Injury Management and Functional Return to Sport: Clavicle Fractures

Cory Edgar MD, PhD
Assistant Professor
Department of Orthopedic Surgery
UConn Health
Team Physician:
University of Connecticut
US Coast Guard Academy
Injury Management and Functional Return to Sport: Clavicle Fractures
Operative vs Non-Operative

Treatment in the Athlete may be different?
Surgical Indications – In General

• **Open Fractures**
• **Floating Shoulder**

Failure of nonop Rx

• Pain
• Dysfunction
• Nonunion
• Malunion
Nonunion

- Thought to be very low
- Until recently
  - Poor numbers
  - Retrospective
- Better work has come
- Higher than previously thought
Predisposing Factors

• Displacement
• Physiology
• Gender
• Comminution
• Location
• Age

Surgery?
Definitions

**Displacement**
Lack of cortical contact

**Shortening**
Length of SC -> AC Distance decreased
Shortening of Myotendinous Unit
Large Butterfly Fragment -
Large Butterfly Fragment -

Inter-Frag Fixation with 2.0 Screw

Modular Hand Set
Nonunion risk

- Hill 1999: 15%  
- Smith 2000: 14%  
- Robinson 2003: 21%  
- COTS 2006: 15%
Non-Union Risk

• Increased displacement
  – Nordqvist
  – Hill

• Female
  – Larsson
    • Women 13%
    • Men 3%
Risk Factors for non-union

- Robinson ’04
  868 patients included
  561 Diaphysis
  263 Lateral
  Monitored for 24 wks (6M)

- Prevalence on Non-union
  - Overall 6.2 %
  - Diaphysis 4.7%
  - Lateral 11.5%
  - Medial 8.3%
Risk Factors for non-union

Robinson ’04

• Risk factors:
  – Complete displacement (lack of any cortical apposition)
  – Female gender
  – Comminution
  – Advancing age
  – Lateral Fracture Position (Displaced/Age only factors)

Prognostic Index: Everyone starts with ($-0.85$) then... ($X$ 1 if displaced or 0 if not) + ($-0.36$)($X$ (1 if female or 0 if male)) + ($-0.37$)($X$ (1 if comminuted or 0 if noncomminuted)) + ($-0.01$)($X$ patient age in years).
Prognostic Index

Risk at 24 Weeks
## Additive Affects

| Age (yr) | Displaced | | Comminuted | | Displaced and Comminuted |
|---|---|---|---|---|
| | Females | Males | Females | Males | Females | Males |
| 25 | 19% | 8% | 7% | 3% | 33% | 20% |
| 35 | 20% | 11% | 8% | 4% | 35% | 21% |
| 45 | 25% | 14% | 10% | 5% | 37% | 25% |
| 55 | 28% | 18% | 12% | 6% | 42% | 29% |
| 65 | 33% | 20% | 18% | 7% | 47% | 33% |
Randomized Control Trial

- Smith, et al
- Sling versus ORIF
- Displaced clavicle #’s
- 100 patients
- Nonunion rate
  - 13% in sling group
  - 0% in ORIF group
Non-Op vs ORIF

- COTS: RCT
  - Sling
  - ORIF

- 111 Patients
  - With > 1 yr follow-up
    - 49 Non-op
    - 62 ORIF

100% Displacement
<table>
<thead>
<tr>
<th>Results / Complications</th>
<th>Non-op</th>
<th>ORIF (Superior)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-union</strong></td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>- Required ORIF</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Malunion</strong></td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>- Symptomatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RSD</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Painful plates</strong></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td><strong>Infections</strong></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Loss of fixation</strong></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Constant Score Results

Weeks

Non operative
Operative

Fig. 2
Natural History

  - 225 Fractures 17 yr f/u!!!
  - 185 Asymptomatic (82%)
  - 40 / 53 Malunions Good
  - 3 / 7 Nonunions Good
  - 83% Displaced, 73% Comminuted
Natural History

- Nowak, et al ‘05
  - 222 Fractures (prospective)
  - Nonunion 7%
  - Sequelae at 6 mos: 42%
    - 72% in nonunions
    - 80% of these had cosmetic concerns

[Image of X-rays]
Natural History
Natural History

• Faldini, et al ’10
  – 100 Fractures f/u 3 yrs
  – 3 Nonunions
  – DASH avg = 24
  – 81 E, 12 G, 5 F, 2 P
  – 77 Pain free, 23 occ pain
  – 81 No limits, 19 slight
Natural History

- McKee, et al ’06
  - 15 Satisfied, 7 Partly 8 Not
  - DASH > 30
    - 7/11 > 2cm short
    - 3/19 ≤ 2cm short
  - Constant 71 vs 92 (p = .02)
Shoulder Strength

P < 0.05 for all

% of Contra-lateral Arm

Flexion  Abduction  ER  IR

Maximal  Endurance

Natural History
Shortening – What is it!!

- Several articles discuss
- > 2 cm quoted
- Indication for surgery
- Predisposes to poor outcome
- *Definition???*

**Midshaft Malunions of the Clavicle**

By Michael D. McKee, MD, FRCS(C), Lisa M. Wild, BScN, and Emil H. Schemitsch, MD, FRCS(C)

Investigation performed at the Upper Extremity Reconstructive Service, Division of Orthopaedics, Department of Surgery, St. Michael’s Hospital and the University of Toronto, Toronto, Ontario, Canada

“As measured radiographically, the mean degree of shortening (compared with the contralateral, normal clavicle) was 2.9 cm (range, 1.6 to 4.0 cm)”
Example

Shortening = 2.5 cm
Better Way??

Shortening = 1.2 cm
Nonunion

• How bad is it?

• How important to avoid it?

• Treatment?

• Results?
Surgical Indications

Pain!!!
Treatment

- Basic fracture principles

- Diaphyseal
  - Open
  - Re-canalize

- Stable fixation

- Possible bone graft
Results...Union

- Olsen ’95 (16) 94%
- Davids ’96 (14) 100%
- Bradbury ‘96 (32) 97%
- Ebraheem ‘97 (16) 94%
- Boyer ‘97 (7) 100%
- Larson ‘99 (12) 92%
- Sadiq ‘02 (13) 100%
- Rosenberg ’07 (13) 100%
- Rolf ‘08 (24) 100%
- McKee ’08 (38) 95%
Outcome Clinical

• McKee ‘08
  – 32/36 (89%) satisfied with the procedure
  – Mean DASH score 12.5 (0 to 58)
  – Mean SF-36 score 75.9 ± 17.1

• Khan ‘08
  – Locking plates..osteopenia
  – DASH 24 (from 42)
Clinical Outcome

Rosenberg ‘07

• 13 Patients

• All united

• 46% Returned to priors

• 3 / 10 Pain free
Operative Versus Nonoperative Care of Displaced Midshaft Clavicular Fractures: A Meta-Analysis of Randomized Clinical Trials

Only 6 eligible Studies!

3 Plate Fixation (Superior)

3 Pin/Intramedullary

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Journal or Meeting</th>
<th>No. of Patients Followed</th>
<th>Operative Type</th>
<th>Operative</th>
<th>Nonoperative</th>
<th>Outcome Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Virtanen et al.13</td>
<td>Annual Meeting of the American Academy of Orthopedic Surgeons</td>
<td>51</td>
<td>Plate</td>
<td>0/26</td>
<td>6/25</td>
<td>CS = 86.5, DASH = 4.3</td>
</tr>
<tr>
<td>2009</td>
<td>Smeekel et al.17</td>
<td>Journal of Orthopaedic Trauma</td>
<td>60</td>
<td>Pin</td>
<td>0/30</td>
<td>3/30</td>
<td>CS = 97.9, DASH = 4.3</td>
</tr>
<tr>
<td>2000</td>
<td>Judd et al.16</td>
<td>The American Journal of Orthopedics</td>
<td>57</td>
<td>Pin</td>
<td>1/29</td>
<td>1/28</td>
<td>CS = 97.9, DASH = 4.3</td>
</tr>
<tr>
<td>2007</td>
<td>Canadian Orthopedic Trauma Society (COTS) 23</td>
<td>The Journal of Bone and Joint Surgery (American)</td>
<td>111</td>
<td>Plate</td>
<td>2/62</td>
<td>7/49</td>
<td>CS = 96.1, DASH = 5.2</td>
</tr>
<tr>
<td>2007</td>
<td>Witzel18</td>
<td>Zeitschrift für Orthopädie und Unfallchirurgie</td>
<td>68</td>
<td>Pin</td>
<td>NA/35</td>
<td>NA/33</td>
<td>Postoperative mobility and strength measures were significantly better in the operative group</td>
</tr>
<tr>
<td>2000</td>
<td>Smithy et al.14</td>
<td>Annual Meeting of the American Shoulder and Elbow Surgeons</td>
<td>65</td>
<td>Plate</td>
<td>0/30</td>
<td>12/35</td>
<td>NA</td>
</tr>
</tbody>
</table>

Totals: 412 patients, 3 out of 212 in the operative group and 25 out of 200 in the non-operative group.
Operative vs Non-Operative

Operative Versus Nonoperative Care of Displaced Midshaft Clavicular Fractures: A Meta-Analysis of Randomized Clinical Trials

Robbin C. McKee, Daniel B. Whelan, MD, FRCS(C), Emil H. Schemitsch, MD, FRCS(C), and Michael D. McKee, MD, FRCS(C)

Investigation performed at St. Michael’s Hospital and the University of Toronto, Toronto, Ontario, Canada

Only one study full 2 years

Lost to follow-up needs to be considered

<table>
<thead>
<tr>
<th>Study Ref</th>
<th>Randomization Technique</th>
<th>Follow-up</th>
<th>Lost to Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtanen et al. (2010)</td>
<td>Blocked randomization, sized randomly from 4-10, sealed envelope</td>
<td>1 year</td>
<td>15%</td>
</tr>
<tr>
<td>Smekal et al. (2009)</td>
<td>Balanced block randomization with a block size of 4, and sealed envelope</td>
<td>2 years</td>
<td>13%</td>
</tr>
<tr>
<td>Judd et al. (2009)</td>
<td>Sealed envelope</td>
<td>1 year</td>
<td>0%</td>
</tr>
<tr>
<td>COTS (2007)</td>
<td>Permutation blocks of 4 per investigational site, sealed envelope</td>
<td>1 year</td>
<td>16%</td>
</tr>
<tr>
<td>Witzel (2007)</td>
<td>Not stated</td>
<td>120 days</td>
<td>Not stated</td>
</tr>
<tr>
<td>Smith et al. (2000)</td>
<td>Sealed envelope</td>
<td>Until radiographic union or nonunion</td>
<td>35%</td>
</tr>
</tbody>
</table>
### Operative vs Non-Operative

<table>
<thead>
<tr>
<th>TABLE III Complications</th>
<th>Operative Group (N = 212 Patients)</th>
<th>Nonoperative Group (N = 200 Patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virtanen et al.</strong>&lt;sup&gt;13&lt;/sup&gt; (2010)</td>
<td>1 refracture</td>
<td>1 brachial plexus irritation</td>
</tr>
<tr>
<td></td>
<td>3 delayed unions</td>
<td>2 refractures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 symptomatic malunions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 delayed union</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 nonunions</td>
</tr>
<tr>
<td><strong>Smekal et al.</strong>&lt;sup&gt;17&lt;/sup&gt; (2009)</td>
<td>1 delayed union</td>
<td>6 delayed unions</td>
</tr>
<tr>
<td></td>
<td>2 implant failures</td>
<td>2 symptomatic malunions</td>
</tr>
<tr>
<td></td>
<td>5 medial nail protrusions</td>
<td>3 transient neurogenic compromises</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 nonunions</td>
</tr>
<tr>
<td><strong>Judd et al.</strong>&lt;sup&gt;16&lt;/sup&gt; (2009)</td>
<td>6 pin track infections</td>
<td>1 refracture</td>
</tr>
<tr>
<td></td>
<td>3 pin removals</td>
<td>1 nonunion</td>
</tr>
<tr>
<td></td>
<td>1 transient radial nerve palsy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 delayed union</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 pin fracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 refracture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 nonunion</td>
<td></td>
</tr>
<tr>
<td><strong>Canadian Orthopaedic Trauma Society (COTS)</strong>&lt;sup&gt;12&lt;/sup&gt; (2007)</td>
<td>3 wound infections</td>
<td>9 symptomatic malunions</td>
</tr>
<tr>
<td></td>
<td>5 hardware irritations (removal required)</td>
<td>7 transient brachial plexuses</td>
</tr>
<tr>
<td></td>
<td>8 transient brachial plexuses</td>
<td>7 nonunions</td>
</tr>
<tr>
<td></td>
<td>2 nonunions</td>
<td></td>
</tr>
<tr>
<td><strong>Witzel (2007)</strong>&lt;sup&gt;15&lt;/sup&gt;</td>
<td>NR*</td>
<td>NR*</td>
</tr>
<tr>
<td><strong>Smith et al.</strong>&lt;sup&gt;2000&lt;/sup&gt;&lt;sup&gt;14&lt;/sup&gt;</td>
<td>3 mild nerve compressions</td>
<td>17 mild nerve compressions</td>
</tr>
<tr>
<td></td>
<td>15 hardware removals for discomfort</td>
<td>4 symptomatic malunions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 nonunions</td>
</tr>
<tr>
<td><strong>Total Complications</strong></td>
<td>62</td>
<td>84</td>
</tr>
</tbody>
</table>
Operative vs Non-Operative

Non Union Rate
- 29/200 Non-op
- 3/212 Operative

Symptomatic Mal-union Rate
- 17/200 Non-op
- 0/212 Operative

Complications
- 84/200 (42%) Non-op
- 62/212 (29%) Operative – hardware related (48% in one study)

Early return to Function
- Pain scores improved over first 33 days
- Return to moderate activity earlier
Functional Outcome: Acute vs Delayed

- Potter, et al ‘07
  - 15 Acute, 15 Nonunions (9 yrs older)
  - Satisfaction: Acute 9.8, Delayed 9.6
  - Union 100%
  - DASH
  - BTE testing
### Table 1: Fixation Rates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Delayed fixation (%)</th>
<th>Early fixation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strength</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>93</td>
<td>94</td>
</tr>
<tr>
<td>Abduction</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>External rotation</td>
<td>90</td>
<td>97</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>96</td>
<td>97</td>
</tr>
<tr>
<td><strong>Endurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>80</td>
<td>109</td>
</tr>
<tr>
<td>Abduction</td>
<td>81</td>
<td>107</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- DASH: Disability of the Arm, Shoulder, and Hand
- CSS: Constant Shoulder Score
Technique

- Be careful!!!
- Real risks
- Bone is crooked!
- Minimize stripping
- Go loooooooooooooooooong
Plate Location

Anterior inferior plate position
Plate Location
Plate Location

- Sturno-mastoid muscle
- Anterior scalene muscle
- Brachial plexus
- Subclavian artery
- Clavicle
- Subclavius muscle
- Subclavian vein
- Pectoralis major
- Pectoralis minor
Anterior Inferior Plating
Anterior Inferior Plating
Clavicle Fractures: Which to Fix???
2.2 cm
Not Enough -
Infection and Non-union – it happens!
If it heals we get lucky!
Biology is important!
This One?
Decisions

• Nondisplaced.....NO!
• Displaced?
• Comminuted?
• Older Woman?
• All risks?
• Nonunion risk 3% - 47%
Displaced?

• 100 Patients c displaced fx
• 80 Operations on patients that would have healed
• 20 That could have similar outcome if did later....
• COTS... 9 points on DASH
  – Better function, less complaints
My Opinion...

- Very short (> 2cm)
- Very inferior (> 1.5 cm)
- Floating shoulder?
- Neurologic compromise
- Skin at risk

• Painful nonunions
Lateral or Distal Clavicle

Neer Classification

Non-Union Rates 28-46%

Traditional Treatment
Lateral or Distal Clavicle Fracture Dislocation of the AC Joint
Lateral or Distal Clavicle

Minimal Fixation
Bone Quality
Locked Screws Don’t matter – Screw Pull-out
Does not address “Suspension” Deficit
Distal Clavicle Fracture

16 y/o 3 Sport Over head Athlete
-Dominant extremity

Injury to CC Ligaments
Fracture at AC Ligaments
Distal Clavicle Fracture

Injury within Rotator Interval Makes Dissection Easier

Exposing Under the Coracoid
Distal Clavicle Fracture

Pin Passed through the Base
Distal Clavicle Fracture
Distal Clavicle Fracture

F/u at 2.5 Months
- No pain
- Strength Training
- Tolerating light Throwing
Rehab and Return to Play

Return to Sports After Plate Fixation of Displaced Midshaft Clavicular Fractures in Athletes

Maximiliano Ranalletta,* MD, Luciano A. Rossi,**† MD, Nicolás S. Piužzi,* MD, Agustín Bertona,* MD, Santiago L. Bongiovanni,* MD, and Gaston Maignon,* MD
Investigation performed at the Italian Hospital of Buenos Aires, Buenos Aires, Argentina

AJSM 2015

- Mean Return to Sport – 68 days (5-180)
- Constant 94 (78-100)
- QuickDASH 0.4 +/- 4.7 (0-7.1)
- ROH 10%

### TABLE 1
Demographic and Fracture-Related Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47 (87)</td>
</tr>
<tr>
<td>Female</td>
<td>7 (13)</td>
</tr>
<tr>
<td>Age, y, mean ± SD</td>
<td>30.1 ± 10.8</td>
</tr>
<tr>
<td>Dominant arm</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>23 (43)</td>
</tr>
<tr>
<td>Yes</td>
<td>31 (57)</td>
</tr>
<tr>
<td>Edinburgh classification</td>
<td></td>
</tr>
<tr>
<td>Subtype B1</td>
<td>38 (70)</td>
</tr>
<tr>
<td>Subtype B2</td>
<td>16 (30)</td>
</tr>
<tr>
<td>Mechanism of injury</td>
<td></td>
</tr>
<tr>
<td>Sports</td>
<td>25 (46)</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>12 (22)</td>
</tr>
<tr>
<td>Fall</td>
<td>6 (11)</td>
</tr>
<tr>
<td>Car accident</td>
<td>5 (9)</td>
</tr>
<tr>
<td>Bicycle</td>
<td>4 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Pre-injury sport level</td>
<td></td>
</tr>
<tr>
<td>Competitive</td>
<td>29 (54)</td>
</tr>
<tr>
<td>Recreational</td>
<td>25 (46)</td>
</tr>
</tbody>
</table>

*Data are presented as n (%) unless otherwise indicated.

Figure 3. Percentage of patients who returned to sports after surgery.
# Return to Sports After Plate Fixation of Displaced Midshaft Clavicular Fractures in Athletes

Maximiliano Ranalletta,* MD, Luciano A. Rossi,**† MD, Nicolás S. Piusi,* MD, Agustin Bertona,* MD, Santiago L. Bongiovanni,* MD, and Gaston Maignon,* MD

*Investigation performed at the Italian Hospital of Buenos Aires, Buenos Aires, Argentina

## Table 3
Summary of Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>n (%)</th>
<th>Athletic Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonunion</td>
<td>1 (1.8)</td>
<td>Recreational</td>
</tr>
<tr>
<td>Hardware loosening</td>
<td>1 (1.8)</td>
<td>Competitive</td>
</tr>
<tr>
<td>Subclavian vein compression</td>
<td>1 (1.8)</td>
<td>Competitive</td>
</tr>
<tr>
<td><strong>Minor</strong></td>
<td>6 (11.1)</td>
<td></td>
</tr>
<tr>
<td>Hardware removal</td>
<td>5 (9.3)</td>
<td>3 competitive,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 recreational</td>
</tr>
<tr>
<td>Hypertrophic scar</td>
<td>1 (1.8)</td>
<td>Recreational</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9 (16.6)</td>
<td></td>
</tr>
</tbody>
</table>
Rehab and Return to Play

Return to Athletic Activity After Plate Fixation of Displaced Midshaft Clavicle Fractures

AJSM 2013

30 cases

- Mean Return 83 Days (13-277)
- 23% < 6wks

![Image](https://via.placeholder.com/150)

**TABLE 1**

<table>
<thead>
<tr>
<th>Sport</th>
<th>Injuries, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>16 (53)</td>
</tr>
<tr>
<td>Riding sport</td>
<td>2 motocross, 1 all-terrain vehicle,</td>
</tr>
<tr>
<td></td>
<td>1 mountain bike (13)</td>
</tr>
<tr>
<td>Soccer</td>
<td>3 (10)</td>
</tr>
<tr>
<td>Baseball or softball</td>
<td>2 baseball, 1 softball (10)</td>
</tr>
<tr>
<td>Basketball</td>
<td>2 (7)</td>
</tr>
<tr>
<td>Lacrosse</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Downhill skiing</td>
<td>1 (3)</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th></th>
<th>Time to Return to Play, d</th>
<th>QuickDASH Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sport</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Football (n = 11)</td>
<td>84 (13-277)</td>
<td>0.6 (0-2.3)</td>
</tr>
<tr>
<td>Basketball (n = 7)</td>
<td>84 (37-171)</td>
<td>0.3 (0-2.3)</td>
</tr>
<tr>
<td>Other (n = 12)</td>
<td>82 (42-182)</td>
<td>1.3 (0-4.6)</td>
</tr>
<tr>
<td><strong>Athletic level at time of injury</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school (n = 20)</td>
<td>91 (37-277)</td>
<td>0.7 (0-4.6)</td>
</tr>
<tr>
<td>College (n = 5)</td>
<td>42 (13-86)</td>
<td>0.5 (0-2.3)</td>
</tr>
<tr>
<td>Recreational (n = 5)</td>
<td>90 (42-182)</td>
<td>1.8 (0-4.6)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (n = 27)</td>
<td>82 (13-277)</td>
<td>0.8 (0-4.6)</td>
</tr>
<tr>
<td>Female (n = 3)</td>
<td>96 (42-171)</td>
<td>0.8 (0-2.3)</td>
</tr>
</tbody>
</table>

*Values are expressed as mean (range). QuickDASH, Quick Disabilities of the Arm, Shoulder and Hand.*

Figure 2. Open reduction internal fixation of a left-sided clavicle fracture with a precontoured clavicular plate.
Focused Rehab

Stage 1
• Immediate Shoulder PROM
• Immediate Activation of Peri-Scapular Complex
• Soft tissue /Scar Mobilization
• Out of Sling after 1 wk (“Move it But Don’t Use It”)

Stage 2
• Shoulder Strength and Conditioning
• Controlled Pectorals and Trapezius Activation and Strength
• Running and Jumping
• Sport Specific conditioning without contact at 4 wks.

Stage 3
• Maximize Shoulder Strength and Conditioning
• Slow return to contact at 8wks
• Full Contact – Football/Hockey/MMA/Motorcross 3 Months.
Thank you -