMALLY-INVASIVE PERCUTANEOUS PLATE OSTEOSYNTHESIS

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Fractures of the distal third of the humerus may be complicated by complete lesions of the radial nerve which may be entrapped or compressed by bone fragments. Indirect reduction and internal fixation may result in a permanent nerve lesion.

We describe the treatment of these lesions by insertion of a bridge plate using the minimally-invasive percutaneous technique. Six patients were operated on and showed complete functional recovery. Healing of the fractures occurred at a mean of 2.7 months (2 to 3) and complete neurological recovery by a mean of 2.3 months (1 to 5). In one patient infection occurred which resolved after removal of the implant.

Minimally-invasive surgery for the treatment of diaphyseal fractures of long bones in the lower limbs was introduced in the 1980s. It has been used successfully for the management of fractures of the shaft of the humerus without palsy of the radial nerve.4-6

Fractures of the distal third of the humerus may be complicated by lesions of the radial nerve7 and treatment by indirect reduction and fixation may increase the risk of a permanent nerve lesion. Spiral or oblique fractures of the distal third may be complicated by laceration, contusion or interposition of the radial nerve at the site of the fracture.7

We describe an approach to the management of such fractures with complete palsy of the radial nerve using minimally-invasive percutaneous plate osteosynthesis.

Operative technique. The radial nerve was exposed between the brachialis and brachioradialis muscles through an oblique incision approximately 5.0 cm to 8.0 cm long at the junction of the middle and distal thirds of the forearm (Fig. 1). After identifying the nerve it was freed from its distal part proximal to its emergence from the lateral intermuscular septum, which was released (Fig. 2). Fixation was performed using the technique of minimally-invasive percutaneous plate osteosynthesis. Proximal access was gained between the biceps tendon medially and the tendon of deltoid and the cephalic vein laterally. The distal approach was as described by Kocher.8 A narrow dynamic compression plate (Synthes, Sao Paulo, Brazil) was moulded to fit the anterior face of the lateral column and inserted through the distal incision. The hole for the most distal screw was then drilled. The arm was then abducted to between 60° and 90° to correct the varus deviation, the length re-established by traction and the distal fragment rotated into alignment with the proximal part of the shaft before attaching the plate by a single proximal screw. The proximal and distal fragments were then fixed with further screws (Fig. 3). The wound was closed without drains or external immobilisation. After operation the patients were referred for physiotherapy and were instructed to use the arm for the activities of daily living.

Results

All the fractures had healed at a mean of 2.7 months (2 to 3) and the nerve lesion recovered at a mean of 2.3 months (1 to 5). The carrying
angle of the elbow and a normal range of movement were re-established in all cases (Table II). One patient developed a haematoma in the distal incision after a fall. This became infected and in spite of exploration and treatment with antibiotics it did not resolve until the implants had been removed through the original incisions ten months after the first operation.

Discussion
The incidence of fractures of the diaphysis of the humerus in North America is 20 per 100 000 inhabitants per year. Half involve the middle third and 20% to 30% are in the distal third. Transverse fractures are more common in the middle third and spiral and oblique fractures in the distal third.
Lesions of the radial nerve occur inbetween 1.8% and 18% of cases with a mean of approximately 11%. Some recommend conservative treatment of the fracture in these cases since in more than 80% the nerve will recover function spontaneously. However, others advise immediate surgical exploration of the nerve with internal fixation of the fracture. In the middle third of the humerus the radial nerve is still not fixed by the intermuscular septum and there is a greater protective layer of soft tissue between the nerve and the shaft of the humerus. Traumatic lesions of the radial nerve at this level are generally due to neurapraxia and have a high potential for spontaneous recovery. In the distal third of the humerus, the nerve is fixed by the lateral intermuscular septum and is in close contact with the diaphysis. Acute lesions or those which develop during conservative management of a fracture at this level are due to contusion or entrapment of the radial nerve. Spiral or oblique fractures have a greater propensity towards causing this type of nerve lesion, making spontaneous recovery impossible, improbable or unpredictable. In two of our six patients the nerve was interposed between bone fragments and in the remaining four it was compressed by a spike of bone due to proximal deviation of the distal fragment (Fig. 4).

The cases reported in the literature are not uniform as regards the type of lesion. In partial lesions or motor lesions with preserved sensory function, the rate of spontaneous recovery is greater than in those with complete sensory and motor loss.

Intramedullary implants are not the treatment of choice in most distal fractures. Open reduction and internal fixation with plates is more appropriate despite the greater surgical morbidity.

The procedure described in our study uses the advantages of the minimally-invasive percutaneous osteosynthesis technique with the need for exploration and freeing of the radial nerve in these cases. It reduces morbidity and the length of the operation and lessens the risk of infection, delayed union and pseudarthrosis. It facilitates early exploration of the nerve and allows stabilisation of the fracture without requiring more than minor exposure of the bone fragments, thus minimising their devitalisation and enhancing consolidation. If it is necessary to remove the plate this may be done through the original proximal and distal incisions without risk of further compromise of the radial nerve.

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References