Results of Distal Radius Fracture Reduction in the Emergency Department With or Without Fluoroscopic Assistance

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Background and Objectives

Fracture reduction in the emergency department is a common procedure performed by orthopaedic surgery residents. Real-time fluoroscopic imaging is frequently used by resident physicians as a tool to help assist in reductions of fractures.

Although assumed to be helpful for direct visualization of the reduction, no significant data exists to show support of the use of a mini C-arm in the emergency department for such fractures. Some literature supports the use of fluoroscopy and/ or arthroscopy for fracture reduction assistance in the operating room. Significant money and time are invested into maintaining an available mini-c-arm near or in the emergency department.7

The purpose of this study is to compare the results of reductions completed by orthopaedic residents when using fluoroscopy versus traditional closed reduction without fluoroscopic assistance. Using this information, we can begin to better understand the usefulness of fluoroscopy guided closed reductions in the emergency room.

We hypothesize that reduction of distal radius fractures aided by a mini-c-arm fluoroscopy device would (1) allow a more anatomic fracture reduction, (2) decrease the number of repeat reductions or subsequent procedures, and (3) reduce the overall orthopedic consultation time in the emergency department.

Study Population

•Adult patients at least 18 years of age and able to provide informed consent are eligible for participation

•Criteria for inclusion in the study include uncomplicated, isolated distal radius fractures. Concomitant injuries to the ipsilateral upper extremity or multi-trauma patients are excluded

•Initial power analysis required 50 subjects for each group

Location

The study was conducted in the emergency department at UPMC Hamot

Methods

Process

•Subjects eligible for the study were randomly assigned to fracture reductions using the mini-c-arm fluoroscopy (mini-c-arm group), or fracture reductions without the aid of mini-c-arm fluoroscopy (control group)

•Fracture reductions are carried out by the junior orthopedic surgery resident on call

•Pre- and post-reduction radiographs are obtained for each subject

Outcomes

•The primary preliminary outcomes consisted of radiographic measurements of the reduced distal radius including: radial height, radial inclination, and volar tilt, and intra-articular step-off. These were measured independently by two co-investigators with mean values used as the final data.

•The total consultation time between initial patient contact until post-reduction radiographs obtained with the mini-c-arm and post-reduction radiographs obtained were determined from emergency department charts and data sheets

•Secondary outcomes considered include pre- and post-reduction comparisons of the individual patient analyzed to account for severity of the original fracture. Also, participant records will be followed to identify those whose went on to surgical fixation

•The Student’s t-test was used to compare the means outcomes between the two groups; a p-value ≤ 0.05 was considered as significant

No significant differences were found in most pre- and post-reduction alignment parameters.

•Pre-reduction radial inclination was more severe in the mini-c-arm group (7.8 ± 6.9 vs 14.3 ± 5.3 degrees, p = 0.01) compared to the control group

•More repeat reductions were performed in the control group compared to the mini-c-arm group.

•Average orthopaedic consultation time was significantly decreased with use of a mini-c-arm (64.5 ± 14.8 vs 37.9 ± 10.9 minutes, p < 0.001).

Conclusions

•Preliminary results from this study suggest that the use of mini-c-arm fluoroscopy does not significantly improve the quality of distal radius fracture reductions when compared to conventional means.

•The use of the mini-c-arm with distal radius fracture reductions can decrease the total orthopaedic consultation time. While there was no significant difference between the rate of repeat reductions between the mini-c-arm and the control groups, the use of the mini-c-arm shows a trend towards reduced rate of repeat reductions.

•Further study enrollment will increase statistical power and provide more accurate and applicable information and results.

Table I. Patient Demographics

| Table II. Injury Data and Study Outcomes |

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Table I. Patient Demographics

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Mini-C-Arm Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Average age (yrs)</td>
<td>61.8 ± 15.7 (38-86)</td>
<td>43.8 ± 16.8 (18-64)</td>
</tr>
<tr>
<td>Gender: Male</td>
<td>2/13 (15.4%)</td>
<td>4/14 (28.6%)</td>
</tr>
<tr>
<td>Gender: Female</td>
<td>11/13 (84.6%)</td>
<td>10/14 (71.4%)</td>
</tr>
<tr>
<td>No. of intra-articular fractures</td>
<td>5/13 (38.5%)</td>
<td>3/14 (21.4%)</td>
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</tbody>
</table>

Table II. Injury Data and Study Outcomes

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Mini-C-Arm Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volar tilt (degrees)*</td>
<td>-18.5 ± 22.7</td>
<td>-23.9 ± 12.2</td>
</tr>
<tr>
<td>Radial inclination (degrees)</td>
<td>14.3 ± 5.3</td>
<td>7.8 ± 6.9</td>
</tr>
<tr>
<td>Radial Height (mm)</td>
<td>5.35 ± 5.55</td>
<td>4.4 ± 4.5</td>
</tr>
<tr>
<td>Intra-articular Step-off</td>
<td>46</td>
<td>1.18</td>
</tr>
<tr>
<td>Number of repeat reductions</td>
<td>4/13 (30.8%)</td>
<td>1/14 (7.1%)</td>
</tr>
<tr>
<td>Consultation Time</td>
<td>64.5 ± 14.8</td>
<td>37.9 ± 10.9</td>
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<tr>
<td>Future Surgical Fixation</td>
<td>6/12 (50%)</td>
<td>9/13 (69.2%)</td>
</tr>
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References