Intramedullary bone-cement fixation for proximal humeral fracture in elderly patients

A report of 5 cases

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We treated 5 proximal humeral fractures associated with advanced osteoporosis with conventional plate and screw fixation augmented by intramedullary bone cement. These osteosyntheses remained stable during a 1-year follow-up and the outcome was similar to that after fractures in younger patients without osteoporosis.

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Stable plate and screw fixation of a proximal humeral fracture in osteoporotic bone may be difficult (Kristiansen and Christensen 1986), and many surgeons prefer closed treatment (Einarsson 1958, Leyshon 1984). Augmentation with methylmethacrylate has been helpful in osteoporotic fractures of the distal femur, distal radius and calcaneus (Benum 1977, Kiyoshige 1997, Kiyoshige et al. 1997). We present our experience of intramedullary bone cement augmentation and osteosyntheses in osteoporotic proximal humeral fractures, where traditional osteosynthesis is often likely to fail.

Patients and methods

5 patients, mean age 81 (75–84) years, with advanced osteoporosis sustained acute traumatic fractures of the proximal humerus. Such fractures have been treated by intramedullary augmentation with bone cement, in combination with plate and screw fixation since November 1997 to March 1998 in our hospital. Bone cement acted as an internal fixation material and as an anchor for the the screws. 5 younger patients (age 54–68) who had similar fractures but without radiographic osteoporosis were treated with similar conventional plate and screw fixation without cement during the period November 1997 to February 1998. They served as controls. Postoperatively all patients had a sling to support the arm. Physical therapy started on the first postoperative day, consisted of an active range of motion exercise of the elbow, wrist and fingers, and passive movement of the shoulder.

The joint motion was evaluated every 3 weeks up to 3 months after surgery. The clinical results were assessed, using a part of the Constant scoring system (Constant and Murley 1987). Mean follow-up period was 12 months in the cement group, and 13 months in the control group. 1 patient died of pneumonia 10 months after surgery.

Surgical technique

The fracture was reduced under interscalene anesthesia, using a deltopectoral incision. With the aid of a fluoroscope, an 8-hole ACE Symmetry plate (ACE Medical Company, Los Angeles, CA, USA) was placed just laterally to the biceps tendon. The proximal fragment was then fixed with cancellous screws in the proximal 2 holes and the distal shaft was fixed with cortical screws through the distal 2 holes, only to keep the alignment. If there was no perforation, the cortex of the fracture was incised over an area about 15 × 10 mm. In the osteoporotic bone of the elderly, the medullar cavity is commonly almost empty. After irrigation of the cavity,

Figure 1. A 75-year-old woman. Preoperatively.

it was filled with bone cement, using a pressurized cement gun. Cancellous screws were inserted into the bone cement before polymerization in the remaining 4 holes of the plate.

Results

In the cement group at 3 months postoperatively, on average, 76% of the motion on the healthy side was obtained in anterior elevation, 67% in abduction, 29% in external rotation. The outcome was similar in the control group: 76% in anterior elevation, 71% in abduction, 35% in external rotation (Table). The clinical results, according to a part of the Constant score at 3 months, were 46 (34–59) points in the cement group and 49 (40–63) points in the control group (Table). Radiographic cortical bone healing occurred within 9 weeks (Figures 1–3). No osteosynthesis failed at the 1-year follow-up. There were no infections or wound complications.

Discussion

Plate osteosynthesis in the treatment of proximal humeral fracture has been successful (Paavolainen et al. 1983). However, fractures in the osteoporotic elderly are generally unstable. Even if the fracture can be reduced and well fixed, early failure and loosening of the implant occur fre-

Figure 2. 1 week postoperatively.

Figure 3. Callus formation 6 weeks postoperatively.

Motion (range) and clinical results, according to the Constant scoring system at 3 months

	Cement group (n 5)	Control group (n 5)
ROM		
Elevation	76 (57–100)	76 (69–89)
Abduction	67 (56–96)	71 (56–83)
Ext. rotation	29 (17–50)	35 (17–50)
Constant score		
Pain, 15 points	12 (10–15)	12 (10–15)
Activity of daily living, 20 points	14 (10–18)	15 (12–18)
Joint movement, 40 points	20 (14–26)	22 (18–30)
Total, 75 points	46 (34–59)	49 (40–63)

quently (Sturzenegger et al. 1982). In osteoporotic patients, immediate rehabilitation is also risky. The ultimate goal is a rigid internal fixation to allow immediate mobilization. Cement augmentation has given good results in osteoporotic distal radial and calcaneal fractures in elderly patients (Kiyoshige 1997, Kiyoshige et al. 1997).

With the intramedullary bone cement augmentation procedure described here, the plate osteosynthesis of the osteoporotic proximal humerus fracture was stable and made early mobilization safe. The average shoulder joint motion at 12 weeks postoperatively was about the same in younger patients treated similarly who had no osteoporosis. The advantage of the cement augmentation procedure is that it is easy to perform, gives good stability and does not appear to involve a higher risk of complications.

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