Sliding Hip Screws and Nails:

What can we Learn from the Literature and the Hip Fracture Registry?

Gary Zohman MD

Learning Objectives

• Summarize Historical Events Leading up to Current Treatment of Intertrochanteric Fractures
• Summarize Literature Evidence on Treatment of Intertrochanteric Fractures with Sliding Hip Screws (SHS) versus Intramedullary Nails (IMN)
• Summarize Kaiser Experience with these Fractures based on 2009 Registry Data
• Discuss Advantages of each Treatment Approach

Summary

• SHS has been the Gold Standard for majority of Intertrochanteric Fractures since 1950s
• Prospective Randomized Trials and Meta-analyses do not support the superiority of IMN over SHS
• In USA Since 2000, IMN has been steadily increasing for this indication (Geographically and Temporally)
• Why? and what is the Practical Significance for us?
History

- SHS introduced in 1950s to replace fixed angle devices.
- It became the Gold Standard for Treatment of Intertrochanteric Fractures


N=200
Randomized to SHS versus Short Gamma Locking Nail
11% intra-op and postop femoral shaft fx with Gamma Nail

History

- In 1980’s Gamma Nail Developed by Halder
- Designed 1986 by Grosse and Kempf in Strasbourg, France. (Pioneers of locking nail technology)
History

• Despite theoretical advantages of incorporating the hip screw into an intramedullary device:
  ➢ Preventing shaft medialization
  ➢ Neutral axis implant
  ➢ Minimally invasive
  ➢ Ease of trochanteric start site

• US Market became discouraged with short nails for Hip Fractures in 1990s.

History

It came to be understood
That the SHS was great
For the MAJORITY of
Trochanteric Fractures,
But not
Necessarily for ALL of them

Kaiser 2009: 1442 Type A

A1 629
44%

A2 542
38%

A3 271
19%
History

• During this time the main Cephalomedullary implant was the Reconstruction Nail
  ➢ Long Nail
  ➢ Piriformis Start
  ➢ Far Fewer Surgeons in 90s comfortable with nailing, especially with locking into the head

History

Fracture Lines in Piriformis Fossa “Precluded” Nailing

History

• Newer Generation Cephalomedullary Nails:
  • Less Bend
  • Short and Long Options

Newer models / brands
Treatment Evolution

Long and Short nails with Trochanteric Start make Supine Nailing more pleasant

We have overcome our fear of drilling through the abductor insertion

Concept of “What is a Nailable Femur Fracture” has greatly expanded

Jeffrey O. Anglen, MD; James N. Weinstein, DO

Nail or Plate Fixation of Intertrochanteric Hip Fractures: Changing Pattern of Practice: A Review of the American Board of Orthopaedic Surgery Database


Treatment Evolution: over Time

• 1999 – 2006
• All case lists submitted by Applicants to the Oral Board Part II exam
• N = 18720 Intertrochanteric Fractures (along with complications)
• Nail Use increased from 3% in 1999 to 67% in 2006
• Highest Adoption rates in South, Southeast, and Southwest Regions
Anglen JBJS 2008: SHS vs IMN for IT fx

Treatment Evolution: over Region

Mary L. Forte, DC; Beth A. Vrign, PhD, MPH; Robert L. Kane, MD; Sara Durham, MS; Mohit Bhandari, MD, MSc, FRCSC; Roger Feldman, PhD; Marc F. Swiontkowski, MD

Geographic Variation in Device Use for Intertrochanteric Hip Fractures


- Medicare files 2000 – 2002
- All Intertroch Fractures
- N = 212,821

- IMN adopted regionally in US
  - Mountain and Southern Regions highest
  - Surgeon < 45 and Teaching Hospitals Highest

- Geographic variation unrelated to patient factors.
Question

What fraction of Permanente Surgeons treat this with a SHS?

- A) 0
- B) 25%
- C) 50%
- D) 75%
- E) 100%
Question

- What fraction of Permanente Surgeons treat this with a SHS?
  - A) 0
  - B) 25%
  - C) 50%
  - D) 75%
  - E) 100%

Answer

25%
Question

- What fraction of Permanente Surgeons treat this with a SHS?
  - A) 0
  - B) 25%
  - C) 50%
  - D) 75%
  - E) 100%

Answer

12%

Kaiser 2009

<table>
<thead>
<tr>
<th>Hip Screw</th>
<th>Nail</th>
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<tbody>
<tr>
<td>A1</td>
<td>43%</td>
</tr>
<tr>
<td>A2</td>
<td>25%</td>
</tr>
<tr>
<td>A3</td>
<td>12%</td>
</tr>
</tbody>
</table>
Evidence


- Tristan M. Barton, MBChB, MSc, Robert Gleeson, FRCS(Orth), Claire Topliss, FRCS(Orth), Rosemary Greenwood, MSc, William J. Harries, FRCS(Orth), and Timothy J.S. Chesser, FRCS(Orth), A Comparison of the Long Gamma Nail with the Sliding Hip Screw for the Treatment of AO/OTA 31-A2 fractures of the Proximal Part of the Femur, A Prospective Randomized Trial, J Bone Joint Surg Am. 2010;92:792-8

Evidence

- Cochrane Review (Parker)
- Meta-analysis of ALL randomized and quasi-randomized controlled trials to date.
  - SHS versus Gamma (22 trials, n = 3671)
  - SHS vs IMHS (5 trials, n = 623)
  - SHS vs PFN (3 trials, n = 394)
  - No differences in wound infection, LOS, mortality, or medical complications.
- Overall higher incidence of operative and late femur fx with intramedullary implants.

Evidence

- Norris

- 13,568 patients from 89 studies, focusing on the incidence of post operative secondary femoral shaft fracture following the use of intramedullary nails in the fixation of trochanteric hip fractures.

- The overall reported incidence of secondary fracture around the nail was 1.7%.
- (Incidence after SHS is 0.1%)
Evidence

- Barton
- Prospective Randomized Trial comparing SHS to Long IMN
- N = 210
- Primary outcome measure was reoperation within the first postoperative year.
- Secondary measures included mortality, LOS, transfusion rate, change in mobility and residence, and quality measured with the EuroQol 5D outcome score.
- No Differences

Evidence

- No data support the routine use of IMN in the treatment of stable Intertrochanteric Fractures

Evidence

- Randomized trials do not support the use of SHS for a subset of pertrochanteric fractures: those with an unstable, reverse oblique pattern, and transverse intertrochanteric fractures (A3)
Evidence

• There is modest support in the literature for the use of IMN to treat intertrochanteric fractures with subtrochanteric extension

Evidence

• Despite changes in design, IMNs continue to be associated with a small risk of iatrogenic femoral shaft fracture both intraoperatively and for many months postoperatively

Why?

• Training Programs / Intrinsic Attraction to New Technology
• Marketing to Surgeons
• Simplification for OR Staff
• Fear of failure of SHS
• Reimbursement
• Desire to Stabilize the Entire Femur
• Possible Undetected Extension of Fracture into Shaft
• Possible Conversion of A1 into A3
Why?

- Training Programs / Intrinsic Attraction to New Technology
- Marketing to Surgeons

Why?

- Simplification for OR Staff

Why

- Fear of failure of SHS In certain fractures
Why?

• Reimbursement: 27244 vs 27245
  ($272)

Why?

• Possible Undetected Extension of Fracture into Shaft

Why?

• Possible Conversion of A1 into A3
  ➢ May occur intraoperatively or postoperatively if undetected fracture lines are present at site of insertion of hip screw
  ➢ Fracture which originally appeared stable, then becomes a reverse obliquity and begins to collapse
Why?

- Desire to Stabilize the Entire Femur
  - Treat all osteoporotic Fractures as “pathologic”
  - Avoid potential reoperation or revision of implants
  - Some now use cephalomedullary nails routinely for all femur fractures

Practical Significance

- If the price were the same, would we be talking about this?
  - $1582
  - $1902
  - $687

- In 2009 the calculated total cost of implants (SHS + Short + Long IMN) we used was $1.60M
<table>
<thead>
<tr>
<th>SHS for All A1 &amp; A2</th>
<th>IMN for All A1 &amp; A2</th>
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<tbody>
<tr>
<td>$1750 per implant</td>
<td>$2.05M</td>
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<tr>
<td>$687 per implant</td>
<td>$0.80M</td>
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<td>N = 1171</td>
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Bibliography

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M.J. Parker and H.H. Handoll

Norris R, Bhattacharjee D, Parker MJ

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