PENTALATERAL OSTEOTOMY FOR CUBITUS VARUS

CLINICAL EXPERIENCES OF A NEW TECHNIQUE

W. LAUPATTARAKASEM. B. MAHAISAVARIYA. W. KOWSUWON. S. SAENGNIPANTHKUL

From Srinagarind Hospital, Khon Kaen, Thailand

Several methods for the correction of cubitus varus have been described, but most reported series are small and show a high rate of complications. We report a six-year personal experience of 77 osteotomies by a new technique which provides rigid fixation and allows correction of both varus and rotation deformities. It also prevents lateral bulging at the level of the osteotomy.

In 58 cases followed up for an average of 16 months, there were no serious complications, a satisfactory carrying angle and no significant loss of movement, giving 88% excellent or good results.

Cubitus varus is the most common late complication of supracondylar fracture of the humerus (McCoy and Piggot 1988), which is the commonest paediatric elbow injury (Blount, Schulz and Cassidy 1951). Many methods of correction have been described (Bellemore et al 1984), but the lateral closing wedge osteotomy of French (1959) has been one of the most popular, and has been followed or modified by many recent authors who report satisfactory results (Carlson and Rosman 1982; Bellemore et al 1984; McCoy and Piggot 1988).

We have used a similar closing wedge osteotomy but experienced some difficulties in fixation with Kirchner wires. The senior author (WL) modified the technique by leaving a lateral spike to facilitate fixation, but observed in six of nine cases that although correction of the varus angle had been successful, there was still an ugly bulging of the lateral epicondyle (Laupattaraksan et al 1982), an appearance also noted by Bellemore et al (1984) and Huurman (1985). This bulge is most noticeable when the medial cortex has been used as a hinge (as in French’s technique); it is due to lateral protrusion of the distal osteotomised fragment and is made more prominent when there is atrophy of the flexor muscles of the forearm (Fig. 1). This ‘lazy S’ deformity may cause further cosmetic concern. Our technique aims to prevent this deformity and the size of the wedge is now decided on the basis of the pathology seen at operation rather than from pre-operative radiographs. A five-sided section of bone is removed; we call it a pentalateral osteotomy.

The significance of medial rotation deformity is debatable (French 1959; Smith 1960; Yamamoto et al 1985). We believe that minor rotation can be compensated by shoulder movement, but a major and recent deformity may produce an attitude of medial rotation of the limb that makes the varus deformity look worse. We therefore correct any rotation which is found at operation to be in excess of 20°.
PATIENTS AND METHODS

From 1982 to 1988, 108 corrective osteotomies for cubitus varus were performed at Srinagarind Hospital, Khon Kaen, Thailand by two of the authors (WL and BM) using the pentalateral technique in 77. Of these, 58 osteotomies of 57 elbows were followed up for over six months and included in a prospective study. Two elbows needed re-operation, one for refixation and the other for a second osteotomy. There were 37 male and 20 female patients; 31 patients had left-sided deformity. The average age at operation was 14 years (range 3 to 62) and the interval between injury and osteotomy averaged 69 months (range 3 months to 23 years). The mean carrying angle on the normal side was 8.6° (s.d. 3.2) as against −18.3° (s.d. 8.4) on the affected side. The arc of movement on this side averaged 132.9° (s.d. 21.3).

Operative technique. The patient is placed semiprone with 90° of elbow flexion. A standard lateral approach gives inadequate posterior exposure, and is modified by a distal extension from the lateral epicondyle, curving towards the olecranon process (Fig. 2a). Subperiosteal exposure is made distal to the origin of the brachioradialis and behind the lateral intermuscular septum, then between triceps and anconeus (Fig. 2b). Wide exposure of the posterior aspect is important but identification of the local nerves is not necessary.

The osteotomies are then planned (Fig. 3a). CD is the line joining the epicondyles, practically parallel with the transverse axis of the elbow C'D'. AB is parallel to CD and just proximal to the olecranon fossa. AF is about half of the estimated shaft diameter and the angle OPB is about 120°. This angled line is marked and cut (Fig. 3b), and the proximal part mobilised (Fig. 3c).

The proximal bone is then divided at QB, at about 95° to the longitudinal axis of the shaft MN. The line XY and the angle XYB can then be marked by temporarily reducing the cut surfaces (Fig. 3d).

The cut surface of the proximal stump will show evidence of any medial rotation deformity. This is made apparent by a triangular zone of subperiosteal new bone posterior to the original posterior cortex (Fig. 4). The degree of rotation can be directly measured from this. The cut XY is then made perpendicular to the coronal plane of the old bone; this ensures that, after reduction, rotation will be corrected.

When the osteotomies are complete, reduction is performed with the elbow extended. There may be minor discrepancy between YB and PB, but this makes little difference to the medial contour. The fragments are fixed,
RESULTS
Mean follow-up was 16.1 months (range 6 to 60). In 31 cases by the original lateral approach the mean operation time averaged 67 minutes but using the modified incision in 27 cases, this was reduced to 37 minutes (range 25 to 60). The mean postoperative carrying angle was 6.8° (s.d. 7.7) and the range of elbow movement was 136.7° (s.d. 22.8). This represents very satisfactory correction of the varus deformity and no change in the arc of movement.

Overall clinical evaluation was made by the criteria in Table I. An excellent result requires that, except for the surgical scar, the external appearance and range of movement of both elbows is identical. By these criteria, we had 22 excellent results (38%), 29 good (50%), five fair (8.5%), and two (3.5%) poor results.

Complications. In one early case 5° of varus remained after a technical error, but since the normal elbow had a zero carrying angle, the appearance was accepted. Loss of fixation occurred in three patients (5.2%) in whom the operated limb had not been splinted. One had a further osteotomy at two years and another needed refixation at three weeks; both had good final results. The third patient refused further surgery, accepting a 20° recurrent varus deformity. Two patients (3.5%) still had a 'lazy S' deformity caused by an error in the osteotomy. There were no significant neurovascular or infective complications and the scars were all acceptable.

DISCUSSION
In Thailand, the treatment of closed skeletal injuries in rural areas is still quite commonly handled by bone-setters. Our relatively large series of patients was mainly the result of this practice. Most of our patients gave a history suggestive of a supracondylar fracture, and had been immobilised with the elbow extended in a bamboo splint for some weeks.

Our modified lateral approach with distal curvature facilitates both exposure and fixation and allowed reduction of operation time. The design of the osteotomy retains a spike of bone which allows rigid fixation with a

Table I. Criteria used to assess results

<table>
<thead>
<tr>
<th>Grade*</th>
<th>Difference from normal side</th>
<th>Range of movement (degrees)</th>
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</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0 (degrees)</td>
<td>0</td>
</tr>
<tr>
<td>Good</td>
<td>1 to 5 (degrees)</td>
<td>1 to 10</td>
</tr>
<tr>
<td>Fair</td>
<td>6 to 10 (degrees)</td>
<td>11 to 20</td>
</tr>
<tr>
<td>Poor</td>
<td>&gt; 10 (degrees)</td>
<td>&gt; 20</td>
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* the lowest grade for either factor is counted. The presence of lazy S deformity reduces the grade by one level.
lag screw. Both varus deformity and any significant rotation can be corrected and normal anatomical relationships are restored to avoid the 'lazy S' appearance.

Despite the use of a lag screw and Kirschner wire, we have seen no evidence of significant growth disturbance. Like Oppenheim et al (1984) we consider that the deformity should be corrected early in childhood. Our rigid fixation should have made postoperative splintage unnecessary, but we found that a short period of protection was needed, and a protective brace is recommended during rehabilitation (Laupattarakasem 1988).

The deformity of cubitus varus is three-dimensional, so radiographic and clinical measurements may be unreliable. At operation our technique allows correction in all three planes, and makes pre-operative measurements unnecessary. Our few 'poor' results, 3.5% in a large personal series, were due to technical errors or to lack of compliance, and our 'fair' results correspond to the 'good' results of Bellemore et al (1984).

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES


