Conflicts!

• Publications:
  - Rockwood and Green, Tornetta and Ricci TIFS, Tornetta and Einhorn: Subspecialty series, Court-Brown, Tornetta; Trauma, AAOS; OKU Trauma, ICL Trauma, Tornetta; Op Techn in Ortho Surg, OTA Slide project
  - Journals: JOT, Deputy editor, CORR, JAAOS, JBJS; Reviewer

• Research:
  - NIH, OTA, FOT, OREF, Aircast foundation, AIOD, Smith Nephew

• Designer
  - Smith and Nephew, Kinespring

CRPP Hip

• Indications
  - Garden 1,2
  - Physiologically young patient
  - Severe cardiopulmonary limited patient
  - Garden 3...reducible?
Garden I femoral neck fractures in patients 65 years old and older: Is conservative functional treatment a viable option?

J. M. Buord**, X. Flecher*, S. Parratte*, L. Boyer*,
J.-M. Aubaniac*, J.-H. Argenson*

- 57 Fractures
- Avg age 82
- 33% Displaced
  - Avg 10 days
- 1 Case AVN

Outcome of non-operative management in Garden I femoral neck fractures

Ma Shuqiang**, Wang Kunzheng*, Tong Zhichao*,
Zhang Mingyu*, Wang Wei*

- 115 Fractures
- 41% Displaced
- Union avg 62 yo
- Nonunion avg 73 yo

Example
A new measurement for posterior tilt predicts reoperation in undisplaced femoral neck fractures
113 consecutive patients treated by internal fixation and followed for 1 year
Henrik Palm, Kasper Greve Jørgensen, Michael Kruse-Hansen, Steffen Jacobsen, and Peter Gelbhu

• 113 Fractures
• ≥ 60 yrs old
• 14 / 25 > 20° tilt reoperated
• 12 / 88 < 20° tilt reoperated

76 Year old woman

Calcar Fixation
**Healed**

**Displaced Fractures**

- Reducible?
- Garden 3 vs 4?
- If reducible, then consider fixation
Displaced Fractures

• Reducible?

• Garden 3 vs 4?

• If reducible, then consider fixation

Reducible

Healed
FEMORAL NECK FRACTURES
165 Cases Treated by Multiple Percutaneous Pinning
H. Kofoed & A. Alberts

- Garden 3…97% Union
  - AVN 8%
- Garden 4…73% Union
  - AVN 14%

Success
- Reduction
- Reduction
- Reduction
- Posterior comminution
- Bone quality
- Position of implants

Factors Predisposing to Healing Complications
After Internal Fixation of Femoral Neck Fracture
A Stepwise Logistic Regression Analysis
Karl Akke Alberts, M.D., Ph.D., and Jacob Jerwall, M.D.

- 133 Fractures, 85 displaced
- Reduced: 155° - 185° Garden
- 2/3 screws in 2 sectors
  - Both views
  - ≤ 10mm subchondral
Factors Predisposing to Healing Complications After Internal Fixation of Femoral Neck Fracture
A Stepwise Logistic Regression Analysis

KARL AXEL ABERTS, M.D., PH.D., AND JACOB JERVALES, M.D.

- 95% Good implant if reduced
- Failure 15 / 79 vs 19 / 22!!
- G3: 8 / 24  G4: 21 / 40
- Implant 28 / 93 vs 6 / 8

Factors Predisposing to Healing Complications After Internal Fixation of Femoral Neck Fracture
A Stepwise Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Quality of Reduction</th>
<th>Position of Fixation Material</th>
<th>Predicted Probability of Healing Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>I, II</td>
<td>+</td>
<td>+</td>
<td>0.05</td>
</tr>
<tr>
<td>III</td>
<td>+</td>
<td>+</td>
<td>0.18</td>
</tr>
<tr>
<td>IV</td>
<td>+</td>
<td>+</td>
<td>0.35</td>
</tr>
<tr>
<td>L, II</td>
<td>+</td>
<td>-</td>
<td>0.39</td>
</tr>
<tr>
<td>III</td>
<td>-</td>
<td>+</td>
<td>0.77</td>
</tr>
<tr>
<td>IV</td>
<td>-</td>
<td>+</td>
<td>0.89</td>
</tr>
<tr>
<td>L, II</td>
<td>-</td>
<td>+</td>
<td>0.43</td>
</tr>
<tr>
<td>III</td>
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<td>0.91</td>
</tr>
<tr>
<td>IV</td>
<td>-</td>
<td>-</td>
<td>0.98</td>
</tr>
</tbody>
</table>

> 50% Inverted triangle
- 73% Three screws
- 80% No capsulotomy
- 87% Weightbearing
Weight Bearing Status

• Koval et al., JBJS, 1998
  ◦ 32 Elderly pts s/p ORIF hip fracture
  ◦ WBAT
  ◦ Load applied measured
    ◦ 51% at one week
    ◦ 87% at twelve weeks
  ◦ Elderly patients voluntarily protect weight bearing

How Many Screws?

• Springer et al., CORR, 1991
  ◦ Three or four 6.5mm cancellous screws
  ◦ No difference in max load to failure or stiffness
  ◦ Quality of trabecular bone of femoral neck is determining factor

How Many Screws?

• Swiontkowski et al., JOR, 1987
  ◦ Three, four or five screws
    ◦ Asnis screws
    ◦ AO/ASIF 6.5mm cancellous screws (16mm tread)
  ◦ No difference in bending or torsional stability
  ◦ Three screws sufficient
How Many Screws?
• Kauffman et al., JOT, 1999
• Three or four screws
  • Posterior comminution
  • Four screws higher resistance to axial and anterior displacement, higher axial load to failure
• Posterior comminution?

Reduction and Fixation of Displaced Intracapsular Fractures of the Proximal Femur

Ulrich Bosch, MD; Thomas Schreiber, MD; and Christian Krettek, MD
Young Vertical

Results of Internal Fixation of Pauwels Type-3 Vertical Femoral Neck Fractures
Liporace, Frank MD; Salcine, Robert MD; Collinge, Cory MD; Shaddock, George J MD

- 76 Fractures
- Screws: 19%
- Fixed angle: 8%
- AVN: 11%

Prevent Shear
Surgical Dislocation

Conclusions...
- Undisplaced...YES
- Displaced...if reducible?
- Inverted triangle
  - Calcar screw
  - Posterior cortex
  - Add fourth, post comminution?
- Failures 30%, shortening

Future: is a fixed angle device better?
Is a fixed angle device better?

Using Alternative Implants for the Surgical Treatment of Hip Fractures (The FAITH Study)

This study is currently recruiting participants.

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NIH: 1 R01 AR 046819-01A1

Thank You