Peritrochantric Fractures

Decision Making

Mahlisha Kazemi, MD
Hip Surgeon
TUMS

Sep 2021


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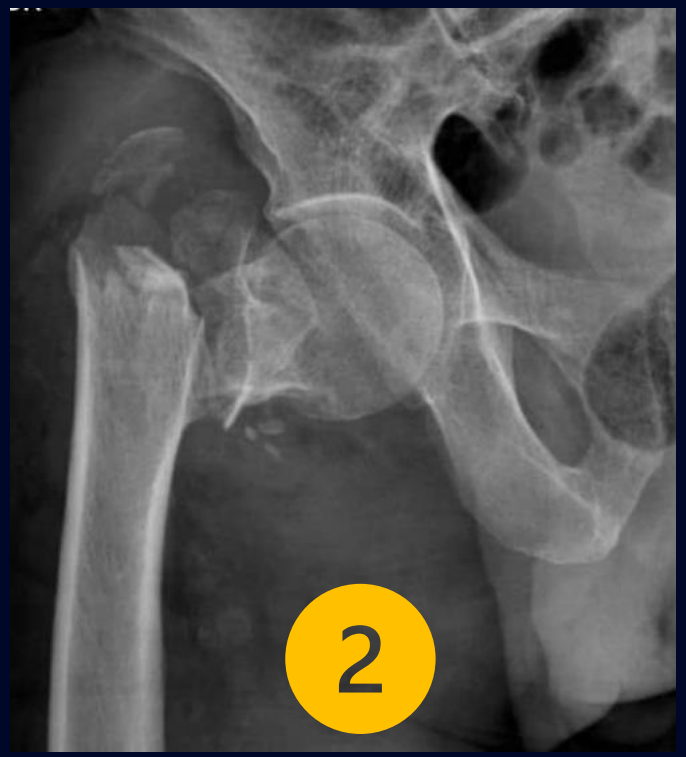
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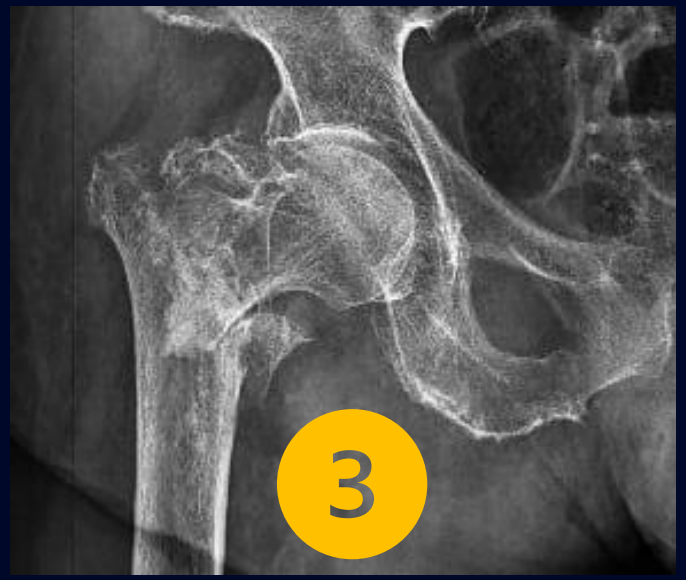
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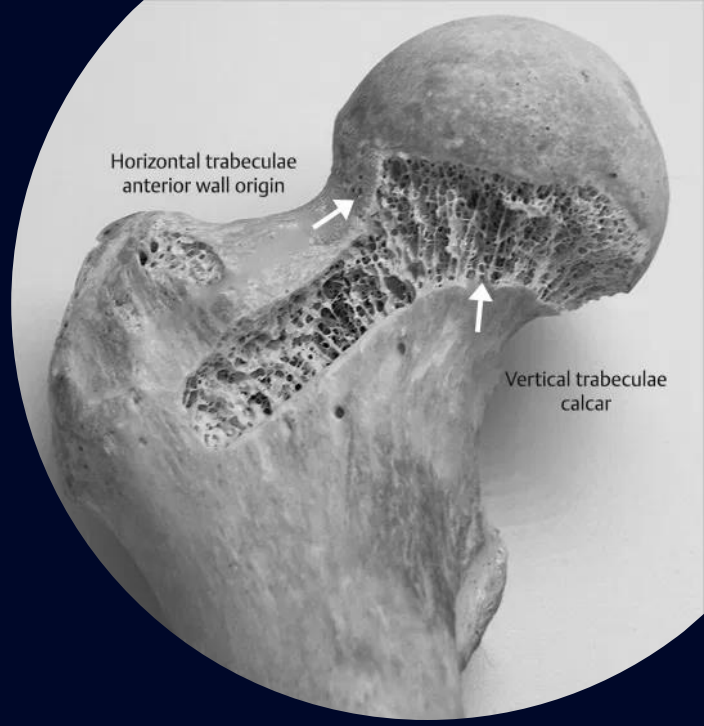
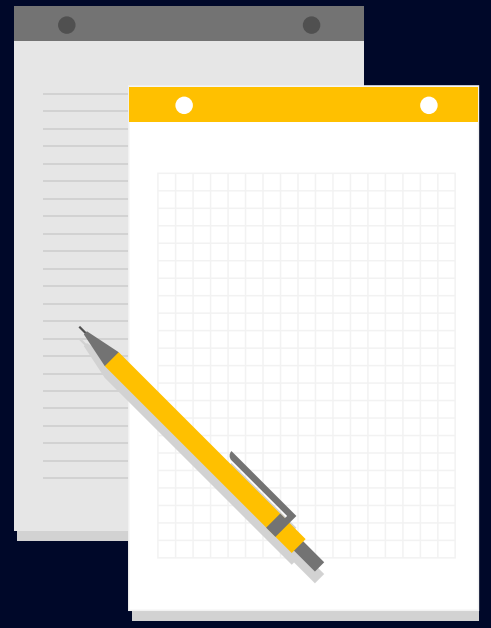
Outlines

- Timing of Surgery
- Imaging
- Implant of Choice
- Weight Bearing





Timing of surgery

Perform surgery on the day of, or the day after, admission (NICE)

Accelerated surgery versus standard care in hip fracture (HIP ATTACK): an international, randomised, controlled trial

*The HIP ATTACK Investigators**

Accelerated surgery

did not have a significant effect on :

- Mortality
- Major complications

did demonstrate a reduction in :

- Delirium
- Urinary Tract Infection
- Moderate-to-severe Pain On Days 4–7
- Mortality in patients with high Troponin

Royal College of Physicians | Falls and Fragility Fracture Audit Programme

Hospital Number / Patient label here

National Hip Fracture Database

Dataset specification v13.0 (2020)

(Applicable to patients with any form of hip/femoral fracture admitted from 1 Jan 2020)

Theatre Data Collection Sheet - Only for use in operating theatre – Only to be completed by theatre staff

Date & time of primary surgery	**Side of fracture** (For bilateral fractures complete two forms)
__ __ / __ __ / __ __ __ __ __ __ : __ __ ☐ No operation performed	☐ Left ☐ Right

Type of fracture (Please note that selecting the correct fracture type affects the measurement of compliance with NICE guidance)

Hip Fracture
- ☐ Intracapsular - displaced
- ☐ Intracapsular - undisplaced
- ☐ Trochanteric - grade A1/A2
- ☐ Trochanteric - grade A3 (including reverse oblique)
- ☐ Subtrochanteric

Femoral shaft fractures

Definition: A fracture 5cm or more below the lesser trochanter and 5cm or more above the knee joint

- ☐ Femoral shaft

Distal femoral fracture

Definition: Fracture involving within 5cm above knee joint (=1 Muller square)

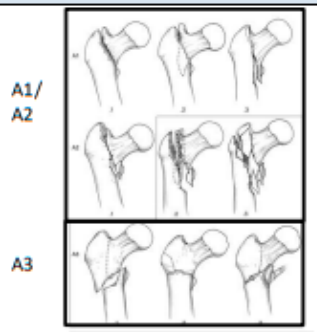
- ☐ Distal femoral – Extra-articular
- ☐ Distal femoral – Intra-articular

Peri-prosthetic femoral fracture

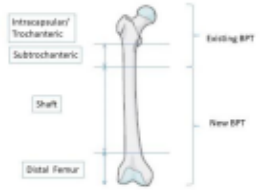
Definition: Do not include acetabular/ pelvic or tibial fractures

- ☐ Peri-prosthetic, around a hip replacement – A (trochanteric)
- ☐ Peri-prosthetic, around a hip replacement – B (around the stem)
- ☐ Peri-prosthetic, around a hip replacement – C (distal to stem/ cement)
- ☐ Peri-prosthetic, around a knee replacement – A (epicondyles)
- ☐ Peri-prosthetic, around a knee replacement – B (involving implant/ cement)
- ☐ Peri-prosthetic, around a knee replacement – C (proximal to implant/cement)
- ☐ Peri-prosthetic, between a THR and a TKR – D (inter-prosthetic)
- ☐ Peri-prosthetic, around previous fixation device – plate
- ☐ Peri-prostheti, around previous fixation device – nail

Pathological
- ☐ Atypical bisphosphonate type subtrochanteric fracture
- ☐ Malignancy
- ☐ No



Femoral fracture BPT



- ☐ Unknown

ASA grade	**Type of anaesthesia (Tick all which apply in this case)**
☐ 1. A normal healthy patient ☐ 2. A patient with mild systemic disease ☐ 3. A patient with severe systemic disease ☐ 4. A patient with severe systemic disease that is a constant threat to life ☐ 5. A moribund patient who is not expected to survive without the operation ☐ Unknown	☐ GA ☐ Spinal ☐ Epidural ☐ Intra-operative sedation ☐ Intra-operative nerve-block ☐ High volume peri-articular LA infiltration (by surgeon)
Operation performed **B M**	**Reason if delay > 36 Hours**
☐ Internal fixation - Sliding Hip Screw ☐ Internal fixation - Cannulated screws ☐ Internal fixation - IM nail (long) ☐ Internal fixation - IM nail (short) ☐ Arthroplasty – Unipolar hemi (uncemented – uncoated/ monoblock) ☐ Arthroplasty – Unipolar hemi (uncemented – uncoated/ modular) ☐ Arthroplasty – Unipolar hemi (uncemented - HA coated/ monoblock) ☐ Arthroplasty – Unipolar hemi (uncemented - HA coated/ modular) ☐ Arthroplasty – Unipolar hemi (cemented/ monoblock) ☐ Arthroplasty – Unipolar hemi (cemented/ modular) ☐ Arthroplasty - Bipolar hemi (uncemented - HA coated) ☐ Arthroplasty - Bipolar hemi (cemented) ☐ Arthroplasty - THR (uncemented - HA coated) ☐ Arthroplasty - THR (cemented) ☐ Arthroplasty - THR hybrid ☐ Other	☐ No delay - surgery < 36hrs ☐ Awaiting orthopaedic diagnosis/investigation ☐ Awaiting medical review/investigation or stabilisation ☐ Delayed for reversal of warfarin ☐ Delayed for reversal of DOAC* ☐ Administrative/logistic - awaiting space on theatre list ☐ Administrative/logistic - cancelled due to theatre over-run ☐ Other ☐ Unknown ** Direct oral anticoagulants (DOACs) are apixaban, edoxaban, rivaroxaban and dabigatran* *(Do not record clopidogrel or prasugrel - they are antiplatelet drugs not DOACs)*

Femoral fracture at sites other than the hip may be coded using operations from the list above, or using one of the following additional options: *(these additional options are not to be used for patients with hip fracture)*	**Grade of senior surgeon present in operating room**	**Grade of senior anaesthetist present in operating room**
☐ Plate and screws/cables ☐ Arthroplasty – revision TKR ☐ Arthroplasty – revision THR (cemented) ☐ Arthroplasty – revision THR (uncemented) ☐ Arthroplasty – revision THR (Hybrid) ☐ Arthroplasty – revision THR (reverse Hybrid) ☐ Arthroplasty – primary TKR ☐ Arthroplasty - excision	☐ Consultant ☐ Associate specialist ☐ Staff-grade/specialty doctor ☐ ST3+ ☐ Below ST3 ☐ Unknown	☐ Consultant ☐ Associate specialist ☐ Staff-grade/specialty doctor ☐ ST3+ ☐ Below ST3 ☐ Unknown

Reason if delay > 36 Hours

- ☐ No delay - surgery < 36hrs
- ☐ Awaiting orthopaedic diagnosis/investigation
- ☐ Awaiting medical review/investigation or stabilisation
- ☐ Delayed for reversal of warfarin
- ☐ Delayed for reversal of DOAC*
- ☐ Administrative/logistic - awaiting space on theatre list
- ☐ Administrative/logistic - cancelled due to theatre over-run
- ☐ Other
- ☐ Unknown

** Direct oral anticoagulants (DOACs) are apixaban, edoxaban, rivaroxaban and dabigatran*

(Do not record clopidogrel or prasugrel - they are antiplatelet drugs not DOACs)

Lateral X-ray

→ Yes

→ No

Traction

→ Yes

→ No

Considerations

Especial considerations:

- Sever hip osteoarthritis
- Pathologic Fractures

Unstable Fractures:

- Basicervical fractures (B2.1)
- The presence of a subtrochanteric extension to the fracture
- Loss of the lateral cortical support
- Posteromedial Commiunation
- Medialization of the femur
- Severe displacement or angulation of the fracture on the lateral radiograph

THE BONE & JOINT JOURNAL

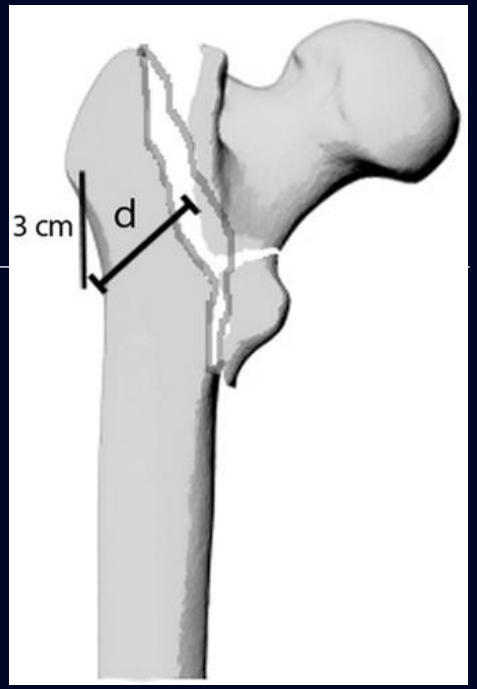
■ TRAUMA

Lateral femoral wall thickness

A RELIABLE PREDICTOR OF POST-OPERATIVE LATERAL WALL FRACTURE IN INTERTROCHANTERIC FRACTURES

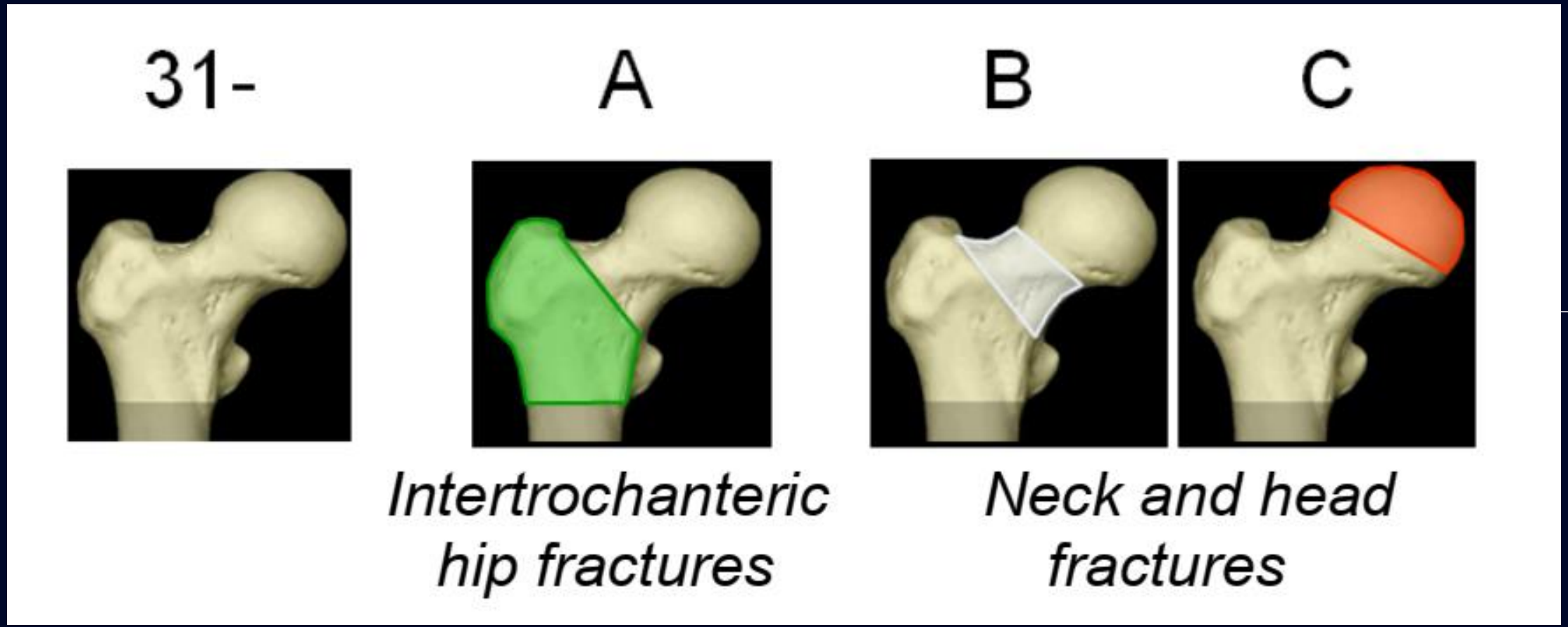
C-E. Hsu,
C-M. Shih,
C-C. Wang,
K-C. Huang

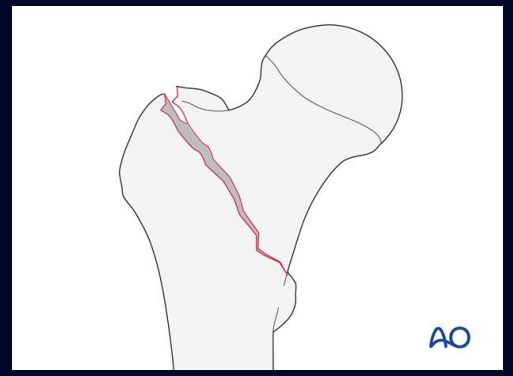
From Taichung Veterans General Hospital, Taichung, Taiwan

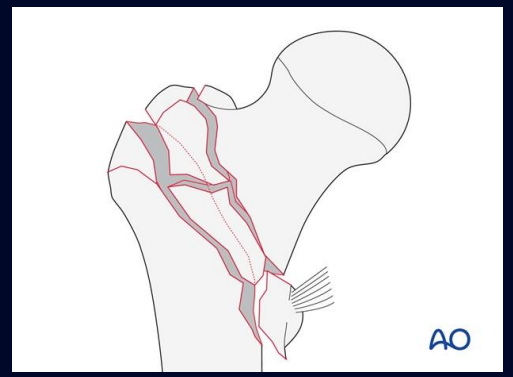


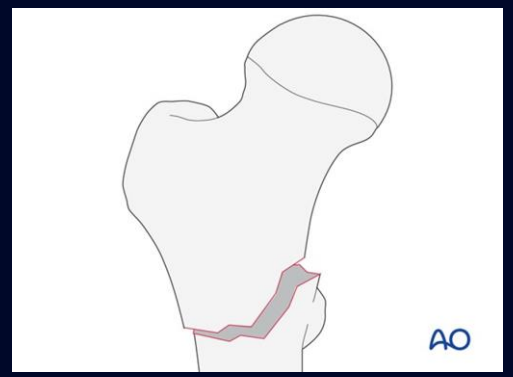
To our knowledge, this is the first study to investigate the risk factors of post-operative lateral wall fracture in intertrochanteric fracture. We found that lateral wall thickness was a reliable predictor of post-operative lateral wall fracture and conclude that intertrochanteric fractures with a lateral wall thickness < 20.5 mm should not be treated with DHS alone.

Classification









Classification

New AO

31A1 / 31A2 / 31A3

Stable

Unstable

Potentially Unstable

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*

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

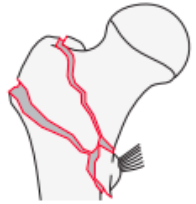
Two-part fracture
31A1.2

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

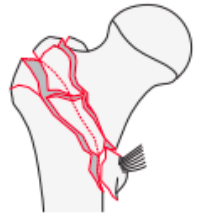
Group: Femur, proximal end segment, trochanteric region, **multifragmentary pertrochanteric, lateral wall incompetent (≤ 20.5 mm) fracture** 31A2

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.

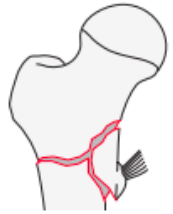
Group: Femur, proximal end segment, trochanteric region, **intertrochanteric (reverse obliquity) fracture** 31A3

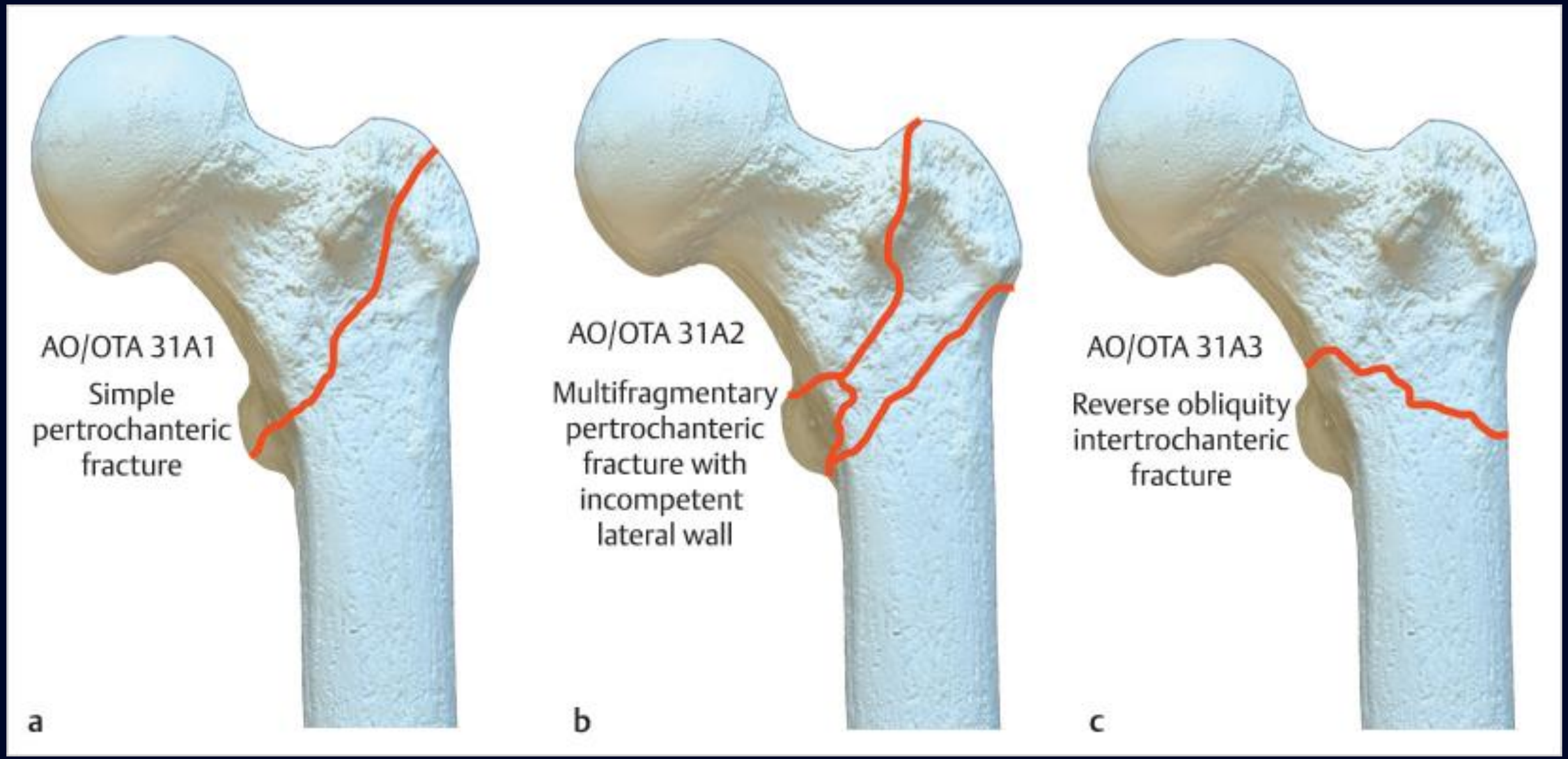
Subgroups:

Simple oblique fracture
31A3.1

Simple transverse fracture
31A3.2

Wedge or multifragmentary fracture
31A3.3




AO/OTA 31A1
Simple pertrochanteric fracture
a
AO/OTA 31A2
Multifragmentary pertrochanteric fracture with incompetent lateral wall
b
AO/OTA 31A3
Reverse obliquity intertrochanteric fracture
c

Femoral medialization

- Reduced area of bone to bone contact
- Delayed fracture healing
- An increased risk of fracture-healing complications
- Reduction in function from loss of femoral offset and moment arm

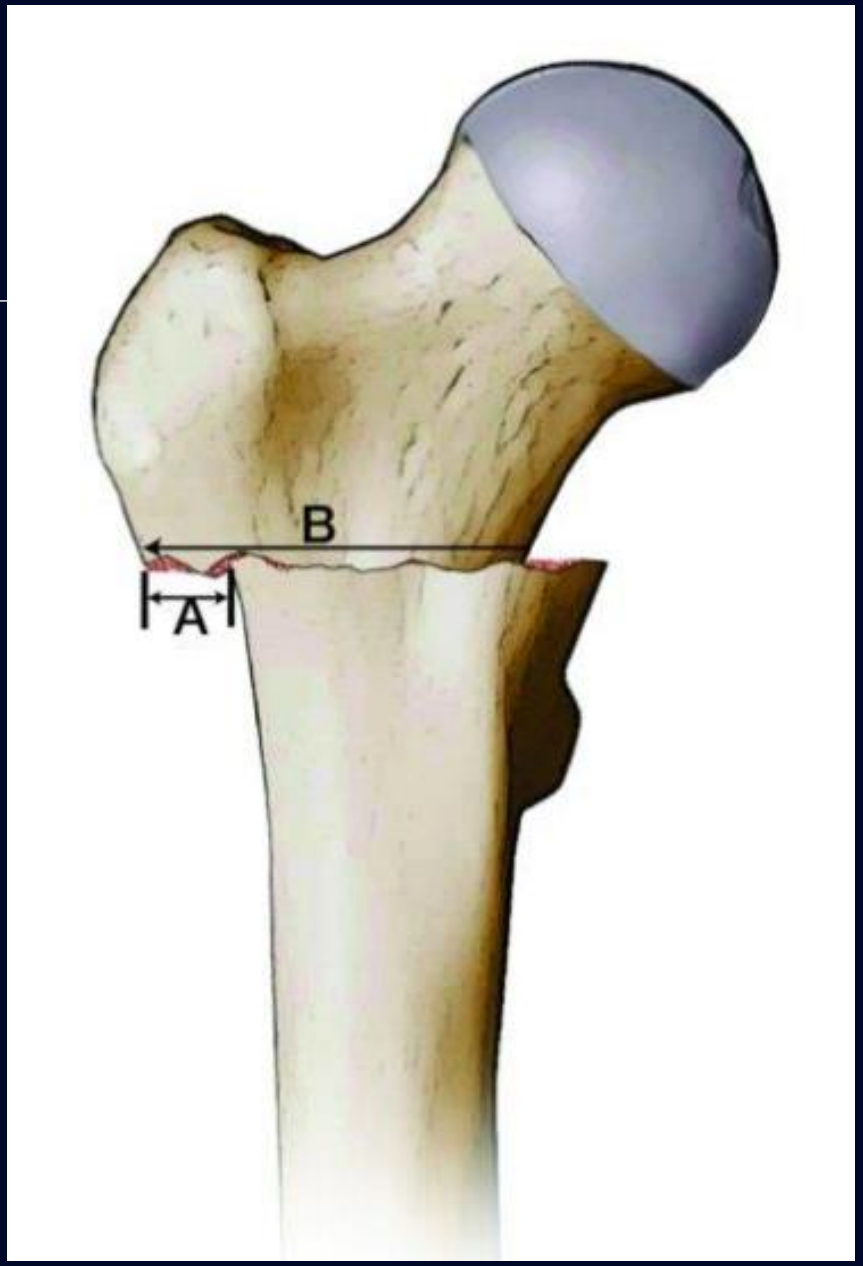
Femoral medialization

1°medialization => 1% increase in the risk of fixation failure

greater than 50% medialization has been found to be associated with a lower regain of function

DHS : 10%
CMN : 2%

Medialization > 50% :
7% DHS
1% CMN



Bretherton, C. P., & Parker, M. J. (2016). Femoral Medialization, Fixation Failures, and Functional Outcome in Trochanteric Hip Fractures Treated With Either a Sliding Hip Screw or an Intramedullary Nail From Within a Randomized Trial. Journal of Orthopaedic Trauma, 30(12), 642–646.

Combat Femoral Medialization

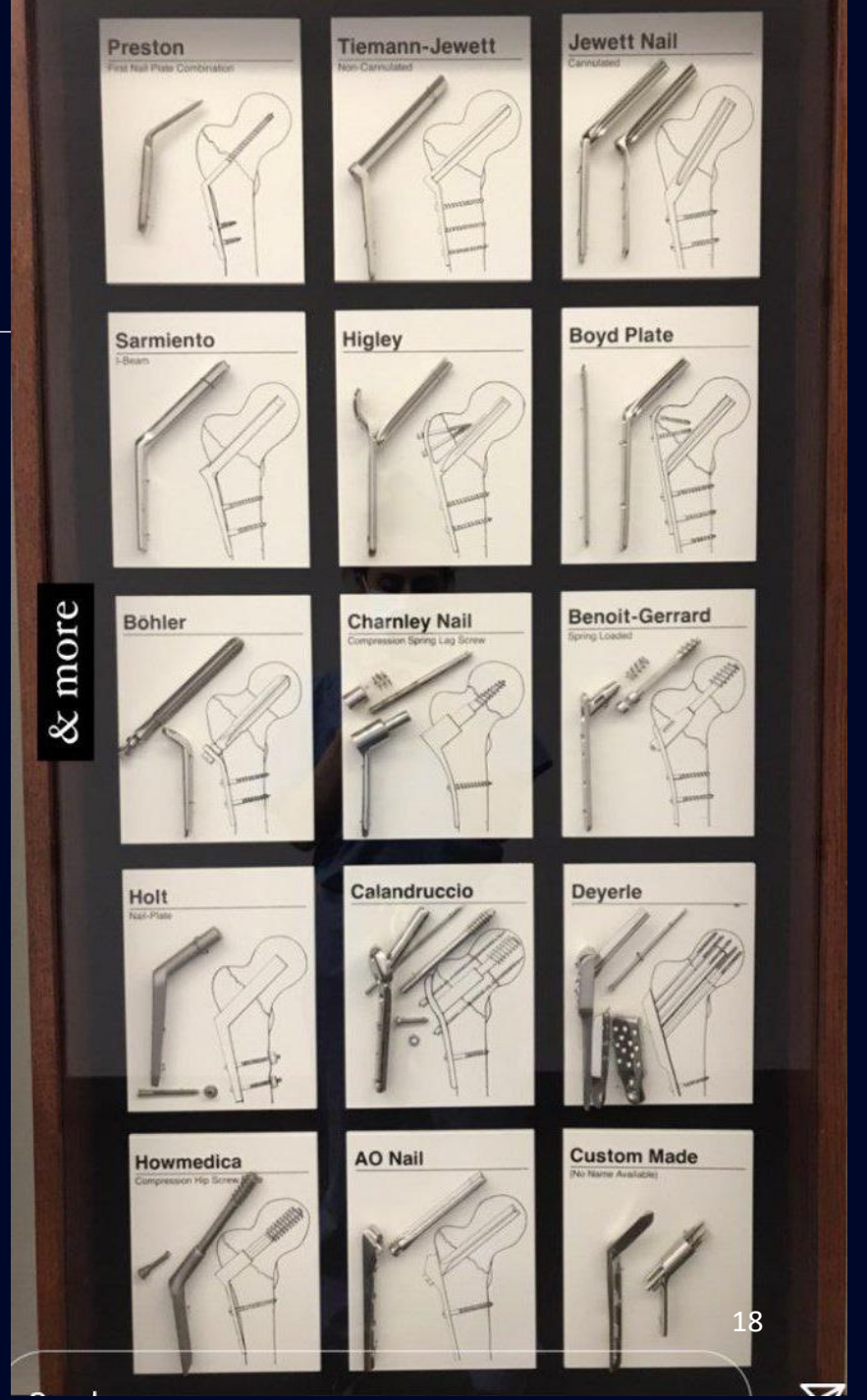
DCS – ABP

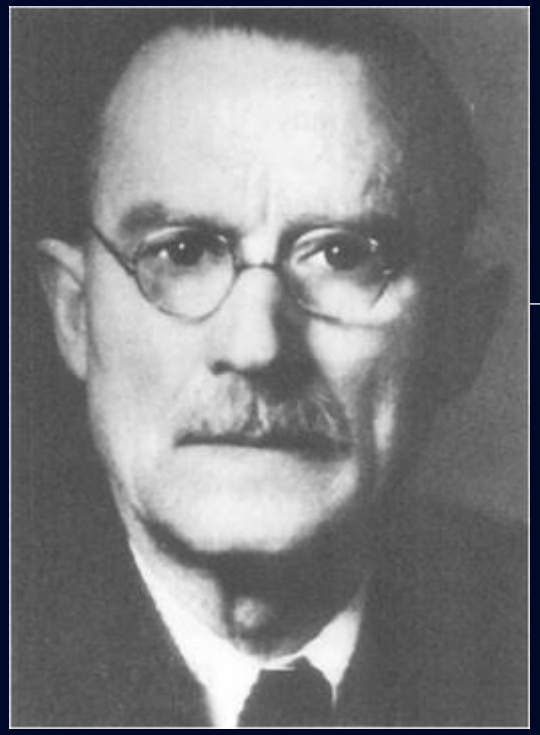
DHS+TSP

CMN

Implant Selection

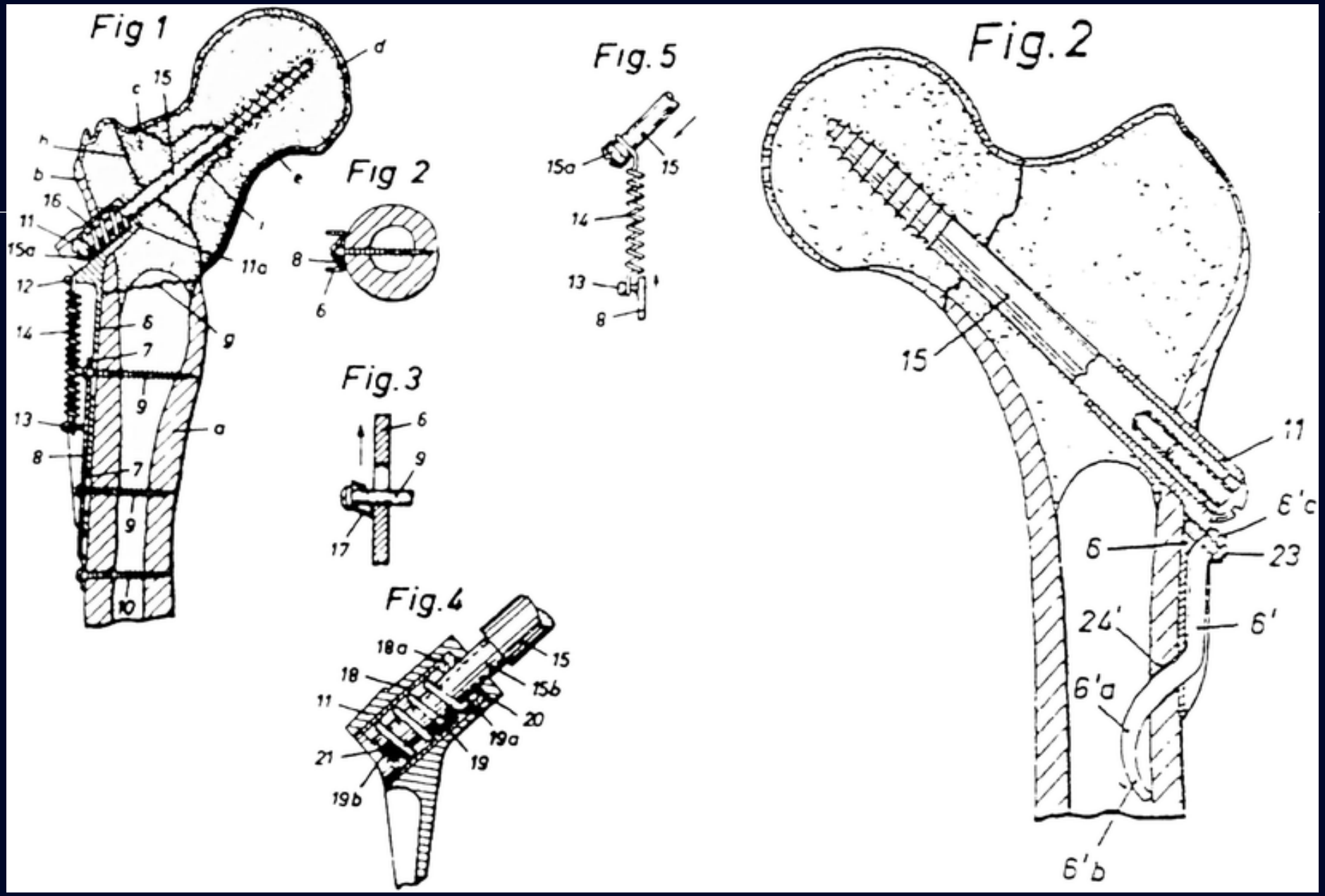
- **Extramedullary**
- **Intramedullary**
- **External fixation**
- **Replacement arthroplasty**





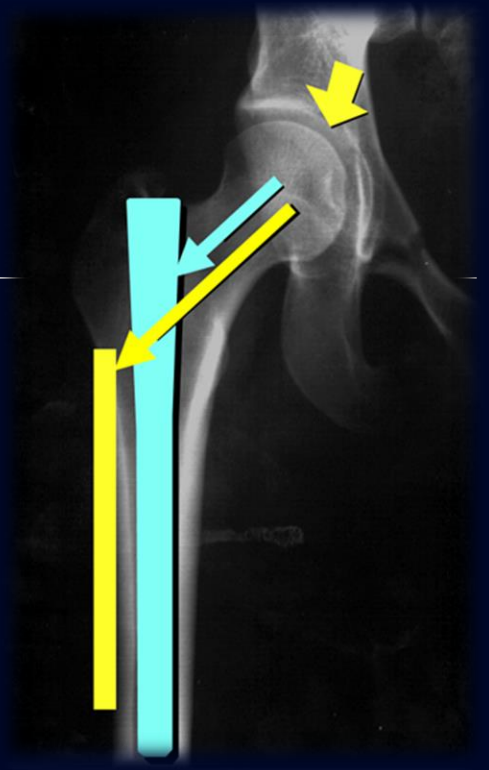
Ernst Pohl (1876–1962)

1951



Pohl’s patent of the “Pohlsche Lasche” in Germany

Evidence for Implant Selection

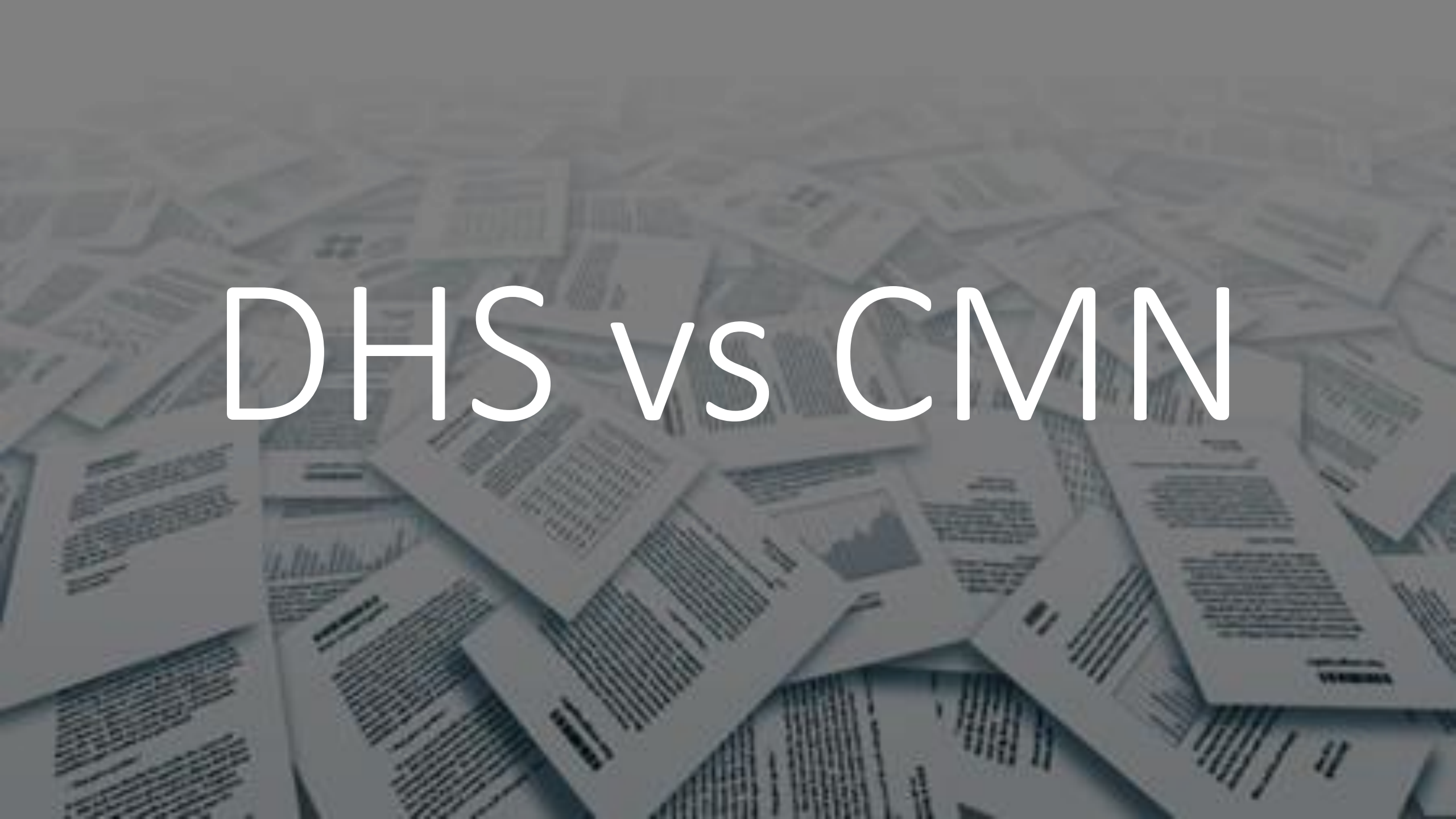


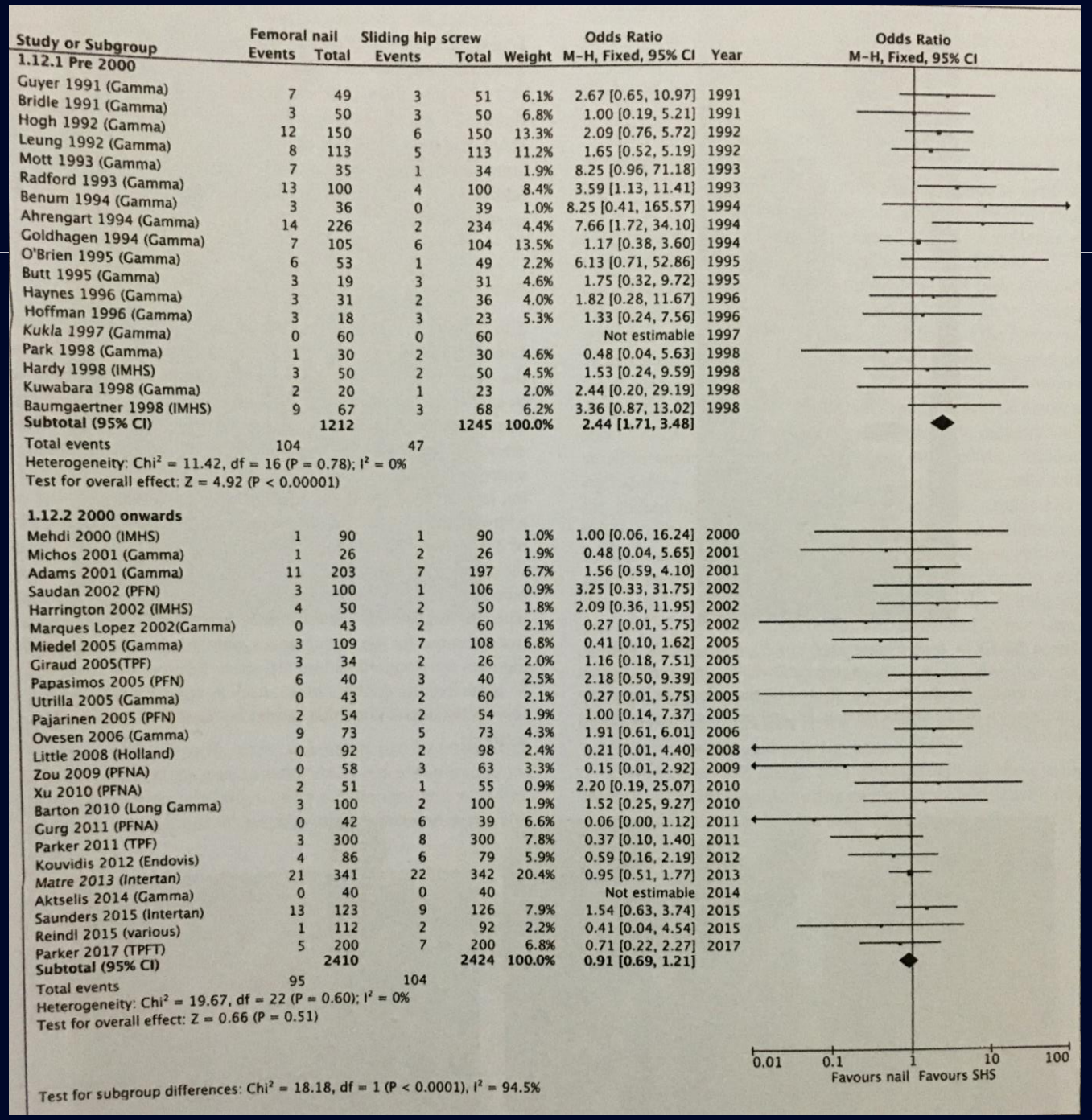
Biomechanical Studies
Case Series
Registries'
Small RCTs’

We Need Large RCTs’

functional outcomes : > 500 patients

fracture-related complications : > 1,000 patients


DHS vs CMN



Study or Subgroup	Femoral nail Events	Total	Sliding hip screw Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
1.12.1 Pre 2000							
Guyer 1991 (Gamma)	7	49	3	51	6.1%	2.67 [0.65, 10.97]	1991
Bridle 1991 (Gamma)	3	50	3	50	6.8%	1.00 [0.19, 5.21]	1991
Hogh 1992 (Gamma)	12	150	6	150	13.3%	2.09 [0.76, 5.72]	1992
Leung 1992 (Gamma)	8	113	5	113	11.2%	1.65 [0.52, 5.19]	1992
Mott 1993 (Gamma)	7	35	1	34	1.9%	8.25 [0.96, 71.18]	1993
Radford 1993 (Gamma)	13	100	4	100	8.4%	3.59 [1.13, 11.41]	1993
Benum 1994 (Gamma)	3	36	0	39	1.0%	8.25 [0.41, 165.57]	1994
Ahrengart 1994 (Gamma)	14	226	2	234	4.4%	7.66 [1.72, 34.10]	1994
Goldhagen 1994 (Gamma)	7	105	6	104	13.5%	1.17 [0.38, 3.60]	1994
O'Brien 1995 (Gamma)	6	53	1	49	2.2%	6.13 [0.71, 52.86]	1995
Butt 1995 (Gamma)	3	19	3	31	4.6%	1.75 [0.32, 9.72]	1995
Haynes 1996 (Gamma)	3	31	2	36	4.0%	1.82 [0.28, 11.67]	1996
Hoffman 1996 (Gamma)	3	18	3	23	5.3%	1.33 [0.24, 7.56]	1996
Kukla 1997 (Gamma)	0	60	0	60		Not estimable	1997
Park 1998 (Gamma)	1	30	2	30	4.6%	0.48 [0.04, 5.63]	1998
Hardy 1998 (IMHS)	3	50	2	50	4.5%	1.53 [0.24, 9.59]	1998
Kuwabara 1998 (Gamma)	2	20	1	23	2.0%	2.44 [0.20, 29.19]	1998
Baumgaertner 1998 (IMHS)	9	67	3	68	6.2%	3.36 [0.87, 13.02]	1998
Subtotal (95% CI)		**1212**		**1245**	**100.0%**	**2.44 [1.71, 3.48]**	
Total events	104		47				
Heterogeneity: $Chi^2 = 11.42$, df = 16 (P = 0.78); $I^2 = 0\%$							
Test for overall effect: Z = 4.92 (P < 0.00001)							
1.12.2 2000 onwards							
Mehdi 2000 (IMHS)	1	90	1	90	1.0%	1.00 [0.06, 16.24]	2000
Michos 2001 (Gamma)	1	26	2	26	1.9%	0.48 [0.04, 5.65]	2001
Adams 2001 (Gamma)	11	203	7	197	6.7%	1.56 [0.59, 4.10]	2001
Saudan 2002 (PFN)	3	100	1	106	0.9%	3.25 [0.33, 31.75]	2002
Harrington 2002 (IMHS)	4	50	2	50	1.8%	2.09 [0.36, 11.95]	2002
Marques Lopez 2002(Gamma)	0	43	2	60	2.1%	0.27 [0.01, 5.75]	2002
Miedel 2005 (Gamma)	3	109	7	108	6.8%	0.41 [0.10, 1.62]	2005
Giraud 2005(TPF)	3	34	2	26	2.0%	1.16 [0.18, 7.51]	2005
Papasimos 2005 (PFN)	6	40	3	40	2.5%	2.18 [0.50, 9.39]	2005
Utrilla 2005 (Gamma)	0	43	2	60	2.1%	0.27 [0.01, 5.75]	2005
Pajarinen 2005 (PFN)	2	54	2	54	1.9%	1.00 [0.14, 7.37]	2005
Ovesen 2006 (Gamma)	9	73	5	73	4.3%	1.91 [0.61, 6.01]	2006
Little 2008 (Holland)	0	92	2	98	2.4%	0.21 [0.01, 4.40]	2008
Zou 2009 (PFNA)	0	58	3	63	3.3%	0.15 [0.01, 2.92]	2009
Xu 2010 (PFNA)	2	51	1	55	0.9%	2.20 [0.19, 25.07]	2010
Barton 2010 (Long Gamma)	3	100	2	100	1.9%	1.52 [0.25, 9.27]	2010
Gurg 2011 (PFNA)	0	42	6	39	6.6%	0.06 [0.00, 1.12]	2011
Parker 2011 (TPF)	3	300	8	300	7.8%	0.37 [0.10, 1.40]	2011
Kouvidis 2012 (Endovis)	4	86	6	79	5.9%	0.59 [0.16, 2.19]	2012
Matre 2013 (Intertan)	21	341	22	342	20.4%	0.95 [0.51, 1.77]	2013
Aktselis 2014 (Gamma)	0	40	0	40		Not estimable	2014
Saunders 2015 (Intertan)	13	123	9	126	7.9%	1.54 [0.63, 3.74]	2015
Reindl 2015 (various)	1	112	2	92	2.2%	0.41 [0.04, 4.54]	2015
Parker 2017 (TPFT)	5	200	7	200	6.8%	0.71 [0.22, 2.27]	2017
Subtotal (95% CI)		**2410**		**2424**	**100.0%**	**0.91 [0.69, 1.21]**	
Total events	95		104				
Heterogeneity: $Chi^2 = 19.67$, df = 22 (P = 0.60); $I^2 = 0\%$							
Test for overall effect: Z = 0.66 (P = 0.51)							
Test for subgroup differences: $Chi^2 = 18.18$, df = 1 (P < 0.0001), $I^2 = 94.5\%$							

Odds Ratio M-H, Fixed, 95% CI

0.01 0.1 1 10 100

Favours nail Favours SHS

Stable

CMN=DHS

DHS is Cheaper

Unstable

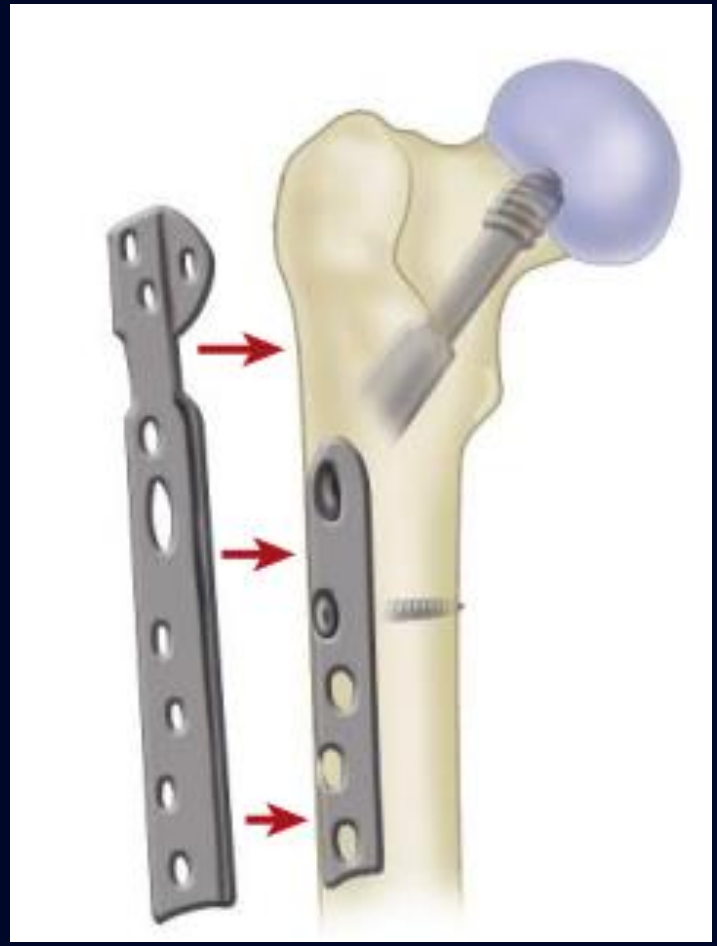
CMN may be better than DHS

CMN

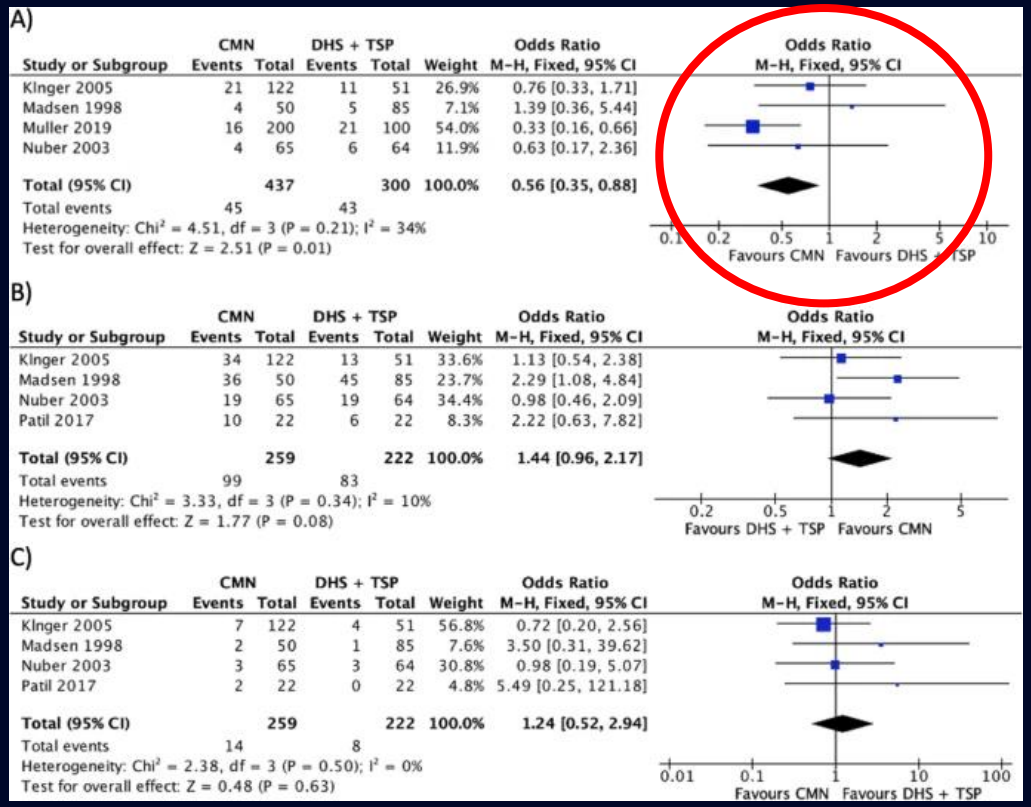
Lateral cortical disruption (preoperative or occurring during surgery)

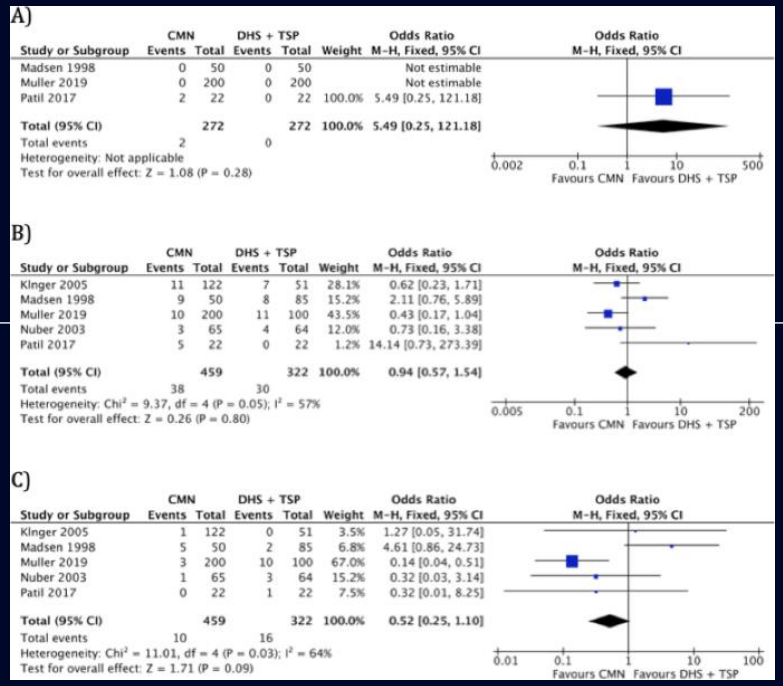
Sliding hip screw with plate

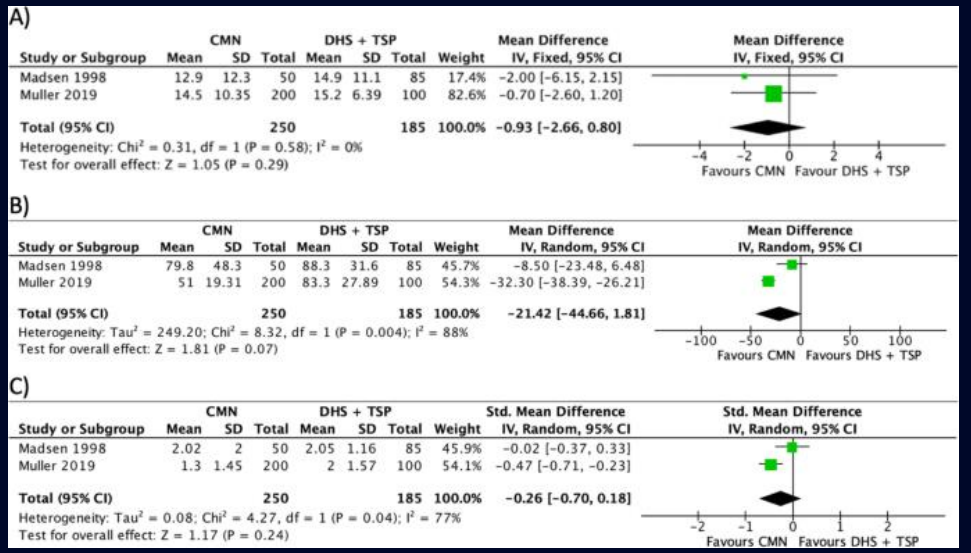
CMN



CMN vs DHS+TSP







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Nailing may not be possible

- Bone deformity or previous surgery that prevents nailing
- Previous Intamedulary Device

SHORT OR LONG NAILS
FOR INTERTROCHANTERIC FEMORAL FRACTURES

Without Subtrochanteric Extension

No Difference


R

R

Weigh Bearing After Surgery

Delayed weightbearing negatively impacts function, particularly with gait

Campbell :

POSTOPERATIVE CARE Patients with intertrochanteric femoral fractures treated with a compression hip screw are allowed to bear weight as tolerated in most circumstances because this device is used in more stable fracture patterns.

POSTOPERATIVE CARE Patients with intertrochanteric femoral fractures treated with an intramedullary device are allowed to bear weight as tolerated in most circumstances; however, this device may be used in more unstable fracture patterns and occasionally weight-bearing status needs to be modified based on these fracture patterns.

Rockwood :

Postoperative Care

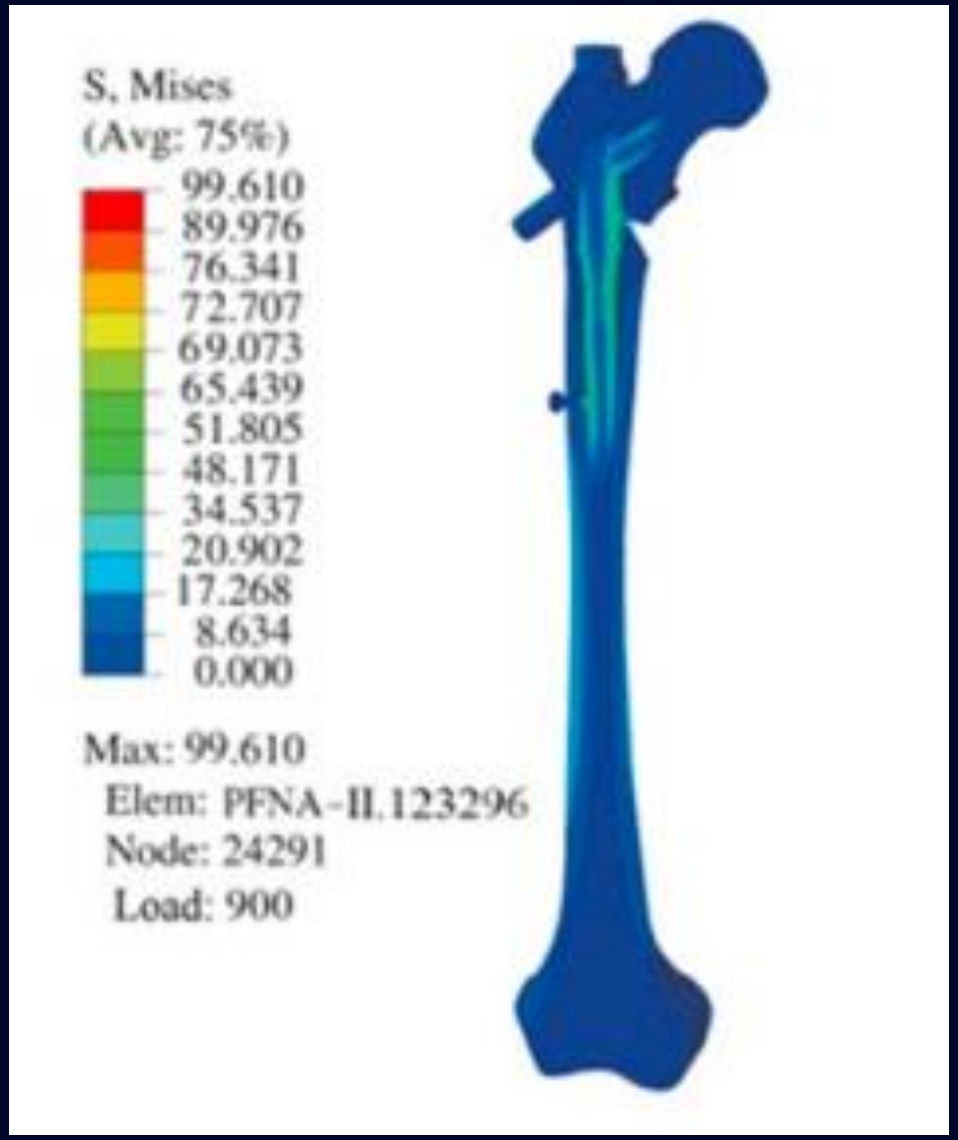
Following surgery with the appropriate surgical management, it should be possible to mobilize all patients with a trochanteric fracture fully weight bearing with no restrictions on hip movement or function. In practice, because of the pain associated with the fracture, patients will in effect weight bear as tolerated and then, as the fracture consolidates and becomes less painful, they will be able to put more weight through the injured limb.

Weigh Bearing After Surgery

Antromedial Cortex

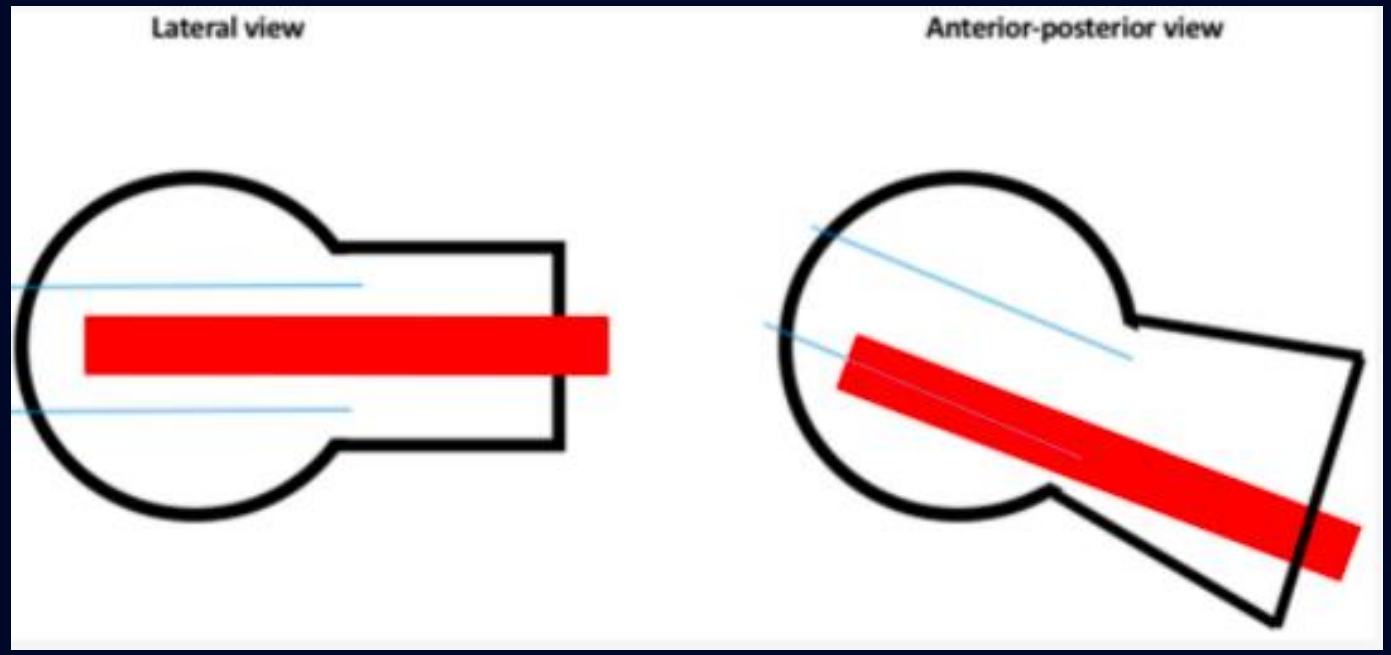
- ✓No Communation
- ✓Well Reduced

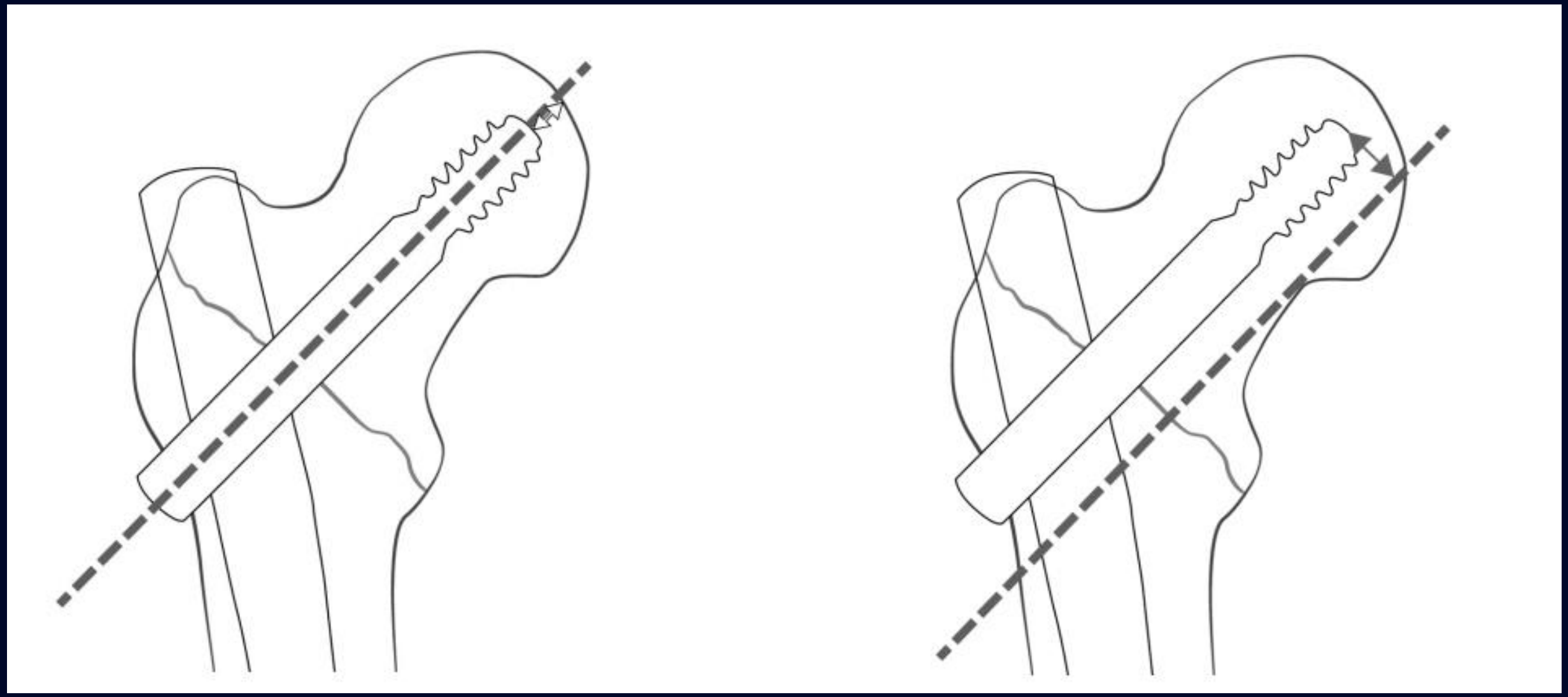
early weightbearing load of 900 N
(1.45 times body weight)
can be recommended for postoperative rehabilitation



Li S, Sun GX, Chang SM, Yang CS, Li Y, Niu W, Zhang LZ, Zhang C. Simulated postoperative weight-bearing after fixation of a severe osteoporotic intertrochanteric fracture. Int J Clin Exp Med. 2017 Jan 1;10(5):8438-48.

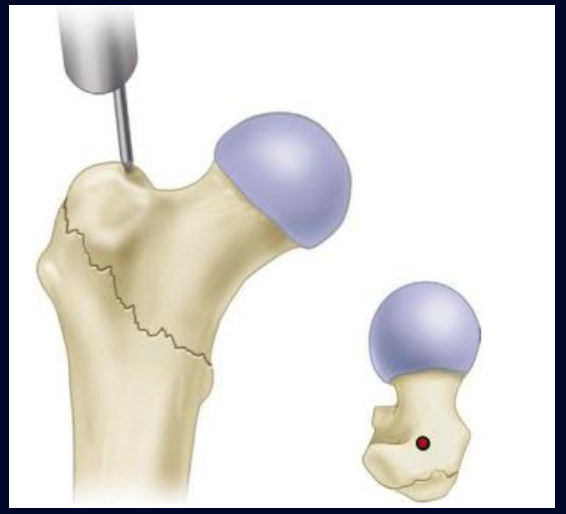
Few Tips

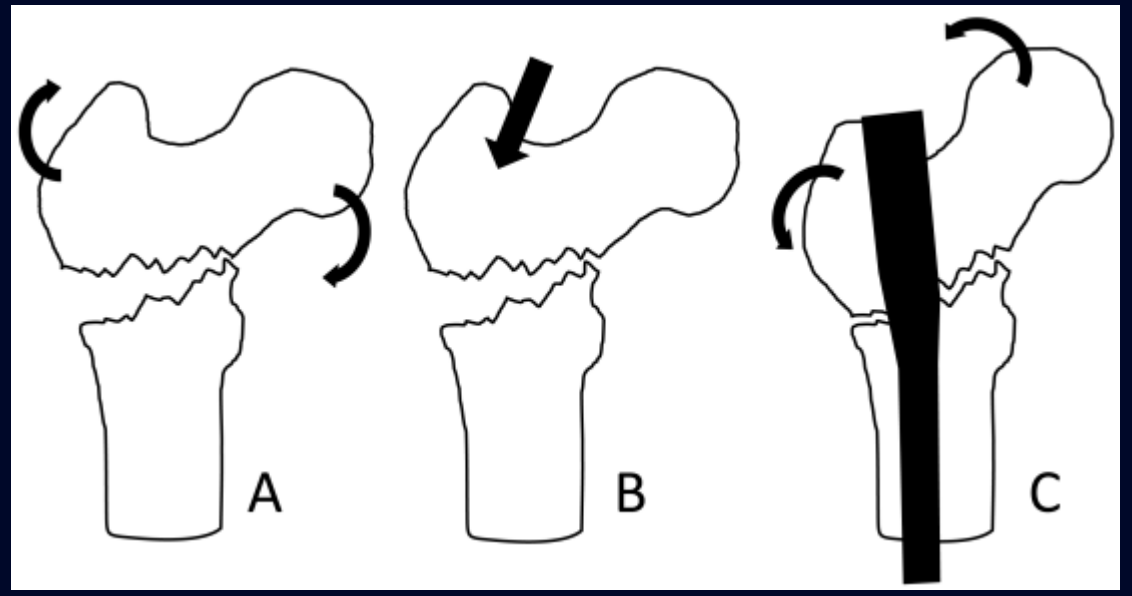


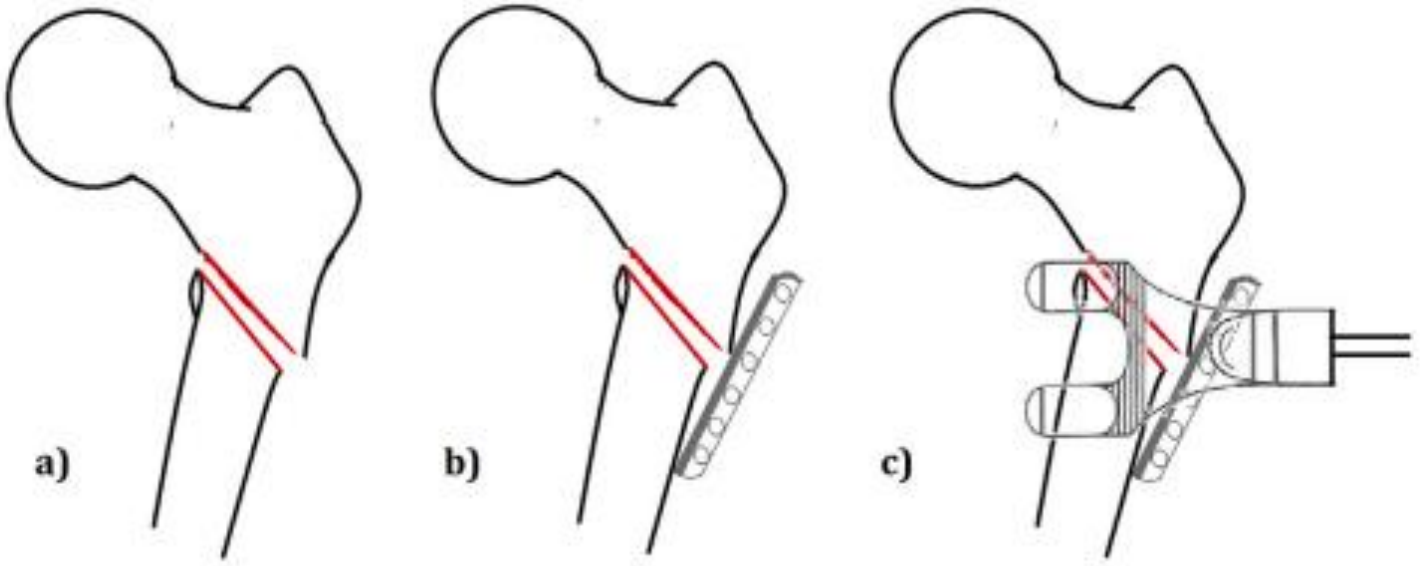


Avoid Varus

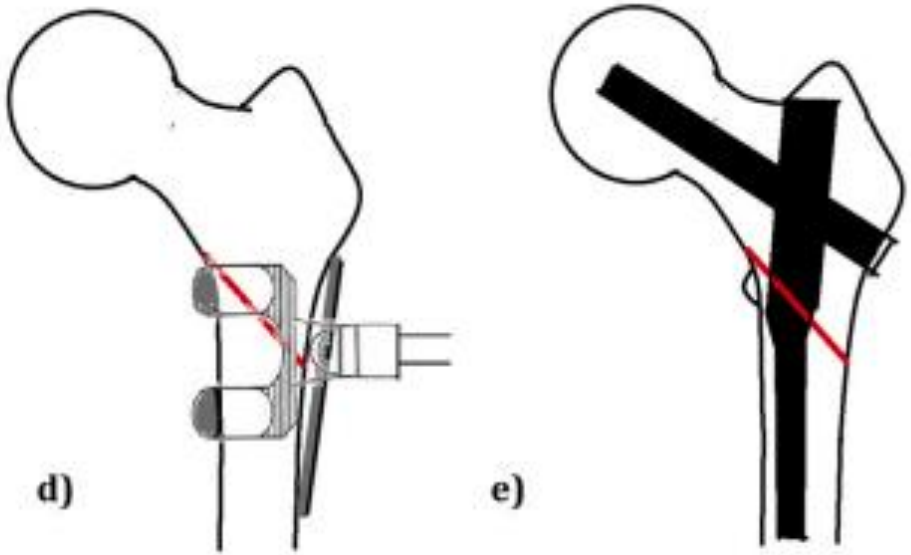
- Entry point : medial to the tip of the greater trochanter
- Avoid over-reaming the entry
- Proximal reaming : towards a slightly lateral direction distally
- Maintain the reduction



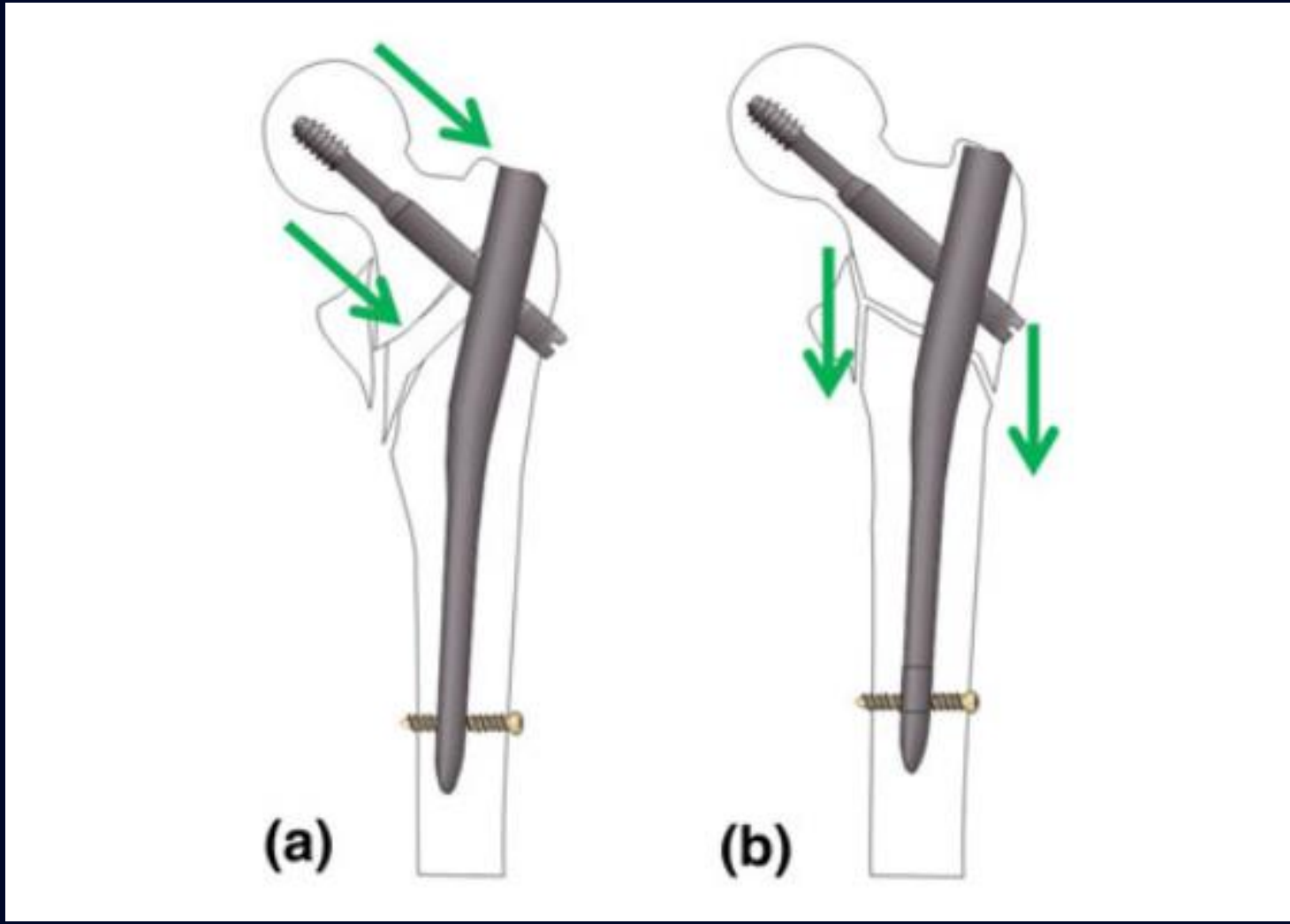




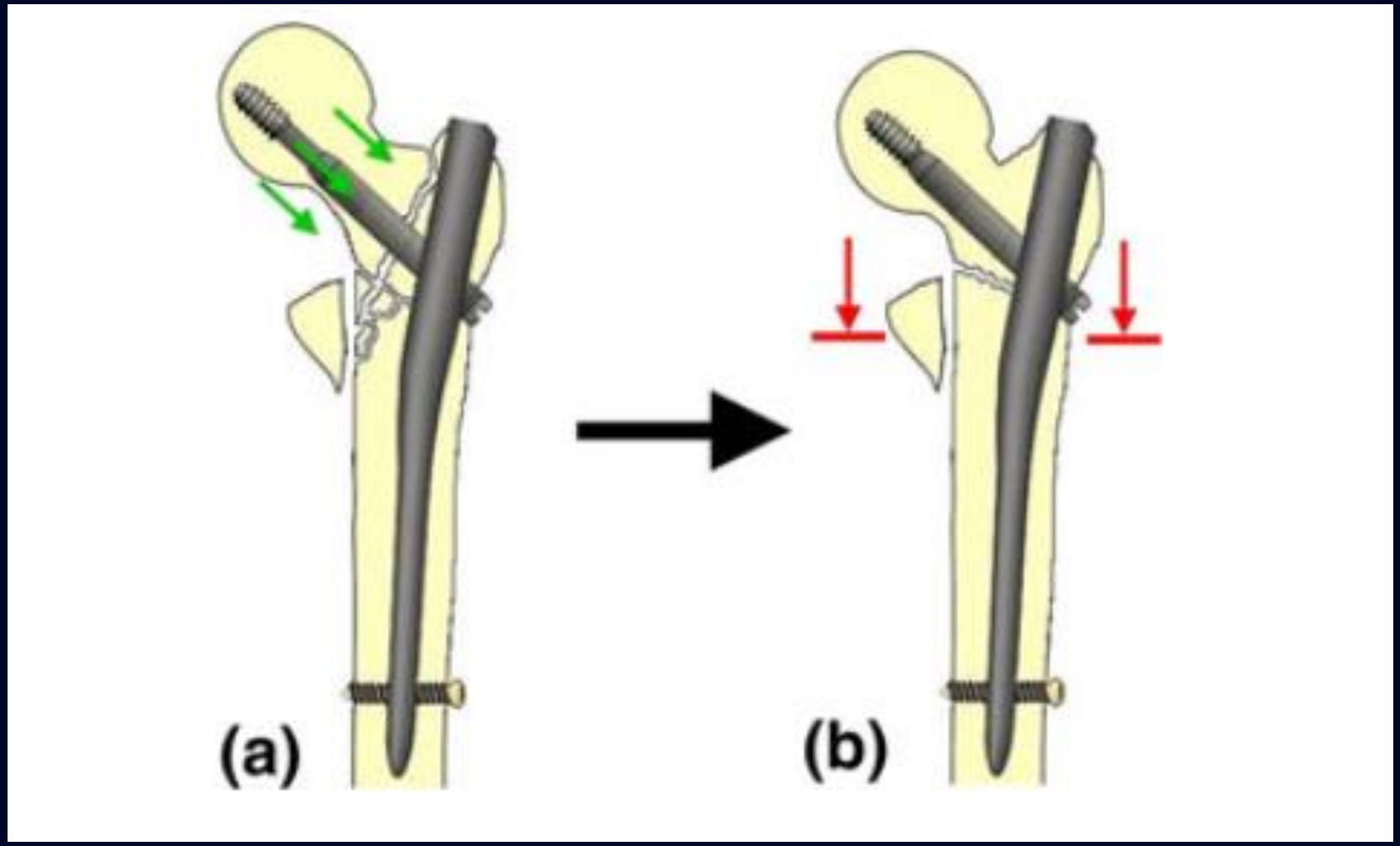
Lowman clamp



Kumar A, Chouhan D, Narang A, Khan R, Mittal S. “Clamp and plate”-A simple technique for prevention of varus malreduction in reverse oblique peritrochanteric fractures. Journal of Clinical Orthopaedics and Trauma. 2020 Jul 1;11:S667-70.



Biber, R., Bail, H.-J., & Stedtfeld, H.-W. (2013). Lateral cortical notching in specific cases of delayed unions or nonunions after intertrochanteric and reversed fractures. Archives of Orthopaedic and Trauma Surgery, 133(4), 495–501.



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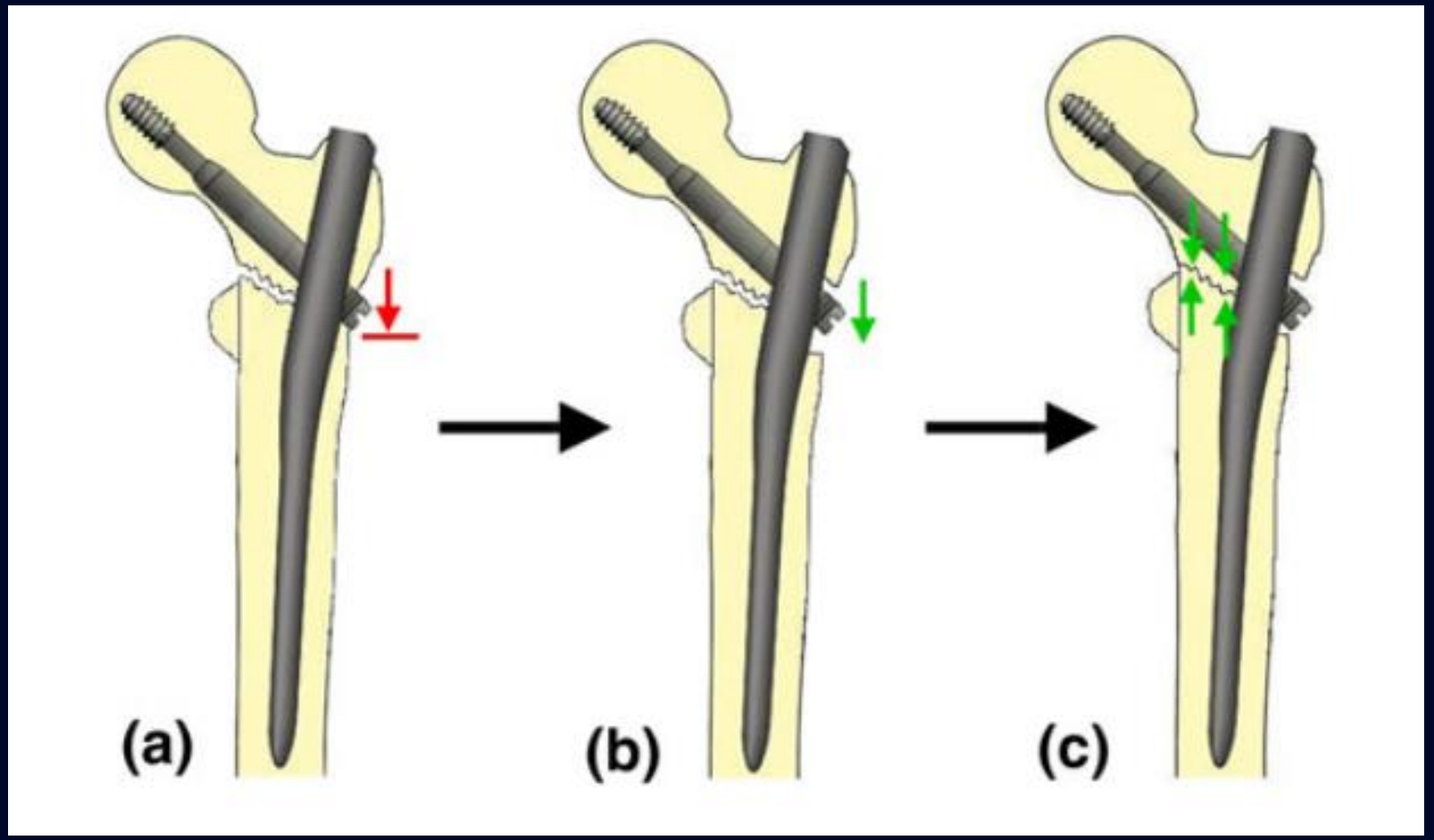
Effective dynamization may require lateral notching of the femur



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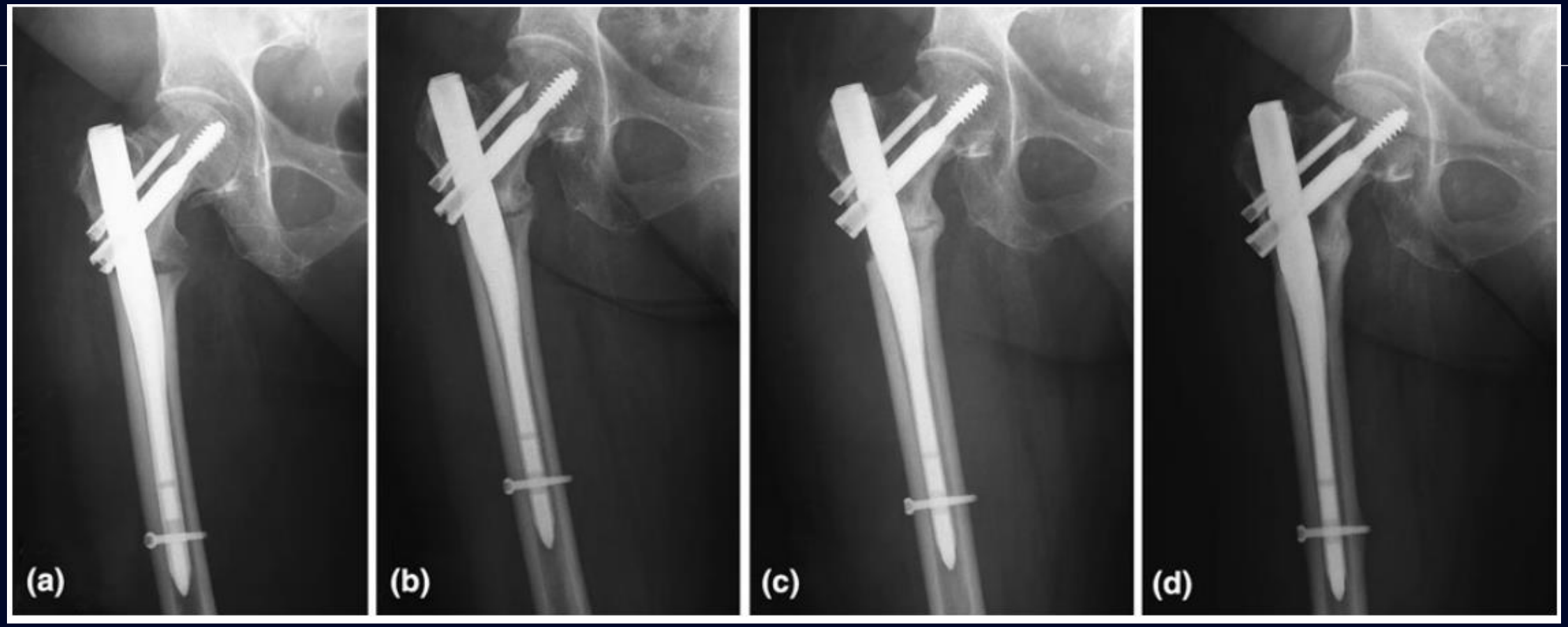

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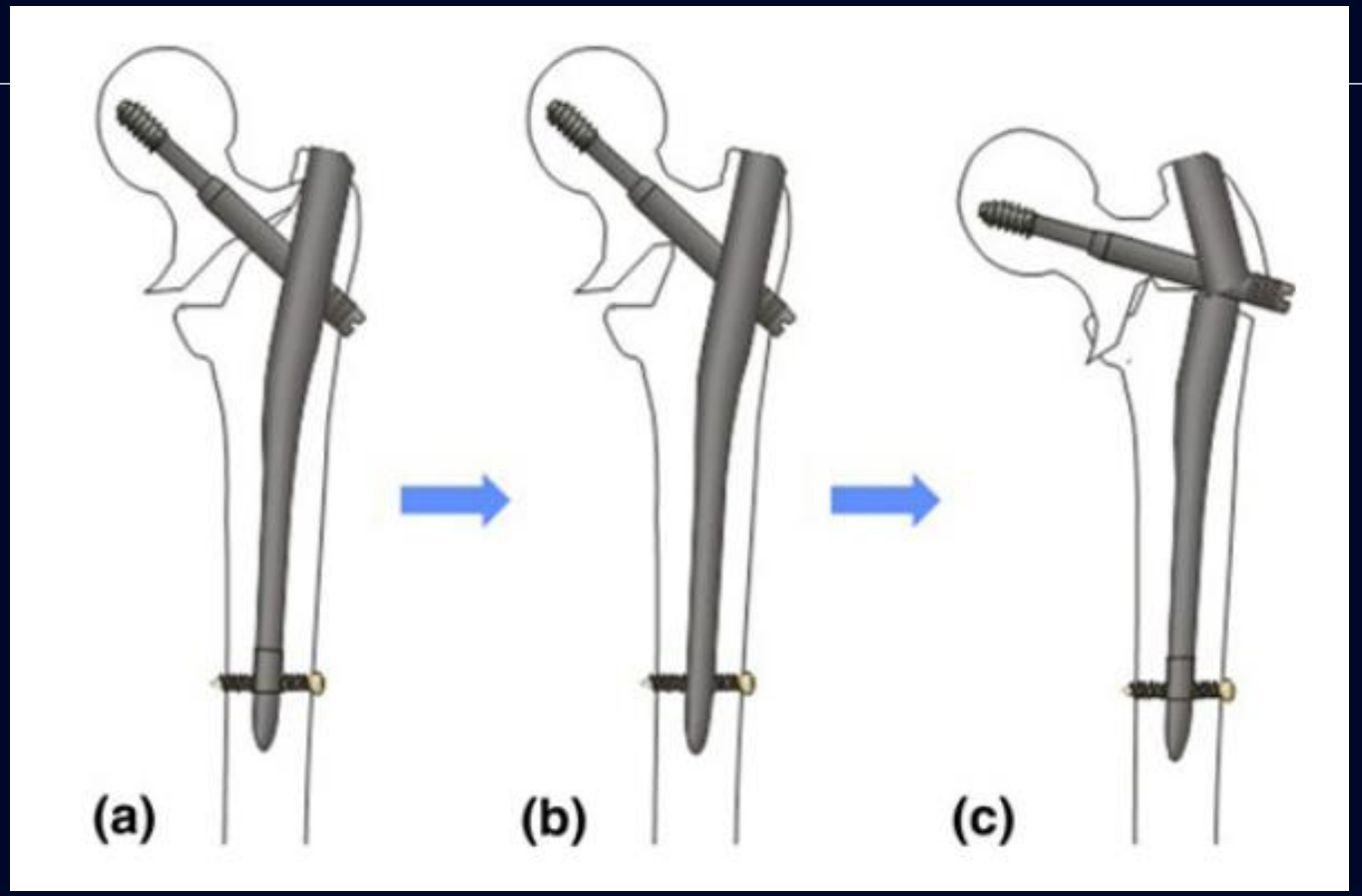

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Take Home Message

- Don not Delay
- Understand the Fracture
- Be Familiar with the device
- Avoid
  - Varus Malreduction
  - Femoral Medialization
- Be familiar with complications