Antegrade Rush nailing for fractures of the distal humerus

A CASE SERIES

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A single antegrade Rush nail was used to treat 37 fractures of the distal humerus extending to the olecranon fossa and up to 6.5 cm proximal to it. In order to stabilise the fracture, the bent tip of the Rush nail was directed into the lateral epicondylar ridge. This gave immediate stability. All the fractures united without residual stiffness of the shoulder or elbow.

The conservative management of fractures of the shaft of the humerus presents considerable difficulties, and internal fixation is frequently employed. Fractures of the distal humerus are not suitable for stabilisation with an intramedullary nail, and fixation with plates is usually recommended. However, this technique requires considerable disruption of the soft tissues. Plating requires a major exposure, and a locking nail has to pass through the rotator cuff. In the light of such difficulties we have developed a closed procedure using a Rush nail and a simple operative technique with traditional equipment which does not require special technical expertise, even for comminuted fractures reaching the level of the olecranon fossa (Fig. 1).

Patients and Methods

Between February 1998 and November 2006, 40 fractures of the distal humerus were managed using this technique. The mean age of the patients was 29.3 years (14 to 53). The mean proximity of the fracture from the olecranon fossa was 2.5 cm (0 to 6.5).

Operative technique. The patient lies supine with a sandbag under the ipsilateral scapula, and the shoulder over the edge of the table. The deltoid is split through a 15 mm lateral skin incision. Using an awl, an entry is made into the greater tuberosity avoiding the rotator cuff. The nail should be as long as the distance between the entry point and 1 cm proximal to the lateral epicondyle. The nail is appropriately contoured particularly distally, being bent by 5° about the middle and by about 10° at a point 2 cm from its tip and at 4 cm from its proximal end (Fig. 2). Alternate hammering and side-to-side movements facilitate its introduction.

Insertion is relatively easy. The fracture is reduced and the nail advanced into the lateral pillar between the olecranon fossa and the lateral cortex of the humerus. At the time of impaction, counter-pressure at the elbow is necessary to avoid distraction of the fracture.

Post-operatively, a collar and cuff sling is used for about four weeks. Gentle shoulder and elbow mobilising exercises are started on the first post-operative day. Rotational exercises are avoided until bridging callus is visible. The nail is usually removed at about nine months post-operatively.
Results
A total of 31 of 40 fractures (77.5%) were comminuted. Road traffic accidents were responsible for 31 injuries (77.5%). Seven fractures (17.5%) followed falls, and two (5%) resulted from a heavy object falling on the arm. The mean operative time was 58 minutes (20 to 95). Three patients were lost to follow-up. Union was judged to have occurred in all the remaining 37 fractures based on the presence of bone bridging the fracture site in two radiological views and the absence of pain and tenderness on stressing the bone (Fig. 2). All the fractures united, the mean time to union for 35 fractures was 5.7 weeks (2 to 8), two had delayed union of nine and 14 months, respectively. The range of movement of the shoulder and elbow were compared with the other side unless there was a history of previous injury or other recent injuries such as a fracture of the radial head. Elbows regained movement from full extension to between 130° and 140° of flexion. The mean follow-up was 24.8 months (3 to 108), and the patients regained a full range of all movements of the shoulder (flexion, extension, abduction and rotation).

Two patients had a radial nerve palsy at presentation and underwent open reduction with exploration of the nerve which was found to be intact. The nerve palsy resolved within six months in both cases. Two other patients underwent open reduction for failed closed reduction, and a further two had radial palsies which were iatrogenic, and also recovered in six months. Lateral skin incisions, 3 cm long, with minimal dissection were enough to facilitate reduction. A minor varus deformity ranging between 2° and 13° was present in 11 patients but produced no functional deficit (Fig. 3). Neither anteroposterior (AP) angulation (Fig. 4) nor rotational malalignment was seen. There was no deep infection.

Nine patients asked for the nail to be removed. This was undertaken at a mean of 14 months (9 to 32) after the operation and was a simple day-case procedure. As the nail fits snugly in the lateral pillar, sometimes side to side movements were necessary to facilitate extraction.

Discussion
Extra-articular fractures of the distal humerus are usually managed conservatively or by plating. The distal fragment...
is short and the medullary canal is narrow, rendering it unsuitable for locked intramedullary nailing. With plating the rate of nonunion is increased and the operating time is longer. The implant may subsequently require removal, the scar is unsightly,\(^3\) and infection may occur. Patients treated either conservatively\(^{1,2}\) or with plating may have persistent pain and limitation of movement of the elbow.\(^4\)

Other methods of treatment include multiple Ender nails,\(^5\) retrograde epicondylar nails,\(^6\) straight Rush nails\(^7\) and Hackethal nails,\(^8\) but each has its own problems.

The technique described in this paper allows easy direction of the tip of the bent nail into the narrow pillar of bone lateral to the olecranon fossa where it engages and provides fixation.

The oldest patient in our series was 53 years of age. Accordingly we do not know whether this method is suitable for elderly patients with osteoporotic bone. The fractures can usually be reduced by gentle manipulation, but a small exposure to facilitate open reduction may be needed.

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References