TROCHANTERIC FRACTURES

HOW TO AVOID AND HOW TO MANAGE COMPLICATIONS?

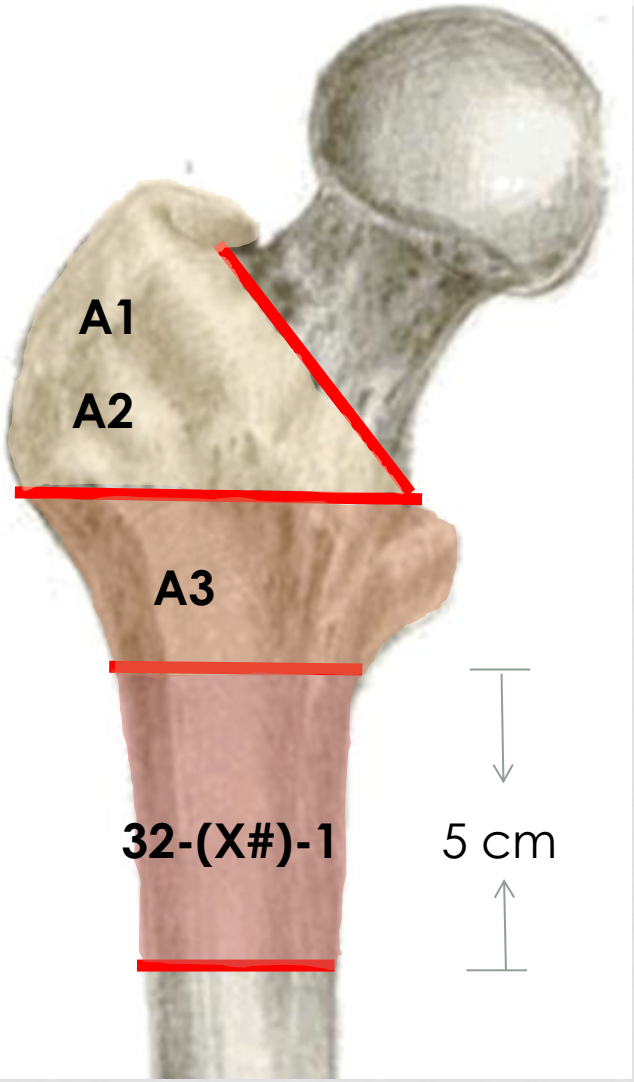
ANTE KALSTAD, ST.OLAVS HOSPITAL, NORWAY

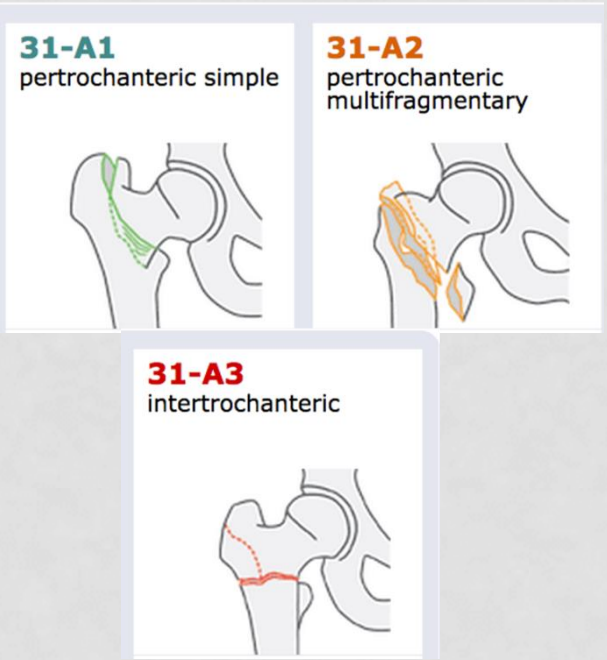
AO-classification

Pertrochanteric

Intertrochanteric

Subtrochanteric

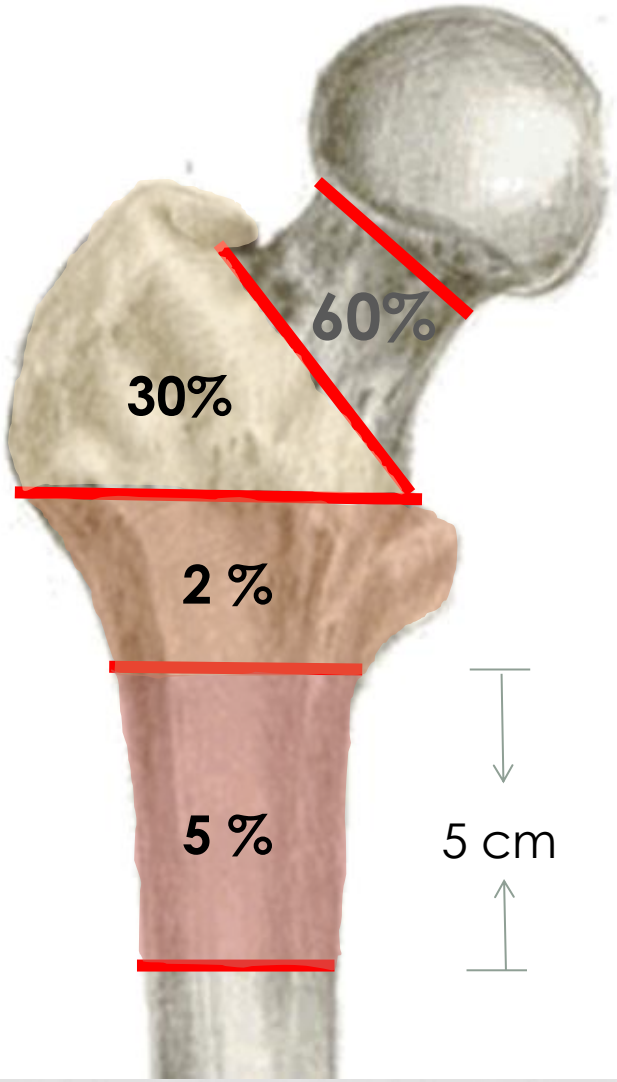




Pertrochanteric

Intertrochanteric

Subtrochanteric



Nasjonal Kompetanse-tjeneste for Leddproteser og Hoftebrudd

Proximal femur fractures

FCF		60.4 %
PTFF	A1	15.6 %
	A2	15.3 %
	A3	2.0 %
STFF		5.3%

- 90% fall from standing height
- 90% > 65 years (mean 82 years *Lamb, 2014*)
- ♀ : ♂ 3 : 1
- 20-30% mortality (first year)

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

COMPLICATIONS

Malreduction

Loss of reduction

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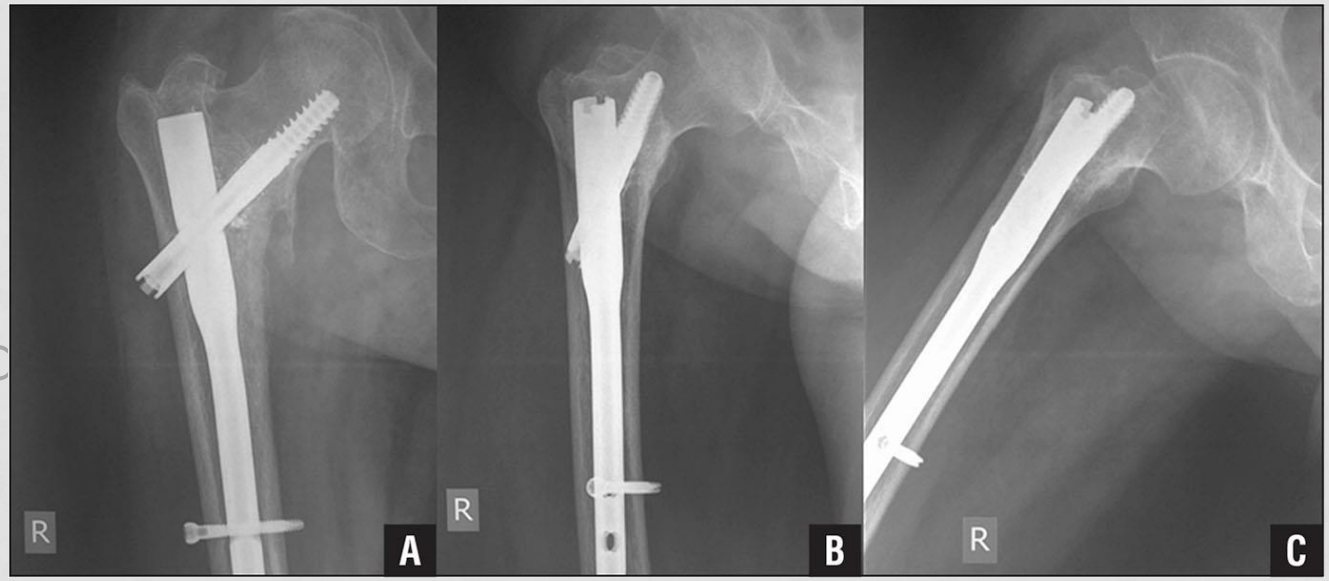
Implant failure

Peri-implant fra

Non-union

Avascular necrosis

- **Malrotation**



COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

- Malrotation
- **Varus**
- **Distraction**

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

Progressive varus

Excessive shortening

- Functional impariment
  - 5 mm → lower SF36

Zlowodski M, 2008

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

- **Screw cut out**

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

- Screw cut out
- **Screw pull out**

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

- Screw cut out
- Screw pull out
- **Screw migration**

COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

- Screw cut out
- Screw pull out
- Screw mig
- **Z-effect**

COMPLICATIONS

Malreduction

Loss of reduction

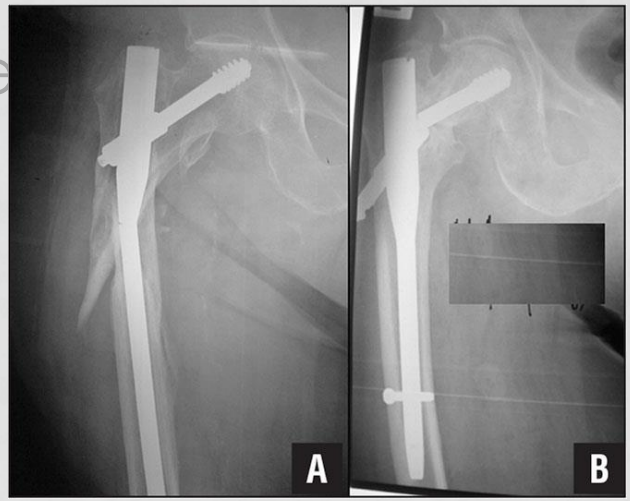
Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis



COMPLICATIONS

Malreduction

Loss of reduction

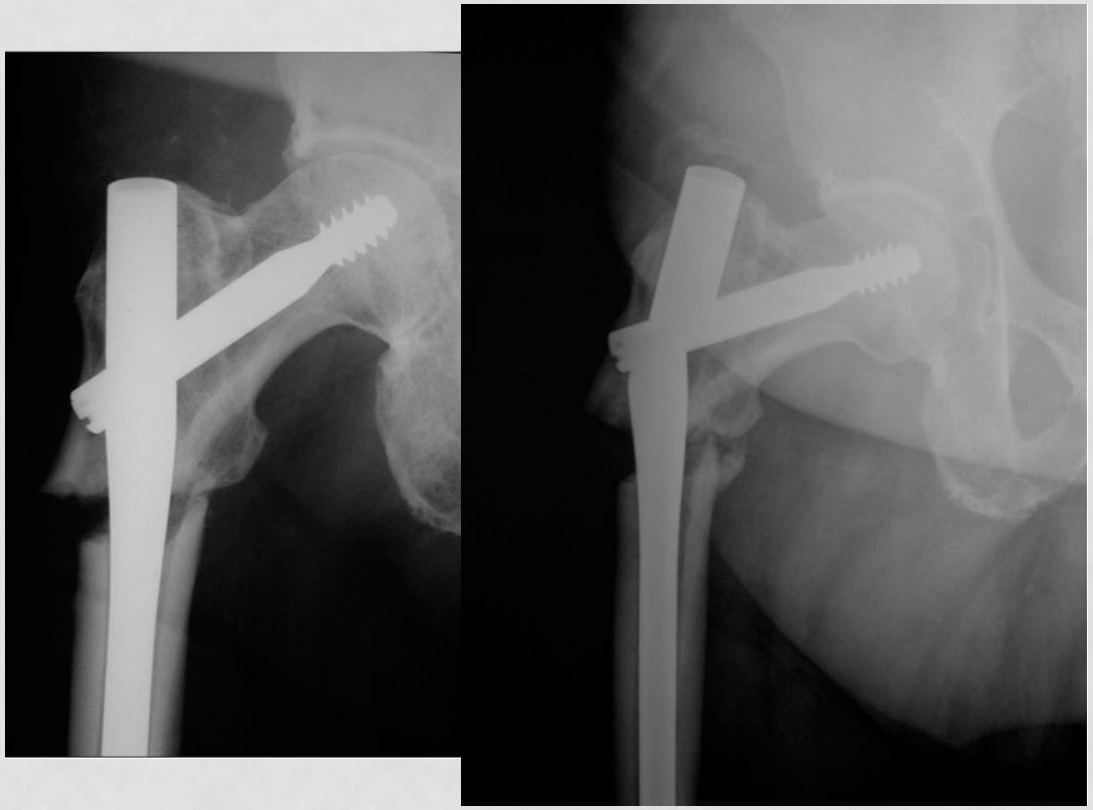
Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis



COMPLICATIONS

Malreduction

Loss of reduction

Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis

COMPLICATIONS

Malreduction

Loss of reduction

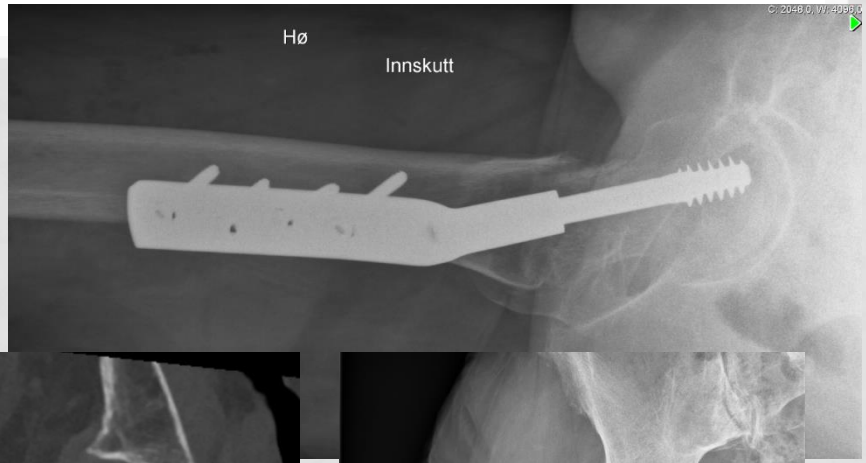
Loss of fixation

Implant failure

Peri-implant fracture

Non-union (< 2%)

Avascular necrosis



COMPLICATIONS

Malreduction

Loss of reduction

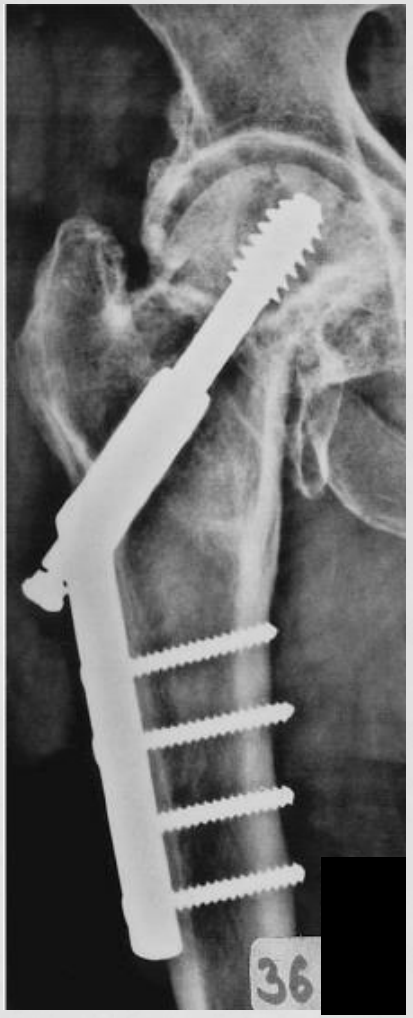
Loss of fixation

Implant failure

Peri-implant fracture

Non-union

Avascular necrosis (0,5 – 1%)



HOW TO AVOID COMPLICATIONS

1. Understand the fracture pattern
2. Select the correct implant
3. Do a proper reduction
4. Maintain the reduction
5. Correct implant positioning

FRACTURE PATTERN

Two part fracture

Stable

FRACTURE PATTERN

Multifragmentary

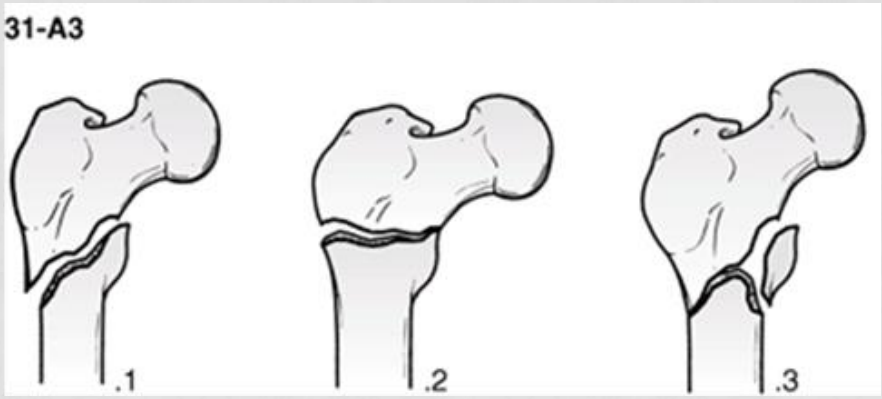
Stable / Unstable

Unstable when:

- >50% of calcar affected
- Greater and lesser trochanter separate fragments (4-part)

FRACTURE PATTERN

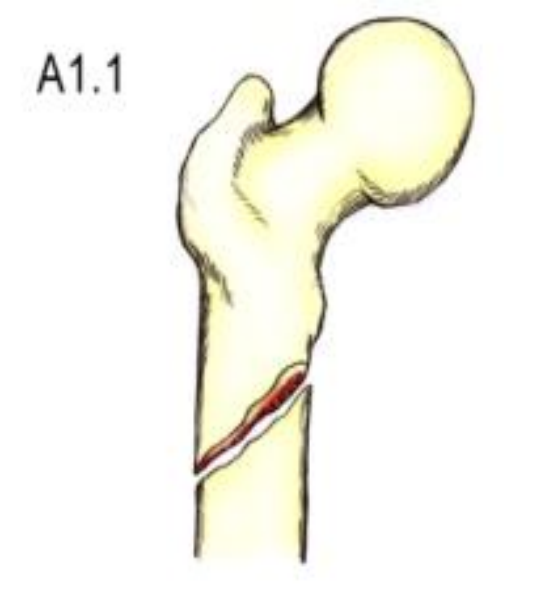
Intertrochanteric

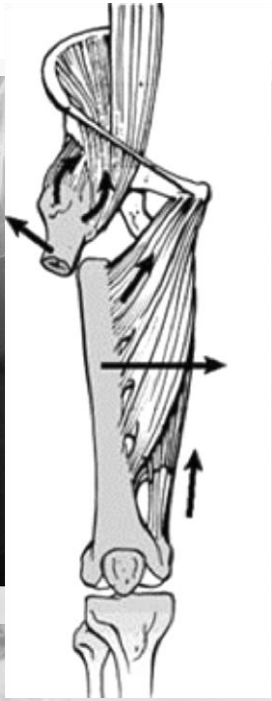


Unstable

FRACTURE PATTERN

Subtrochanteric





Unstable

Displaced

CORRECT IMPLANT?

- Sliding Hip Screw
- Intramedullary device
- Hybrid locking plates
- Arthroplasty
- External fixation

CORRECT IMPLANT?

- **Sliding Hip Screw**
- Intramedullary device
- Hybrid locking plates
- Arthroplasty
- External fixation

CORRECT IMPLANT?

- Sliding Hip Screw
- **Intramedullary device**
- Hybrid locking plates
- Arthroplasty
- External fixation

CORRECT IMPLANT

- Sliding Hip Screw
- Intramedullary device
- **Hybrid locking plates**
- External fixation
- Arthroplasty

Injury, Int. J. Care Injured 44 (2013) 751–756

Contents lists available at SciVerse ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

High failure rate of trochanteric fracture osteosynthesis with proximal femoral locking compression plate

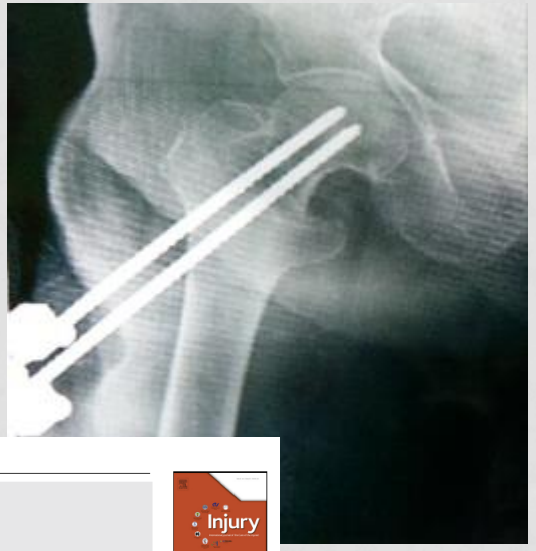
C. Wirtz [a], F. Abbassi [a], D.S. Evangelopoulos [a,b,*], S. Kohl [a], K.A. Siebenrock [a], A. Krüger [a]

[a] Department of Orthopaedic Surgery, Inselspital, University of Bern, Bern, Switzerland
[b] 3rd Department of Orthopaedic Surgery, KAT Trauma Hospital, University of Athens, Athens, Greece

→ Salvage procedure

CORRECT IMPLANT

- Sliding Hip S
- Intramedullary device
- Hybrid locking plates
- **External fixation**
- Arthroplasty



Injury, Int. J. Care Injured 45 (2014) 568–572

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Treatment of intertrochanteric fractures in elderly highrisk patients: Dynamic hip screw vs. external fixation

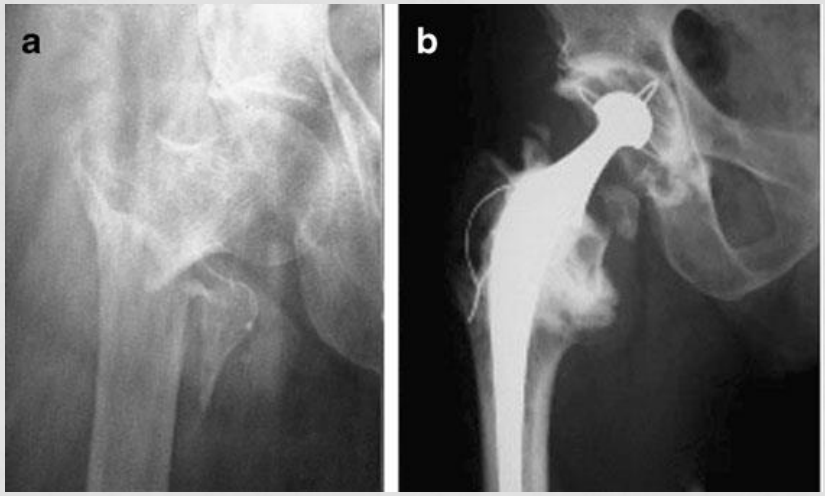
G.H. Kazemian [a], A.R. Manafi [b], F. Najafi [c,*], M.A. Najafi [d]

[a] Department of Orthopedic Surgery, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[b] Department of Orthopedic Surgery, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[c] Department of Orthopedic Surgery, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[d] Faculty of Medicine, Isfahan University of Medical Sciences, Esfahan, Iran

→ Rare salvage procedure

CORRECT IMPLANT?

- Sliding Hip Screw
- Intramedullary device
- Hybrid locking plates
- External fixation
- **Arthroplasty**

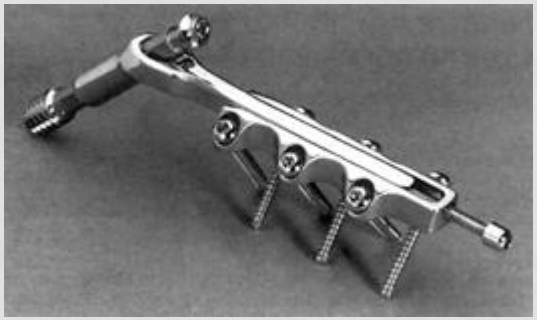


→ Salvage procedure

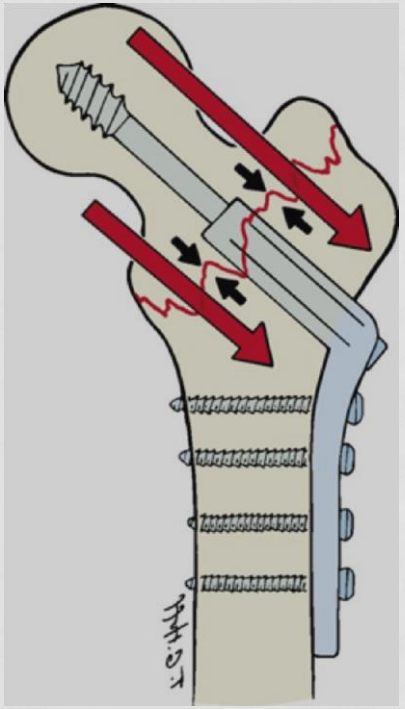
CORRECT IMPLANT

- **Sliding Hip Screw**
- **Intramedullary device**
- Hybrid locking plates
- External fixation
- Arthroplasty

CORRECT IMPLANT

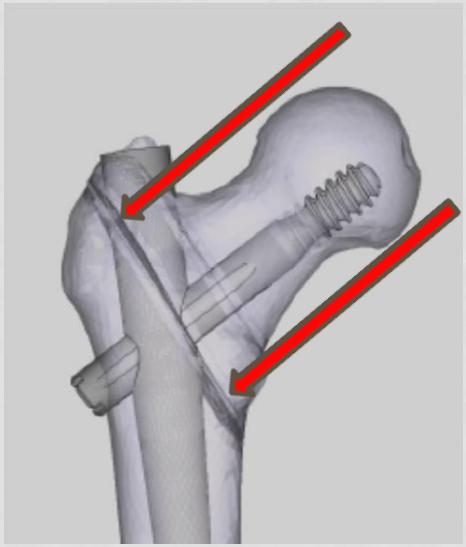


SHS



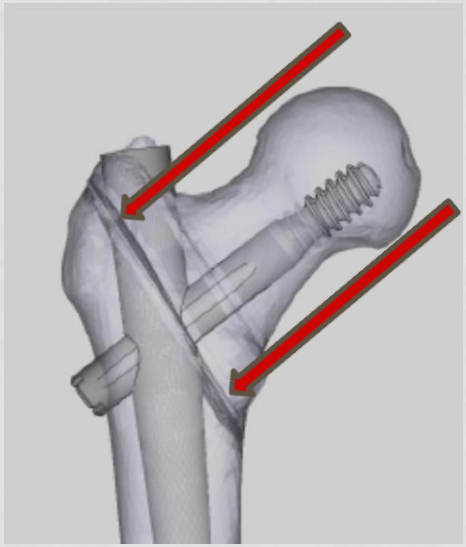
CORRECT IMPLANT

IMN

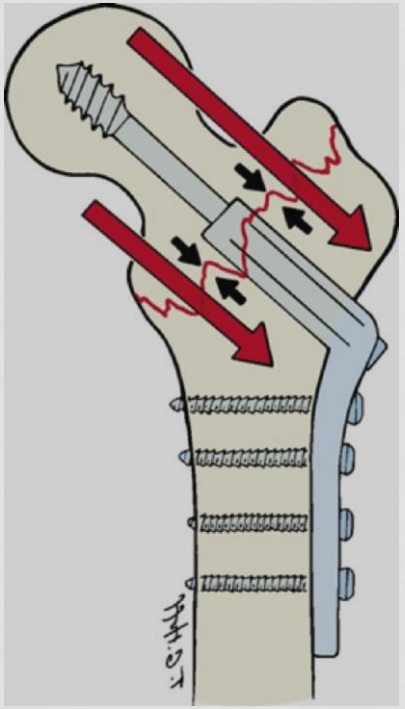


CORRECT IMPLANT

IMN



SHS



GRADUAL CHANGE TOWARDS NAILING

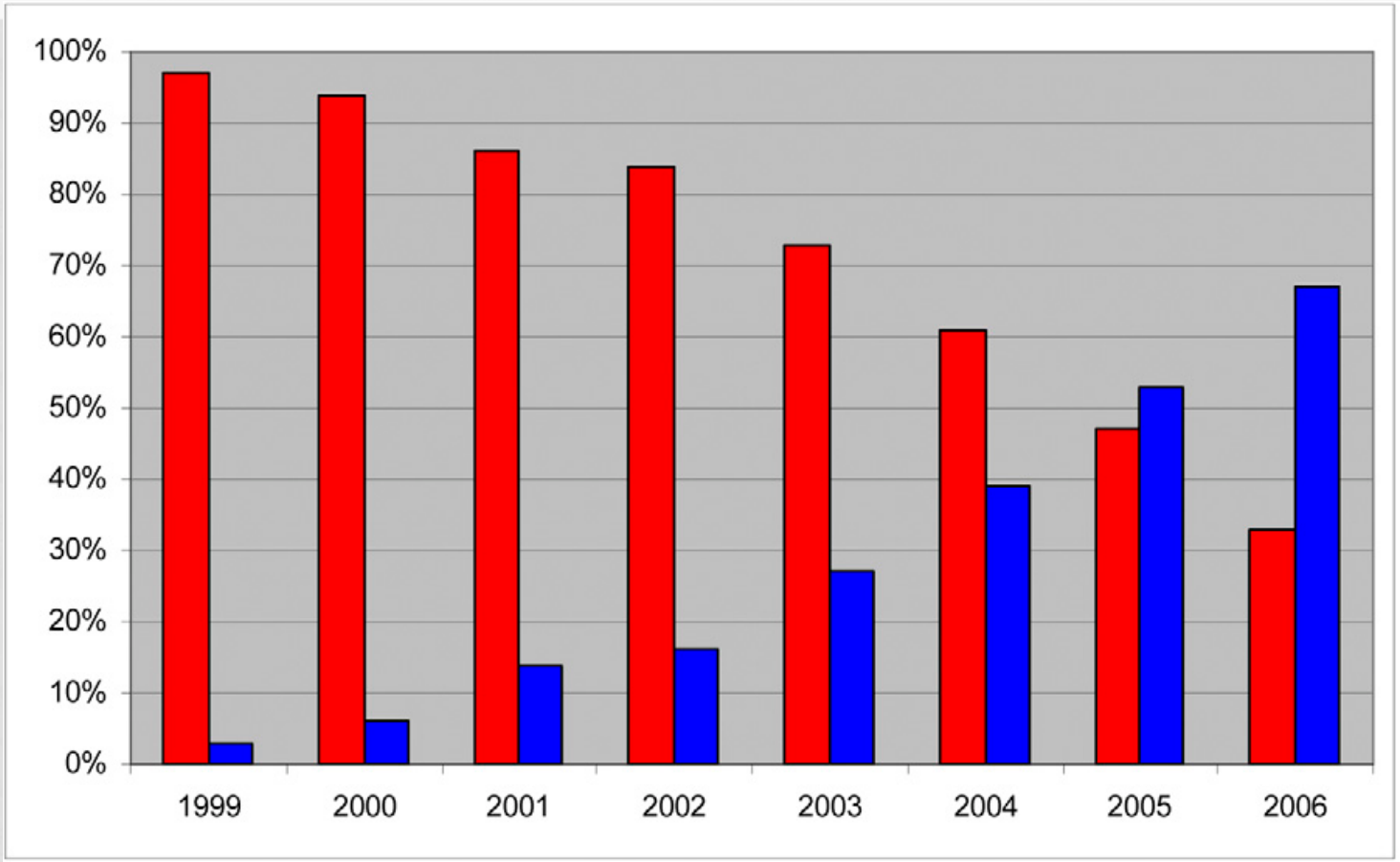
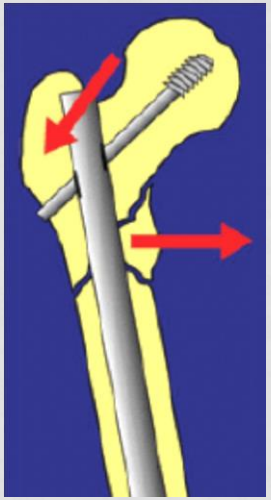


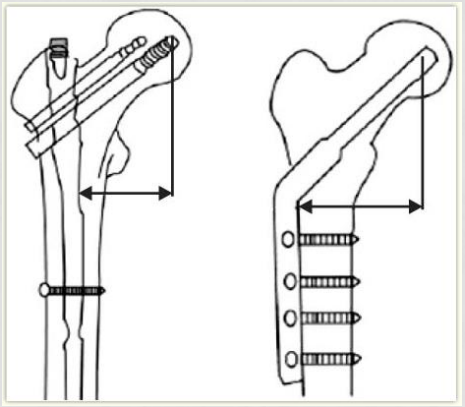
Fig. 1

Bar graph illustrating the proportion of intertrochanteric fractures fixed with plates (red bars) compared with nails (blue bars).

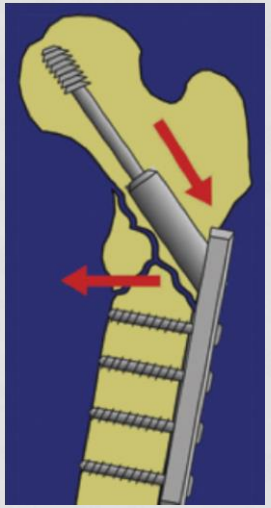
CORRECT IMPLANT

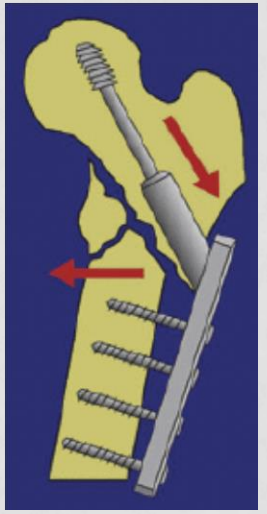
IMN





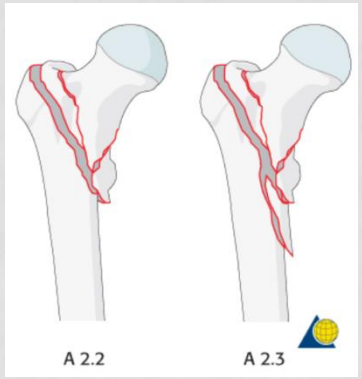
SHS

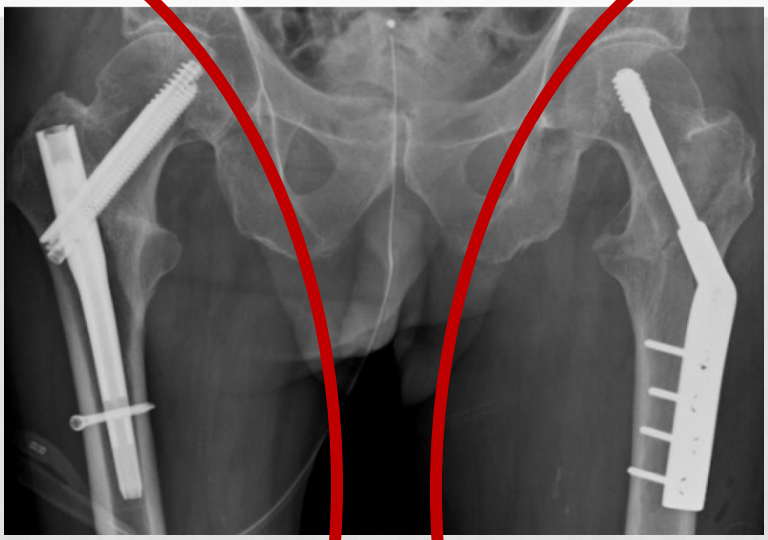




CORRECT IMPLANT

unstable





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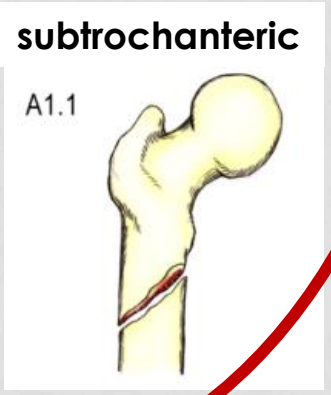
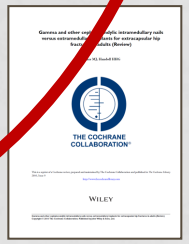


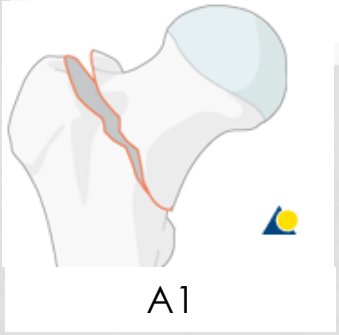


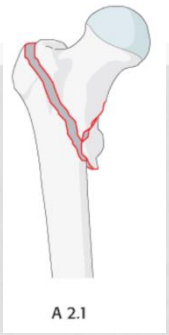
Matre, 2013

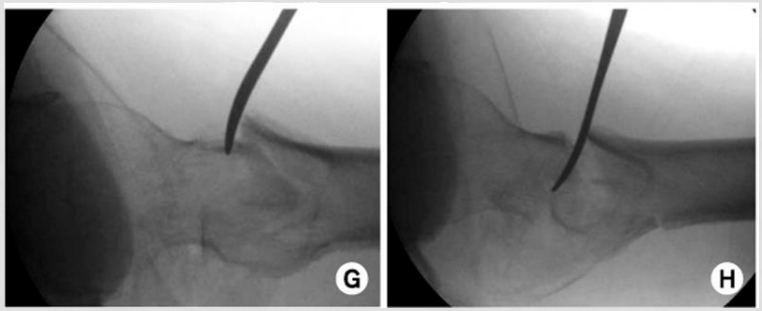
- Gjertsen et al, 2018:
- The results from the Norwegian hip fracture registry for 21 300 patients beteen 2005-2015:
  - A1 fractures have less re operations when operated with SHS
  - A3 fractures and subtrochanteric fractures have fewer reoperations when treated with IMN.

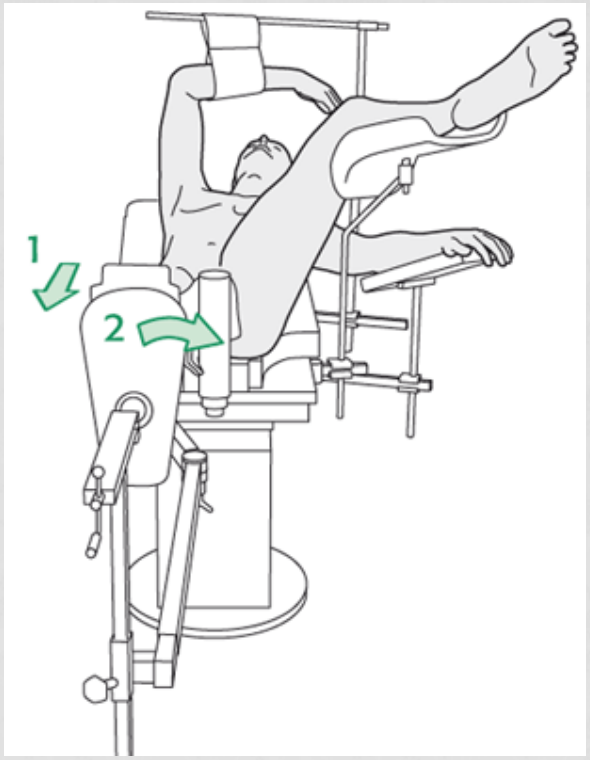
NOT FOR EVERY FRACTURE

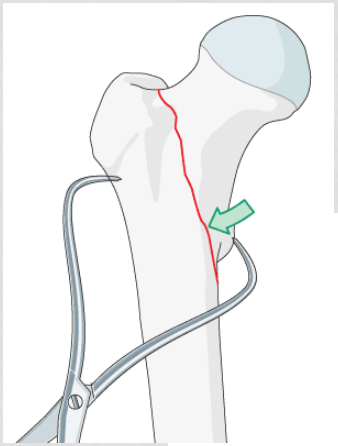
REDUCTION

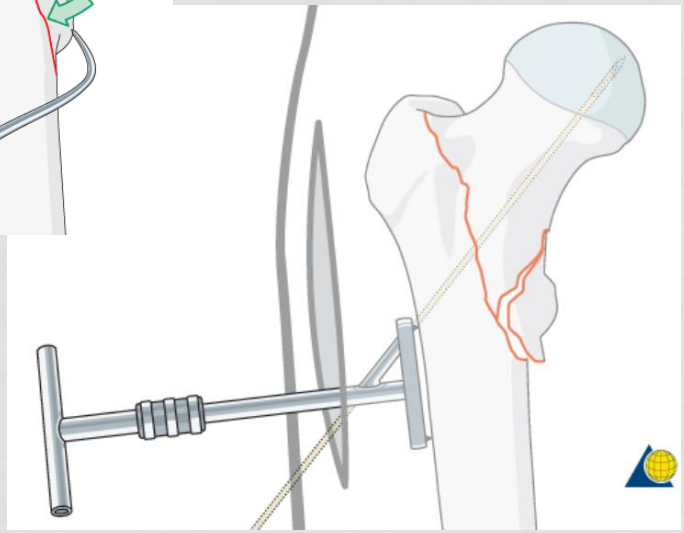






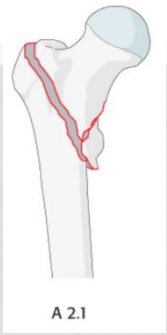




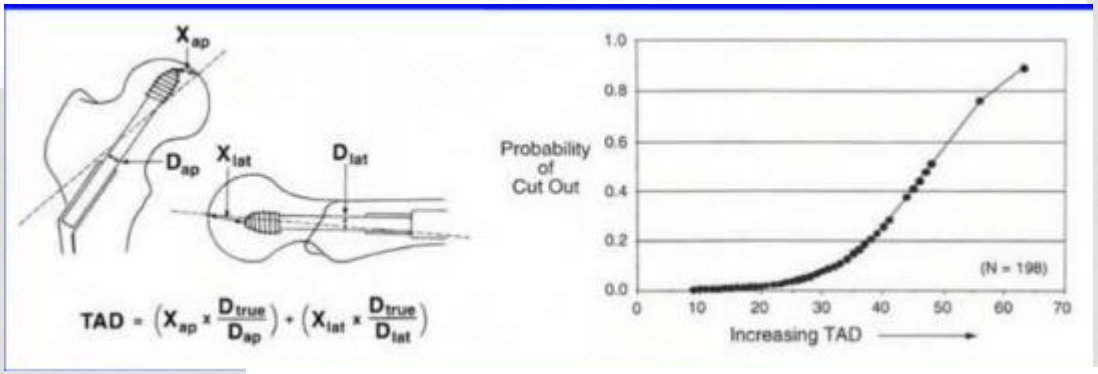


IMPLANT POSITION

A1



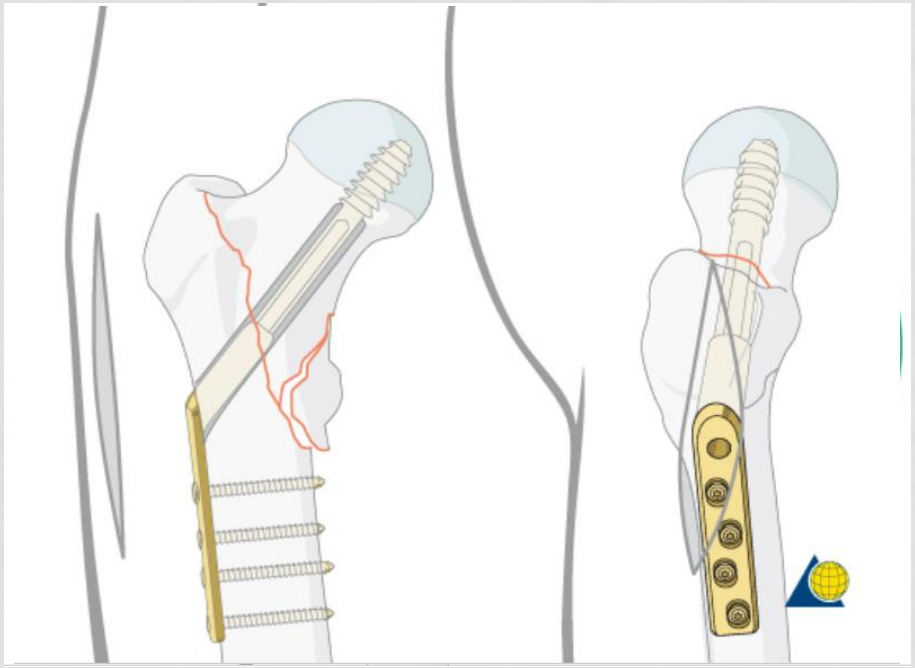
A 2.1

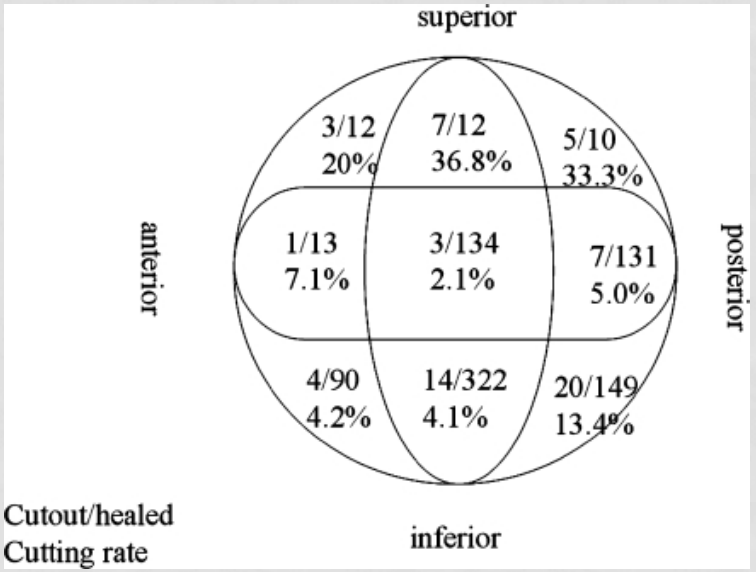


The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip.

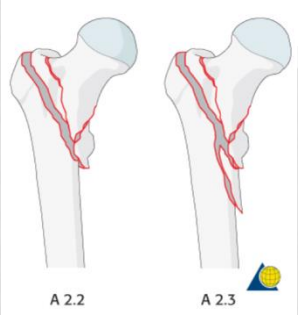
M R Baumgaertner; S L Curtin; D M Lindskog; J M Keggi

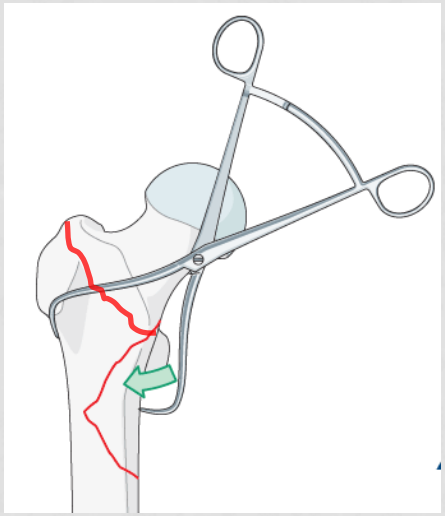
J Bone Joint Surg Am, 1995 Jul; 77 (7): 1058 -1064 . http://dx.doi.org/

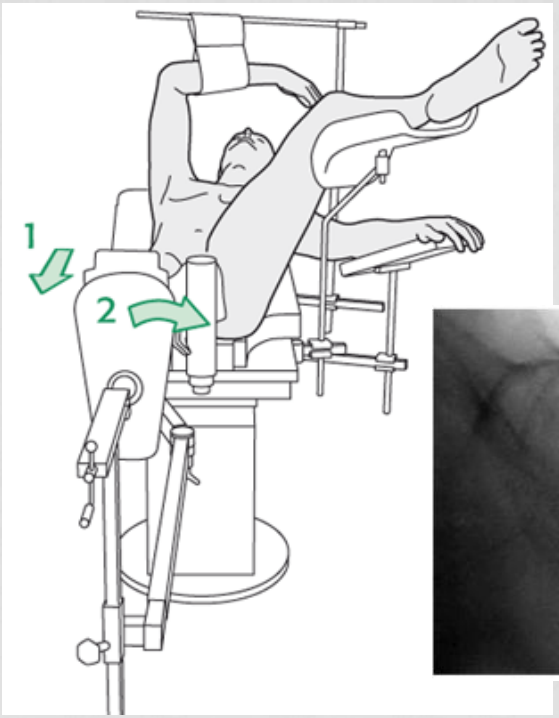


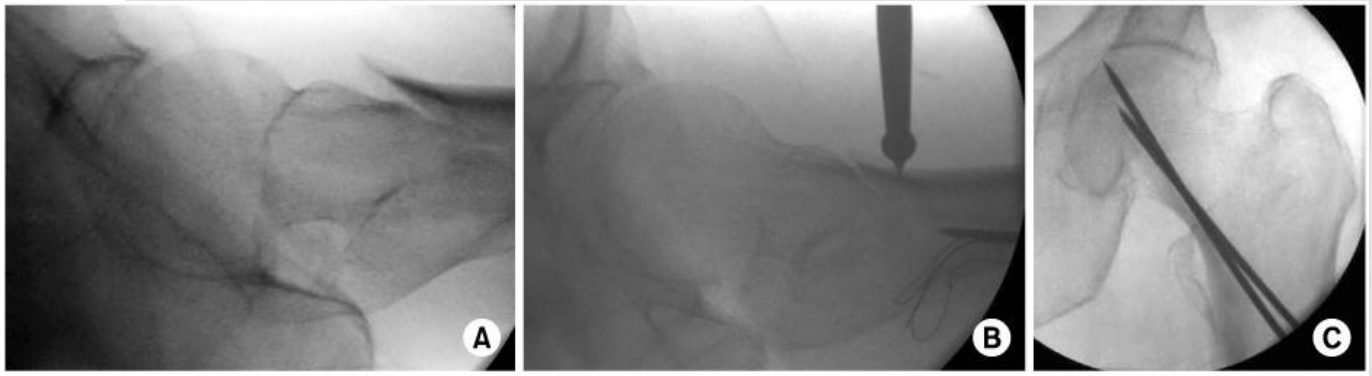


REDUCTION









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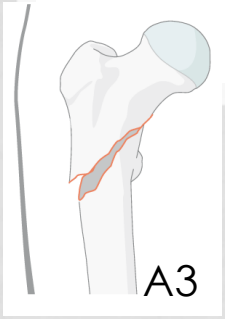
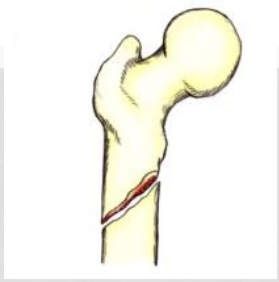
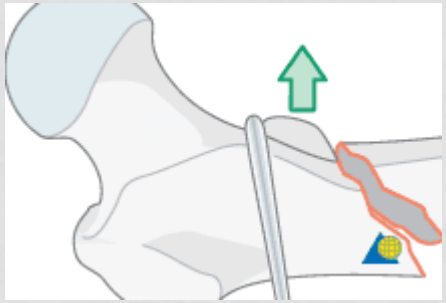
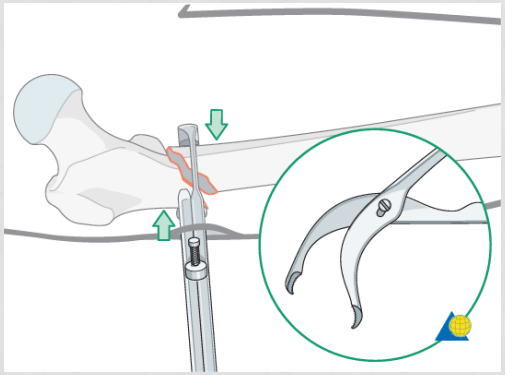
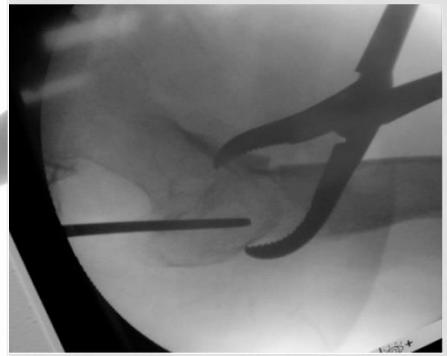




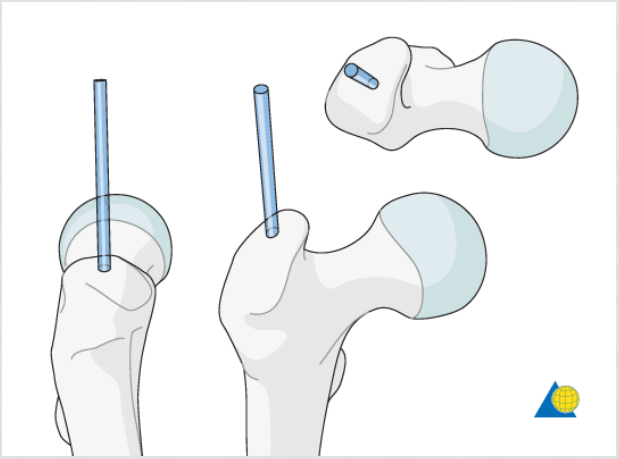


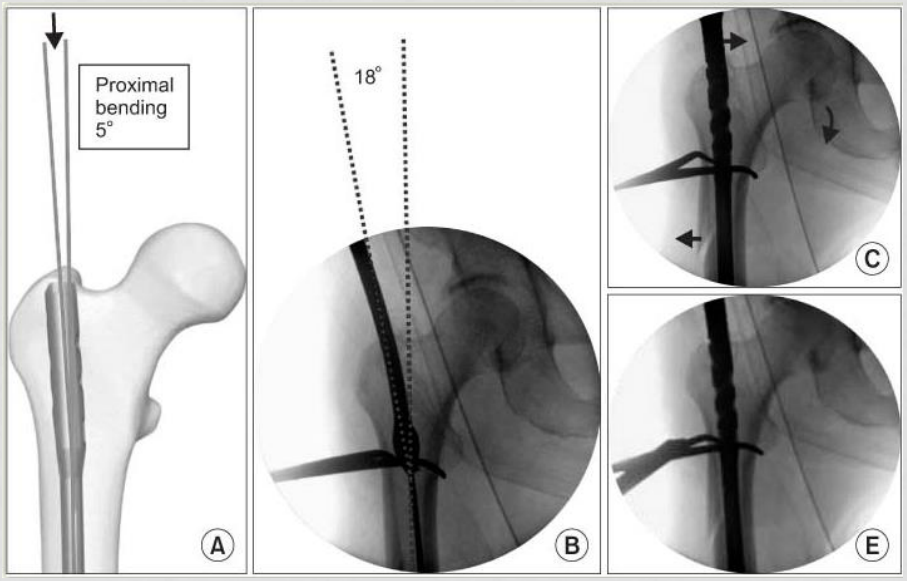




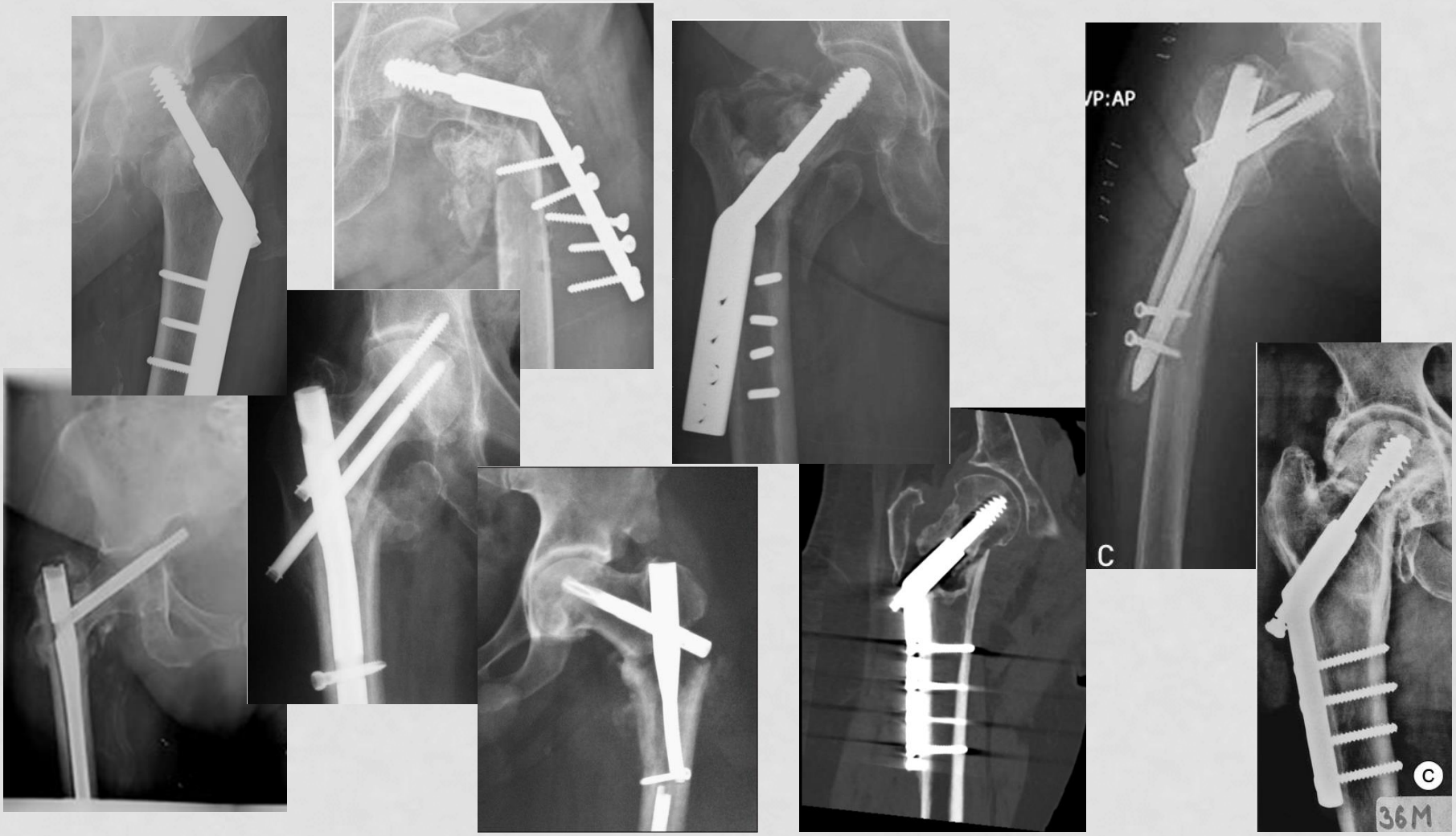
IMPLANT POSITION

- Entry point
  - Slightly medial
  - Slightly anterior
- ***"Thou shall not varus"***





COMPLICATION MANAGEMENT



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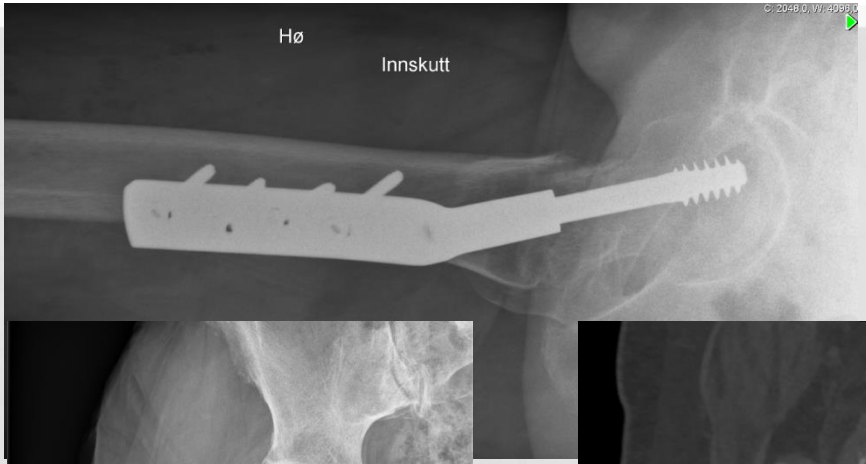
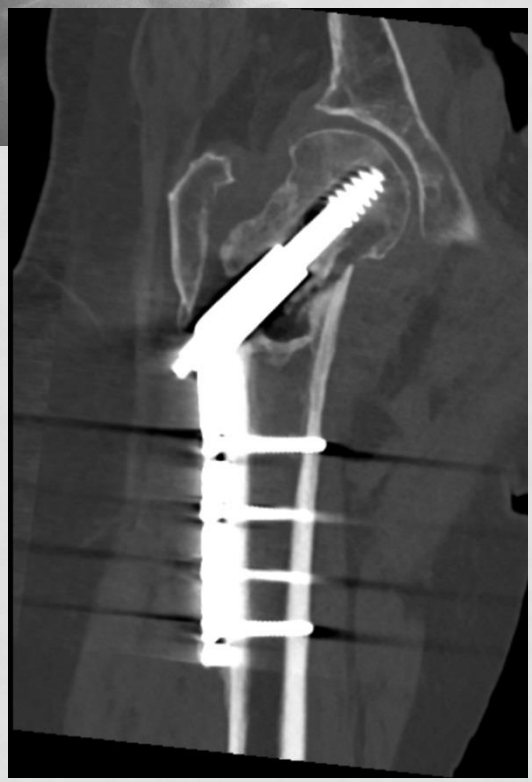




COMPLICATION MANAGEMENT

Female, 76 years

COMPLICATION MANAGEMENT

Joint intact

and

Non-weight bearing possible

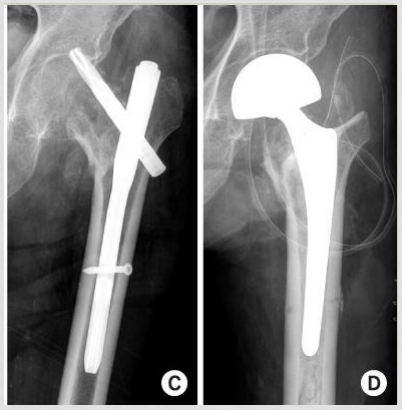
Re-osteosynthesis

Joint not intact

or

Non-weight bearing not possible

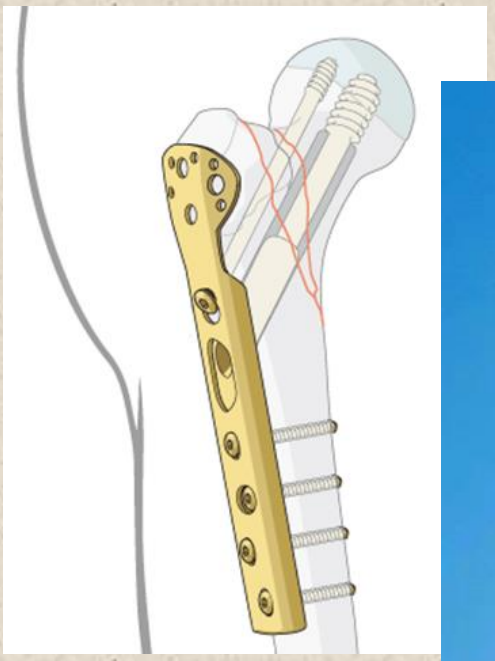
Artroplasty



THANK YOU

QUESTIONS ?

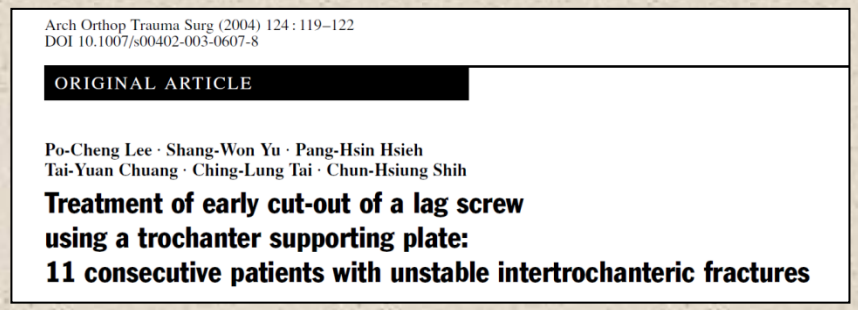
TROCHANTER SUPPORT PLATE (TSP)



Biomechanical or psychologigal support?
Evidence?

TROKANTER STØTTEPLATE (TSP)

n = 11

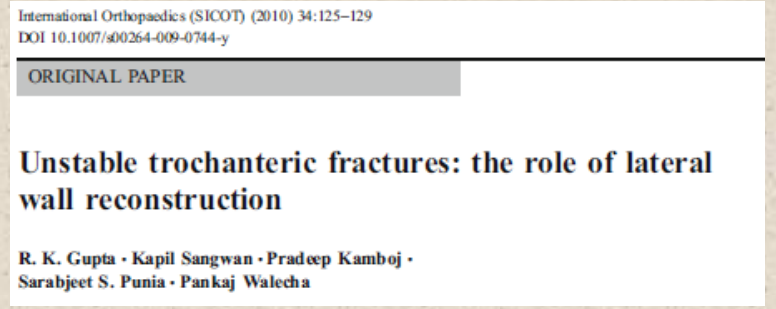

Arch Orthop Trauma Surg (2004) 124 : 119–122
DOI 10.1007/s00402-003-0607-8

ORIGINAL ARTICLE

Po-Cheng Lee · Shang-Won Yu · Pang-Hsin Hsieh
Tai-Yuan Chuang · Ching-Lung Tai · Chun-Hsiung Shih

Treatment of early cut-out of a lag screw using a trochanter supporting plate: 11 consecutive patients with unstable intertrochanteric fractures

n = 46

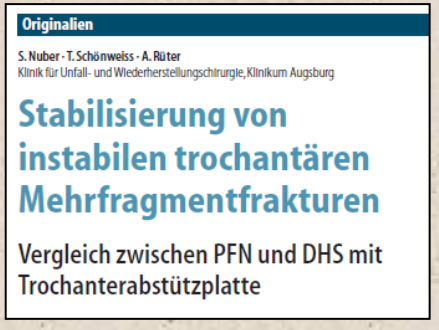

International Orthopaedics (SICOT) (2010) 34:125–129
DOI 10.1007/s00264-009-0744-y

ORIGINAL PAPER

Unstable trochanteric fractures: the role of lateral wall reconstruction

R. K. Gupta · Kapil Sangwan · Pradeep Kamboj · Sarabjeet S. Punia · Pankaj Walecha

n = 64


Originalien

S. Nuber · T. Schönweiss · A. Rüter
Klinik für Unfall- und Wiederherstellungschirurgie, Klinikum Augsburg

Stabilisierung von instabilen trochantären Mehrfragmentfrakturen

Vergleich zwischen PFN und DHS mit Trochanterabstützplatte

Small studies

Not designed for comparing with/without TSP

TROCHANTER SUPPORT PLATE (TSP)

Journal of Orthopaedic Trauma
Issue: Volume 12(4), May 1998, pp 241-248

Dynamic Hip Screw With Trochanteric Stabilizing Plate in the Treatment of Unstable
Proximal Femoral Fractures: A Comparative Study With the Gamma Nail and
Compression Hip Screw

Madsen, Jan Erik*†; Næss, Leif*; Aune, Arne Kristian*; Alho, Antti‡; Ekeland, Arne†; Strømsøe, Knut*

Prospektiv, n = 170

n = 85 randomized (Gamma/CHS) 1990-91

n = 85 prospektive series (CHS w/TSP) 1992-94

Conclusion: The TSP may be an aid in the treatment of these difficult fractures because the problem with femoral shaft fractures using the Gamma nail is avoided and the medialization of the distal fracture fragment frequently associated with the CHS is prevented.

Conclusion:

TSP may be of benefit – preventing medialization

TREATMENT OPTIONS

Cochrane 2010
Parker, M.J.
43 studies
6446 patients


Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults (Review)

Parker MJ, Handoll HHG

THE COCHRANE COLLABORATION®

WILEY

Authors' Conclusions:

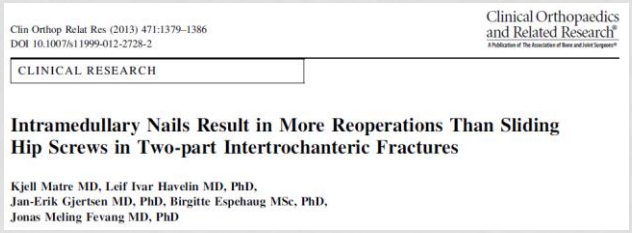
- *With its **lower complication rate** in comparison with intramedullary nails, and absence of functional outcome data to the contrary, the **SHS appears superior for trochanteric fractures**.*
- *Intramedullary **nails may have advantages** over fixed angle plates for **subtrochanteric and some unstable trochanteric fractures**, but further studies are required.*

TREATMENT OPTIONS

Matre, 2013
Register study
N=7643
A1 fractures

Authors' Conclusions:

- *Intramedullary **nails result in more re-operations** than sliding hip screws in **two-part** intertrochanteric [pertrochanteric] fractures.*



Clin Orthop Relat Res (2013) 471:1379–1386
DOI 10.1007/s11999-012-2728-2

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

CLINICAL RESEARCH

Intramedullary Nails Result in More Reoperations Than Sliding Hip Screws in Two-part Intertrochanteric Fractures

Kjell Matre MD, Leif Ivar Havelin MD, PhD,
Jan-Erik Gjertsen MD, PhD, Birgitte Espehaug MSc, PhD,
Jonas Meling Fevang MD, PhD

TREATMENT OPTIONS

Matre, 2013
Register study
N=2716
A3 + subtr. fractures

Authors' Conclusions:

- *12 months postoperatively patients with transverse/**reverse oblique trochanteric and subtrochanteric** fractures operated with a **SHS had a higher reoperation rate** compared to those operated with an IM nail.*

Injury, Int. J. Care Injured 44 (2013) 735–742

Contents lists available at SciVerse ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

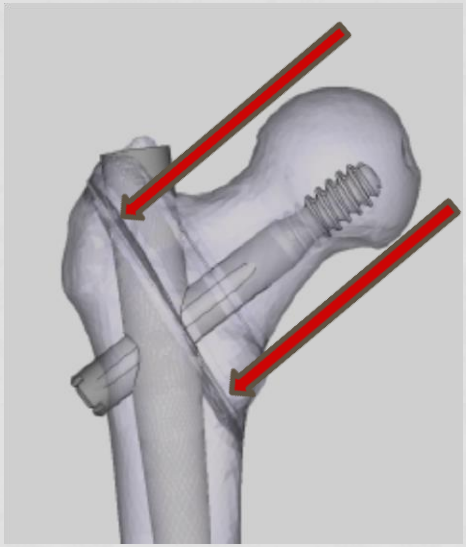
Sliding hip screw versus IM nail in reverse oblique trochanteric and subtrochanteric fractures. A study of 2716 patients in the Norwegian Hip Fracture Register

Kjell Matre[a,*], Leif Ivar Havelin[a,b], Jan-Erik Gjertsen[a], Tarjei Vinje[a], Birgitte Espehaug[a,c], Jonas Meling Fevang[a]

[a] Department of Orthopaedic Surgery, Haukeland University Hospital, Bergen, Norway
[b] Department of Surgical Sciences, University of Bergen, Bergen, Norway
[c] Bergen University College, Bergen, Norway

CORRECT IMPLANT

IMN



SHS