Clavicle Fractures: Nonoperative Treatment

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Clavicle Fractures

Since the dawn of time...

- **Examination:** If thou examinest a man having a break in his collar-bone (and) thou shouldst find his collar-bone short and separated from its fellow.

- **Treatment:** Thou shouldst place him prostrate on back, with something folded between his two shoulder-blades; thou shouldst spread out with his two shoulders in order to stretch apart his collar-bone until that break falls into its place. Thou shouldst make for him two splints of linen, (and) thou shouldst apply one of them both on the inside of his upper arm. Thou shouldst bind it with yarn, (and) treat it afterward with honey every day, until he recovers.
Clavicle Fractures

- One of the most common adult fractures (5 -12% of all fractures)
- Account for 40% of all shoulder fractures
- Incidence 64/100,000 per year
- M:F 2:1
- Over 37 centuries of experience with this injury
Clavicle Fractures

- **Classic Treatment**
  - Benign neglect…
  - It's just cosmetic…
  - Surgery has a higher complication rate and nonunion rate?...
Nonoperative Treatment

- **Hippocrates 4th century**

  “When, then, a clavicle fracture has recently taken place, the patients attach much importance to it, as supposing the mischief greater than it really is, and the physicians bestow great pains in order that it be properly bandaged; but in a little time the patients, having no pain, nor finding any impediment to their walking and eating, become negligent; and the physicians finding that they cannot make the parts look well, take themselves off, and are not sorry at the neglect of the patient, and in the meantime the callus is quickly formed.”
Clavicle Fractures

- Why is this controversial?
Clavicle Fractures

- Not all clavicle fractures are the same…
Clavicle Fractures

- Not all outcomes are the same…
Clavicle Fractures

- Historically, all papers have looked at healing rates after isolated clavicle fractures.
- Function has only been recently analyzed.
- Neer, Rowe quoted nonunion rates <1% in their series in the late 50s / 60s.
- Recent papers have documented slightly higher overall rates – but still low (4.5%).

Function has only been recently analyzed.
Clavicle Fractures: Nonoperative Treatment

  - 242 Consecutive Clavicle Fractures (IN ADULT PATIENTS)
  - 27% - Midshaft and Displaced
  - 15% Nonunion Rate

  - Prospective, Cohort study of 868 clavicle fractures
  - 581 diaphyseal fractures
  - 4.5% Nonunion Rate

What about this fracture?
Clavicle Fractures: To Heal or Not to Heal?

**Conclusion:** “nonunion at 24 weeks after a clavicle fracture is an uncommon occurrence, although the prevalence is higher than previously reported.”

- Overall Nonunion Rate for Displaced Diaphyseal Clavicle Fracture – between 15 – 20%

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**Estimating the Risk of Nonunion Following Nonoperative Treatment of a Clavicular Fracture**

By C. Michael Robinson, BMetSci, FRCS(Orth), Charles M. Court-Brown, MD, FRCS(Orth), Margaret M. McQueen, MD, FRCS(Orth), and Alison E. Wakefield, MD, MCSP

Investigation performed at the Shoulder Injury Clinic, Orthopaedic Trauma Unit, Edinburgh, Scotland
Clavicle Fractures: Evidence-Based Approach

- Plating – Nonunion Rate 2.5% (Displaced 2.2%)
- Intramedullary Fixation – 1.6% (Displaced 2%)
- Fracture displacement, comminution, female gender, advanced age associated with nonunion

- Restricted analysis to adult midshaft clavicle fractures
- 2144 Fractures – 97% midshaft
- Overall Nonunion – 4.2% (3.4 – 5.1%)
- Nonoperative Management – overall 5.9% (Displaced 15.1%)
What About Function?

- Do they all do well?
- Can we predict outcome???
What About Function?

- Pain
- Weakness
- Cosmesis
Functional Results of Nonoperative Treatment

- Average shortening 11.4 mm
- 15% Nonunion
- 31% Not Satisfied with Final Result
- 25% Mild to Moderate Pain
- 29% Parasthesias
- 54% Cosmetically Displeasing

- 242 Consecutive Adult Clavicle Fractures – Treated Conservatively
- 27% (66) – Midshaft and 100% Displaced

CLOSED TREATMENT OF DISPLACED MIDDLE-THIRD FRACTURES OF THE CLAVICLE GIVES POOR RESULTS

JAMES M. HILL, MICHAEL H. MCGUIRE, LYNN A. CROSBY

From Creighton University, Omaha, USA

- Initial Shortening > 2 cm associated with nonunion (6/6)
- Final Shortening > 2 cm associated with poor functional outcome
Functional Results of Nonoperative Treatment

- 208 clavicle fractures followed prospectively for 9 – 10 yrs
- 54% Complete Recovery
- 46% Had Sequelae

Neer Award 2002

Can we predict long-term sequelae after fractures of the clavicle based on initial findings? A prospective study with nine to ten years of follow-up

Jan Nowak, MD, Margareta Holgersson, PhD, and Sune Larsson, MD, PhD, Uppsala, Sweden

Predictors of Outcome
- Lack of Bony Contact
- Comminuted Fracture with Transverse Fragments
- Increasing Age

Did not find a correlation with Shortening, except cosmesis
Functional Results of Nonoperative Treatment

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- Pain at rest – 9%
- Pain with activity – 29%
- Cosmetic Defect – 27%
- “Are you fully recovered?”
  - 46% NO
Functional Results of Nonoperative Treatment

Conservative treatment of fractures at the middle third of the clavicle: The relevance of shortening and clinical outcome

Stefanos Lazarides, MD, and George Zafiropoulos, MD, MPhil, Merthyr Tydfil, Wales

Retrospective Review of 132 united midshaft clavicle fractures (f/u 30 mos)
•25.8% Dissatisfaction Rate
  •Pain – 30.3%
  •Motion Loss – 13.6%
•Shortening was associated with poor result and lower constant scores in the group
  •18 mm Males
  •14 mm Females
Functional Results of Nonoperative Treatment

- Isolated 10 patients / 69 with midshaft clavicle fractures that healed with >15mm shortening
- Bilateral Shoulder CT scans with reconstructions
- Assessed patients function and strength
- All patients complained of either pain or limited function
- Objective weakness noted to extension, adduction and internal rotation
Functional Results of Nonoperative Treatment

• SC Joint Angulation increased by 10.7°

• Scapular Version increased by 6.1°
Operative vs Nonoperative Care of Displaced Midshaft Clavicle Fractures: A Meta-Anaylisis of Randomized Controlled 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
A Meta-Analysis of RCT

- 6 studies included
- Nonunion rates 14% for nonoperative group, 1.4% for operative group
- Symptomatic malunion 8.5% for nonoperative group, 0 for operative group
- Complications 42% for nonoperative group, 29% for operative group
Complications

- Nonoperative group – nonunion, malunion, brachial plexus irritation
- Operative group – symptomatic hardware, wound infection, hardware failure
Return to Function

- Earlier return to function demonstrated in operative group
- At 1 year f/u, overall functional improvement minimal
Functional Outcomes

- 28 operative group, 32 nonoperative group
- At 1 year followup
- No significant difference in CS, DASH, pain scores
How Do We Measure Functional Outcomes?

- MCID – minimal clinically important difference
- MDC – minimal detectable change (i.e. smallest change that a patient may notice)
- For the CS no MDC, or MCID has been reported
- For the DASH score MDC considered to be 10.5 pts, MCID 10.2 pts
Clavicle Fractures: Fact or Fiction??

- Most displaced clavicle fractures heal??
- Most displaced clavicle fractures have near normal or normal function without sequelae?

Not Necessarily…

- Age
- Comminution
- Displacement
- Shortening
- Location
Why is there Debate?

- Patients with a completely displaced midshaft clavicular fracture may be counseled that they will be at a higher risk of sustaining nonunion and symptomatic malunion if the fracture is treated nonoperatively, but that there is no clear evidence that surgical treatment will improve their long-term function in general. They should also be counseled that, approximately 75% of the time, a completely displaced clavicular fracture that is treated nonoperatively will heal with few, if any, long-term consequences.
Clavicle Fractures: Flip Side

- Complications of ORIF
  - PTX
  - Air Embolism
  - Vascular Injury
  - Neurologic Injury
  - Hardware Complications
  - Need for further surgery
Summary

- Clavicular Nonunion for displaced midshaft fractures may be higher than initially reported in the literature – 15%

- Predictors of Nonunion
  - Displacement
  - Comminution
  - Female Gender
  - Advancing Age
Summary

- Displacement greater than 2 cm associated with higher nonunion rates
- Residual Shortening following a healed clavicular fracture is associated with poor functional outcome and pain
- PRCT with intent to treat analysis need to be performed to better define indications for surgery and anticipated outcomes for “at risk” fractures
- Functional outcomes need to be better defined
Thank You