CONSIDERATIONS IN DIAGNOSING AN EXTRA-ARTICULAR FRACTURE OF DISTAL RADIUS BY PLAIN RADIOGRAPHS

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Introduction

- We found intra-articular involvement on pre-operative CT scans in a large number of extra-articular fractures requiring surgery.
- We suspected that many of the fractures with intra-articular involvement might have been considered as extra-articular fractures, as plain radiographs did not clearly show the intra-articular fragment.
- Thus, we measured how accurately surgeons make a diagnosis of the extra-articular fracture using plain radiographs.
- We described the common types of intra-articular involvement found and how the intra-articular involvement affected the treatment.

Material and methods

- October 2013 ~ May 2015
- Inclusion criteria: extra-articular fractures requiring surgery
  ✓ dorsal tilt greater than 10 degrees
  ✓ radial shortening greater than 3mm
  ✓ less than 5 degrees of radial inclination
  ✓ severe dorsal/volar comminution
  ✓ Re-displaced within less than three weeks
- 181 patients (M:F = 44:137), with mean age of 58 (range, 19-77) years
- Plain radiographs: Oblique view is helpful to find an intraarticular involvement (Fig.1).
- CT scans: Frequency of intra-articular involvement and diagnosis accuracy was calculated (Table1). Common types of intra-articular involvement were presented (Fig.2).
- Treatment: ORIF using volar approach (dorsal approach is additionally used, if dorsal articular fragment existed.)
- Comparison of diagnosis accuracy b/w examiners
  ✓ Three different orthopedic surgeons reviewed the same plain radiographs.
  ✓ 1st diagnosis was made using AP + lateral view (Table 1).
  ✓ 2nd diagnosis was made using AP + lateral + oblique view to assess the utility of oblique view.
  ✓ Degree of agreement: inter-observer and intra-observer reliability were tested (Table 2).

Results

Fig.1 Plain radiographs: The oblique view more clearly shows intra-articular involvement, particularly the dorso-ulnar fragment.

Table 1 Diagnosis accuracy of plain radiographs: Articular involvement was found in 43 out of 181 patients (32%) on CT scans.

<table>
<thead>
<tr>
<th>Authors</th>
<th>AP + lateral</th>
<th>AP + lateral + oblique</th>
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<tbody>
<tr>
<td>Observer 1</td>
<td>0.37</td>
<td>0.68</td>
</tr>
<tr>
<td>Observer 2</td>
<td>0.32</td>
<td>0.71</td>
</tr>
<tr>
<td>Observer 3</td>
<td>0.28</td>
<td>0.59</td>
</tr>
<tr>
<td>Mean</td>
<td>0.32</td>
<td>0.66</td>
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</tbody>
</table>

Fig. 2 Intra-articular involvement is classified into three subtypes.; (A) "Dorso-ulnar type" (64%), (B)"Dorso-ulnar+ rim type" (33%), (C)"Bursting type"(3%). Dorso-ulnar fragment was observed in all subtypes.

Table 2 Intra-observer and inter-observer reproducibility for the diagnosis of extra-articular fracture was tested and Fleiss Kappa value was calculated.

<table>
<thead>
<tr>
<th></th>
<th>AP + lateral</th>
<th>AP + lateral + oblique</th>
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<tbody>
<tr>
<td>Intra-observer</td>
<td>0.792 - 0.857</td>
<td>0.689 - 0.746</td>
</tr>
<tr>
<td>Inter-observer</td>
<td>0.702 - 0.789</td>
<td>0.691 - 0.625</td>
</tr>
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Discussion

- Sample size is relatively small.
- Selection bias should be considered.
- The quality of interpretation might be affected by the skill level of examiners.
- When treating displaced extra-articular fractures requiring surgery, surgeons should consider that intra-articular involvement requiring additional fixation might exist.
- CT scan might be necessary not to miss the fragment. At least, oblique views should be added, which was helpful to identify dorso-ulnar fragment.