INTERTROCHANTERIC FEMUR FRACTURES

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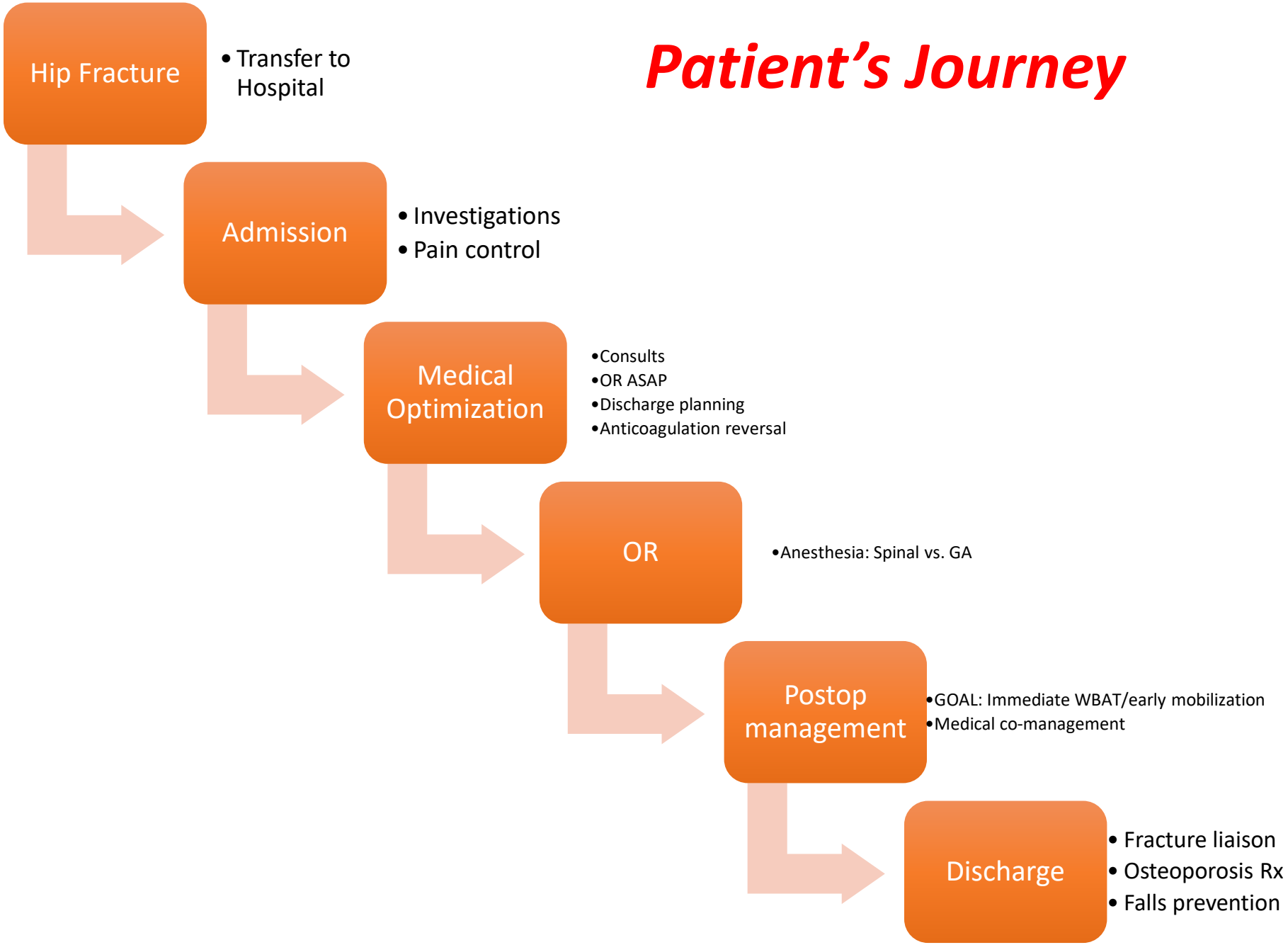
Assistant Professor

University of Vermont Medical Center

Objectives

- **Preoperative considerations**
- **Classification**
  - **Stable vs. Unstable fractures**
- **Implant choice**
- **Intraoperative considerations**
- **Postoperative management**

Patient's Journey



Standardized care pathway is key!

- NPO
- Medicine co-management
- Multimodal analgesia (avoid opioids)
- Delirium prevention
- Medication reconciliation
- Anticoagulation reversal
- Preoperative Thromboprophylaxis (Heparin/LMWH)
- DM – Glucose control

JAMA | Original Investigation

Association Between Wait Time and 30-Day Mortality in Adults Undergoing Hip Fracture Surgery

Daniel Pincus, MD; Bheeshma Ravi, MD, PhD; David Wasserstein, MD, MSc; Anjie Huang, MSc; J. Michael Paterson, MSc; Avery B. Nathens, MD, MPH, PhD; Hans J. Kreder, MD, MPH; Richard J. Jenkinson, MD, MSc; Walter P. Wodchis, PhD

- 42,230 patients with hip fractures
- Overall 30 day mortality 7%
- The risk of complications and 30-day mortality increased when wait times >24 hrs

CONCLUSIONS AND RELEVANCE Among adults undergoing hip fracture surgery, increased wait time was associated with a greater risk of 30-day mortality and other complications. A wait time of 24 hours may represent a threshold defining higher risk.

The Contentious Transthoracic Echocardiography

- 2014 ACC/AHA CPG's on perioperative cardiovascular evaluation & management of patients undergoing noncardiac surgery
  - Routine evaluation of left ventricular function isn't recommended except for new or worsening heart failure
  - Stress testing is only recommended if it will lead to intervention that will change management
  - Despite these guidelines, echocardiography, and pharmacological stress testing are often part of the preoperative evaluation
    - Can lead to a significant surgical delay

ORIGINAL INVESTIGATION

Impact of a Comanaged Geriatric Fracture Center on Short-term Hip Fracture Outcomes

Susan M. Friedman, MD, MPH; Daniel A. Mendelson, MD, MS; Karilee W. Bingham, RN, BS; Stephen L. Kates, MD

- Compared hip fracture outcomes at 2 hospitals
- Same orthopedic and anesthesia departments
- At one hospital, 193 hip fracture patients admitted to an orthopedic-geriatric comanagement service
- 121 patients at the other hospital continued to receive usual care
- Patients admitted for comanagement were older, had more comorbidities & dementia, and less likely to dwell in the community
- **Patients in the comanaged group were operated on sooner, had fewer infections, fewer overall complications and shorter lengths of stay**

Arch Intern Med. 2009;169(18):1712-1717

- *“Hip fracture care that incorporates comanagement by a geriatrician and orthopedic surgeon, standardized protocols, and a total quality management approach leads to improved processes and clinical outcomes”*

Is there a role for non operative treatment?

- **Extremely limited!**

Cannada LK, Mears SC, Quatman C. Clinical Faceoff: When Should Patients 65 Years of Age and Older Have Surgery for Hip Fractures, and When is it a Bad Idea? Clin Orthop Relat Res. 2021 Jan 1;479(1):24-27

Nonoperative Geriatric Hip Fracture Treatment Is Associated With Increased Mortality: A Matched Cohort Study

Jesse D. Chlebeck, MD, Christopher E. Birch, MD,† Michael Blankstein, MD,‡ Thomas Kristiansen, MD,‡ Craig S. Bartlett, MD,‡ and Patrick C. Schottel, MD‡*

- Retrospective review of hip fracture patients treated 2004 to 2012
- 231 study patients - 154 operative & 77 nonoperative patients
- 2:1 matched pairing for factors associated with increased mortality
- No significant differences among age, sex, fracture location, Charlson Comorbidity Index, preinjury living location, dementia, & cardiac arrhythmia

- Nonoperatively treated hip fracture patients had an **84.4% 1-year** mortality that was significantly higher than a matched operative cohort

- Bleak overall prognosis for nonoperatively treated geriatric hip fractures

What if the intertrochanteric fracture is occult and nondisplaced?

ORTHOPAEDIC SURGERY

MRI-only occult geriatric hip fractures: is displacement common with nonoperative treatment?

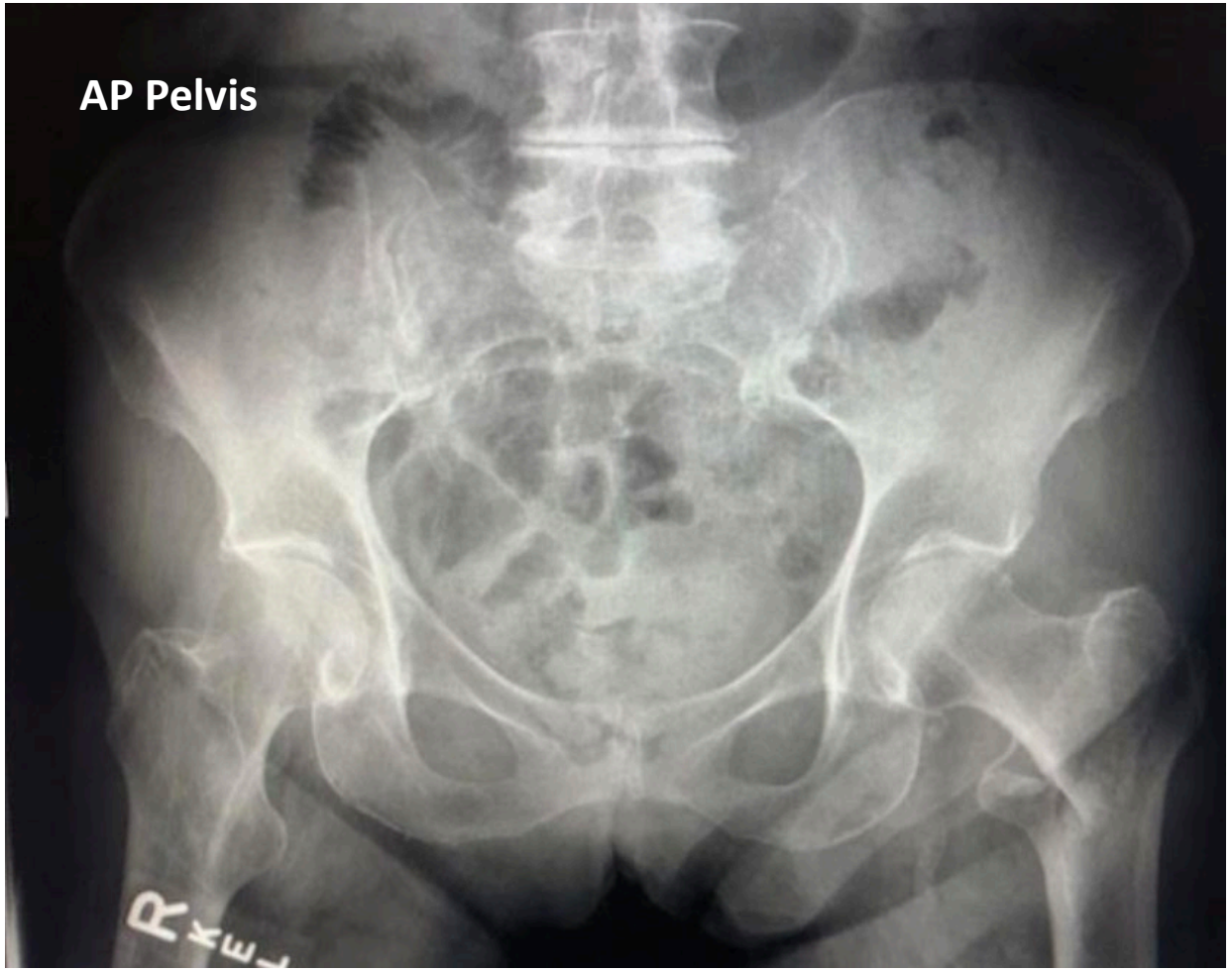
Ryan Caldwell[1] · Michael Blankstein[1] · Craig S. Bartlett[1] · Patrick C. Schottel[1]

Methods: All nonoperatively treated femoral neck or intertrochanteric femur fractures (AO/OTA 31A and 31B) from 2003 to 2018 were identified. Patients >65 years with negative radiographs but a hip fracture evident on MRI were included

Conclusion: Thirty-three percent (2/6, 33%) of femoral neck fractures displaced and required surgery. The remainder of the cohort (13/15, 87%) healed without complication, including all of the intertrochanteric fractures (9/9, 100%). The results may better inform treatment discussions for geriatric patients with occult hip fractures diagnosed by MRI

Archives of Orthopaedic and Trauma Surgery. June 8 2020

Radiographs



Personal x-rays

Intertrochanteric fractures

- Extracapsular!
  - Good healing potential

- **Stable**: will resist medial compressive loads once reduced

- **Unstable**: will collapse into varus or shaft will displace medially

AO/OTA Fracture and Dislocation Classification Compendium—2018

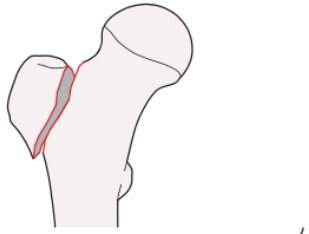
31A

Type: Femur, proximal end segment, **trochanteric region fracture** 31A

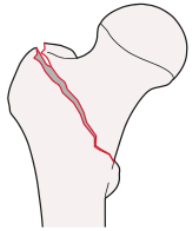
Group: Femur, proximal end segment, trochanteric region, **simple pertrochanteric fracture** 31A1

Subgroups:

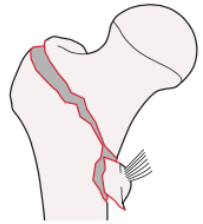
Isolated single trochanter fracture
31A1.1*



Two-part fracture
31A1.2



Lateral wall intact (>20.5 mm) fracture
31A1.3

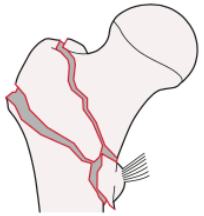


*Qualifications:
n **Greater trochanter**
o Lesser trochanter

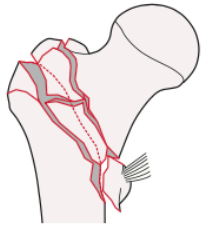
Group: Femur, proximal end segment, trochanteric region, **multifragmentary pertrochanteric, lateral wall incompetent (≤ 20.5 mm) fracture** 31A2

Subgroups:

With 1 intermediate fragment
31A2.2



With 2 or more intermediate fragments
31A2.3

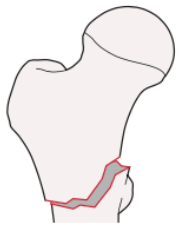


→ For more information about calculating the lateral wall thickness, please refer to the Appendix.

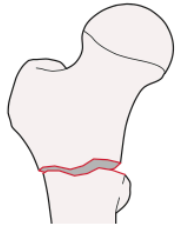
Group: Femur, proximal end segment, trochanteric region, **intertrochanteric (reverse obliquity) fracture** 31A3

Subgroups:

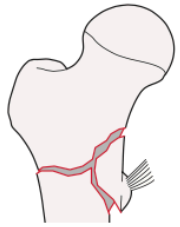
Simple oblique fracture
31A3.1



Simple transverse fracture
31A3.2



Wedge or multifragmentary fracture
31A3.3

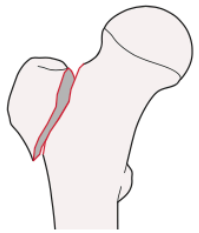


31A

Type: Femur, proximal end segment, **trochanteric region fracture** 31A

Group: Femur, proximal end segment

Subgroups:
Isolated single trochanter fracture
31A1.1*



*Qualifications:
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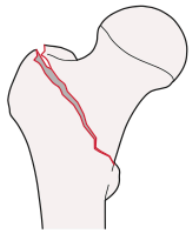
Two-part fracture
31A1.2



Lateral wall intact (>20.5 mm) fracture
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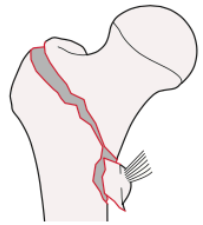
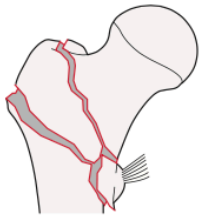


STABLE

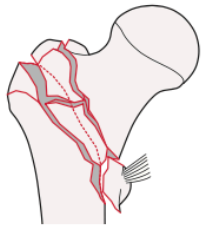
Group: Femur, proximal end segment, trochanteric region, **multifragmentary pertrochanteric, lateral wall incompetent (≤ 20.5 mm) fracture** 31A2

Subgroups:

With 1 intermediate fragment
31A2.2



With 2 or more intermediate fragments
31A2.3



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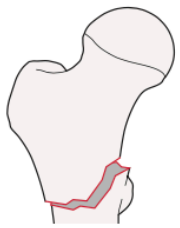
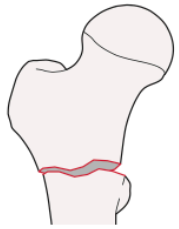
Subgroups:
Simple oblique fracture
31A3.1



Simple transverse fracture
31A3.2



Wedge or multifragmentary fracture
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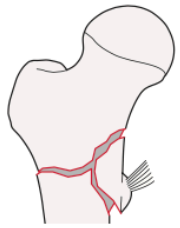

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Isolated single trochanter fracture
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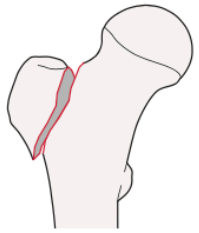

Two-part fracture
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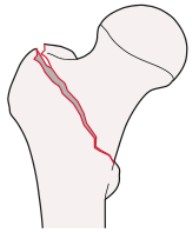

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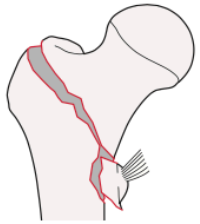

*Qualifications:
- **Greater trochanter**

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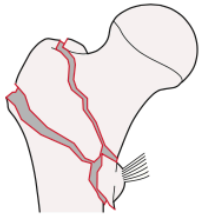

With 2 or more intermediate fragments
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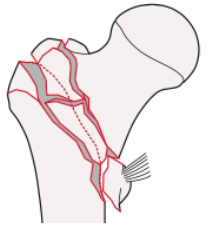

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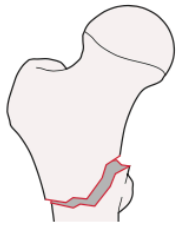

Simple transverse fracture
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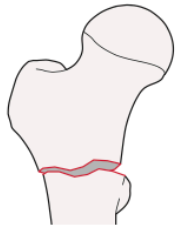
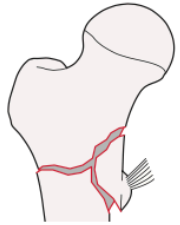


Wedge or multifragmentary fracture
31A3.3



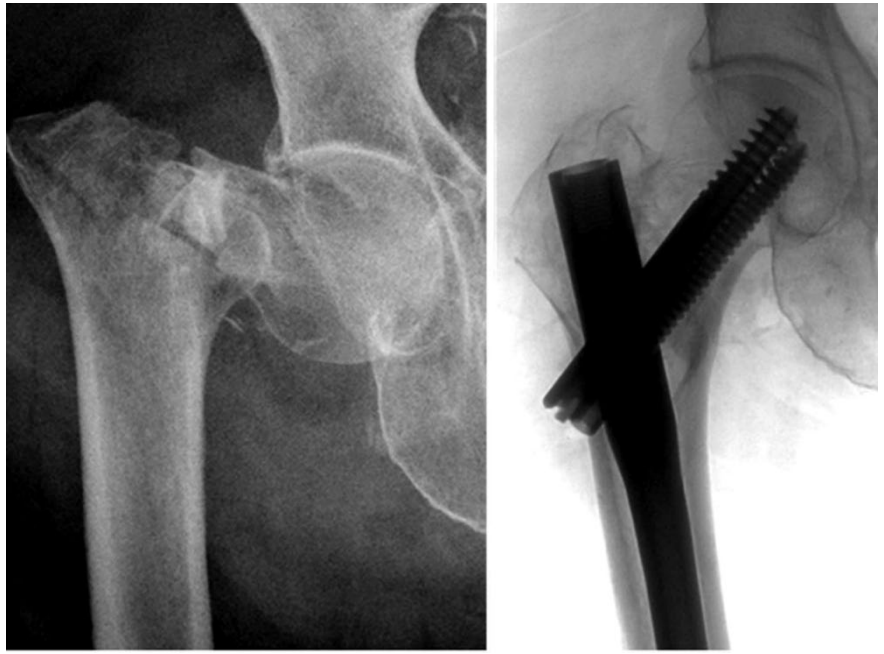
Fracture stability has significant implication on surgical management

UNSTABLE

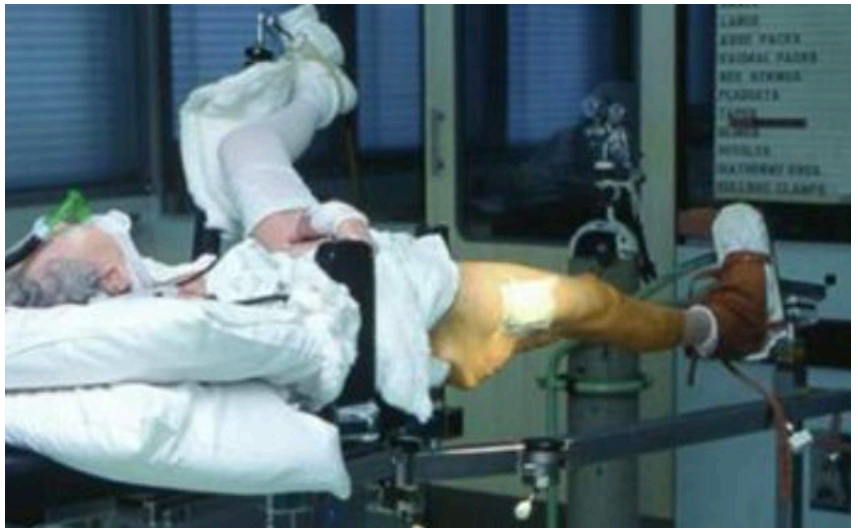
Surgical Goals

- Obtain neck-shaft axial alignment and correct translation
- Anatomic reduction of intermediate fragments is unnecessary

- Surgeon should focus on:
  - Getting Patient to OR ASAP
  - Ideal Implant Selection
  - Obtaining Good Reduction
  - Proper Implant Application



Closed reduction maneuver for IT fractures
- often successful



Traction, Internal Rotation, Adduction

*Image from Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019

Reduction Aids

- Traction (err on the side of valgus)
- Crutch when using fracture table (posterior sag)
- Ball spiked pusher
- Bone hook
- Clamps

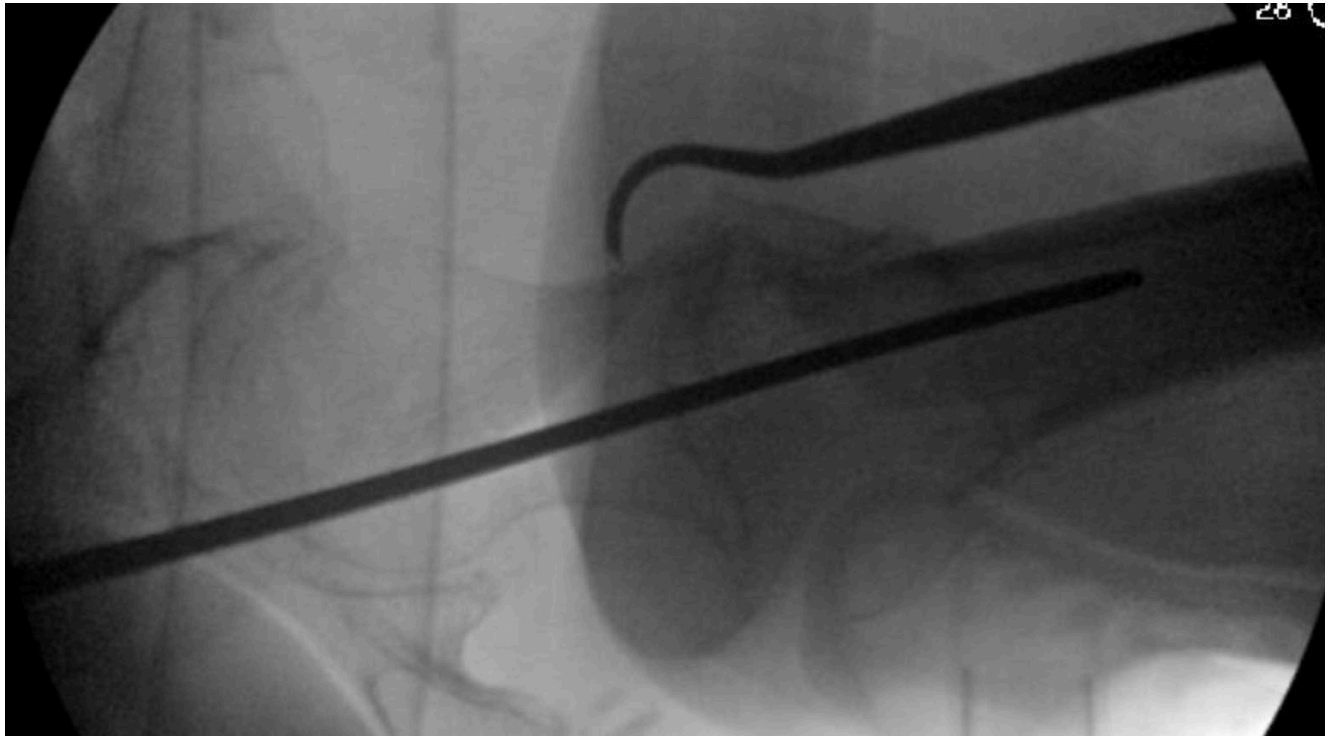
Implant Choices

- Dynamic/Compression/Sliding hip screw (SHS)
- Cephalomedullary nail (CMN) – short vs. long
- 95 degree blade plate (rarely used)

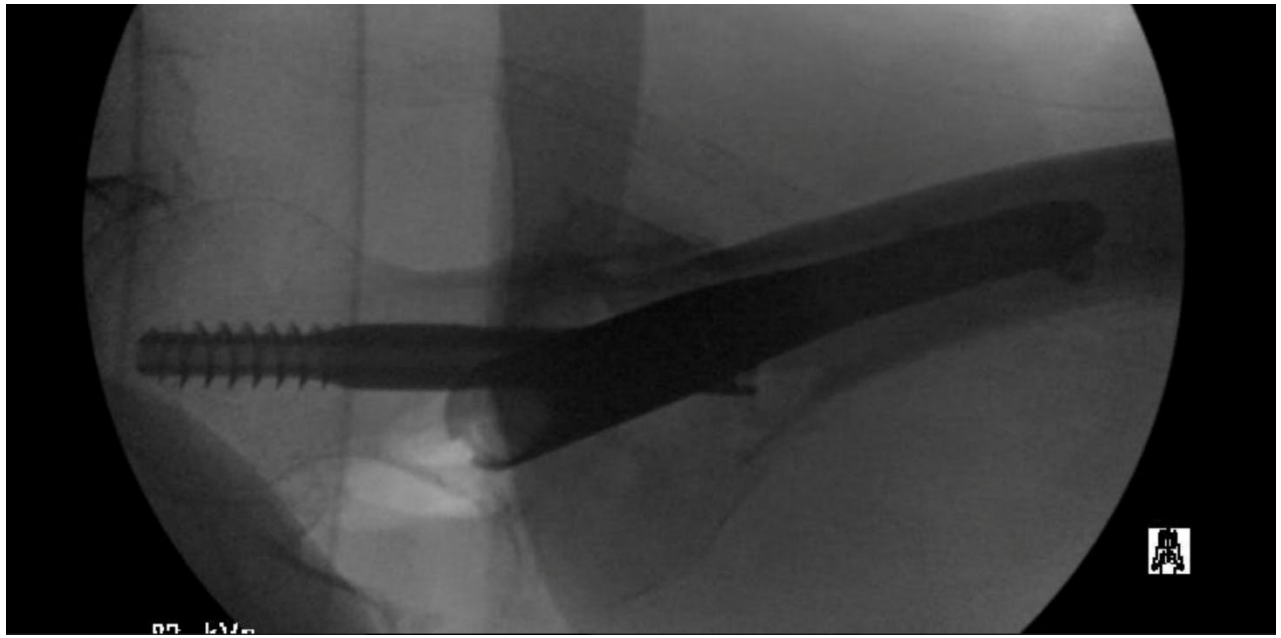
- SHS and CMNs allow for fixed angle controlled collapse (shortening at fracture site)

My Case – 82F, low energy fall

Intraoperative Reduction



Implant Application



4 Weeks Post Op

Nail or Plate Fixation of Intertrochanteric Hip Fractures: Changing Pattern of Practice

A Review of the American Board of Orthopaedic Surgery Database

By Jeffrey O. Anglen, MD, and James N. Weinstein, DO, on Behalf of the American Board of Orthopaedic Surgery Research Committee

Trends demonstrate significant decline of SHS utilization with the usage of Nails on the rise

Conclusions: From 1999 to 2006, a dramatic change in surgeon preference for the fixation device used for the treatment of intertrochanteric fractures has occurred among young orthopaedic surgeons. This change has occurred despite a lack of evidence in the literature supporting the change and in the face of the potential for more complications.

Clin Orthop Relat Res (2015) 473:3647–3655
DOI 10.1007/s11999-015-4469-5

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

CLINICAL RESEARCH

Which Fixation Device is Preferred for Surgical Treatment of Intertrochanteric Hip Fractures in the United States? A Survey of Orthopaedic Surgeons

Emily Niu MD, Arthur Yang MS, Alex H. S. Harris PhD, Julius Bishop MD

- Surveys distributed to active AAOS members
- 37% response rate (3784)
- Despite the fact that sliding hip screw & cephalomedullary nail fixation are associated with equivalent outcomes for most intertrochanteric fractures, nail is the preferred construct
- Surgeons believe nails are easier, associated with improved outcomes, or biomechanically superior to a sliding hip screw

Advantages of Intramedullary Fixation over SHS

- Load-sharing device
- Intramedullary Buttress
  - Nail resists excessive fracture collapse and medialization
- Nail more closely located to the axis of weight-bearing than SHS

Intramedullary Versus Extramedullary Fixation for Unstable Intertrochanteric Fractures

A Prospective Randomized Controlled Trial

Rudolf Reindl, MD, FRCSC, Edward J. Harvey, MD, FRCSC, Gregory K. Berry, MD, FRCSC, and Elham Rahme, PhD, on behalf of the Canadian Orthopaedic Trauma Society (COTS)

- 80 SHS and 87 CMN
- AO/OTA 31-A2 (unstable)
- No significant differences noted between intramedullary and extramedullary fixation
- Intramedullary treatment had less femoral neck shortening
- While the use of the intramedullary devices led to better radiographic outcomes, this did not translate to improved functional outcomes

J Bone Joint Surg Am. 2015 Dec 2;97(23):1905-12

Integrity of the Lateral Femoral Wall in Intertrochanteric Hip Fractures: An Important Predictor of a Reoperation

By Henrik Palm, MD, Steffen Jacobsen, MD, Stig Sonne-Holm, MD, DMSc, and Peter Gebuhr, MD, on behalf of the Hip Fracture Study Group

Investigation performed at the Department of Orthopaedic Surgery, Copenhagen University Hospital of Hvidovre, Hvidovre, Denmark

A postoperative fracture of the lateral femoral wall is the main predictor for a reoperation following an intertrochanteric fracture

Patients with fracture of the lateral femoral wall should not be treated with a sliding/compression hip-screw

J Bone Joint Surg Am. 2007 Mar;89(3):470-5

Perioperative Lateral Trochanteric Wall Fractures: Sliding Hip Screw versus Percutaneous Compression Plate for Intertrochanteric Hip Fractures

Joshua Langford, MD, Gita Pillai, MD,† Anthony D. Ugliailoro, MD,‡ and Edward Yang, MD†*

J Orthop Trauma • Volume 25, Number 4, April 2011

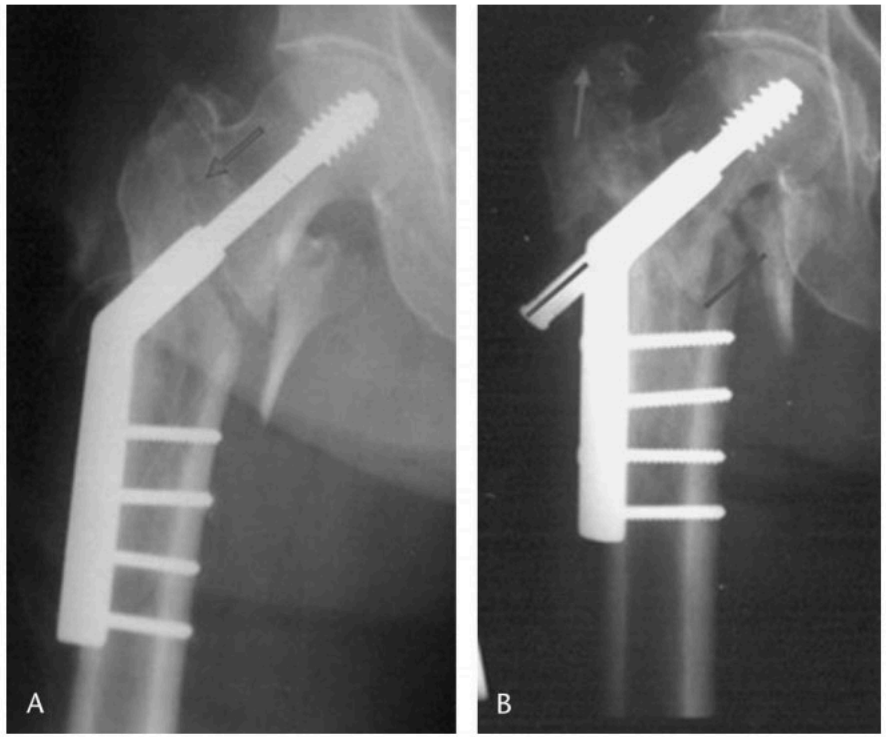


FIGURE 5. (A) Sliding hip screw (SHS) placed in the appropriate position. (B) SHS from A postoperatively goes onto lateral wall fracture, uncontrolled collapse, and medialization of the shaft.

Standard versus reverse obliquity

Reverse Oblique and Transverse Intertrochanteric Femoral Fractures Treated With the Long Cephalomedullary Nail

Kaan Irgit, MD, Raveesh D. Richard, MD,† Michael J. Beebe, MD,‡ Thomas R. Bowen, MD,† Erik Kubiak, MD,‡ and Daniel S. Horwitz, MD†*

Long cephalomedullary nails remain the preferred treatment option for the treatment of 31-A3 intertrochanteric fractures, demonstrating acceptable complication rates, low reoperation rates, and high rates of healing

J Orthop Trauma • Volume 29, Number 9, September 2015

Is the Best Plate a Nail? A Review of 3230 Unstable Intertrochanteric Fractures of the Proximal Femur

Adam Tucker, MB BCh BAO, MRCS, MPhil, Kevin J. Donnelly, MB BCh BAO, MRCS,**
*Clare Rowan, FRCS (Tr+Orth),† Sinead McDonald, RGN, PgDip,‡ and Andrew P. Foster, FRCS (Tr+Orth)**

(*J Orthop Trauma* 2018;32:53–60)

- Multicenter National Prospective Cohort Study
- 2474 SHS, 158 SHS + Trochanteric Stabilization Plate (TSP) and 598 CMNs

- TSP provides an intact lateral buttress for the SHS, thereby reducing the risk of medial migration of the shaft and subsequent failure
- For unstable proximal femur fractures, the authors recommend the use of CMN or SHS + TSP

Indications for cephalomedullary nailing – unstable fractures!

- General consensus:
  - Greater trochanter lateral wall fracture
  - Significant Posteromedial comminution
  - Reverse obliquity
  - Subtrochanteric extension

Remember….SHS works very well when treating stable IT fractures!

AAOS
American Academy of Orthopaedic Surgeons

MANAGEMENT OF HIP FRACTURES IN THE ELDERLY

EVIDENCE- BASED CLINICAL PRACTICE GUIDELINE

STABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports the use of either a sliding hip screw or a cephalomedullary device in patients with stable intertrochanteric fractures.

Strength of Recommendation: Moderate ★★★☆

Description: Evidence from two or more "Moderate" strength studies with consistent findings, or evidence from a single "High" quality study for recommending for or against the intervention.

SUBTROCHANTERIC OR REVERSE OBLIQUITY FRACTURES

Strong evidence supports using a cephalomedullary device for the treatment of patients with subtrochanteric or reverse obliquity fractures.

Strength of Recommendation: Strong ★★★★

Description: Evidence from two or more "High" strength studies with consistent findings for recommending for or against the intervention.

UNSTABLE INTERTROCHANTERIC FRACTURES

Moderate evidence supports using a cephalomedullary device for the treatment of patients with unstable intertrochanteric fractures.

Strength of Recommendation: Moderate ★★★☆

NICE National Institute for Health and Care Excellence

Hip fracture: management

Clinical guideline [CG124] Published date: June 2011 Last updated: May 2017

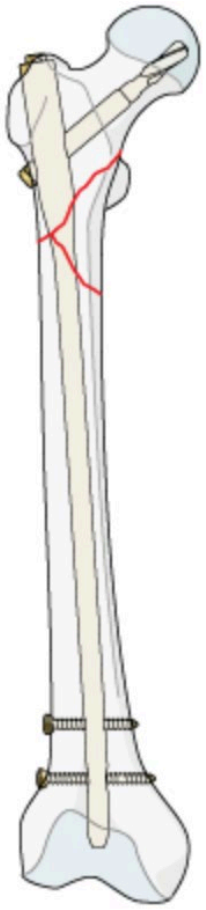
1.6.7 Use extramedullary implants such as a sliding hip screw in preference to an intramedullary nail in patients with trochanteric fractures above and including the lesser trochanter (AO classification types A1 and A2). **[2011]**

1.6.8 Use an intramedullary nail to treat patients with a subtrochanteric fracture. **[2011]**

Long Nail

- <u>Advantages:</u>
- Protection of the entire femoral shaft
- Ideal with diaphyseal fracture extension

- <u>Disadvantages:</u>
- Increased cost
- Longer OR
- Inc Blood loss
- Free-hand distal locking
- Possible mismatch to bow to femur



Short Nail

- <u>Advantages:</u>
- Easier to use
- Targeted locking bolts through the insertion jig
- Decreased operative time and blood loss
- Cheaper

- <u>Disadvantages:</u>
- Older designs had a high rate of periprosthetic femoral shaft fractures
  - Large diameter, rigid, stainless steel implants, with large locking bolts at the distal tip of the nail (stress riser)

Radius of curvature

- Modern nails have lower radius of curvature of 1-1.5 meters

The influence of entry point and radius of curvature on femoral intramedullary nail position in the distal femur

Andrew J. Kanawati, Bob Jang, Richard McGee, Jai Sungaran*

Department of Orthopaedic Surgery Concord Hospital, Hospital Road, Concord, NSW, Australia

Costs and Complications of Short Versus Long Cephalomedullary Nailing of OTA 31-A2 Proximal Femur Fractures in U.S. Veterans

Henry Krigbaum, MD, Steven Takemoto, PhD, Hubert T. Kim, MD, PhD, and Alfred C. Kuo, MD, PhD

262 patients with OTA 31-A2 pertrochanteric fractures

125 treated with short CMNs and 137 treated with long CMNs

No significant differences in complications, readmissions, failures or death

Conclusions: In a cohort of patients with similar characteristics and fracture patterns, the use of long CMNs was associated with similar rates of complications, readmission, and reoperations, but significantly higher costs than with the use of short nails.

JOT 2016;30:125-129

Short Versus Long Intramedullary Nails in the Treatment of Pertrochanteric Hip Fractures: Incidence of Ipsilateral Fractures and Costs Associated With Each Implant

Eric Lindvall, DO, Samia Ghaffar, MD, Armen Martirosian, MD, and Lisa Husak, MPH

610 hip fractures: 171 short CMN and 439 Long CMN

Approximately ½ of nails in both groups were not distally locked

SIMN group showed a higher incidence of refracture than the LIMN (not statistically significant)

Union rates were equivalent between groups and averaged over 97%

15 of the 16 refractures occurred in nails that were not distally locked

No differences in overall costs were seen between SIMNs and LIMNs

Distal locking seems to protect against femur fractures and may also affect the refracture location when using LIMNs

JOT 2016;30:119-124

Short Versus Long Cephalomedullary Nails for Pertrochanteric Hip Fractures: A Randomized Prospective Study

Steven F. Shannon, MD, Brandon J. Yuan, MD, William W. Cross III, MD, Jonathan D. Barlow, MD, Michael E. Torchia, MD, Pamela K. Holte, CNP, and Stephen A. Sems, MD

- 168 patients with intertrochanteric fractures
- Prospectively randomized to Short or Long Cephalomedullary Nail fixation

- Comparable functional outcomes
- No difference in peri-implant fracture or lag-screw cutout
- Short nails tolerated up to 3 cm of subtrochanteric extension

JOT 2019 Oct;33(10):480-486

Outcomes of Low-Energy Basicervical Proximal Femoral Fractures Treated with Cephalomedullary Fixation

Scott T. Watson, MD, Thomas M. Schaller, MD, Stephanie L. Tanner, MS, John David Adams, MD, and Kyle J. Jeray, MD

Investigation performed at the Department of Orthopaedic Surgery, Greenville Health System, Greenville, South Carolina

Basicervical fractures strictly defined as 2-part fractures at the base of the femoral neck and exit above the LT

Retrospective review of 11 patients with a basicervical fracture treated with a CMN

6 /11 had failure of the fixation. All 6 of these patients had an acceptable tip-apex distance and alignment.

CMN may be inadequate fixation for this specific fracture pattern!

J Bone Joint Surg Am 2016 Jul 6;98(13):1097-102

Despite our best efforts… Screw cut-out is still a problem!

- Up to 8-15% in some series
- Implant vs. technique vs. bone problem?

- How can we best achieve stable fixation of elderly osteoporotic hip fractures?

The Value of the Tip-Apex Distance in Predicting Failure of Fixation of Peritrochanteric Fractures of the Hip*

BY MICHAEL R. BAUMGAERTNER, M.D.†, STEPHEN L. CURTIN, M.D.†, DIETER M. LINDSKOG, B.A.†, AND JOHN M. KEGGI, M.D.‡, NEW HAVEN, CONNECTICUT

Investigation performed at the Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven

TAP <25mm

Subchondral Bone

J Bone Joint Surg Am. 1995 Jul;77(7):1058-64

J Orthop Sci (2013) 18:592–598
DOI 10.1007/s00776-013-0402-5

ORIGINAL ARTICLE

Tip to apex distance in femoral intertrochanteric fractures: a systematic review

Jorge Rubio-Avila · Kim Madden · Nicole Simunovic · Mohit Bhandari

Conclusion Tip–apex distance is an important concept in relation to cut-out failure of hip fracture fixation surgery. Surgeons should understand and apply the concept of TAD to improve outcomes for their patients.

Tip-apex distance of intramedullary devices as a predictor of cut-out failure in the treatment of peritrochanteric elderly hip fractures

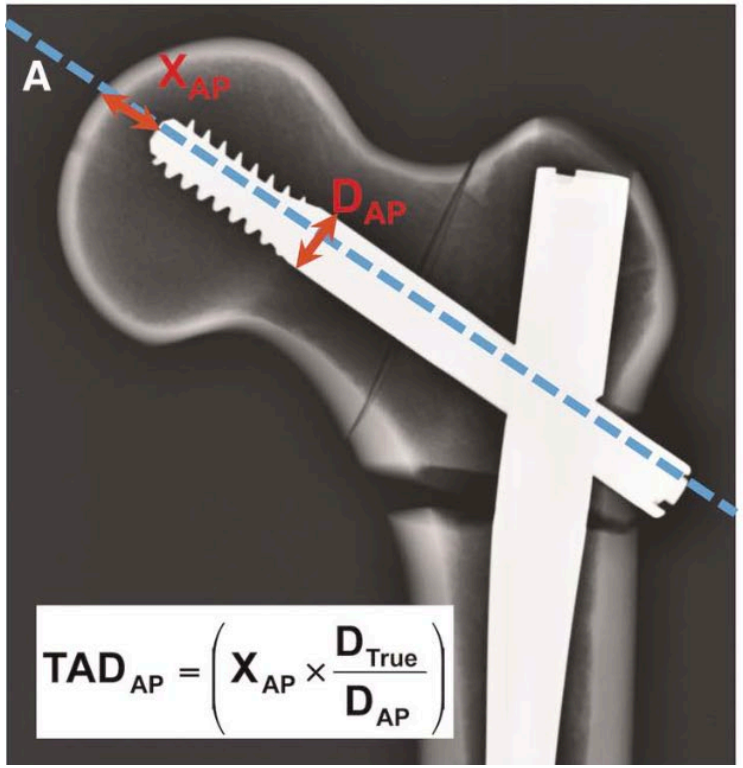
Jeffrey A. Geller · Comron Saifi · Todd A. Morrison · William Macaulay

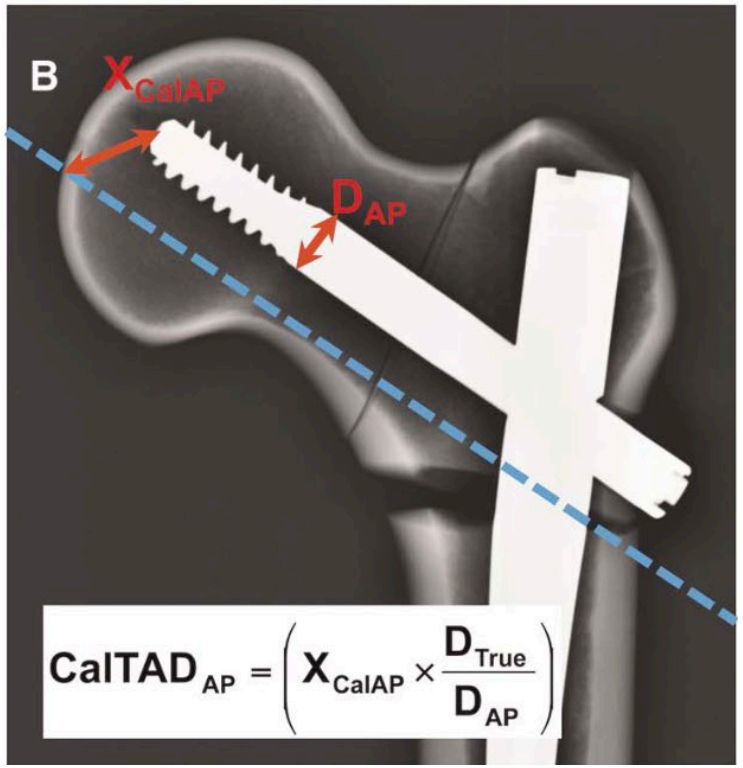
- IM devices are susceptible to cut-out at TAD >25 mm
- Hence, surgeons should strive for a TAD <25 mm when using IM devices, especially in the treatment of comminuted intertrochanteric hip fractures to help avoid lag screw cut-out

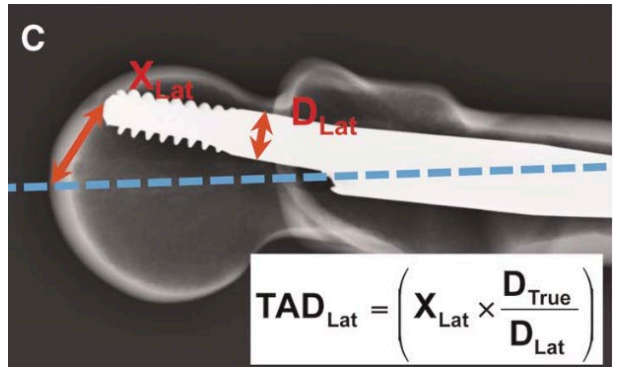
Int Orthop 2010 Jun;34(5):719-22

Femoral Head Lag Screw Position for Cephalomedullary Nails: A Biomechanical Analysis

Paul R. T. Kuzyk, BSc(Eng), MASc, MD, FRCS(C), Rad Zdero, PhD,†‡ Suraj Shah, MEng Candidate,†‡ Michael Olsen, PhD,† James P. Waddell, MD, FRCS(C),* and Emil H. Schemitsch, MD, FRCS(C)*†*







Calcar referenced TAD

JOT 2012 Jul;26(7):414-21

Conclusions: The inferior lag screw position produced the highest axial and torsional stiffness. Anterior and posterior lag screw positions produced the lowest stiffnesses and load-to-failure. Inferior placement of the lag screw on the anteroposterior radiograph and central placement on the lateral radiographs is recommended.

■ HIP

Predictors of failure for cephalomedullary nailing of proximal femoral fractures

Retrospective review of 170 fractures treated with cephalomedullary nailing

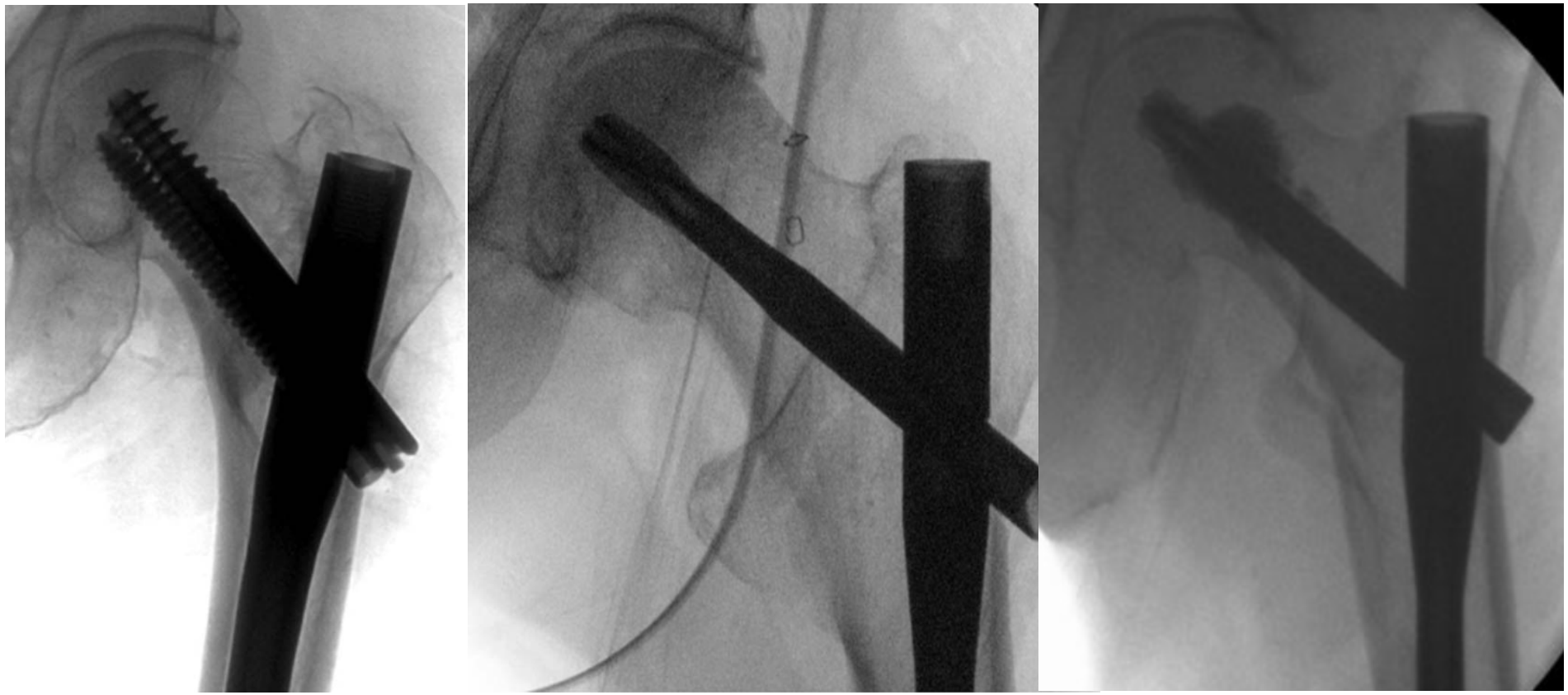
Our data provide the first reported clinical evidence that CalTAD is a predictor of cut-out. The finding of CalTAD as the only significant parameter in the multivariate analysis, along with the univariate significance of Parker's ratio index in the AP view, suggest that inferior placement of the lag screw is preferable to reduce the rate of cut-out.

Disadvantages of the Lag Screw:

- Femoral head rotation during insertion
- Poor rotational control
- Requirement of bone removal prior to screw placement
- Loss of fixation with osteoporotic bone

Can we get even better fixation?

- Newer implant designs or fixation techniques



Personal images

Helical Blade Rationale

- Hypothesized to have better anchorage by compaction of trabecular bone during blade insertion with rotational control
- Does not require over-drilling, which effectively retains cancellous bone
- Several biomechanical studies suggest that helical blades may have higher cut-out resistance

International Orthopaedics (SICOT) (2011) 35:1855–1861
DOI 10.1007/s00264-011-1232-8

ORIGINAL PAPER

Prospective randomised study comparing screw versus helical blade in the treatment of low-energy trochanteric fractures

Richard Stern · Anne Lübbeke · Domizio Suva · Hermes Miozzari · Pierre Hoffmeyer

- 172 screws and 163 blades
- No difference in cut-out rates
- Both the screw and blade performed equally well with both the sliding hip screws or IM nails
- TAD was most important factor in avoiding cut-out

Eur J Orthop Surg Traumatol (2014) 24:1461–1468
DOI 10.1007/s00590-014-1429-9

ORIGINAL ARTICLE

Is helical blade superior to screw design in terms of cut-out rate for elderly trochanteric fractures? A meta-analysis of randomized controlled trials

Xiao Huang · Frankie Leung · Ming Liu · Long Chen · Zhao Xu · Zhou Xiang

- Outcomes related to cut-out, other complications and post-operative function were similar between the blade and screw groups

Radiographic Review of Helical Blade Versus Lag Screw Fixation for Cephalomedullary Nailing of Low-Energy Peritrochanteric Femur Fractures: There is a Difference in Cutout

Lorraine C. Stern, MD, John T. Gorczyca, MD,† Stephen Kates, MD,‡ John Ketz, MD,† Gillian Soles, MD,† and Catherine A. Humphrey, MD†*

- Retrospective radiographic review of 362 patients
- Average age 83, mostly women
- Cephalomedullary nails with blade or single lag screw
- 22 cutouts →15% of helical blades and only 3.0% of lag screws (P = 0.0001)
- Average TAD significantly greater for patients who experienced cut-out both for blades and screws

The Utility of the Tip–Apex Distance in Predicting Axial Migration and Cutout With the Trochanteric Fixation Nail System Helical Blade

Stephen A. Flores, MD, Adam Woolridge, MD, MPH, Cyrus Caroom, MD, and Mark Jenkins, MD

Retrospective review of 258 patients treated with helical blade

Unique mode of failure→ Cut-through!

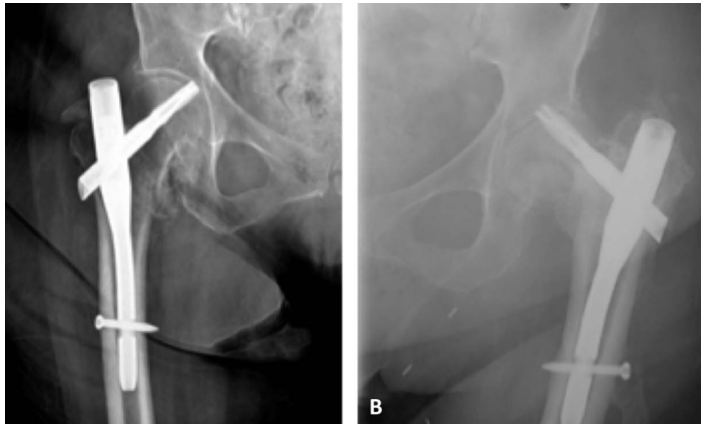
Conclusions: A TAD <20 mm was associated with an increased frequency of axial migration and cutout with the TFN helical blade.

J Orthop Trauma 2016 Jun;30(6):e207-11

Helical Blade Versus Screw Fixation in the Treatment of Hip Fractures With Cephalomedullary Devices: Incidence of Failure and Atypical "Medial Cutout"

Talia Chapman, MD, Benjamin Zmistowski, MD,* James Krieg, MD,† Seth Stake, BS,* Christopher M. Jones, MD,†‡ and Eric Levicoff, MD†‡*

- Retrospective review
- Trochanteric Fixation Nail with either blade or screw
- There were no failures in the screw group compared with 10% failure rate in the blade group (P = 0.02)
- Mode of failure - lateral migration of the femoral head with protrusion of the helical blade
- Of the 126 total cases, there were 7 cases of failed fixation (5.6%) - all helical blades



JOT 2018 Aug;32(8):397-402

Cement Augmentation

- Enhanced fixation via Cement bone interdigitation
- Aims to resist cut-out
- Cement does not act as void filler
- Augmentation away from fracture
- Biomechanically superior
- Safety studies performed

Depuy Synthes
Permission to use image given

Standardised cement augmentation of the PFNA using a perforated blade: A new technique and preliminary clinical results. A prospective multicentre trial

C. Kammerlander [a,*], F. Gebhard [b], C. Meier [c], A. Lenich [d], W. Linhart [e], B. Clasbrummel [f], T. Neubauer-Gartzke [g], M. Garcia-Alonso [h], T. Pavelka [i], M. Blauth [a]

- Contrast dye before cement use to rule out articular penetration

Injury 2011 Dec;42(12):1484-90

Long-term results of the augmented PFNA: a prospective multicenter trial

C. Kammerlander · H. Doshi · F. Gebhard · A. Scola · C. Meier · W. Linhart · M. Garcia-Alonso · J. Nistal · M. Blauth

62 patients

F/U 15 months

Conclusion This study makes us believe that the standardized augmentation of the PFNA with a perforated blade is a safe method to treat pertrochanteric femoral fractures. It leads to good functional results and is not associated with cartilage or bone necrosis.

Arch Orthop Trauma Surg 2014 Mar;134(3):343-9

Cement augmentation of the Proximal Femoral Nail Antirotation (PFNA) – A multicentre randomized controlled trial

Christian Kammerlander[a,*], Einar S. Hem[c], Tim Klopfer[d], Florian Gebhard[e], An Sermon[f,g], Michael Dietrich[h], Olaf Bach[i], Yoram Weil[j], Reto Babst[k], Michael Blauth[b]

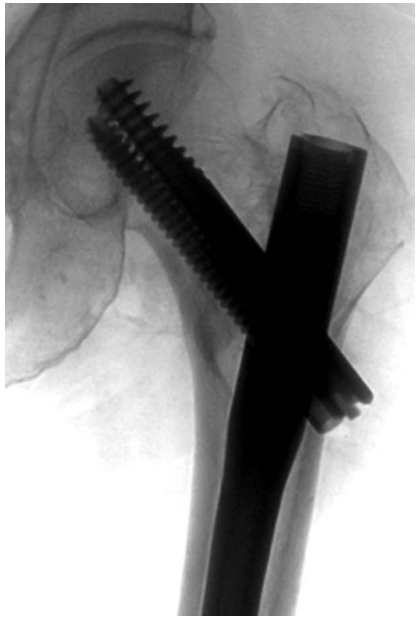
- A prospective multicenter, randomized, patient-blinded trial
- Ambulatory patients >75 with a closed, unstable pertrochanteric fracture
- 105 patients randomized to PFNA Cement Augmentation and 118 to PFNA

- No patient in the PFNA Augmentation group had a reoperation due to mechanical failure or implant migration compared to 6 patients in the PFNA group
- Augmentation of the PFNA blade did not improve patients' walking ability
- Cement Augmentation might have the potential to prevent reoperations by strengthening the osteosynthesis construct

Injury 2018 Aug;49(8):1436-1444

Dual Integrated Cephalocervical Lag Screws

- An intramedullary device using two integrated cephalocervical screws
  - allows linear controlled intraoperative compression with improved rotational stability of the head–neck fragment



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Cephalomedullary Nail Fixation of Intertrochanteric Femur Fractures: Are Two Proximal Screws Better Than One?

Rafael Serrano, MD, James A. Blair, MD,† David T. Watson, MD,‡ Anthony F. Infante, Jr, DO,‡ Anjan R. Shah, MD,‡ Hassan R. Mir, MD, MBA,‡ Benjamin J. Maxson, DO,‡ Katheryne W. Downes, PhD, MPH,§ and Roy W. Sanders, MD‡*

Retrospective review of 413 patients

130 were treated with a single screw device

283 with an integrated dual screw device

The single screw group had significantly higher failure rate of 7.7% as compared to the Dual screw group failure rate of 1.7% (P = 0.007)

Conclusions: A cephalomedullary nail with 2 integrated proximal screws that can be compressed and then locked seems to maintain initial IT fracture reduction and subsequent position over time, with less varus collapse and less shortening than a single screw device.

Five-Year Outcome Analysis of Intertrochanteric Femur Fractures: A Prospective Randomized Trial Comparing a 2-Screw and a Single-Screw Cephalomedullary Nail

Josephine Berger-Groch, MD, Martin Rupprecht, MD, Steffen Schoepper, MD, Malte Schroeder, MD, Johannes Maria Rueger, MD, and Michael Hoffmann, MD

104 patients, mean age 81

Intertrochaneteric femur fractures fixed using a cephalomedullary nail with either a single screw or integrated 2-screws

No difference in cut-out rates

Conclusions: Regarding functional outcome and hospital stay, the IT collective performed better in the 6-month follow-up. After 5 years, no significant differences were recorded.

JOT 2016 Sep;30(9):483-8

Post operative management

- WBAT is the main goal!
- PT and mobilize the patients ASAP
- Antibiotics for 24 hours
- DVT Prophylaxis

Conclusions

- Fixing the hip...ASAP…is the best thing for the patient
- We should continue to work together -- Multidisciplinary approach is key!
- Standardized perioperative care pathway
- Well executed surgery – Get it right the first time!
- Focus on return to function, activities of daily living
- Assessment and treatment of osteoporosis will mitigate the risks of subsequent fractures
- Follow Clinical Practice guidelines

Conclusions

- Cut-out after cephalomedullary nail or sliding hip screw is related to proper surgical technique:
  - Quality of reduction, Implant application
- SHS works well for simple stable intertrochanteric fractures
- When using CMN, distal locking screws may provide additional stability and decrease risk of peri-implant fracture
- Short nails work as well as long nails
  - Use long nails when when facing a subtrochantric extension
- Basicervical fractures should probably be treated with a SHS +/- antirotation screw

Conclusions

- TAD <25mm should be respected regardless of the implant design
  - “Deep center-center position”

- CalTAD with inferior screw placement might be more important when using cephalomedullary nails

- The lag screws, dual integrated screws and blades perform well, but most series continue to report screw cut-outs

Conclusions

- The helical blade “cut-through” has raised concerns, especially with TAD < 20mm

- Cement augmentation has been proven safe thus far and strengthens the fixation construct, without documented cases of cut-out or AVN

Video

- Sliding Hip Screw
- **Intertrochanteric Fracture: Open Reduction Internal Fixation with Dynamic Hip Screw**
- Abiola Atanda, Daniel Bazylewicz, Kenneth A. Egol, Matthew Hamula

- https://otaonline.org/video-library/45036/procedures-and-techniques/multimedia/16731365/intertrochanteric-fracture-open-reduction-internal

Video

- Long Cephallomedullary Nail by Paul Tornetta

- https://otaonline.org/video-library/45036/procedures-and-techniques/multimedia/16776595/cephallomedullary-nail-for-intertrochanteric