Factors Affecting Delayed Displacement of Clavicle Fractures in Polytrauma Patients

Kwang-Hyun Lee, Joo-Hak Kim, Bong Gun Lee, Chang-Hun Lee, Sung-Jae Kim and Wan-Sun Choi

INTRODUCTION

• “Severe trauma” or “polytrauma”
• Injury severity score ≥ 16 points
• Most common cause of death under 40-year-old
• Important socioeconomic problem

• Musculoskeletal injury
• About 70% of polytrauma patients
• Clavicle fracture
• About 10% of polytrauma patients

• Treatment for clavicle fracture in polytrauma patients
• Surgery: 1/6 of isolated clavicle injury
• Lethal condition should be considered
• Tendency for conservative treatment
• Loss of opportunity for optimal treatment

• Purposes of study
• To analyses the factors affecting...
• displacement of fracture in polytrauma patient during conservative treatment

Clinical Significance
• To establish initial treatment strategies
• on the basis of these factors...

MATERIALS & METHODS

• Study design: Retrospective cohort study
• From 2014.1 to 2017.4 / In a single trauma center
• Polytrauma patients: ISS ≥16, EMR review
• Clavicle fracture: ICD-10, S42.0
• Inclusion criteria

- Conservative treatment
  - Indication: displacement < 100% of diameter
  - Proximal 1/3, distal 1/3: arm sling
  - Shaft 1/3: figure of 8 bandage
  - Duration: 4-6 weeks

- Radiologic evaluation
  - Clavicle series: clavicle AP, cephalic tilt view, both acromioclavicular view
  - Interval: 1 week
  - Lethal condition: chest AP or CT
  - Precise date of displacement
  - Chest AP performed daily

- “Late displacement”
  - The increase of the displacement of fracture site over 100% of the clavicle diameter during follow-up
  - Treatment failure / Consider surgery

- Statistical analysis
  - Risk factor analysis for late displacement
  - Logistic regression analysis

RESULTS

• Mean age: 49.5 (16-80) years old
• Male:58 pts., female: 21 pts.
• Late displacement: 31 pts. (39.2%)
• Period to late displacement: 10.1 (2-34) days
• Surgery after displacement: 18 pts. (58%)
• Regression analyses

Univariable logistic regression analysis

<table>
<thead>
<tr>
<th>p value</th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.519</td>
<td>1.412</td>
</tr>
<tr>
<td>Comminution of fracture</td>
<td>0.001</td>
<td>6.248</td>
</tr>
<tr>
<td>Use of ventilator</td>
<td>0.216</td>
<td>0.562</td>
</tr>
<tr>
<td>Ipsilateral acapular fracture</td>
<td>0.434</td>
<td>0.646</td>
</tr>
<tr>
<td>Accompanying upper extremity fracture</td>
<td>0.854</td>
<td>1.168</td>
</tr>
<tr>
<td>Traumatic CNS injury</td>
<td>0.050</td>
<td>1.677</td>
</tr>
<tr>
<td>Location of clavicle fracture</td>
<td>0.042</td>
<td>0.502</td>
</tr>
<tr>
<td>Proximal 1/3 vs distal 1/3</td>
<td>0.030</td>
<td>0.212</td>
</tr>
<tr>
<td>Middle 1/3 vs distal 1/3</td>
<td>0.000</td>
<td>2.817</td>
</tr>
<tr>
<td>Ipsilateral rib fractures</td>
<td>0.101</td>
<td>2.779</td>
</tr>
<tr>
<td>Age</td>
<td>0.362</td>
<td>0.988</td>
</tr>
<tr>
<td>Injury severity score</td>
<td>0.621</td>
<td>1.615</td>
</tr>
<tr>
<td>Duration of ICU care</td>
<td>0.429</td>
<td>0.990</td>
</tr>
<tr>
<td>Duration of intubation</td>
<td>0.709</td>
<td>0.994</td>
</tr>
<tr>
<td>GCS score</td>
<td>0.905</td>
<td>0.963</td>
</tr>
</tbody>
</table>

Univariable logistic regression analysis

<table>
<thead>
<tr>
<th>p value</th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of fracture</td>
<td>0.003</td>
<td>6.228</td>
</tr>
<tr>
<td>Use of ventilator</td>
<td>0.132</td>
<td>0.523</td>
</tr>
<tr>
<td>Ipsilateral acapular fracture</td>
<td>0.217</td>
<td>0.696</td>
</tr>
<tr>
<td>Location of clavicle fracture</td>
<td>0.001</td>
<td>8.277</td>
</tr>
<tr>
<td>Proximal 1/3 vs distal 1/3</td>
<td>0.627</td>
<td>1.750</td>
</tr>
<tr>
<td>Middle 1/3 vs distal 1/3</td>
<td>0.971</td>
<td>0.959</td>
</tr>
<tr>
<td>Ipsilateral rib fractures</td>
<td>0.145</td>
<td>2.779</td>
</tr>
<tr>
<td>Age</td>
<td>0.157</td>
<td>1.939</td>
</tr>
<tr>
<td>Duration of ICU care</td>
<td>0.321</td>
<td>0.354</td>
</tr>
</tbody>
</table>

DISCUSSIONS & CONCLUSION

• Previous study of displaced midshaft clavicle fracture (DMCF) in polytrauma patients:
  - Nonunion rate not differ from isolated DMCF
  - Outcome was comparable after conservative treatment and early or late surgery
  - “Wait and see” may be available in polytrauma patients

• Current trend of DMCF treatment
  - The rate of surgery has increased
  - Surgery decreases nonunion rate
  - Surgery helps rapid functional recovery

• Our opinions...
  - Factors associated polytrauma did not affect late displacement of clavicle fracture
  - The treatment strategy should be similar to an isolated clavicle fracture as much as possible
  - Multidisciplinary approach for polytrauma patients reduces the burden of caring for general condition
  - Optimal treatment should be done as much as possible

• Conclusions
  - Risk factors for late displacement of clavicle fracture in polytrauma patients
    - Fracture comminution
    - Fracture location: middle 1/3
  - Short interval follow-up and surgery should be considered under these conditions