Case Report

Non-union of Fracture of Distal Radius: A Case Report and Literature Review

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ABSTRACT

Non-union of distal radius fracture is uncommon. Promising results in dorsally displaced fractures of distal radius were reported with the use of volar fixed-angle fixation. We report about a 75-year-old woman with non-union of distal radius, treated successfully by using volar locking compression plate.

中文摘要

非連接遠端尺骨骨折不常見。有文獻敘述利用掌側固定角度接合骨板作內固定術，對於背側移位的遠端尺骨骨折不連接，治療效果良好。本報告敘述一名75歲女仕的成功案例，利用鎖定加壓固定角度接合骨板作為遠端尺骨骨折不連接之治療方法。

Excision of the pseudoarthrosis, shortening of proximal radial fragment by 1 cm, and distraction with small Albeitgemeinschaft fur osteosynthesenfagen(association for the study of internal fixation (AO/ASIF) external fixator were performed to realign the fracture. The fracture was fixed with contoured 3.5-mm locking compression plate (Synthes AG Chur). Distal radio-ulnar joint was realigned by ulnar shortening osteotomy for 1 cm over the mid-shaft of ulna, which was fixed with 3.5-mm dynamic compression plate (Figure 3). Resected bone from both proximal radial fragment and ulnar shortening osteotomy was used as bone graft at the pseudarthrosis. Lengthening of the brachioradialis and flexor carpi radialis tendon and arthrolysis of dorsal radiocarpal and/or volar distal radio-ulnar joint were not required.

Flexor tendon tenolysis was carried out to improve the finger passive movement. Carpal tunnel release was performed to relieve the median nerve compression at carpal tunnel. The rupture of flexor digitorum profundus to middle and ring fingers was not repaired and was planned for later reconstruction after regain of passive range of movement. The external fixator was retained to protect the fixation and was removed 3 weeks later because of pin loosening. Short arm plaster cast was applied for another 4 weeks.

The fracture united at 4 months after the operation. At 40 months after operation, the wrist motion was improved with 25° dorsiflexion, 10° ulnar deviation, 40° palmar flexion, 90° pronation, 90° supination, 30° radial deviation, and 10° ulnar deviation. The handgrip and pinch grip were 56.5% (13 kg vs. 23 kg) and 80% (4 kg vs. 5 kg) of contralateral side, respectively. Despite rigorous mobilisation, there was only modest improvement in finger stiffness; hence, it was decided not to

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Figure 1. X-ray of left wrist showed extra-articular fracture of distal radius and distal ulna fracture, both in acute injury and non-union.

Figure 2. Clinical photo showing (A) dorsal side and (B) volar side of left wrist. Left wrist was in severe radial deviation and Z-deformity. (C) Fingers showing flexion contracture at metacarpophalangeal and distal interphalangeal joints.
reconstruct the flexor tendon rupture. The distal radio-ulnar joint did function well with good forearm painless rotation. According to the rating of Fernandez et al., the patient had good clinical result. There was no wrist or distal radio-ulnar joint pain.

Discussion

For distal radius fracture, non-union is arbitrarily defined as no bony union at 6 months after the injury. However, the presence of pseudoarthrosis confirmed the non-union of distal radius fracture as in our patient, though the time interval from injury was 5 months.

The incidence was 0.2% according to New York State Worker’s Compensation Board. There were about 60 cases reported in the English literature. The low incidence of non-union of distal radius fractures is probably because of the impaction of fracture fragment during the injury, the metaphyseal location, and lesser degree of soft tissue disruption in low-energy falls.

Several contributing factors had been elaborated, including the following: concomitant distal ulnar fracture reduces the stability of the distal radius fracture and causes increased motion at the fracture; inadequate fixation or excessive distraction during application of external fixator or pins and plaster; some medical conditions such as heavy smoking, alcohol abuse and peripheral neuropathy in diabetes mellitus also contribute to distal radius fracture non-union. In our patient, the non-union might have been caused by the concomitant distal ulnar shaft fracture, the failure of apposition of the fracture fragments, and an inadequate period of immobilisation.

The results of operation to regain union of distal radius fracture are unpredictable. The aims of treatment for non-union of distal radius fracture are correction of deformity, providing solid fixation to achieve a solid union and well-aligned wrist with preservation of wrist motion. Operative options included open reduction and internal fixation or wrist arthrodesis. Wrist arthrodesis was advocated for firm patients with low functional demand or was used as a salvage procedure after failed attempts to gain union. Some authors advocated wrist arthrodesis as a primary procedure for non-union associated with concomitant distal ulnar fracture. Some recommended 5-mm subchondral bone stock in distal radius fragment as a guideline for choosing between internal fixation and wrist arthrodesis.

A dorsal approach is used when there was dorsal displacement or angulation of the distal fragment and vice versa. Volar approach is usually preferred as there is less irritation or damage to overlying tendons when compared with that by dorsal approach. A variety of fixation methods were reported with successful results, such as the volarly placed fixed-angle...
device in osteoporotic bone based on biomechanical study and promising clinical experiences and placement of two plates in orthogonal plane, that is, the ulnar and radial columns of the distal radius for small distal radius fragments.

The successful union rate for internal fixation in the reported series is 90%, with a range from 60% to 100% (Table). The average range of motion in flexion-extension arc, pronation-supination arc, radio-ulnar deviation arc, and grip strength, were 91.5°, 139°, 38.7°, and 67.5%, respectively.

In summary, non-union of distal radius fracture is rare. Carefully planned open reduction and fixation can help to achieve rapid bone union with satisfactory functional outcome.

References


Table

<table>
<thead>
<tr>
<th>Authors</th>
<th>No. of pt.</th>
<th>FU length</th>
<th>% Fracture union</th>
<th>F/E arc</th>
<th>P/S arc</th>
<th>RD/UD arc</th>
<th>Grip %</th>
<th>Satisfactory result</th>
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<tbody>
<tr>
<td>Fernandez et al</td>
<td>10</td>
<td>40</td>
<td>10/10</td>
<td>105</td>
<td>145</td>
<td>34</td>
<td>73</td>
<td>7/10</td>
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<tr>
<td>Eglseder and Elliott</td>
<td>10</td>
<td>19</td>
<td>8/10</td>
<td>88</td>
<td>131</td>
<td>--</td>
<td>71</td>
<td>--</td>
</tr>
<tr>
<td>Prommersberg et al</td>
<td>23</td>
<td>22</td>
<td>22/23</td>
<td>87</td>
<td>139</td>
<td>40.7</td>
<td>62.5</td>
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Pt – patients; FU length – follow-up length in months; F/E – flexion to extension; P/S – pronation to supination; RD/UD – radial to ulnar deviation; grip % – % strength of the normal side.