EXTERNAL FIXATION OF DISPLACED FRACTURES OF THE PROXIMAL HUMERUS

TECHNIQUE AND PRELIMINARY RESULTS

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A new technique for the treatment of displaced fractures of the proximal humerus is described. Twelve fractures in 11 patients were managed by transcutaneous reduction using a Steinmann pin, and external fixation with a Hoffmann-type neutralising bar connected to two half-pins in the humeral head and three half-pins in the shaft. The pins were removed after four weeks.

Two patients sustained redisplacement after a further injury, but in the others reduction was maintained. Two cases of pin-track infection resolved after antibiotics, but delayed union resulted. There were no neurovascular injuries and at follow-up of 6 to 12 months no refractures had been seen. The early functional results were excellent or satisfactory in nine cases.

Since Neer published his classic study of fractures of the proximal humerus, in which he described methods of classification (1970a) and an assessment of the results of treatment (1970b), there has been disagreement on the management of severe displacement. For badly comminuted fractures which involve the articular surface, either total or partial joint replacement seems to be the treatment of choice (Neer 1970b; Tanner and Cofield 1983; Stableforth 1984), but there is no consensus on the treatment of displaced two-, three- and four-part fractures. Using the Neer assessment, only 50% to 60% of results are reported to be excellent or satisfactory after any of a range of methods of treatment. These include: closed methods (Clifford 1981; Leyshon 1984; Mills and Horne 1985), open reduction and internal fixation (Sturzenegger, Fornaro and Jacob 1982; Paavolainen et al. 1983; Kristiansen and Christensen 1986) and arthroplasty (Kraulis and Hunter 1976; de Anquin and de

presents the preliminary results with special emphasis on technical errors and complications related to the fixator.

MATERIAL AND METHODS

From January to July 1986 we treated 12 proximal humeral fractures in 11 patients by closed reduction and external fixation with a Hoffmann type of fixator.

Selection of cases. The Neer (1970a) classification system was used and we included in the study fractures with more than 1.0 cm of displacement or 45° angulation or rotation of the humeral head. We excluded fractures which had split the head of the humerus.

Technique of operation. With the patient under general anaesthesia and in a supine position a Steinmann pin is introduced transcutaneously under image-intensifier control into the major head fragment and used to help reduce the fracture. This reduction is maintained by an assistant, while two half-pins with continuous threads are

Case 3. Figure 3a—A three-part fracture in a 31-year-old man, showing medial and anterior displacement of the shaft due to the pull of the pectoralis major; 3b, after reposition and external fixation; 3c, after three months the fracture had healed in good position and function was excellent.

Case 7. Figure 4a—A displaced four-part fracture in a 57-year-old man. The articular surface is subluxated downward with impaction at the level of the surgical neck; 4b, after transcutaneous elevation and reposition with external fixation. The fracture healed in unchanged position, giving an excellent functional result at six months.

rehabilitation time (Leyshon 1984; Stableforth 1984; Mills and Horne 1985). Open reduction and internal fixation offers satisfactory stability, but it is a demanding technique sometimes leading to technical error, with a risk of damage to the remaining blood supply to the head of the humerus and avascular necrosis (Sturzenegger et al. 1982; Paavolainen et al. 1983; Kristiansen and Christensen 1986). Infection is seen in about 10% of cases (Paavolainen et al. 1983; Kristiansen and Christensen 1986).

The immobilisation of fracture fragments by the insertion of pins connected externally is not new. In the shoulder region pins in the clavicle or scapular spine proximally and the humeral shaft distally have been

advocated for arthrodesis, comminuted open fractures and infected non-union (Mears 1979; Burny 1985), but we have found no earlier report of pinning the humeral head.

The technique we describe can, in theory, eliminate many of the problems associated with closed methods and with internal fixation. Reduction is facilitated by the transcutaneous insertion of a Steinmann pin and is maintained by the external neutralisation bar. Immediate movement of shoulder, elbow and hand is facilitated, thereby reducing oedema and capsular fibrosis (Sisk 1983). The insertion of pins within the anatomically safe corridors described by Green (1981) should avoid neurovascular lesions and the danger of transfixing

tendons. If redisplacement occurs, the fixator can be loosened and a re-reduction performed. Pins can be removed without anaesthesia in the outpatient clinic.

Fracture reduction succeeded in 10 of our 12 cases and was maintained in all except the two patients who sustained traumatic redisplacement. This indicates that the simple one-plane fixation is mechanically adequate.

Our major problem was pin-track infection leading to delayed union; the incidence in this series is comparable to that in most other reports on external fixation (Green 1983). Prophylactic measures include meticulous daily care and the aggressive treatment of any local reaction.

The early functional results are very satisfactory, and further recovery can be expected up to one year after injury (Lundberg, Svenungsson-Hartwig and Wikmark 1979; Lentz and Meuser 1980; Young and Wallace 1985). Avascular collapse of the humeral head occurs most frequently after more than 12 months' follow-up (Neer 1970b), so knowledge of its incidence in our series will have to await the late results.

Conclusion. Satisfactory fracture reduction and stability, a fairly low rate of complications and good early functional results have been obtained by the technique of transcutaneous reduction and external fixation. This is a useful alternative in the treatment of displaced fractures of the proximal humerus and is to be further evaluated in a controlled clinical trial.

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