Fractures of the clavicle: when and how to operate
—indications and methods of fixation
70–80% are middle third clavicular fractures
Traditional indications

- **Absolute**
  - Open fracture
  - Neurovascular compromise

- **Relative**
  - Polytrauma
  - "Floating shoulder"

  - **“Significant displacement”**

- **Undisplaced fracture**
“Traditional teaching” til ca. 2008

• “Best way to prevent a clavicle fracture from healing is to operate on it”
• “All clavicle fractures heal”
• “Cosmetically unacceptable scar”
• “With surgery, you trade a bump for a scar”
• “Function is normal even following clavicular malunion”
Indications redefined  


Nonoperative Treatment Compared with Plate Fixation of Displaced Midshaft Clavicular Fractures

A Multicenter, Randomized Clinical Trial

By the Canadian Orthopaedic Trauma Society
Methods

Canadian Orthopaedic Trauma Society

- Fracture inclusion criteria included completely displaced (ie, no contact between the principal fragments) middle third clavicle fractures in adults (16–60 years old) with no absolute or relative indications.

- Nonoperative: **sling**

- Operative: open reduction internal fixation (ORIF) using **small fragment plates and screws**

- Outcome: Constant Shoulder Score, DASH scores collected at 6 weeks, 3 months, 6 months, 12 months, and 2 years
Constant Shoulder Score  
Canadian Orthopaedic Trauma Society
DASH scores  Canadian Orthopaedic Trauma Society
• Data supports early operative plate fixation of completely displaced midshaft clavicle fractures in young active individuals

• Nonoperative treatment of midshaft clavicular fractures should be reconsidered
Traditional indications. “skred” fra 2008

- Absolute
  - Open fracture
  - Neurovascular compromise

- Relative
  - Polytrauma
  - “Floating shoulder”

- “Significant displacement”

- Undisplaced fracture
What are the issues?
If conservative:

- Nonunion
- Malunion
Clavicular malunion

- Established diagnosis: “shoulder ptosis”
- Following fractures displaced more than 2 cm
- Orthopedic, neurological, cosmetic symptoms
Clavicular malunion
Clavicular malunion

- Scapular dyskinesia: caused by abnormal kinematics of the musculature controlling shoulder and scapular motion resulting from clavicular malunion
ORIF: cost-effective?

- “Open reduction and internal fixation is most cost-effective for patients who are sensitive to mild functional deficits and strongly value a more rapid return to normal function, particularly in low-cost environments.”

Klavigelfraktur – Korte Kliniske retningslinjer

**Behandling**
Den optimale behandling er meget omdiskuteret. Historisk er konservativ behandling den foretrukne da klaviglen som udgangspunkt har et stort heelingspotential. Operativ behandling er mange steder foretrukket ved dislocerede frakturer, men aktuelle forløger der ikke videnskabelig evidens der taler for bedre resultater efter operativ behandling.

Ved følgende forhold er der oftest indikation for operativ behandling:
- Åbne frakturer
- Truet hud
- Påvirkede neurovaskulære forhold
- Samtidig fraktur af collum scapula (floating shoulder)

Ellers kan de forskellige klavigelfrakturer behandles efter følgende algoritme:

<table>
<thead>
<tr>
<th>Lateral</th>
<th>Udlæseret:</th>
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<td>Slynge behandling</td>
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<th>Midtskafts</th>
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<tr>
<td>Udlæseret (uanset vinkling):</td>
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<td>Slynge behandling.</td>
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<tr>
<th>Medial</th>
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<tr>
<td>Udlæseret (&gt;1 knoglesbrædte med og uden flere fragmenter):</td>
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**Omdisukteret men slynge behandling er at foretrække.**
Undersøgelser viser at der er signifikant let bedre resultater (funktionelt og smertemæssigt) i den første tid efter operationen sammenlignet med slynge behandling, men resultaterne synes at udlines med tiden (ca. 1-2 år.)

Udfarbejdet maj 2012 af
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Technique: approach and structures at risk
Nail versus plate?

- No difference in functional outcome

Other considerations

- Type of plate
- Position of plate
- Hardware removal
Take-home messages

• CONSERVATIVE CARE

• Indications for ORIF of displaced midshaft clavicular fractures have evolved but remain relative

• Risks are malunion or nonunion with conservative care

• If surgery: No difference between nails and plates in terms of healing and outcome
The end

• Herefter følger 2 cases til brug hjemme...
Clavicle fracture

Case for small group discussion: Upper extremity fractures—decision making and methods of stabilization

Brian Bernstein, ZA

AOT Advanced Principles Course
Case description

- 28-year-old woman
- Mountain bike accident
- Isolated fracture left clavicle
- Closed injury
- Neurovascular intact
Question

1. Nonoperative therapy, get locum for work
2. ORIF with MIO (IM device)
3. Plate osteosynthesis
2-week follow-up

What treatment would you recommend at this point?
6-week follow-up
1-year follow-up
Full range of motion with no complaints
Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures

Canadian Orthopaedic Trauma Society (J Bone Joint Surg Am. 2007;89:1–10)
Summary

- Relative indications for operative fixation of clavicle fractures are becoming more widely accepted.
- Previous “myths” have been dispelled.
- Nonunion and malunion may have significant morbidity.
- Nonoperative therapy remains an appropriate option, but requires monitoring and patient compliance.
- Critically appraise the literature with regard to indications for nonoperative vs operative treatment.
Displaced clavicle fracture

Case for small group discussion: Upper extremity fractures—decision making and methods of stabilization

AOT Advanced Principles Course
42-year-old man, fell off mountain bike

- Displaced fracture of the clavicle
- Neurovascular intact
Postoperative x-ray
Summary

• In displaced clavicle fractures there is some evidence (RCT) that operative treatment have better patient oriented outcomes.

• Using a DCP/LC-DCP is better than reconstruction plates according to biomechanical studies. [Iannotti et al (J Shoulder Elbow Surg. 2002;11:457–462)]

• Surgical approach and plate placement depends on surgeon preference.
Can we predict who will suffer nonunion?


- Calculated probability of a nonunion at 24 weeks after a clavicular shaft fractures, based on age, sex, comminution, and displacement*

<table>
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*The values are based on studies including a total of 581 fractures\textsuperscript{9,125}.*