ANTERIOR SUPRACONDYLAR FRACTURE OF THE HUMERUS (FLEXION TYPE)

A SIMPLE TECHNIQUE FOR CLOSED REDUCTION AND FIXATION IN ADULTS AND THE AGED

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The management of an anterior supracondylar fracture by closed reduction, traction, percutaneous pinning or open reduction is seldom satisfactory, especially for adults and the aged with a lesser ability to remodel and a slower functional recovery. A new, safe, and simple technique is described in which the condylar mass is pushed posteriorly along the axis of the forearm and the hand is rotated to full supination while the elbow is held in flexion to correct deformities. Fixation is divided into two parts: the circular cast around the upper arm provides a firm buttress onto which the lower fragment is reduced and then the arm is immobilised in a plaster which includes the wrist. Four cases of delayed, comminuted, compound fractures have been fully evaluated clinically and radiologically and the results assessed as good or excellent.

An anterior supracondylar fracture of the humerus is rare even in children. Its management has been controversial and the results of various methods have not been acceptable.

Closed reduction in flexion by direct digital pressure on the small condylar mass is admittedly difficult and almost always fails (Fowles and Kassab 1974). Closed reduction in flexion and percutaneous fixation using a Kirschner wire (Judet 1947; Swenson 1948) is possible under radiological control, but repeated radiographs are hazardous for the surgeon and in half of the children so treated the result is not acceptable (Fowles and Kassab 1974).

Closed reduction and fixation in extension (Jones method), either in a plaster cast or by a Thomas's splint, has been supported by those experienced in this technique (El-Sharkawi and Fattah 1965; Wilson 1976b). It may have a place in children who have a strong, intact anterior sheet of periosteum (Charnley 1961) which may control the reduction and aid recovery, but this opinion is not shared by all (Fowles and Kassab 1974). The papery thin periosteum in adults and in the aged offers little resistance and gross displacement may result. There is also a considerable doubt whether an injured adult elbow held in extension for some weeks can ever regain a useful range of movement.

Fixation by a shoulder spica in lateral rotation (Madsen 1955) has been abandoned because of the discomfort, and the difficulties and deformities that result (Siris 1939). Skin traction (Dunlop) has given stiffness and malunion in almost two-thirds of the cases so treated (Wilson 1976a).

Skeletal traction through the olecranon has resulted in non-union, infection of the pin track and skin necrosis (Edman and Lohr 1963; Merle D'Aubigné, Meary and Carlioz 1964) among other difficulties, and requires three to six weeks confinement to bed which is an inconvenience to an active adult and a serious hazard to an elderly person.

Open reduction and internal fixation (Sharrard 1971) is performed occasionally in most centres.

Some authorities, disappointed with the results of all these methods, prefer to leave this fracture to heal spontaneously when it occurs in children. For adults and the aged an easy technique has been developed. This will now be described, together with the satisfactory results.

OPERATIVE TECHNIQUE

Stage 1. A general anaesthetic is administered to the patient who lies supine. The surgeon with one hand grasps the condylar eminence and pulls gently but steadily and firmly along the line of axis of the patient's forearm, disengaging the fragments from the soft tissues, the patient's weight generally being sufficient for counter-traction; with his other hand holding the patient's wrist he then flexes the injured elbow to an angle of a little less than 90 degrees, with the hand in full supination. By this time any overriding angulation and rotation is corrected but the fragments are not yet aligned. The assistant now wraps the upper arm, elbow, forearm and hand in layers of orthopaedic wool and puts a circular cast around the upper arm only (Figs. 1 and 2).

Stage 2. As soon as the plaster has set, the surgeon places one hand under the cast to carry the weight and with his

Fig. 1

Fig. 2 (above) Fig. 3 (below)

Fig. 4

The two stages of the technique. *Stage 1:* Figure 1—The surgeon with one hand grasps the condylar mass and with the other keeps the patient's hand in supination and the elbow in flexion. As the plaster on the upper arm sets the surgeon's fingers prevent the front edge from cutting into the skin, and keep the condylar mass free to fall into place in the next stage. Figure 2—Diagram showing the movement necessary to obtain a reduction. *Stage 2:* Figure 3—Diagram to show the direction of forces required and the elbow flexed to less than a right angle. Figure 4—The surgeon places one hand under the plaster, the other pushing the patient's forearm firmly backwards.

other hand pushes the patient's hand, forearm and condylar mass in one line (with the wrist in the neutral position) backwards and outwards (Figs. 3 and 4); replacement of the fracture can be felt if not heard. The assistant then completes the long arm plaster and includes the wrist. A control radiograph is desirable, and if reduction is not acceptable the manipulation can be repeated with no hesitation; this has not been necessary with the cases done to date.

ILLUSTRATIVE CASE HISTORIES

Case 1. A housewife aged fifty-eight years was brought to the accident department of Dryburn Hospital, Durham, England, in October 1971, complaining of painful swelling of the right elbow after a fall at home on the same day. A radiograph (Fig. 5) showed a displaced anterior supracondylar fracture and early osteoarthritic changes due to an old injury which had restricted her elbow movements for some years before this accident. The fracture was managed by this technique, a radiograph (Fig. 6) showed satisfactory reduction, the plaster was discarded after six weeks and wax baths and gentle active exercises were prescribed. Pain, swelling and tenderness reduced gradually and elbow movements returned to the pre-accident range. She was discharged from the clinic in February 1972 (Fig. 7).

Case 2. A frail old lady aged sixty-eight fell at home and was brought to the accident department of West Middlesex Hospital, England, in February 1974 with a compound anterior supracondylar fracture of the right elbow. The two-inch wound on the back of her elbow was sutured under local anaesthesia and she was admitted with a

temporary splint and antibiotic cover for investigation and blood transfusion. Reduction and fixation was done by this technique two days later and a radiograph confirmed satisfactory reduction despite considerable comminution. The plaster was discarded and routine physiotherapy was started after six weeks. On her discharge from the clinic in June 1974 she had 0/120 degrees of flexion compared with 0/150 degrees on the left side. Reviewed three years later she had no pain, no deformity and full range of supination and pronation with 0/130 (0/150) degrees of flexion. She was quite active, doing everything for herself including washing and ironing.

Case 3. A man aged forty-six, a builder who was both epileptic and alcoholic, fell off the stairs in June 1976 and injured his left elbow. Early management in his provincial hospital was not successful and he came to the accident unit of Pahlavi Hospital, Tehran, ten days later with swollen fingers and a long arm plaster. This plaster was discarded, the swollen, blistered elbow was dressed and the fracture reduced and fixed by this technique. The radiograph showed acceptable reduction. This second plaster was discarded after six weeks, and a further radiograph showed no more displacement. The patient failed to attend his physiotherapy session and was out of touch until May 1977 when he returned with an injury of his foot. By this time he had no complaint of his elbow, no deformity and a full range of supination and pronation with 10/135 (0/140) degrees of flexion.

Case 4. A nurse aged thirty gave a clear history of having been hit on the back of her right elbow by a passing van and falling on her outstretched left hand, injuring both, in October 1976. Radiographs taken in the accident unit of Pahlavi Hospital, Tehran, showed a comminuted Colles's fracture of the left wrist and a completely displaced anterior supracondylar fracture of the right elbow which was managed satisfactorily by this technique. After discarding the plaster

Fig. 5

Fig. 6

Fig. 7

Case 1. Figure 5—Original radiograph showing complete displacement. Figure 6—Good apposition after reduction. Figure 7—Callus formation and no further displacement. Note the osteoarthritic changes in the joint.

and having routine physiotherapy her final radiograph revealed sound healing in a good position. On review in June 1977 she had no complaint, a normal carrying angle with a full range of supination and pronation and 0/140 (0/150) degrees of flexion and extension.

None of these cases has had neurovascular complications before or after the reduction and fixation.

DISCUSSION

Though the two types of supracondylar fractures of the humerus have been recognised for many years, the flexion type has received little attention in the past, even in children, perhaps because of its rarity: its incidence is only 4 per cent of all supracondylar fractures (Siris 1939; Lagrange and Rigault 1962).

In adults, with a lesser ability to remodel and a slower functional recovery, and especially in the aged in need of the maximum elbow movement, the condition is quite different. There have been few papers on this subject (Decoulx *et al.* 1964; Judet 1964; Merle D'Aubigné *et al.* 1964), their collective figures are very small (Judet 1964) without specification, but their illustrations reveal some supracondylar fractures in the so-called extra-articular group and especially the anterior fracture which had proved difficult to manage (Merle D'Aubigné *et al.* 1964).

The technique described aims to deal with the anterior type of fracture in adults and in the aged because no satisfactory procedure has previously been developed for this group. If this technique is good for the worst condition—delayed, displaced, comminuted, and compound fractures in adults and the aged—it is bound to do well in the most favourable cases, for example in children.

The technique is based on the anatomical relation between the forearm bones and condylar mass at the elbow: after a complete fracture, this mass behaves as a part of the forearm. A comparison of the two types of fracture clarifies the mechanisms involved and the displacement produced (Lagrange and Rigault 1962). In practice, a closed reduction of the common posterior type is effected by pulling on the forearm to lift the condylar mass forwards; similarly, for the anterior type the act is reversed and the forearm pushed backward (see Stage 2), the only modification being that the classic reduction and fixation have each been divided into two parts to ease the procedure. After correction of the deformities, the first part of fixation (the upper arm plaster cylinder) is effected and this works as a buttress for anatomical alignment.

This technique has many advantages. It is simple, non-traumatic, time-saving and easy to learn. The sclerotic and fragile arteries of the elderly patients are maintained in a relaxed condition. It follows the principles of closed reduction and fixation of the elbow in approximately a right angle, it is safe (Charnley 1961; Fowles and Kassab 1974) and the patient regains the full range of movement.

The clinical results are given for each case separately. Unfortunately, there are no previously recorded results for adults, but when comparisons are made with those recorded in children these results fall into the good and excellent categories (Decoulx *et al.* 1964). I have recently used this technique on three out of four children with this injury. The results were similar but are outside the scope of this paper.

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