Dome osteotomy for cubitus varus in children

Ramsundar Ram Kanaujia, Yoshikazu Ikuta, Hiroshi Muneshige, Tetsuki Higaki and Koichi Shimogaki

In 11 children, varus deformity of the elbow after supracondylar or transcondylar fractures was corrected with a dome osteotomy. The indication was usually cosmetic. The patients were followed for 5 years. The correction was satisfactory in all the cases, and there was no serious complication.

Cubitus varus deformity is not a functional problem, but it may become so disfiguring that correction is indicated (Carlson et al. 1982, King and Sector 1951, French 1959, Amspacher and Messenbaugh 1964, Langenskiöld and Kivilaakso 1967).

The wedge osteotomy with some modifications (Carlson 1982, Labelle 1982, Yamamoto et al. 1985, So et al. 1985, Oppenheim et al. 1984) has been commonly used, but the cosmetic result has not always been satisfactory. The dome osteotomy was initially mentioned by Tachdjian (1972) without giving details, followed by Higaki and Ikuta (1982) who reported in Japanese. We have performed this osteotomy using a new fixation and guiding device for better alignment and improved cosmetic result.

Patients and methods

Nine boys and 2 girls with a cubitus varus deformity after supracondylar or transcondylar fracture of the humerus were operated on by dome osteotomy 4 (0.5-6) years after the injury. Their ages ranged from 5-14 years at the time of operation, and they were followed for 5 (3-9) years. The loss of carrying angle, i.e., the angle between the long axis of the humerus and the midline of the forearm was measured in full extension and supination with a goniometer. Radiographically, the humeral-elbow-wrist angle was measured according to Oppenheim et al. (1984). The varus deformity was 31° (18-45°; Table 1). The carrying angle on the normal side was 2-10° of valgus.

At operation a 10-cm S-shaped incision was made on the posterolateral aspect of the elbow. The ulnar nerve was first exposed on the medial side and protected with a rubber band. Thereafter, an incision between the triceps and brachioradialis muscles was made, and the triceps tendon was elevated subperiosteally from the tip of the olecranon exposing the lateral border and the posterior surface of the humerus. The humeral condyle was then dissected subperiosteally from all sides. A Kirschner wire was inserted perpendicular to the midline between two condyles and perpendicular to the humeral shaft (Figure 1). A center point was determined on the olecranon 3-5 mm from the tip. From this point the osteotomy line was decided. The osteotomy was performed using an osteotome or an oscillating saw. To hold the distal fragment, Ikuta’s fixation device was used (Figure 2). Then, the distally inserted Kirschner wire was rotated medially to correct the varus angle and, if necessary, internally to correct the lateral tilt. After proper correction, both guide wires became parallel to each other. For fixation, two or three crossing Kirschner wires
Figure 1. Operative technique of dome osteotomy.
A. Kirschner wire insertion after measuring the angle of osteotomy by aluminum model.
B. The center of the osteotomy line is about 3–5 mm from the tip of the olecranon, and from that point about 20–30-mm distance is measured for determining the line of osteotomy.

were inserted over the osteotomy (Figure 3). Finally, the guide wires were removed and the wound closed. The elbow was kept at 90° of flexion and immobilized with a plaster cast for 3–4 weeks.

Results

All the osteotomies healed normally and there was no ulnar nerve palsy. The postoperative carrying angle was normal in all the patients except 1 (Table 1), and there was no recurrence of the deformity during the observation time. The radial prominence of the lateral condyle was also markedly reduced, giving better appearance of the arm. In Case 11, about 5 mm of semilunar

Table 1. Dome osteotomy for traumatic cubitus varus. Clinical data

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Side</th>
<th>Duration of injury</th>
<th>Carrying angle Preop. varus</th>
<th>Postop. valgus</th>
<th>Range of motion Preop.</th>
<th>Postop.</th>
<th>Duration of postop. follow-up (yr)</th>
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osteotomy was performed for shortening of the lateral condyle because of the severe degree of deformity, which facilitated another 10° of correction. The Ikuta's fixation device proved to be useful during the correction of the deformity and for holding the distal fragment.

Discussion

Medial displacement of the distal fragment (Siris 1939), growth disturbance (Brewster 1964, Palmer 1978), medial tilt (Aitken 1943, D'Ambrosia 1972, King and Sector 1951, Lund-Kristensen and Vibild 1976, Smith 1960), and unreduced inward rotation (French 1959, Madsen 1955) have been implicated as a cause of cubitus varus deformity. Medial tilt is most common, and it is sometimes difficult to prevent (Carlson 1982).

Different procedures for correction of cubitus varus deformity have been advocated. French (1959) used a lateral closing wedge through a posterior approach, placing a screw in each fragment joined by a wire. This is technically difficult and the fixation is inadequate. King and Sector (1951) advocated a medial approach and an opening wedge osteotomy with a bone graft; and Langenskiöld and Kivlaakso (1967) advocated a lateral closing wedge, but with plate and screw fixation – a difficult technique because of the thin supracondylar ridge. Carlson (1982) used staple fixation after fracturing the medial cortex and predrilling the lateral ridge. Oppenheim et al. (1984) performed wedge osteotomy and fixed the fragments with threaded Steinmann pins, plate and screws; and they had a 24 percent complication rate.

All of these operations aim at correction of only the varus deformity, and the rotational problems are left untreated (Blender 1979, Yamamoto et al. 1985); about 30 percent failure has been recorded (Sweeney 1975). This is because the lateral
tilt of the distal bone fragments can be increased by the rotational deformity (Watson Jones 1982) and the lateral condyle becomes too prominent causing an ugly appearance. Dowd and Hopcroft (1979) reported 85 percent varus deformity due to medial rotation or tilt of the distal fragment. Therefore, the operative procedure must permit reduction of the internal rotation or of the prominence of the lateral condyle, which has been difficult by other procedures.

References


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