ABSTRACT

Purpose. To review the one-year outcome after volar locking plate fixation for distal radial fractures.

Methods. Records of 22 men and 40 women aged 17 to 86 (mean, 52.5) years who underwent volar locking plate fixation for distal radial fractures were reviewed. According to the Fernandez classification, the distal radial fractures were classified as type 1 (n=20), type 2 (n=24), type 3 (n=6), type 4 (n=6), or type 5 (n=6). Three types of plate were used: Stryker Variax (n=33), Synthes LCP (n=20), and Smith & Nephew Peri-Loc (n=9). Wrist function was assessed at one year using the validated patient-rated wrist evaluation (PRWE) questionnaire.

Results. 14 (23%) of the 62 patients had 24 complications: stiffness (n=13), median nerve symptoms (n=4), malunion (n=2), implant removal for persistent pain and stiffness but no improvement shown (n=2), complex regional pain syndrome (n=2), and carpal arthritis (n=1). The complication rates for types 1, 2, 3, 4, and 5 fractures were 20%, 17%, 67%, 0%, and 33%, respectively (p=0.052). The complication rates for low-risk (types 1 and 2) and high-risk (types 3, 4, and 5) fractures were 18% and 33%, respectively (p=0.315). The complication rates for Stryker Variax, Synthes LCP, and Smith & Nephew Peri-Loc were 26%, 20%, and 14%, respectively (p=0.75). At one year, the mean PRWE score was comparable in patients with low-risk or high-risk fractures (14 vs. 19, p=0.5). 79%, 13%, and 8% of the patients recovered >50%, 20–50%, and <20% of range of movement of the contralateral side, respectively.

Conclusion. Volar locking plate fixation followed by early rehabilitation for distal radial fractures achieved good outcome, with a low rate of implant-related complications.

Key words: radius fractures; treatment outcome; volar plate; wrist injuries

INTRODUCTION

In the United Kingdom, the incidence of fractures in adults has been reported to be 1.07% to 2.35% for men...
and 0.995% to 1.88% for women.1–3 The incidence of distal radial fractures is most common and increases from 0.1% to 1.2% for women and from 0.1% to 0.33% for men from the age <85 to >85 years.4 Distal radial fractures occur more commonly in women than men (0.37% vs. 0.09%).5 The optimal treatment for distal radial fractures remains controversial.6–7 Treatment options include casting, percutaneous fixation, internal fixation, and external fixation. Open reduction and internal fixation using a volar locking plate enables anatomic and rigid fixation and early rehabilitation,8 particularly for intra-articular or multi-fragmentary fractures. It is also indicated when closed reduction or percutaneous fixation fails, or when bones are osteoporotic.9 Volar plating is as good as dorsal plating and avoids tendinopathy that is associated with dorsal plates.10 This study reviewed the one-year outcome after volar locking plate fixation for distal radial fractures.

MATERIALS AND METHODS

Records 22 men and 40 women aged 17 to 86 (mean, 52.5) years who underwent volar locking plate fixation through the bed of flexor carpi radialis tendon under image intensification for distal radial fractures between January 2007 and January 2009 were reviewed. Patients with open fractures or rheumatoid arthritis were excluded.

According to the Fernandez classification (Table), the distal radial fractures were classified as type 1 (n=20), type 2 (n=24), type 3 (n=6), type 4 (n=6), or type 5 (n=6). Based on the surgeon’s preference and plate availability (rather than the fracture type), 3 types of plate were used: Stryker Variax (n=33), Synthes LCP (n=20), and Smith & Nephew Peri-Loc (n=9).

Postoperatively, the wrist was bandaged for 2 weeks, and active finger flexion and extension exercises and shoulder and elbow exercises were encouraged. At 2 weeks, dressings were removed and physiotherapy commenced, with an aim to achieve full range of movement at the wrist and hand. Patients were monitored for signs of carpal tunnel syndrome and function of the extensor pollicis longus. No strengthening work, heavy pushing, pulling, or lifting was allowed. At 6 weeks, strengthening exercises were commenced.

Malunion was defined as dorsal angulation greater than neutral, articular step off >2 mm, loss of radial inclination >5°, or radial shortening >2 mm. Wrist function was assessed using the validated patient-rated wrist evaluation (PRWE) questionnaire. Wrist stiffness/range of movement was defined as >50%, 20–50%, or <20% of the contralateral side. Complication rates in terms of the fracture type and plate type were analysed using the Fisher’s exact test. The PRWE scores in patients with low- or high-risk fractures were compared using the student’s t test. A p value of <0.05 was considered statistically significant.

RESULTS

14 (23%) of the 62 patients had 24 complications: stiffness (n=13), median nerve symptoms (n=4), malunion (n=2), implant removal for persistent pain and stiffness but no improvement shown (n=2), complex regional pain syndrome (n=2), and carpal arthritis (n=1). The 4 patients with median nerve symptoms had no history of carpal tunnel syndrome; it is not known whether this complication was due to the injury itself or the operative procedure. One patient had symptoms that resolved spontaneously and the remaining 3 underwent carpal tunnel decompression.

The complication rates for types 1, 2, 3, 4, and 5 fractures were 20%, 17%, 67%, 0%, and 33%, respectively (p=0.059). The complication rates for low-risk (types 1 and 2) and high-risk (types 3, 4, and 5) fractures were 18% and 33%, respectively (p=0.315). The complication rates for Stryker Variax, Synthes LCP, and Smith & Nephew Peri-Loc were

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bending fracture of the metaphysis (Colles and Smith fractures)</td>
</tr>
<tr>
<td>2</td>
<td>Shearing fracture of the joint surface: Barton’s fracture, reversed Barton’s styloid process fracture, simple articular fracture</td>
</tr>
<tr>
<td>3</td>
<td>Compression fracture of the joint surface (die-punch), intra-articular comminuted fracture</td>
</tr>
<tr>
<td>4</td>
<td>Fracture of the ligament attachments to ulnar and radial styloid process, radiocarpal fracture-dislocation</td>
</tr>
<tr>
<td>5</td>
<td>Combined fractures (types 1–4), high-energy injuries</td>
</tr>
</tbody>
</table>
26%, 20%, and 14%, respectively (p=0.75). At one year, the mean±standard deviation PRWE score was comparable in patients with low-risk or high-risk fractures (14±18 vs. 19±22, p=0.5). 79%, 13%, and 8% of the patients recovered >50%, 20–50%, and <20% of range of movement of the contralateral side, respectively.

DISCUSSION

Volar locking plate fixation achieved good anatomic reduction and functional outcome for unstable distal radial fractures; the complication rate at 12 months was 10%, with no implant-related complications (implant loosening or removal).11 Fixation using a Synthes LCP-4 or DVR-37 plate achieved good or excellent outcome at 12 months in 78% of patients; the complication rate was 22%, including loss of reduction, hardware removal for tendon irritation, wound dehiscence, and metacarpophalangeal joint stiffness.12 Younger patients recovered more quickly than those aged >60 years after fixation using the DVR volar locking plate, despite comparable final outcome and complication rate (18%).13 81% of 150 patients achieved good or excellent outcome, with 8 major complications: death unrelated to surgery (n=2), tendon rupture (n=2), and implant-related complication requiring surgery or removal (n=4).14 One study reported a complication rate of 15%.15 Another reported a complication rate of 13% but an implant removal rate of 44%, with no assessment of wrist stiffness.16 In our study, patients with low-risk or high-risk fractures treated with various plate types were comparable in terms of the complication rate and PRWE score. Surgeons should choose a plate based on familiarity and cost rather than fracture pattern. Fixation outcome is similar between cheaper and more expensive plates.

This study had limitations. It was retrospective and lacked a control group; different types of implant were used; and surgery was performed by different surgeons. Larger studies with a control group are needed to confirm the conclusion of low rate of implant-related complication.

CONCLUSION

Volar locking plate fixation followed by early rehabilitation for distal radial fractures achieved good outcome, with a low rate of implant-related complications.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES