The Incidence and Characteristics of Carpal Fractures Arising Concurrently with Distal Radius Fractures After a Fall onto an Outstretched Hand

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Disclosures:
R. Nicolescu: None. C. Kam: None. P. Sawardeker: None. E.A. Ouellette: 2; Auxxillium, Synthes. 3B; Stryker. P. Clifford: None. L. Latta: 7; Springer Verlag, ASOP, Jaypec Bros.

Introduction: Simultaneous scaphoid and distal radius fractures, and the importance of their identification, have been previously described in multiple reports. However, few studies have investigated the incidence of carpal fractures, in general, occurring concurrently with distal radius fractures after a common mechanism of wrist injury. The purpose of this study is to investigate the incidence and characteristics of carpal fractures occurring simultaneously with distal radius fractures after a fall onto an outstretched hand. Furthermore, we hope to determine whether different fall parameters, such as hand position and forearm rotation, influence the frequency of this injury.

Methods: Baseline MRI scans and fluoroscopic images of the wrist were obtained for two sets of 24 fresh frozen cadaveric arms. All of the arms were transected 18 cm proximal to Lister’s tubercle and then mounted at 80° of wrist extension and full pronation. In the first set of 24 arms, eight were mounted perpendicular to the MTS table top, eight were radially deviated 10-15°, and eight were ulnarly deviated 10-15°. In the second set of 24 arms, twelve underwent 5 N-m of external forearm rotation, with six of the arms perpendicular to the MTS table top and the other six ulnarly deviated 10-15°. The last twelve arms underwent 5 N-m of internal forearm rotation, with six of the arms perpendicular to the MTS table top and the other six radially deviated 10-15°. The arms were then loaded on an MTS machine and axially displaced 2.5 cm at a compression rate of 5 cm/sec. Post injury fluoroscopic images and MRI scans of the wrist were obtained and analyzed. The MRI scans were scrutinized by one of us (EAO) - a board certified orthopaedic surgeon.

Results: All of the arms sustained a distal radius fracture. Post-stress MRI revealed that 25 (52%) of the wrists also sustained at least one carpal bone fracture. The most common carpal bone injured was the scaphoid, which was fractured in 18 of the 25 arms with concurrent carpal fractures, or 38% of the arms overall. Moreover, lunate fractures were present in 11 of the wrists, triquetral fractures in 5 of the wrists, capitate fractures in 6 of the wrists, and 3 hamate fractures were present. Of the 25 arms with concurrent fractures, 16 had been subjected to a rotational force during MTS testing.

Discussion: The incidence of carpal fractures occurring simultaneously with distal radius fractures after a fall onto an outstretched hand comprised a substantial proportion of the arms examined. While the type of carpal fracture does not appear to correlate with a specific hand position, it is evident that forearm rotation is more likely to result in concomitant injury. Early wrist motion now the standard of care after immobilization of a patient with a distal radius fracture may result in non-union if a missed carpal fracture is also present.

Significance: Practitioners should maintain a high suspicion of concurrent carpal fractures in patients who present with a distal radius fracture after a fall onto an outstretched hand, particularly if forearm rotation is involved.

Acknowledgments: This work was performed at Max Biedermann Institute For Biomechanics

Incidence of Carpal Fractures concomitant with Distal Radius fractures

<table>
<thead>
<tr>
<th></th>
<th>Distal Radius</th>
<th>Scaphoid</th>
<th>Lunate</th>
<th>Triquetrum</th>
<th>Capitate</th>
<th>Hamate</th>
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</thead>
<tbody>
<tr>
<td>No. of wrists</td>
<td>48</td>
<td>15</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>% of wrists</td>
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<td>31</td>
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ORS 2014 Annual Meeting
Poster No: 1030