Comminuted Fractures of the Proximal Humerus Treated with Hook Plate

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Summary. Good results were obtained using a hook plate to fix bone in 18 cases of fracture of the proximal humerus in which the bone was greatly comminuted or dislocated. The hook plate protects the fixed area against rotation, shear stress and flexion much better than other fixation methods.

Fractures involving the proximal humerus may be treated conservatively when there is minimal displacement, but if there is severe displacement and the humeral head is dislocated, open reduction and internal fixation become necessary. However, internal fixation using various conventional methods is a relatively difficult procedure. In some cases, a prosthesis replacement is done [4, 5]. In some cases we have had success in forming a strong internal fixation with a hook plate. The operative methods are reported and representative cases are discussed in this paper.

Patients and General Results

There were 18 cases in which a follow-up was done more than 2 years after operation. The fracture was located in the anatomical neck of the humerus in 13 cases, in the surgical neck in four cases, and in the humeral head in one case. The head was dislocated in eight cases. Based on the classification of Neer, there were five cases of two-part fracture, seven cases of three-part fracture, five cases of four-part fracture (Table 1), and one head-splitting fracture-dislocation.

The final range of movement is set out in Table 2. In 12 cases the results of the operation were excellent. There were no complaints and there was practically full range of motion. The results were good in five cases in which no disabilities in daily activities were observed, although there were some limitations in the range of motion. Necrosis of the head developed in one case 6 months after operation, and the results were considered poor in this case.

Operative Methods

The fractured proximal part of the humerus was exposed through a deltopectoral approach and was reduced anatomically. The operative methods are reported and representative cases are discussed in this paper.

Table 1. Types and location of fractures in 17 patients

<table>
<thead>
<tr>
<th>Fracture-Dislocation</th>
<th>Surgical neck</th>
<th>Anatomical neck</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Two-part</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Three-part</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Four-part</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Results of treatment with hook plate in 18 patients

<table>
<thead>
<tr>
<th>Flexion and Abduction</th>
<th>n</th>
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<tbody>
<tr>
<td>&gt;120° (excellent)</td>
<td>12</td>
</tr>
<tr>
<td>120°–80° (good)</td>
<td>5</td>
</tr>
<tr>
<td>&lt;80° (poor)</td>
<td>1</td>
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</table>
A hook plate was employed to join the large pieces, namely, the head and shaft. The hook part of the plate was about 3 cm in length and was formed by bending the plate nearly 90°. It was inserted into the center of the head from the anterolateral side of the head and then fixed. The plate was placed against the shaft and fastened with two or three screws. It is easier to insert the hook into the head correctly by first choosing the proper three-dimensional direction and then drilling a 2.5-mm hole accurately in that direction.

After the operation the arm is put in a sling, and the shoulder joint is actively exercised from the 10th day.

Case Reports

Case 1
A 54-year-old woman farmer was injured in a head-on collision. Her left humeral head was dislocated, and there was a three-part fracture of her surgical neck. The head was reduced and fixed with a hook plate bent at about 120°. She had full range of motion in her shoulder joint 6 months after surgery (Fig. 1).

Case 2
A 68-year-old housewife fell off her bicycle and sustained a four-part fracture of the anatomical neck of her left humerus. The head and shaft were fixed with a hook plate bent at about 100°. The greater and lesser tubercles were reattached with wires. Eight months after the operation, the patient had regained full range of motion in her shoulder joint (Fig. 2).

Case 3
A 59-year-old woman farmer fell when trying to get on her bicycle and injured her left shoulder. There was a four-part fracture of the anatomical neck of her left humerus, which was dislocated. The dislocated head was repositioned gently and joined with a hook plate bent at 90°. The dislocated bone fragments were joined with braided silk thread to the neck. Full range of motion in the shoulder joint was obtained 5 months after surgery (Figs. 3, 4).

Case 4
A 74-year-old woman fell down while carrying something. She sustained a four-part fracture-dislocation of the anatomical neck preoperatively; middle and right — 6 months postoperatively

Fig. 1. Case 1: Left — three-part fracture-dislocation of surgical neck preoperatively; middle and right — 6 months postoperatively

Fig. 2. Case 2: Left — four-part fracture of anatomical neck preoperatively; middle and right — 5 months postoperatively