HERBERT SCREW FIXATION BY LIMITED ACCESS FOR ACUTE FRACTURES OF THE SCAPHOID

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We describe a semi-closed method of Herbert screw fixation for acute fractures of the scaphoid. All 40 patients treated achieved solid union with satisfactory wrist function. This technique gave a significantly shorter time to union and allowed an earlier return to manual labour compared with conservative treatment. There were no complications.

Semi-closed insertion requires considerable skill, but produces consistently satisfactory results after minimal exposure of the scaphoid.

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Approximately 95% of acute fractures of the scaphoid will achieve union if they are properly immobilised.\(^1\)\(^-\)\(^5\) The average time for union varies with the level of the fracture; those of the distal third heal in approximately six to eight weeks, of the middle third in eight to 12 weeks, and of the proximal third in 12 to 23 weeks.\(^2\)\(^,\)\(^4\)\(^,\)\(^6\) Healing is also related to the degree of displacement of the fragment.\(^3\)\(^,\)\(^4\)

The fracture is common in active young men, many of whom are manual labourers. They are significantly disabled if prolonged immobilisation is needed to achieve union. Surgical treatment allows early mobilisation of the wrist and is justified for patients who cannot afford to be away from work for long periods or who require early use of the injured hand due to multiple fractures of the extremities.

Treatment of an acute fracture of the scaphoid by percutaneous screw fixation has been reported by Wozasek and Moser\(^7\) who used a cannulated screw with a success rate of 89%, and Inoue and Tamura\(^8\) who treated ten patients with an undisplaced fracture by a Herbert screw, achieving a success rate of 100%.

We now report our technique for the treatment of acute fractures of the scaphoid and have also analysed the results of conservative and surgical treatment in relation to the time to union and return to work.

PATIENTS AND METHODS

Between 1984 and 1995, we treated 145 patients with acute fractures of the scaphoid who were examined within two months of the original injury. Fractures of the tubercle were excluded. We treated 42 patients conservatively with a below-elbow cast including the thumb, and 103 by operation. Of these, 57 with an unstable fracture had an open reduction and fixation by a Herbert screw with or without bone grafting; the remaining 46 were treated by fixation by a Herbert screw using a semi-closed technique. The latter technique was used for an undisplaced fracture of the waist (type A2 according to Herbert’s classification),\(^9\) an oblique fracture of the waist (type B1), and a displaced fracture of the waist with an offset less than 1 mm and/or a gap of less than 2 mm between the fragments (type B2). Fractures of the proximal pole, fracture-dislocations, comminuted fractures, and displaced fractures with fragments offset more than 1 mm were contraindications to the use of this technique; such fractures were treated by open reduction and Herbert screw fixation.

Most of the fractures of the distal third of the scaphoid were treated conservatively, the indications for which were the same as for a semi-closed operation.

The patients were given a choice of the two methods of treatment and management was instituted accordingly. Of these, 39 in the conservative group and 40 who chose an operation had a minimum follow-up of six months after treatment and were available for review. Details of both groups are given in Table I.

Table I. Details of the patients in the conservative and surgical treatment groups

<table>
<thead>
<tr>
<th></th>
<th>Conservative</th>
<th>Surgical</th>
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<tbody>
<tr>
<td>Number of patients</td>
<td>39</td>
<td>40</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Manual labourers</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Fracture type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>B1</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>B2</td>
<td>14</td>
<td>15</td>
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</table>
**Conservative group.** There were 7 females and 32 males with an average age of 26 years (13 to 69). Seventeen (44%) were involved in manual labour. There were 23 type-A2 fractures, 2 type-B1 and 14 type-B2. The average time from injury to treatment was 7 days (1 to 60). The fractures were located in the waist of the scaphoid in 29 wrists and in the distal third in 10. Associated injuries included five ipsilateral fractures of the distal radius and one ipsilateral fracture of the neck of the radius. All patients were immobilised in a short-arm thumb spica cast for an average period of 8 weeks (4 to 16), except for one. He also had a fracture of the neck of the radius and was treated by an above-elbow cast and a thumb spica for three weeks before changing to the standard below-elbow cast.

**Surgical group.** There were 3 females and 37 males with an average age of 27 years (18 to 62). Thirty-four patients (85%) were involved in manual labour. There were 18 type-A2 fractures, 7 type-B1, and 15 type-B2. The average time from injury to operation was 13 days (1 to 47). The fractures were located in the waist of the scaphoid in 38 wrists and in the distal third in two. Eight associated injuries included three fractures of the lower leg, three ipsilateral fractures of the distal radius, one contralateral fracture of the distal radius, and one contralateral fracture of the scaphoid. Thirty-four of the 40 patients were allowed to use the injured hand immediately after surgery. Three wrists were immobilised in a short-arm thumb spica cast for three to four weeks because of an ipsilateral fracture of the distal radius. Three wrists with type-B2 fractures were immobilised in a short-arm thumb spica for two to three weeks because of failure to obtain rigid fixation. After removal of the cast these patients were allowed to use the injured hand for everyday activities. Three who had associated fractures of the lower leg were allowed to use the injured hand to assist walking with crutches at three weeks after operation. Free loading of the scaphoid was allowed after bony union had been confirmed radiologically (Table I).

**Operative technique.** Using wrist or axillary block anaesthesia, a 1 cm incision was made over the tubercle of the scaphoid and dissected down to bone. The anterior capsule of the wrist joint and the scaphotrapezial joint was left intact. Using an image intensifier with the wrist in neutral position, a 1.2 mm Kirschner (K) wire was inserted into the bone through the tubercle of the scaphoid, directed at an angle of 45° to the forearm in the coronal and sagittal planes. The K-wire was driven accurately in the direction of the proximal pole (Fig. 1). After confirming its correct position (Fig. 2), it was then removed, and a 1.5 mm K-wire inserted into the previously drilled hole. The length of screw required was determined by measuring the difference in length between the inserted K-wire and a second parallel wire of the same length with its tip at the distal pole. The scaphoid was then drilled using a 1.9 mm drill along the course of the pilot hole. This was tapped and the screw inserted freehand (Fig. 3). When the fracture gap was large, a screw 2 mm shorter than the measured length was used and an additional two or three turns applied when the trailing thread of the screw was fully within the bone, with...
the aim of compressing the fracture site (Fig. 4). A standard Herbert bone screw was used in 36 cases and a Herbert/Whipple cannulated screw in four.

RESULTS

Clinical and radiological evaluation was undertaken every three to four weeks until union occurred. The average time of follow-up was 9 months (6 to 34) for the conservative group and 11 months (6 to 48) for those treated by operation. Radiological union was judged to be present when bony trabeculae were seen to cross the fracture site in four standard views and, if necessary, an anteroposterior view of the wrist in full ulnar deviation. Definite union was obtained in 38 of the 39 patients in the conservative group and in all of those having an operation, with no complications. The average time for union in the conservative group was 9.7 weeks (6 to 22) and in the surgically treated group 6 weeks (4 to 15) (p < 0.001; Student’s t-test). For the 16 type-B fractures in the conservative group the average time for union was 12.2 weeks and for the 22 treated by operation 6.5 weeks (p < 0.0001).
The key to the success of this technique is accurate placement of the guidewire within the scaphoid. The use of an image intensifier during the operation is mandatory; this allows the guidewire to be inserted easily into the scaphoid. It is advisable to use a K-wire of smaller diameter for a guide drill; it may be redrilled if placed inappropriately, but if a larger wire is used there may be a poor grip of the fragments from the screw. A Herbert/Whipple cannulated screw may be much easier to insert, but we prefer the standard Herbert screw because it gives a better grip and more stable fixation.

Use of the semi-closed technique for insertion of a Herbert screw in acute scaphoid fractures significantly decreases the time to union, especially in the unstable B1 and B2 types of fracture, and allows earlier return to manual work compared with conservative management. Some patients in light occupations are able to return to work wearing a cast, but those who do manual labour are unable to do so until bony union has been achieved. This technique eliminates extensive exposure of the scaphoid, prevents the formation of hypertrophic scars, and minimises damage to the blood supply to the bone. It requires some skill, but is safe and produces consistently satisfactory results. It may be used in acute fractures of the distal and middle thirds of the scaphoid, even if they are undisplaced, should the patient’s economic situation and preference so require.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

**REFERENCES**