Analysis of radial nerve paralysis caused by humeral shaft fracture
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Objective
Treatment of radial nerve palsy in distal third humeral shaft fracture
Do they require surgical treatment?

The purpose of this study is to analyze the relationship between the location of humeral shaft fracture and the recovery of radial motor nerve paralysis.

Method
11 patients out of 110 humeral shaft fracture patients with radial nerve palsy prior to treatment between 2010 and 2017 were reviewed.
Gender: males 3 females 8
Average age: 54.7 years old (21 to 90)

Factors reviewed
- Location of humeral shaft fracture
- Distance from the proximal edge of the olecranon fossa to the fracture location measured using plain radiograph
- Fracture type
- Period from surgery to the recovery of extensor carpi radialis (ECR) and extensor digitorium communis (EDC) by MMT(Manual Muscle Testing) of 3 or more
- Status of the radial nerve during operation

Patients characteristics

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Mechanism of injury</th>
<th>Fracture location</th>
<th>Fracture pattern</th>
<th>Surgical Method</th>
<th>Nerve exploration</th>
<th>Nerve status</th>
<th>ECR (month)</th>
<th>EDC (month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>F</td>
<td>Traffic accident</td>
<td>Distal1/3</td>
<td>transverse</td>
<td>Plating</td>
<td>○</td>
<td>continuity</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>F</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>comminuted</td>
<td>Plating</td>
<td>○</td>
<td>continuity</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
<td>F</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>comminuted</td>
<td>Plating</td>
<td>○</td>
<td>continuity</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>M</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>comminuted</td>
<td>Plating</td>
<td>○</td>
<td>continuity</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>73</td>
<td>F</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>comminuted</td>
<td>Plating</td>
<td>○</td>
<td>continuity</td>
<td>5</td>
<td>–</td>
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<tr>
<td>6</td>
<td>82</td>
<td>F</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>transverse</td>
<td>Nailing + K-wire</td>
<td>○</td>
<td>continuity</td>
<td>5</td>
<td>12</td>
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<tr>
<td>7</td>
<td>21</td>
<td>M</td>
<td>Baseball throw</td>
<td>Distal1/3</td>
<td>comminuted</td>
<td>Ender nail</td>
<td>○</td>
<td>continuity</td>
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<tr>
<td>8</td>
<td>24</td>
<td>M</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>spiral</td>
<td>Nailing</td>
<td>×</td>
<td>–</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>74</td>
<td>F</td>
<td>Fall</td>
<td>Distal1/3</td>
<td>oblique</td>
<td>Nailing</td>
<td>×</td>
<td>–</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>F</td>
<td>Fall</td>
<td>Middle1/3</td>
<td>spiral</td>
<td>Nailing</td>
<td>×</td>
<td>–</td>
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</tr>
<tr>
<td>11</td>
<td>63</td>
<td>F</td>
<td>Fall</td>
<td>Proximal1/3</td>
<td>oblique</td>
<td>Nailing</td>
<td>×</td>
<td>–</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

- Fracture locations: Distal 9 case, middle 1 case, Proximal 1 case.
- Average distance from the proximal edge of the olecranon fossa to the fracture location: 69.1mm(42~92mm).
- Fracture type: 2 comminuted, 2 spiral, 2 oblique 2 transverse
- Exploration of the radial nerve performed in 7 case revealed continuity of the nerve in all cases.
- Average period for the recovery of MMT 3 in ECR: 3.7 months, EDC: 4.6 months. One case of an open fracture took five months for the recovery of ECR and 12 months for the recovery of EDC.
- No significant difference between the recovery period and the fracture type.

Results

Fracture locations Distal 9 case, middle 1 case, Proximal 1 case.
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Representative Case

A 21-year old male with comminuted humerus fracture by throwing.
(a) Preoperative radiograph
(b) Postoperative radiograph
(c) Exposure of the nerve revealing continuity

Conclusion

- There was no relationship between the type of the fracture and radial nerve paralysis. The majority of the fracture location was distal third.
- Seven cases of which radial nerve surgically explored showed continuity in all cases. However, according to the literature, transection of the nerve is found in 12% of the patients. Surgical intervention should be performed depending on the lack of recovery sign as EMG and Tinel like sign.
- The average period for the recovery of MMT 3 in ECR: 3.7 months and 4.6 months for EDC. There were three cases of with the time lag in the recovery period of ECR and EDC. This reflects that the nerve has gone under Wallerian degeneration.

Reference