Systematic use of short unicortical epiphyseal locking screws versus full-length unicortical locking screws in distal radius fracture volar plating

A prospective and comparative study

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CONFLICTS OF INTEREST

None
INTRODUCTION

Volar locking plates for DISTAL RADIUS FRACTURE (DRF)

→ Extensor tendon irritation and rupture are a recognized complication of volar plate fixation of DRF reported in 0.8–12% of cases

→ The epiphyseal screws length is adjusted so that it flushes the dorsal cortex without crossing it

→ Anatomic studies:
  Irregular shape of the dorsal distal radius → sources of mistakes in screws length estimations
INTRODUCTION

• Biomechanical lab study: (Baumbach 2015)
  Stability with 100% length locking screws = 75% > 50%

• Ultrasonography is an excellent test to diagnosis dorsal penetrating screws (Se & Spe 100%). Cheap, quick, non-invasive, non-irradiative

• Hypothesis:
  Short epiphyseal screws 16mm for females and 18mm for males (based on 75% of distal radial average depth) erase any risk of dorsal conflict between tendons and screws without compromising the stability
OBJECTIVES

1) Evaluate the effectiveness of a strategy consisting in using a single short screws length in preventing dorsal cortex penetration

2) Determine if this strategy had any impact on stability compared to the conventional full-length unicortical epiphyseal screws
MATERIAL and METHODS

Prospective
Extra-articular (A), partially articular (B) and complete articular (C) DRF
Exclusion of partial dorsal joint fractures
ORIF / Volar Locking Plate
Per-operative fluoroscopy: AP / L / SLV
Immobilization: 3W splint
X-Rays: D0 + W3 + W6 + M3
US: M3

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 surgeons</td>
<td>3 surgeons</td>
</tr>
<tr>
<td>Short epiphyseal screws</td>
<td>Full-length epiphyseal screws</td>
</tr>
<tr>
<td>16 mm ♀ / 18 mm ♂</td>
<td>measuring tool</td>
</tr>
</tbody>
</table>
### MATERIAL and METHODS

<table>
<thead>
<tr>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
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<tbody>
<tr>
<td>37 p.</td>
<td>39 p.</td>
</tr>
<tr>
<td>148 epiphyseal screws</td>
<td>156 epiphyseal screws</td>
</tr>
<tr>
<td>5 ♂</td>
<td>9 ♂</td>
</tr>
<tr>
<td>32 ♀</td>
<td>30 ♀</td>
</tr>
<tr>
<td>Mean 56 years (20–81)</td>
<td>Mean 58 years (19–83)</td>
</tr>
<tr>
<td>34 dorsally and 3 volarly displaced fractures</td>
<td>36 dorsally and 3 volarly displaced fractures</td>
</tr>
<tr>
<td>5 intra-articular DRF</td>
<td>7 intra-articular DRF</td>
</tr>
<tr>
<td>32 extra-articular DRF</td>
<td>32 extra-articular DRF</td>
</tr>
</tbody>
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## RESULTS

### 0 TENDON RUPTURE (Gp A & Gp B)

<table>
<thead>
<tr>
<th></th>
<th>SHORT screws (A)</th>
<th>LONG screws (B)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal cortex penetration (US)</td>
<td>0 (0%)</td>
<td>10 (6,5%)</td>
<td>0,002</td>
</tr>
<tr>
<td>Volar tilt variation 0-3 M (XR)</td>
<td>-0,6° (-2,4 to 0,7)</td>
<td>-0,7° (-3 to 1,1)</td>
<td>0,22 / NS</td>
</tr>
<tr>
<td>Radial inclination variation 0-3 M (XR)</td>
<td>-0,4° (-2,8 to 1,2)</td>
<td>-0,4° (-2,5 to 1,0)</td>
<td>0,94 / NS</td>
</tr>
<tr>
<td>Inter-observer correlation (X-rays)</td>
<td></td>
<td></td>
<td>0,75</td>
</tr>
<tr>
<td>OMERACT score</td>
<td>St 0: 35p</td>
<td>St 0 : 28p</td>
<td>0,003</td>
</tr>
<tr>
<td></td>
<td>St 1 : 2p</td>
<td>St 1 : 5p</td>
<td></td>
</tr>
<tr>
<td></td>
<td>St 2 : 0 p</td>
<td>St 2 : 6p</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS
LIMITS

• Non-randomized

• Experience in skyline view realization and interpretation could differ from one to another

• Measurements on digital radiographies could expose to a measurement bias

• Ultrasonography: Only one lecture per patient.
DISCUSSION

• The shape of the dorsal surface of the distal radius is complex and variable. Fluoroscopy may be poor at detecting prominent screws under the shadow of the Lister’s tubercle. (Pichler)

• Preventing tendon injury:
  • Dorsal incision (Benson), lunar-depth (Ljungquist), early plate removal, …
  • Letissier (scanner study) : diaphysal screw → epiphyseal length

• Usefullness of short screws:
  • Baumbach: Cadaver / 75% vs 100% length / no difference in stability
  • Dardas: 2mm shorter than measured/ Neither tendon injury nor ‹DS
  • Seki: In vivo / 75% vs 100% length / no difference in stability
CONCLUSION

• The current study suggests the use of systematic short unicortical locking epiphyseal screws for the treatment of displaced DRF (articular or extra articular, on the exception of the dorsal partial joint fractures).

• Based on 75% of distal radial average depth, screw-lengths of 16mm for females and 18mm for males seem to be the length to use.

• Good stability and avoid any tendon lesion.
THANKS FOR YOUR ATTENTION