Intramedullary nailing of humeral fractures. Is really distal locking necessary?

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Introduction

Distal interlocking is regarded an inherent part of the antegrade humeral nailing technique

Limitations:

• Appropriate position of the patient
• Exposes both the patient and surgeon to radiation
• Time consuming  *(lateromedial locking screw technique)*
The risk of injury to neurovascular structures from distal locking screws of the Unreamed Humeral Nail (UHN): A cadaveric study

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- Potential risk of damaging neurovascular structures:
  - radial and lateral cutaneous nerve,
  - ulnar and median nerve
  - brachial artery
Specifically for the shoulder:

- difficult to obtain a true lateral view
- flattened, slippery surface of distal humerus
- narrow holes of nails
Department of Shoulder & Elbow
University Hospital of Patras

25 years of experience, IM treatment of choice

Modified extra rotator-cuff entry point in antegrade humeral nailing
### Material – Methods

#### 2000-2009

<table>
<thead>
<tr>
<th>64 patients</th>
<th>33 M/31 F  29 L, 35 R</th>
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<tbody>
<tr>
<td>Mean age</td>
<td>41,5 y</td>
</tr>
<tr>
<td>Average</td>
<td>17-76 y</td>
</tr>
<tr>
<td>Open Fx</td>
<td>3</td>
</tr>
<tr>
<td>Traffic acc</td>
<td>39</td>
</tr>
<tr>
<td>Fall</td>
<td>25</td>
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- **Proximal** 19 (30%)
- **Middle** 32 (50%)
- **Distal** 13 (20%)

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AO Classification

12 diaphyseal

12-A simple fracture
- 12-A1 spiral
- 12-A2 oblique (≥ 30°)
- 12-A3 transverse (< 30°)

12-B wedge fracture
- 12-B1 spiral wedge
- 12-B2 bending wedge
- 12-B3 fragmented wedge

12-C complex fracture
- 12-C1 spiral
- 12-C2 segmental
- 12-C3 irregular

36 22 6
Main Measurements

- Delayed Union: 14 w
- Non Union: 24w
- Follow Up: 2 independent observers
- Pain: Patients interview
- Function: Constant Score
- Visualization: 2 planes X-Ray

Exclusion Criteria

- Open growth plates
- Pathological fractures
- Delayed union, nonunion
- Preop radial nerve palsy, polytrauma
Surgical technique

- 2 rigid nail types 7-8 mm: - UHN, Synthes and Russel-Taylor (34) - Smith & Nephew, Richards (30)

- 2 different techniques of proximal nail insertion: through the RC (27) or 1 cm below greater tuberosity (37)

- 2 cm incision at the fracture site: finger use reduction

- Reaming: - Minimal proximal (4 cm) - NO DISTAL (unreamed distal part)

- Proximal locking under fluoroscopy

- Mean operative time: 70 min
Important pitfalls

- Accurate measurement of nail length
- Unreamed insertion in the distal part
Important pitfalls

- As snuggly fitting as possible
- Slight impaction for 1-2 cm into triangular fossa
Postoperative protocol

- Arm suspension in an envelope sling
- Strict advise: **no external rotation** for the first 4 weeks
- 1\textsuperscript{st} postop day-4\textsuperscript{th} week: - flexion to the ipsilateral elbow as many times as possible
  - assisted forward flexion
- 5\textsuperscript{th} week-7\textsuperscript{th} week: active external rotation, muscle strengthening exercises
Results

- No infection, no postop nerve palsies
- Inappropriate length in 4 cases:
  - 1 too long: Revision by ORIF
  - 3 too short
Results

- All fractures except one united by 4-5 months
- Regain preoperative range of motion
- No additional physiotherapy required

Constant score:
- 52 excellent (81.2%)
- 8 very good (12.5%)
- 2 poor (3.1%)
Discussion

Comparative methods of treatment of proximal and middle third humeral shaft fractures

Main problems of antegrade IM
1. Violation of the rotator cuff
2. Soft tissue injury around the shoulder
3. Distal interlocking

Without distal locking technique
1. Avoid radiation - nerve palsies
2. Solid union and excellent clinical follow-up
3. Ongoing research: embiomechanical testing to ensure rotational stability and CT reconstruction humeral model
THANK YOU