



Lessons Learned TSII™ Stem

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Tissue Sparing THA

Adrian J Van Der Rijt pictured below is preparing for his first MSA™ Stem in Australia (Oct.09). My thanks to Adrian providing me an opportunity to visit and observe in this case.

All involved are pleased to-date with the progress and clinical/surgical results so far. This is a new device that holds some real promise in moving this concept forward.

I hope the information within helps to provide for a new level of outcomes for THA.



Lessons Learned TSI™ Stem

The work presented here is from many sources and is truly global in its content.

This is a review of design, development and clinical/surgical results to-date on the Tissue Sparing Implant™ (TSI™) Stem. patents pending

The commercial trademarks (ARC™ & MSA™ Stems) from Omnilife science and Global Orthopaedic Technology.

+20 intraoperative trials between AU & USA by +10 different surgeons

Anterior, Anterior-Lateral & Posterior Surgical Approaches have been used

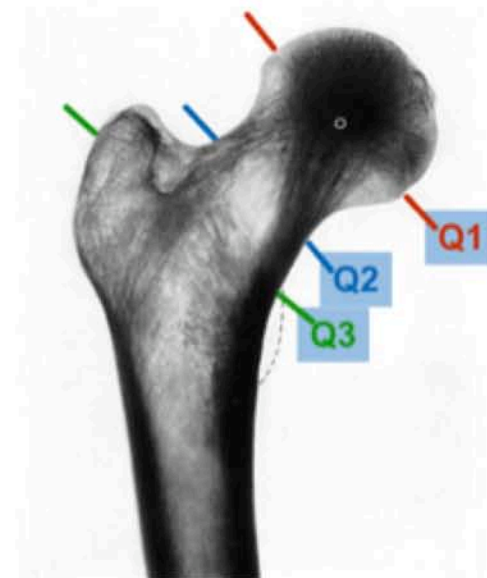
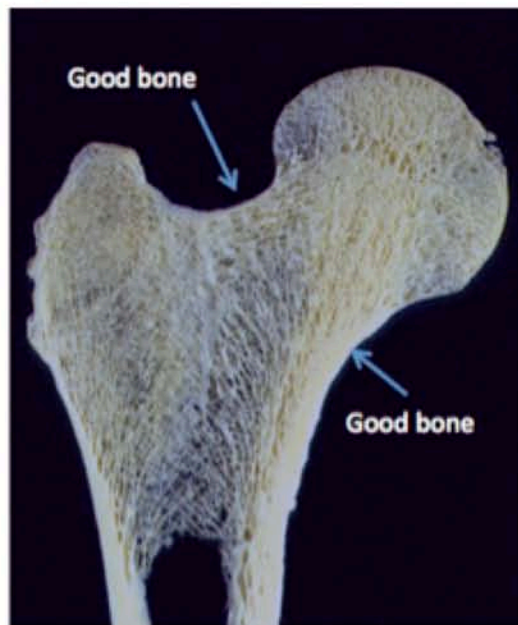
Approximately 100 stems implanted in Australia.

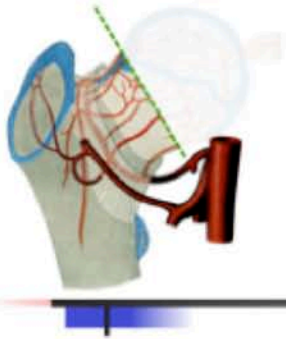
5 done as customs to validate design now 2 1/2 year follow-up

Five Cadaver Labs

Neck Sparing best recent work

Pipino CFP stem





Neck Sparing vs. Conventional THA

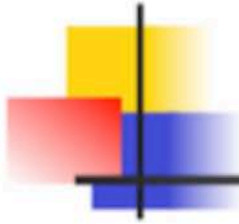


We can save more bone & soft tissue



You can avoid lateral issues





Neck Sparing Curved Stems



Pipino/CFP™



ARC™ stem



MSA™ Stem

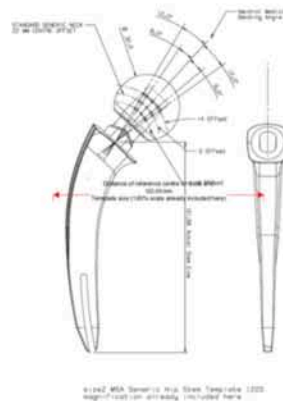
based off the TSI™ Stem design patent pending



Corin



The medial curve is similar between TSI™ Stem



Sixth case in Au / First intra-operative by a surgeon in U.S.



The other significant design features are the ability to fine tune joint mechanics! With the final implant you can adjust varus valgus with the modular neck along with vertical neck length. You also have head/neck adjustment capability.



Curve was good but the shape of the stem was under-designed.



Short stem trends reduce length of current stem designs. There is a difference between short stems and neck sparing stems.



The TSI™ Stem design (ARC™ & MSA™) save more bone both medial and lateral. Micro-plasty requires more bone removal.

MicroPlasty stem not neck sparing same contact points as Taperlock



There is a broad selection of
conservative stems some already on their way out



There have been reports of intra and
post-operative fractures of GT



Silent Stem from DePuy

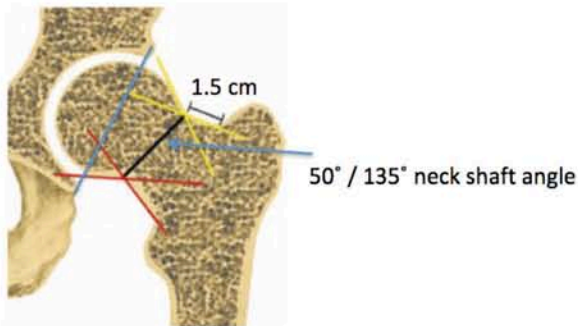
A lot of different style short stems and neck stems are
being evaluated

Neck Resection

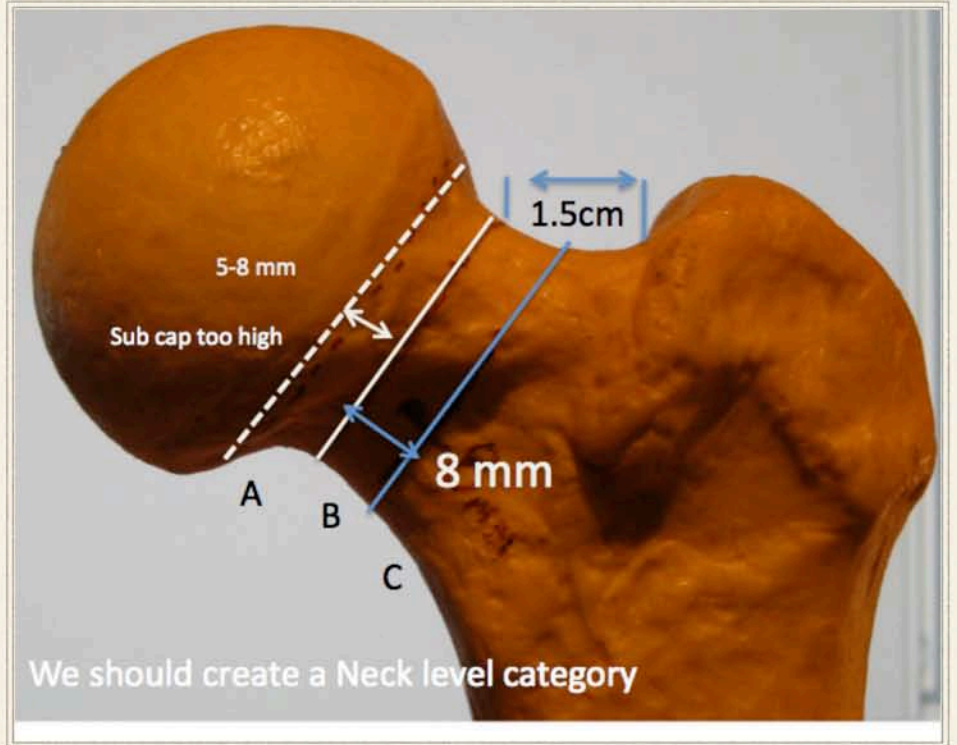
Pipino

The distance to the base of the Greater Trochanter

The acetabulum face angle is approximately 55°



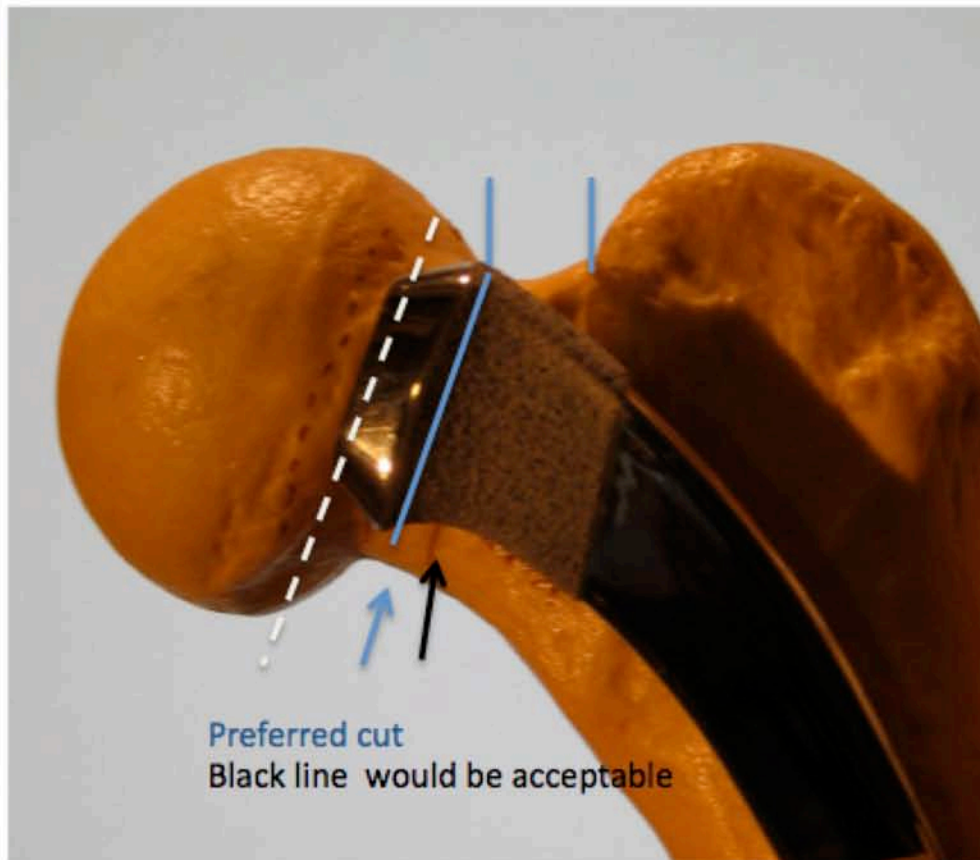
In the Preoperative Planning the osteotomy site is determined by applying tangents as described in illustration. The resection is performed at the isthmus which corresponds to the intersections of the tangents.



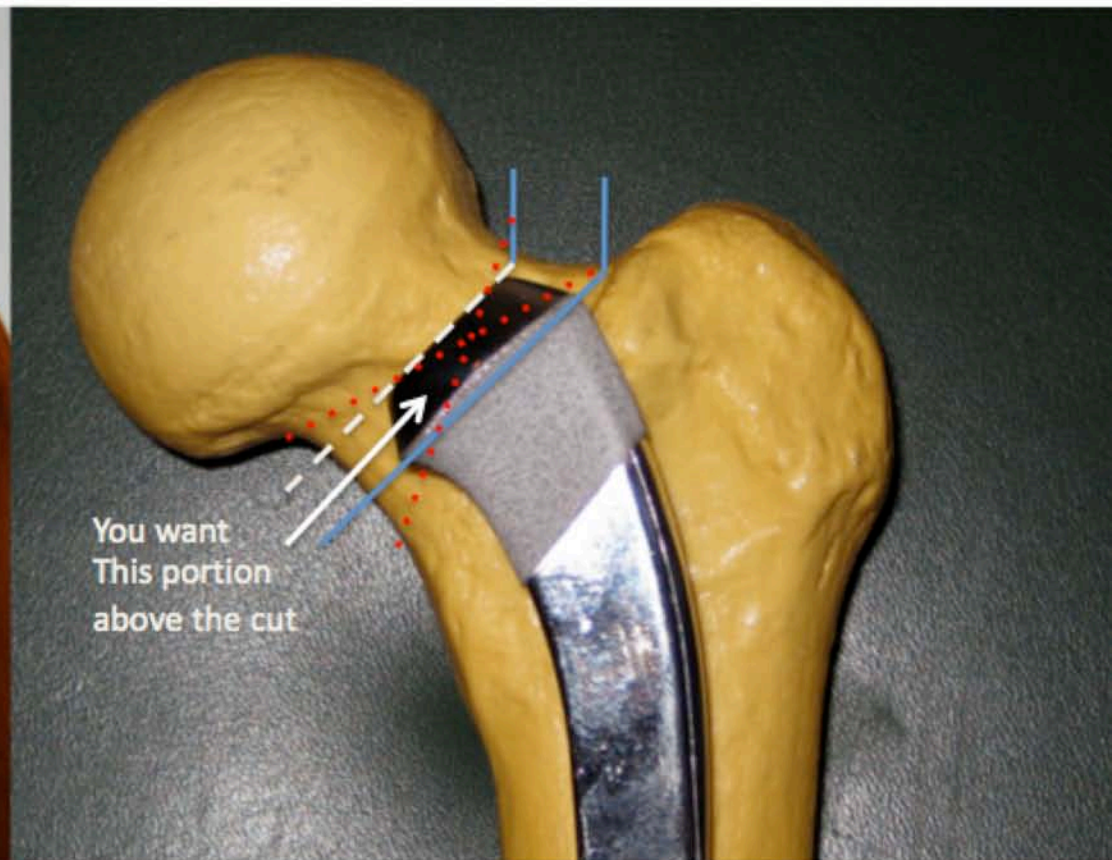
Neck Resection- The creation of a neck resection level category (A,B,C) should help in post-op evaluations.

Osteotomy Cut is important but not critical to stem location

High neck cuts: A, B, C



Slightly below high normal "B"
Let's call mid-level neck cut

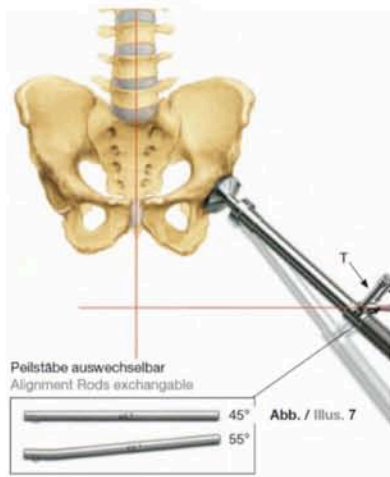


Blue line slightly too low but would be fine
Let's call low level neck cut "C"

• Making cut too vertical or too horizontal can
effect visual reference for preparation



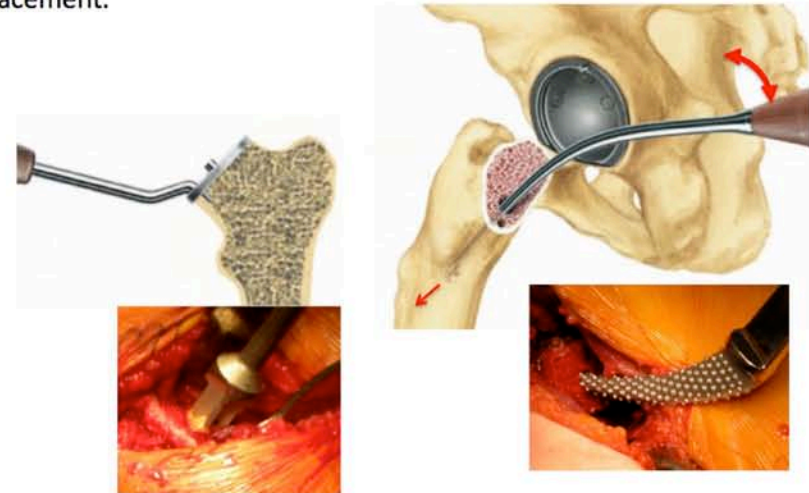
Cup Position



The Alignment Rod is in a 90° angle to the body axis.

Pipino use a guide to place his starting hole. Note: How inferior he is. He also opens with a curved bone curette.

You must when rasping move superior & lateral to prevent varus placement.



Pipino technique

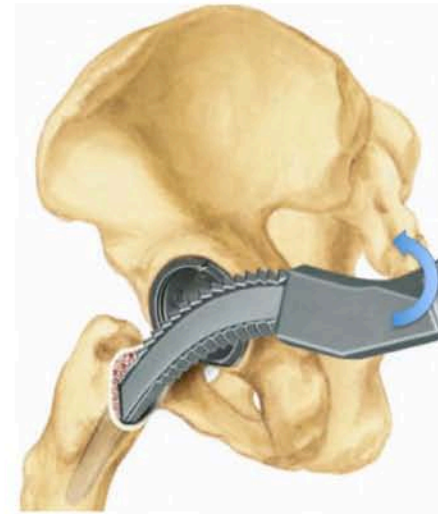


To determine the stem size a Curved Probe is introduced into the canal starting with one size below the size planned. The different Curved Probes are always inserted up to the ring mark. The shaft up to the ring mark corresponds to the length of the Bone Compressor and the final implanted stem respectively.

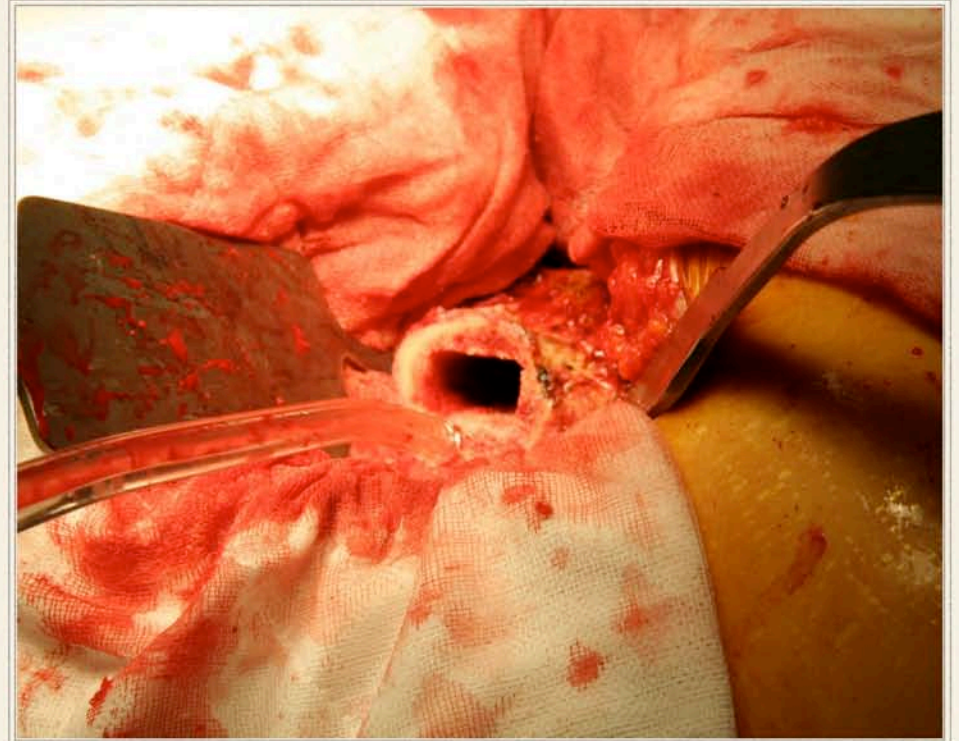
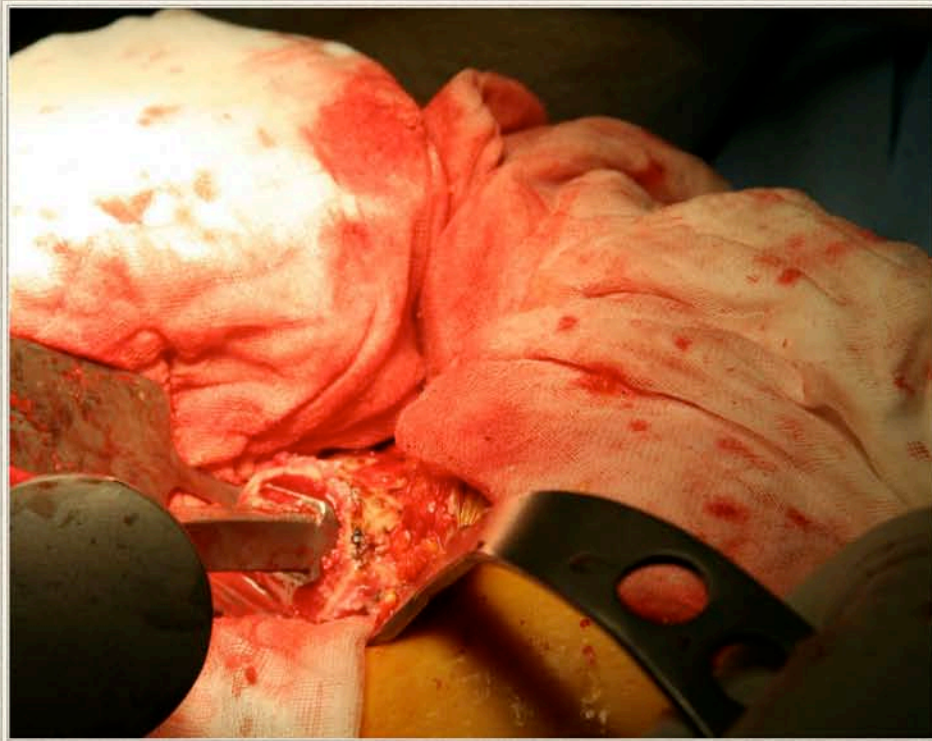
The final opening of the femoral canal to seat the prosthesis stem is prepared by compressing the cancellous bone with the Bone Compressor. The choice of the Bone Compressor depends on the stem curvature based on the pre-planning and the size determined by the Curved Probe.



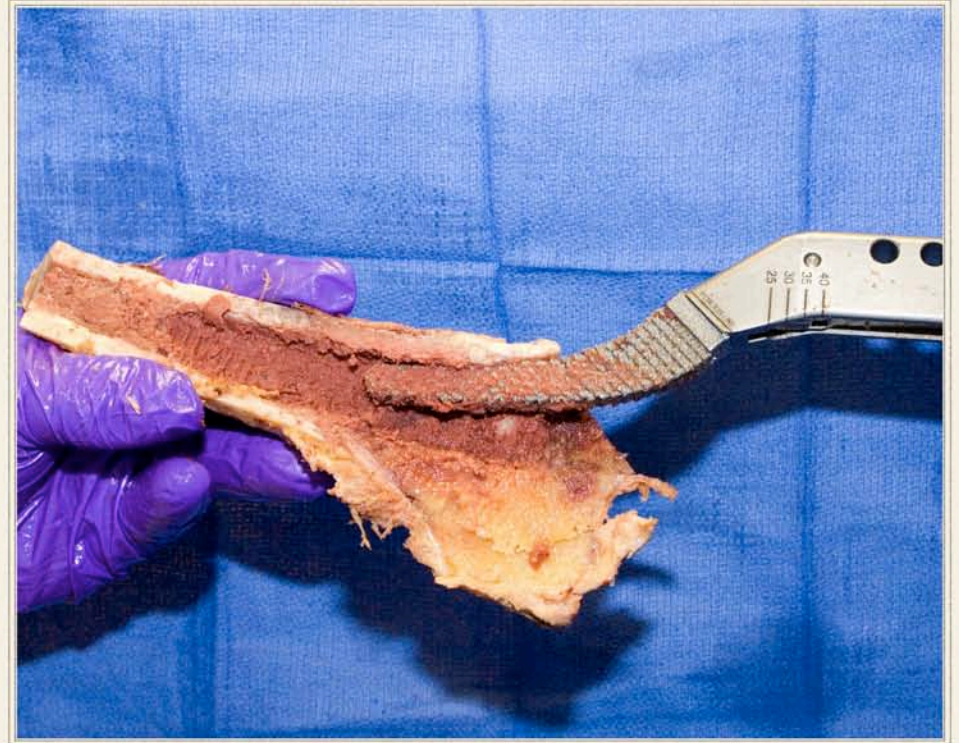
Again you can see one needs to move proximal handle lateral as insertion moves down the shaft to prevent varus position of stem



A curved rasp needs to advance with lateral force on the handle about mid-stem down to reduce varus position.

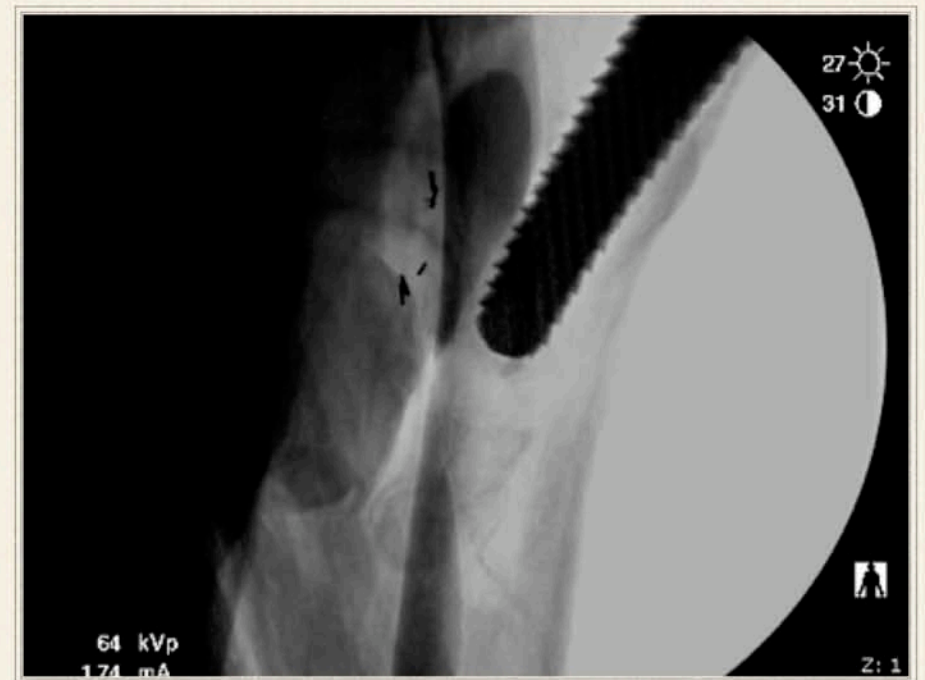


One of the first cases in AU very stable fit.





A curved stem has different techniques for preparation and insertion vs. straight stems.

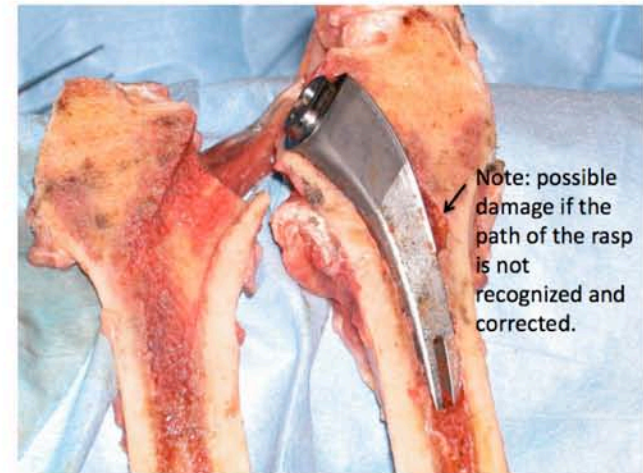


You have to work the medial curve!

Great intrinsic shape for initial implant stability

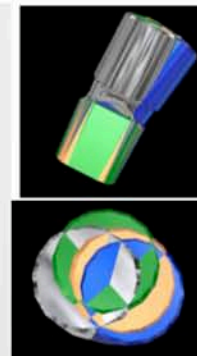
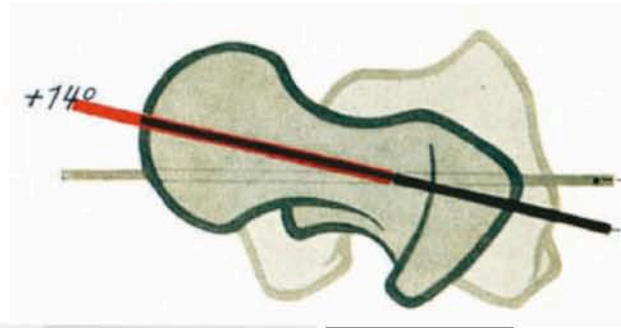


Knowing the shape and function can be very helpful in achieving a good fit and stability of the stem.



Stem shape provides significant initial stability.

Pipino recommends His stem has anatomical anteversion designed into the stem



8-15° version
Can be helpful with
malposition cup



Notes from his Neck Sparing Course in Vienna



Pipino started his work on neck sparing in
1979 with The Biodynamic hip stem



round-off w/ demarcation lines in zones 1-5 (does not load neck)

Biodynamic Design

- C.C. Material
- large circular collar
- 4 stem sizes
- 1 curve
- neck/shaft angle 135°

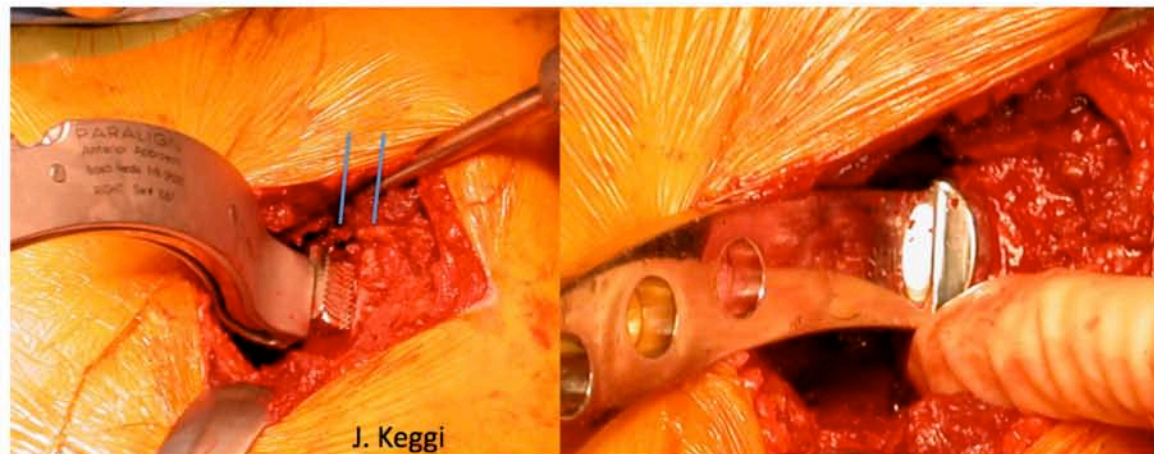


opinion from notes in 2006 McTigue

In my opinion the future focus will not be on aseptic loosening but will be on function and healing. Current traditional cementless implants are working. Clinical/surgical outcome results will be difficult to improve upon (96-97% good-excellent). **However, improving outcomes in specific relate patient activities as to reducing rehab, returning to work etc., will provide ample opportunity to introduce new designs and techniques to the market. Increased post-operative follow-up and documentation will become even more important in the future.**



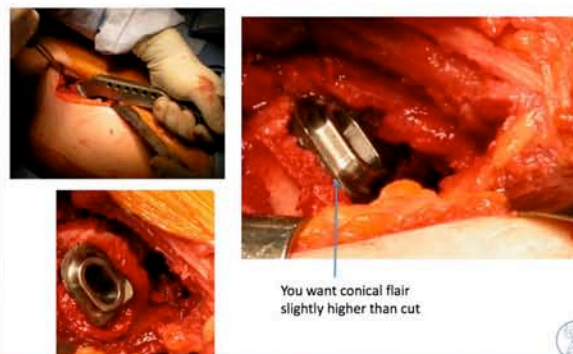
Neck osteotomy should be same angle as proximal stem (Anterior Keggi Approach)



Intra-operative trial preparation too flat leaving gap lateral



Good stem and rasp fit



This cross section gives a good visual on stem placement



S. Sydney

•Blue resection can trend towards valgus placement

•Red resection can place into too much varus

•Proper angle is about 45-50°

• 137.5° neck shaft angle
Varus / Valgus modular neck 8°
129.5-145.5° neck shaft angle



Too much varus



There is a learning curve 2-3 cases.

Intra-operative trial



Neck osteotomy too flat however stem placement was neutral necessary to leave the lateral shoulder of the stem proud of neck resection. Demonstrates the versatility of the design but how visual appearance could allow for incorrect stem placement. This is why I like intra-op x-ray.

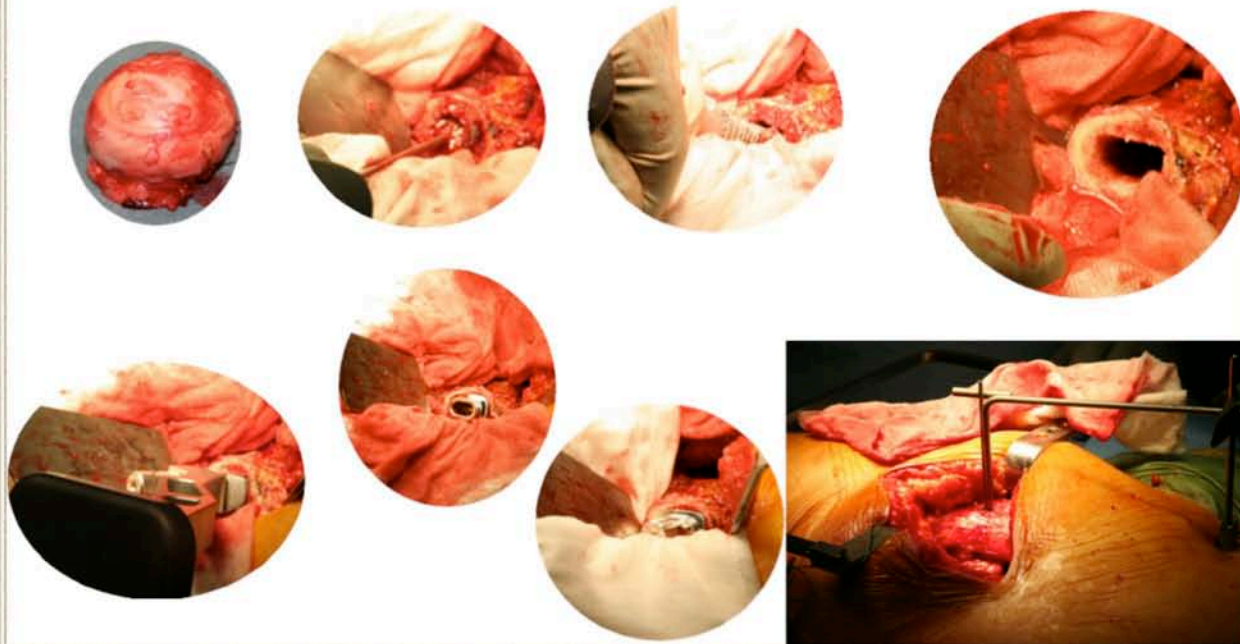
Good stem placement regardless of neck resection. Contact on medial curve is the major goal.

Intra-operative trial with small rasp in place **good stem placement** confirmation can safely rasp up to proper size.

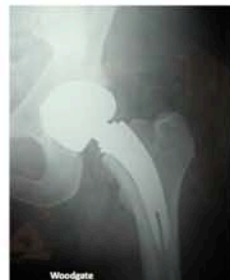


Intra-operative evaluation is important and conversion to a standard cementless stem can be done without compromise .

Case 3



1/18/08 Post-op on 3 case



Rang Office to see if she could go sea kayaking at 3 weeks post surgery and she did!



Very first patient slightly too long and slight varus too high of neck resection



*Slightly more neck resection would have likely dropped the stem into a neutral position

Pt has done very well out almost two years.

Only one modular neck available at that time. Plenty of room to resect another 6-8 mm

Intra-op x-ray would have told this.

However notice the distal stem design takes slight malposition of stem into consideration and reduces chance of end stem contact and possible pain.



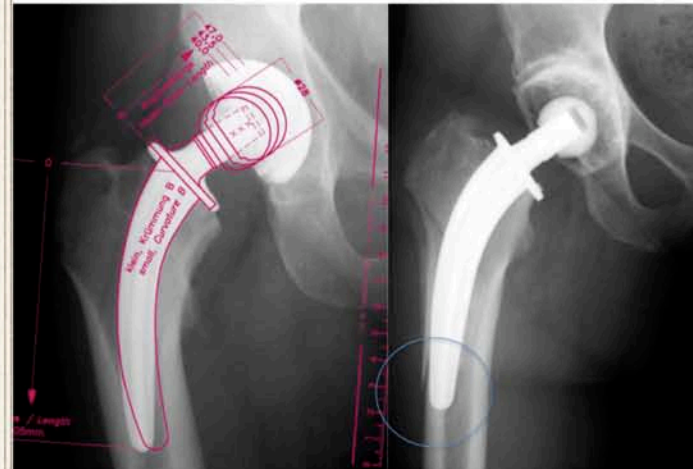
Intra-operative x-ray would have helped.

Sagittal distal slot

- Potential reduction of perforations



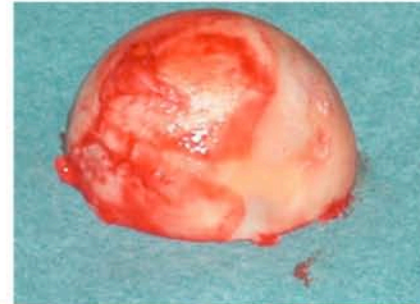
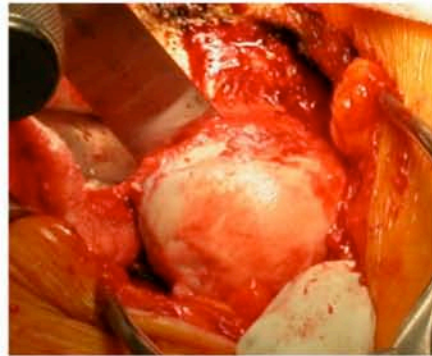
This is the risk if you don't work the medial curve properly
CFP L & R stems and two curves A & B we split the difference and went neutral



This in my opinion makes the stem fit too complex



Too high of resection
take another 5-8mm



Keggi anterior approach
this stem is nice for this technique



Another example of intra-operative x-ray good orientation of rasp
Learning curve is not steep but there is a curve (2-3 cases)



Don't hesitate to take more neck. Learning curve is to error on being too long.

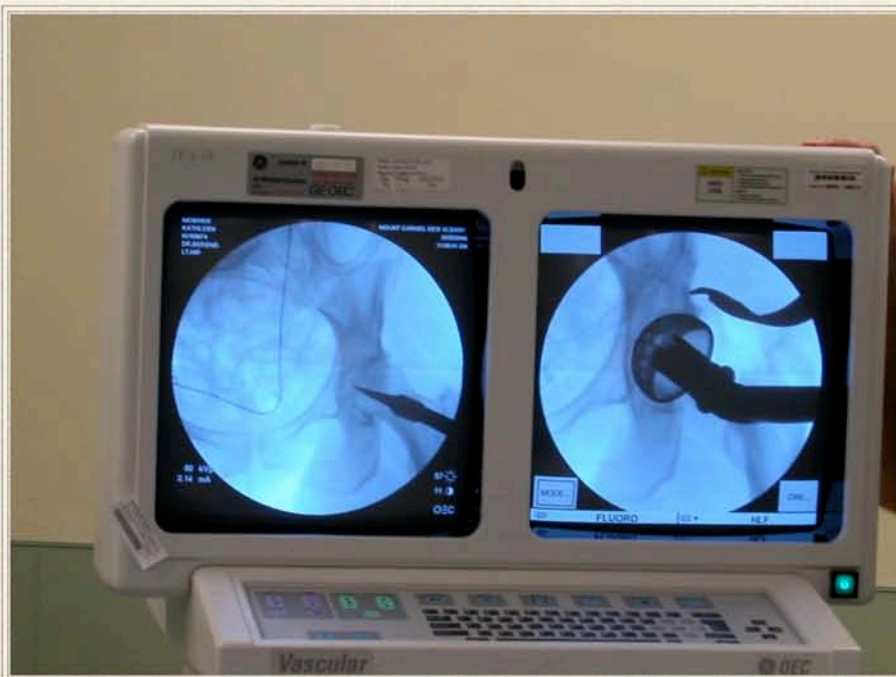
Simple Tray of prototype instruments
Quality of instruments have improved with both companies
Global & Omni



MSA™ neck Resection Guide

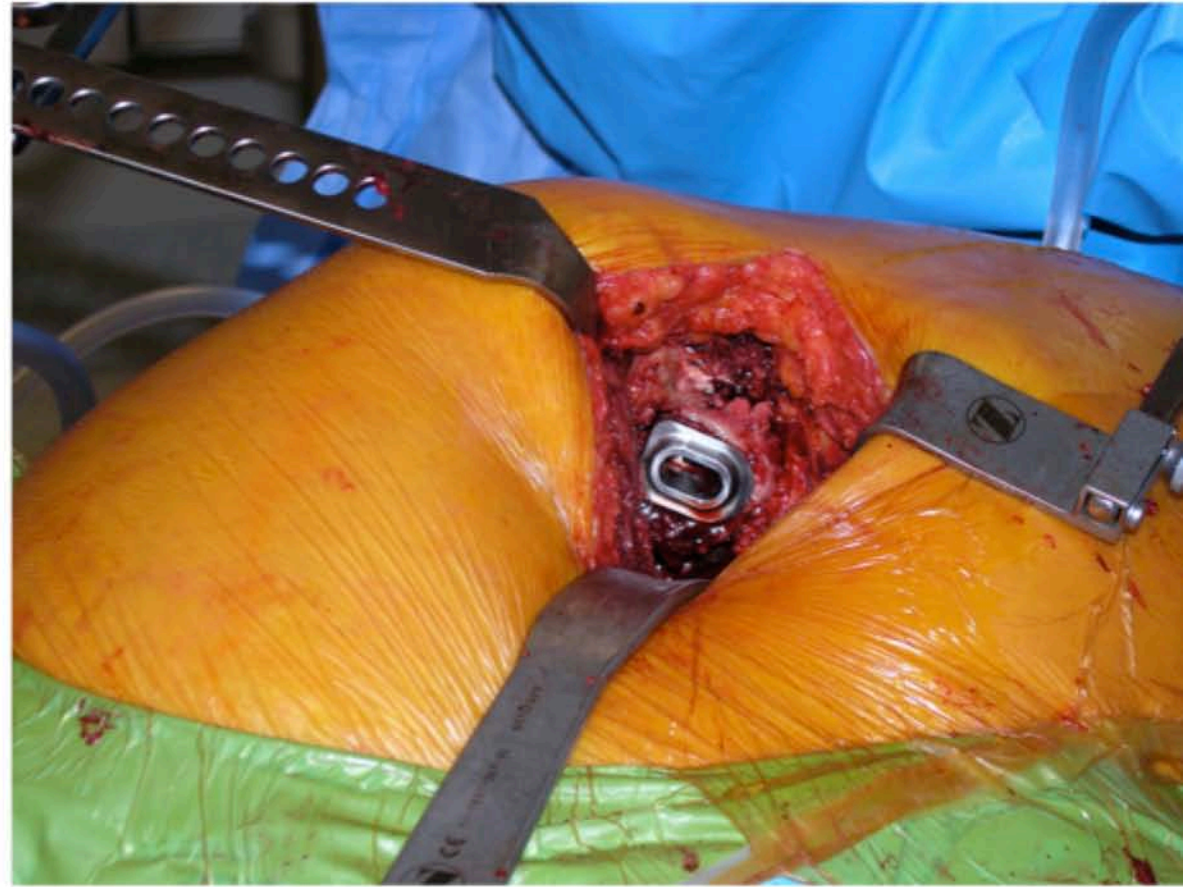


Helpful but can be difficult in tight muscular males



Pre-op x-rays, intra-operative x-ray and mechanical measurement helps ensure a good outcome.

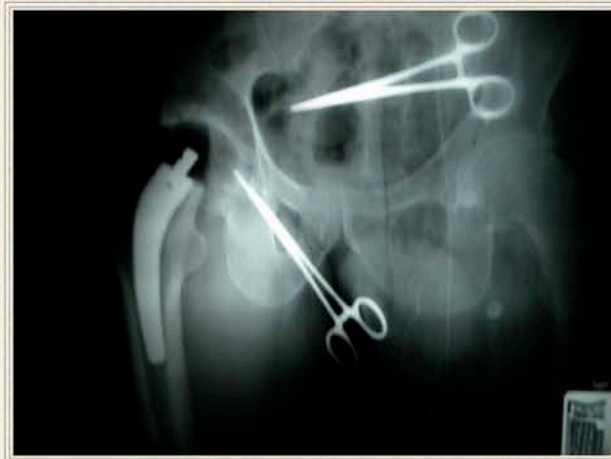
Intra-operative first trial stem



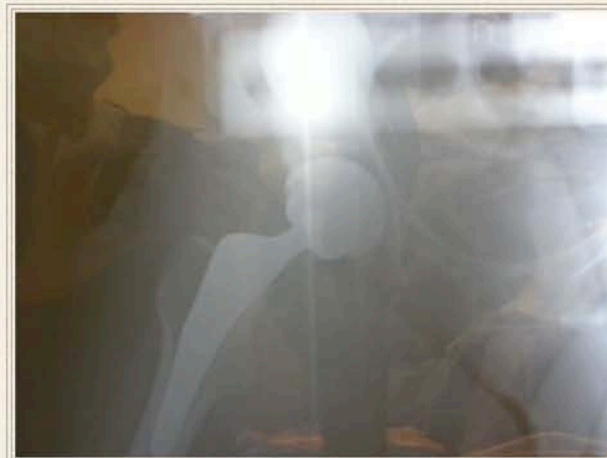
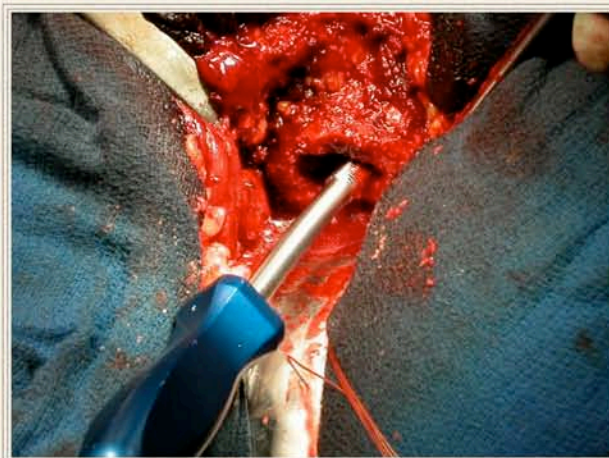
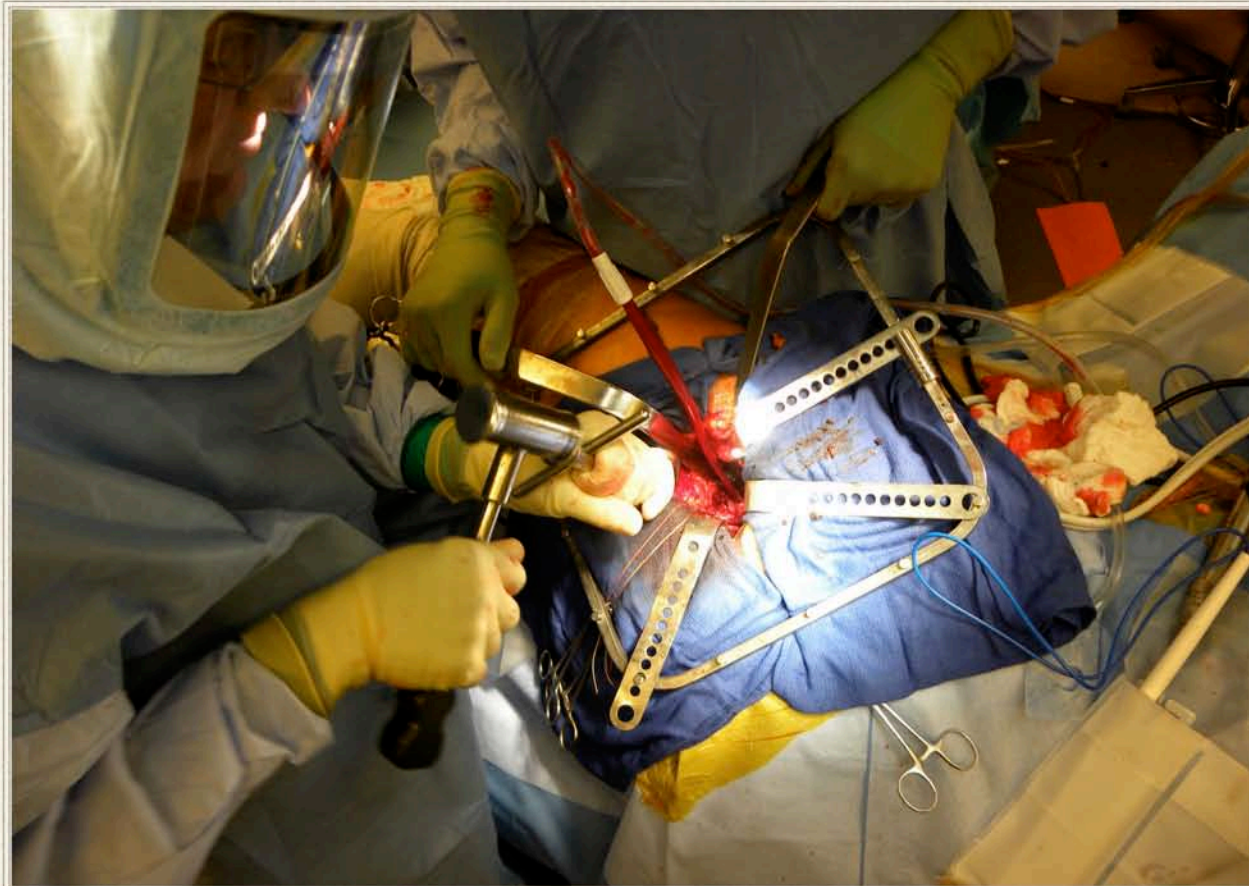
Neck resection slightly too long although good stem position and good fit at the calcar. Could resect another 5-6 mm

Note: I tend to recommend higher level neck cut to demonstrate worse case possible for exposure on first evaluation.

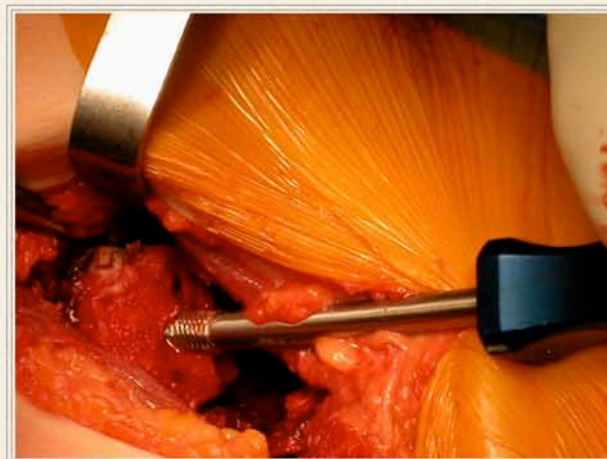
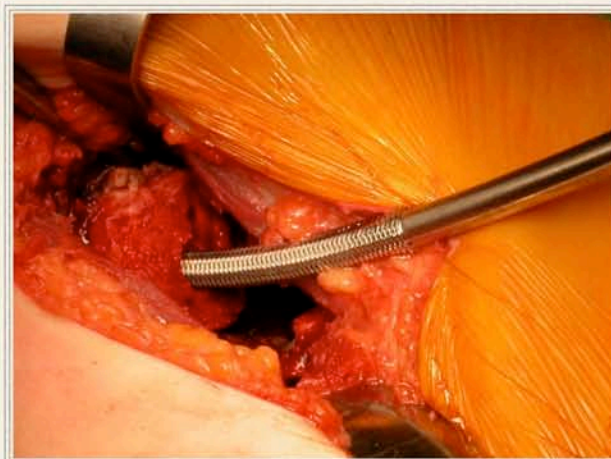
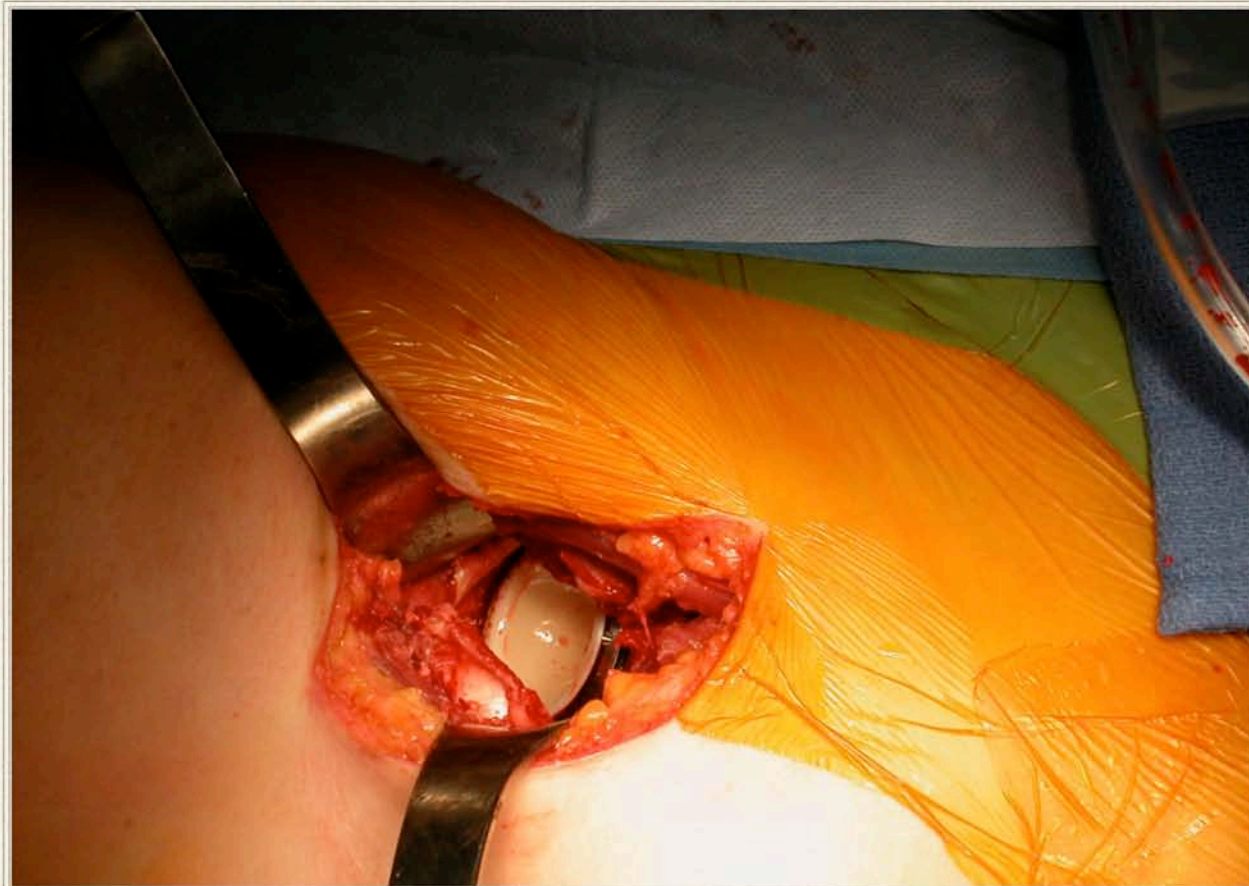




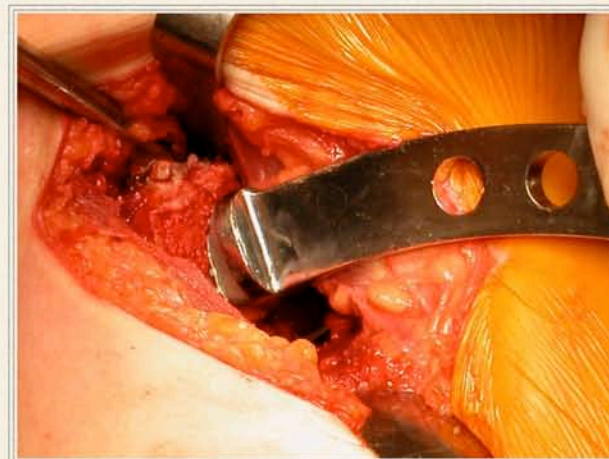
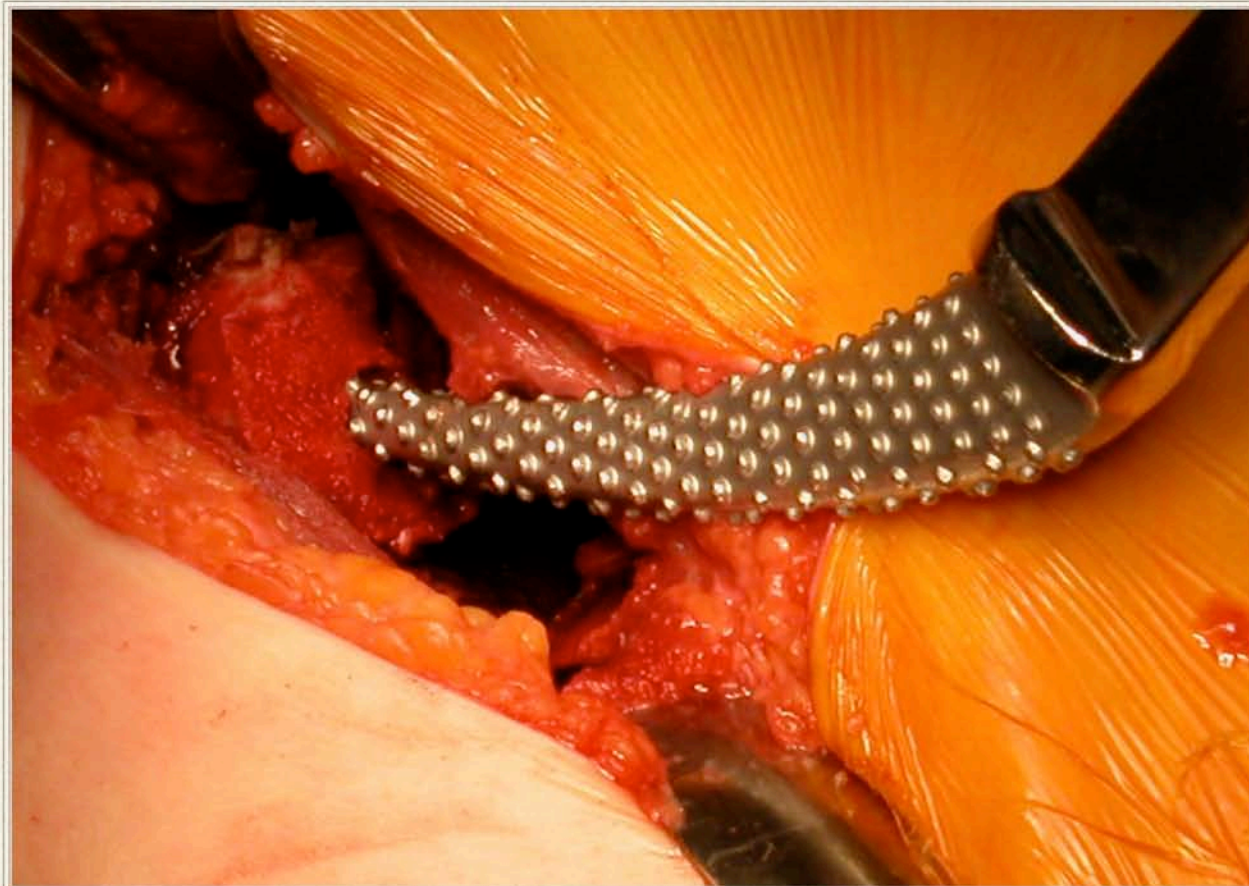
Short Thompson in for 15 years. ARC trial converted to micro-plasty.



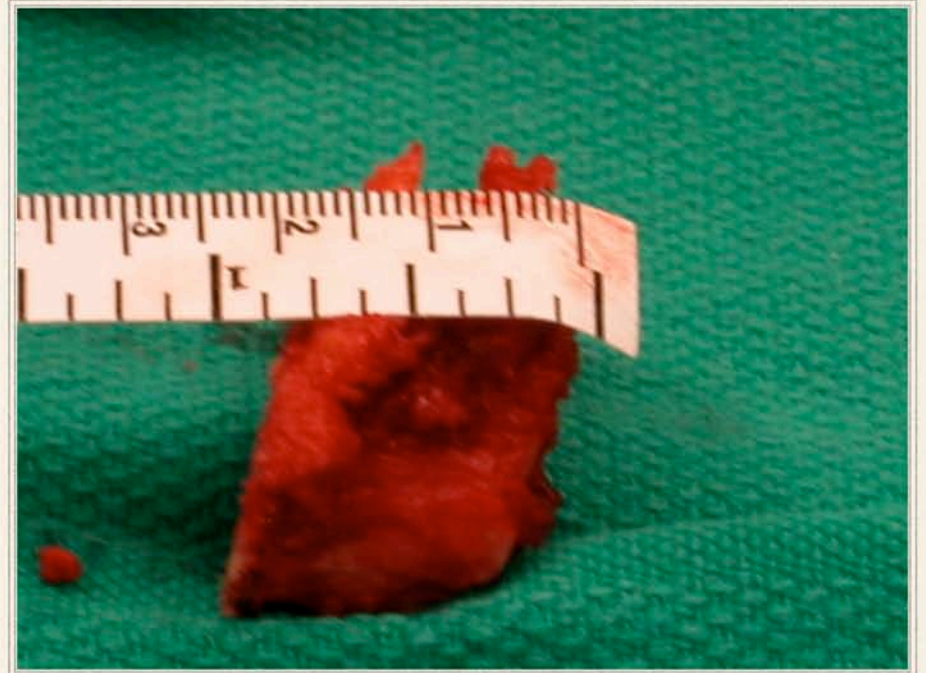
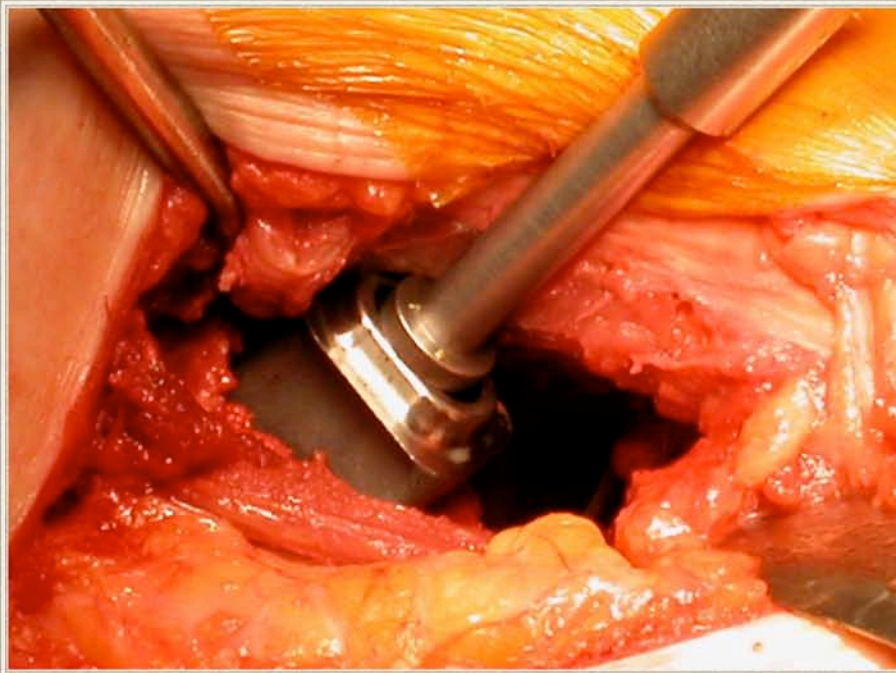
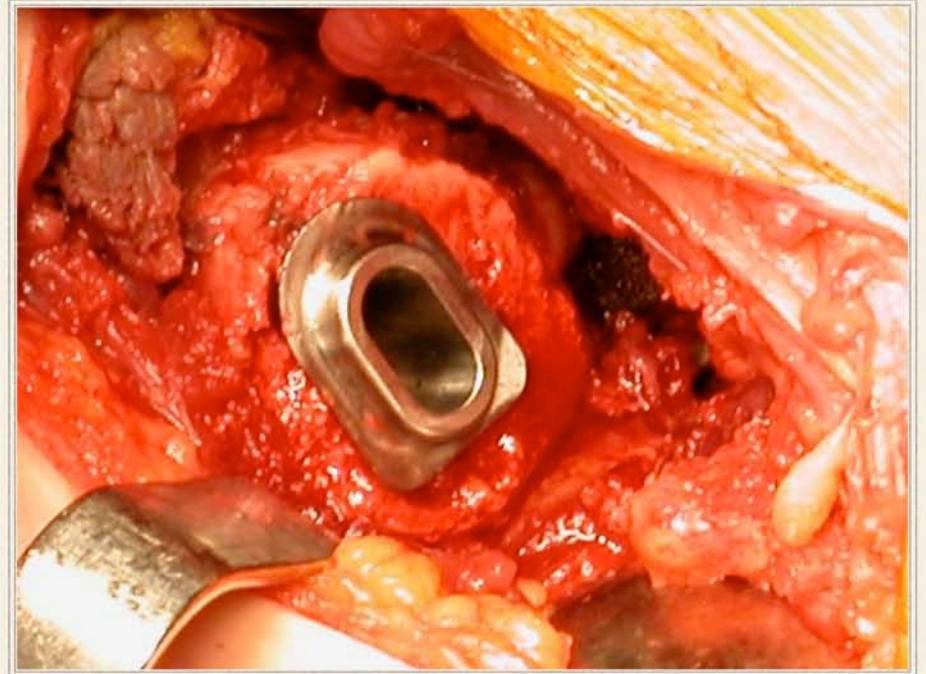
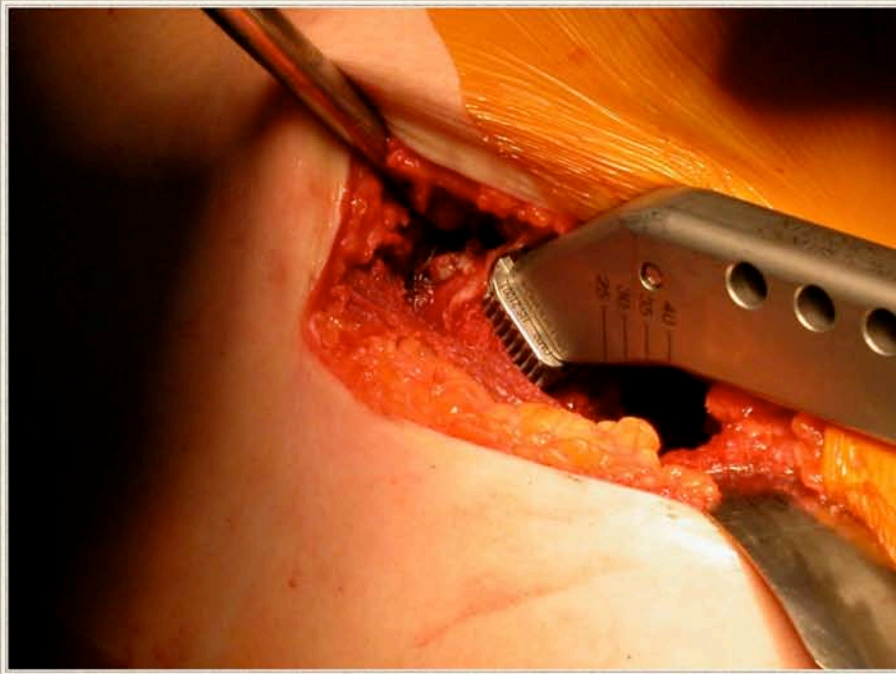
Dave Stulberg, converting ARC to his fit & fill short stem requires more lateral bone removal.



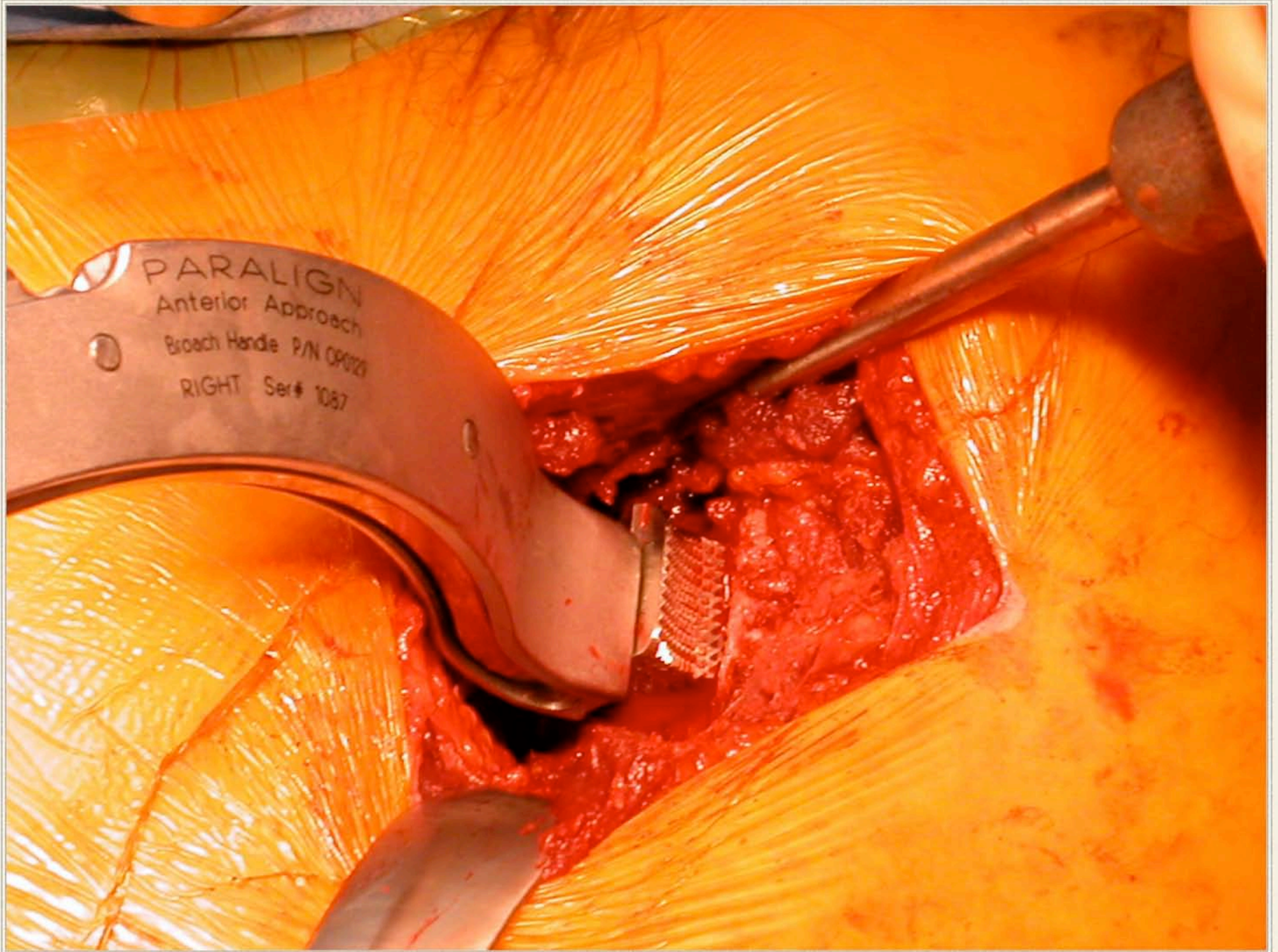
J. Keggi anterior approach no problem with exposure.



Mueller rasp works very well.



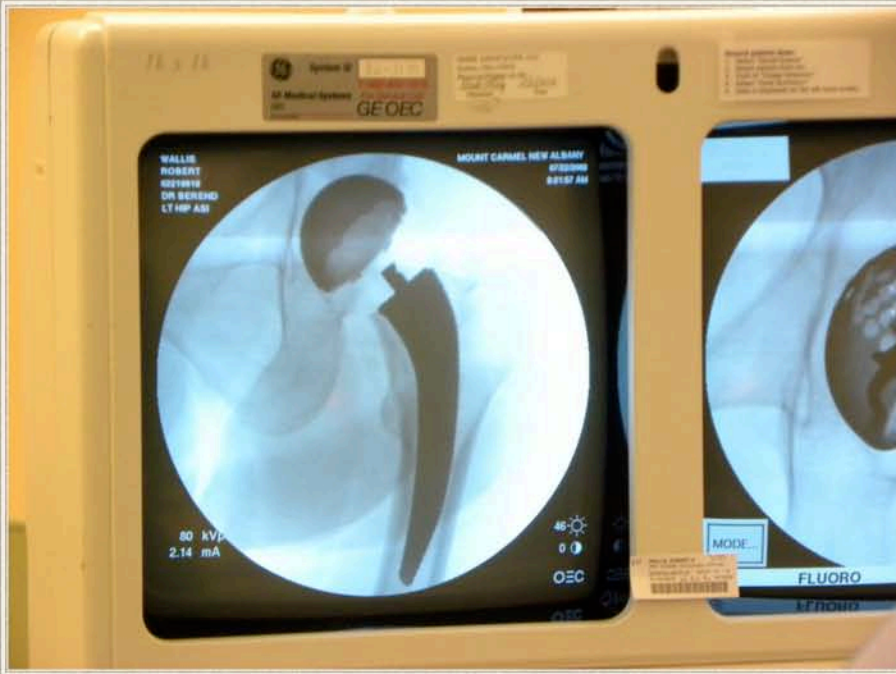
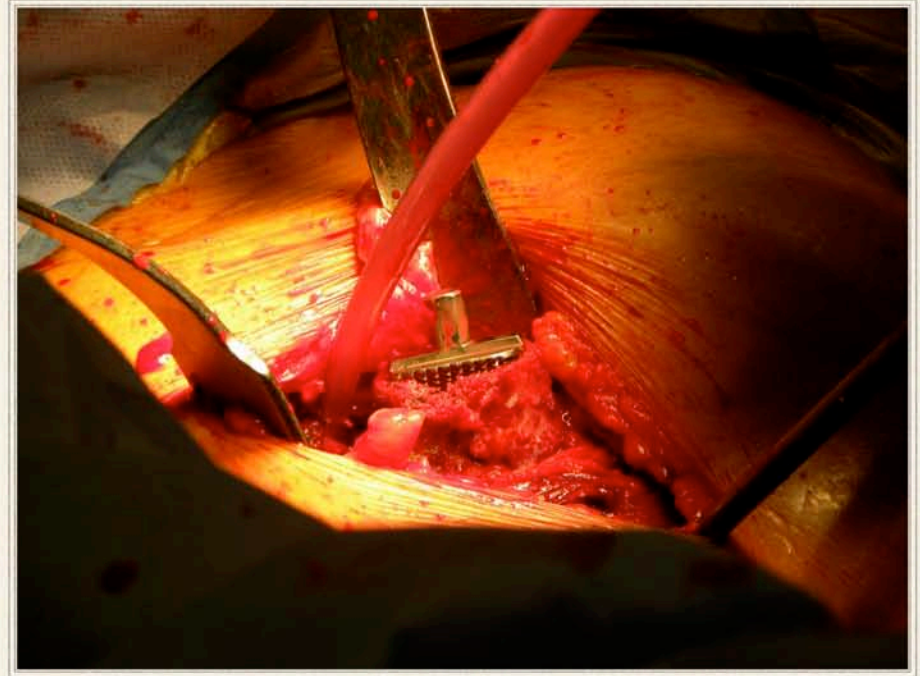
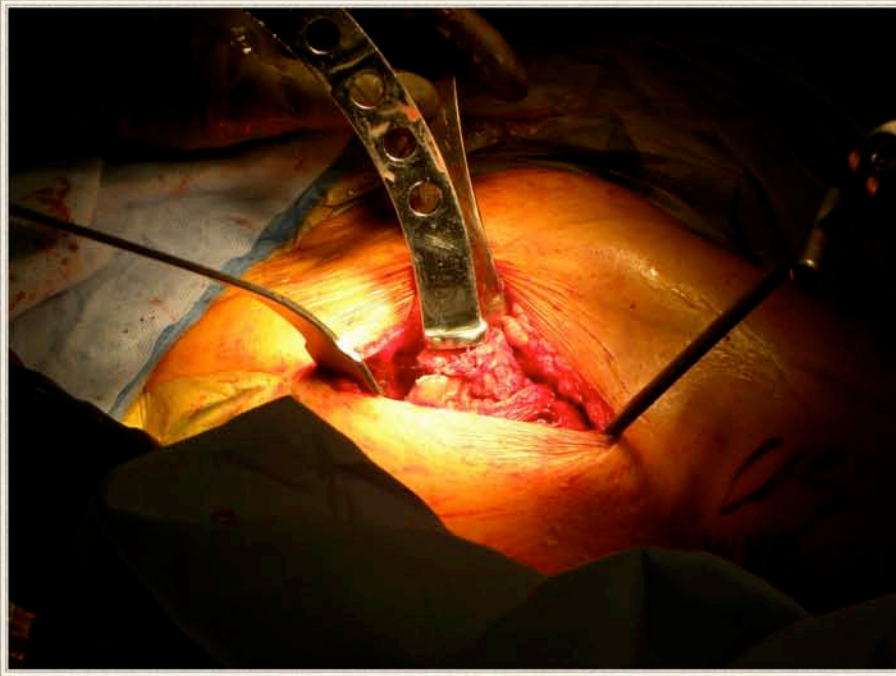
J. Keggi anterior approach then conversion to K2.



Anterior approach curved handle .



Anterior approach first case.



Anterior approach w/table hook ARC™ then converted to Micro-plasty.

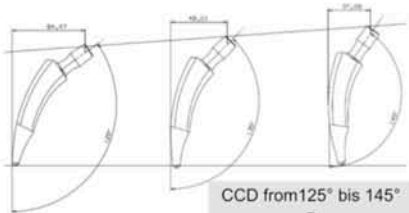


A tight canal : rasp fit flush however T-back hung up the stem 5-6 mm. MSA rasp does not cut for T-back.

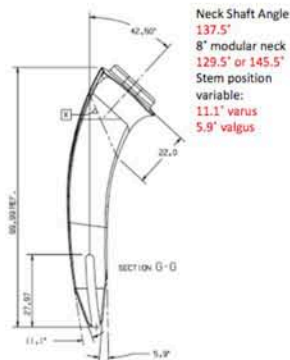
NANOS Stem / TSI™ = ARC™ & MSA™

Offset Possibilities

Maximum Offset-Variation with size 3



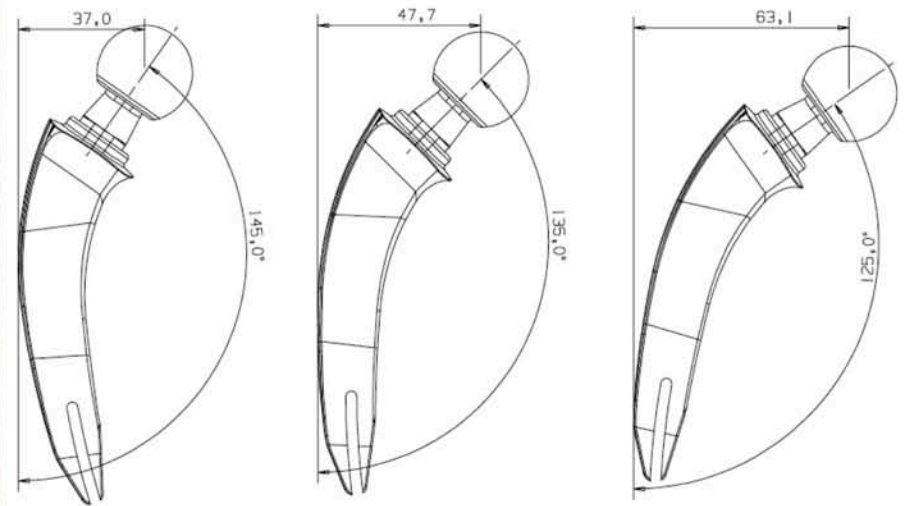
CCD from 125° bis 145°
=
Offset Variation of 28 mm



- So our flexibility can range
Base line: 137.5° w/neutral neck
- To a max varus stem position with
modular neck: 118.4°
- To a max valgus stem position with
modular neck: 151.4°

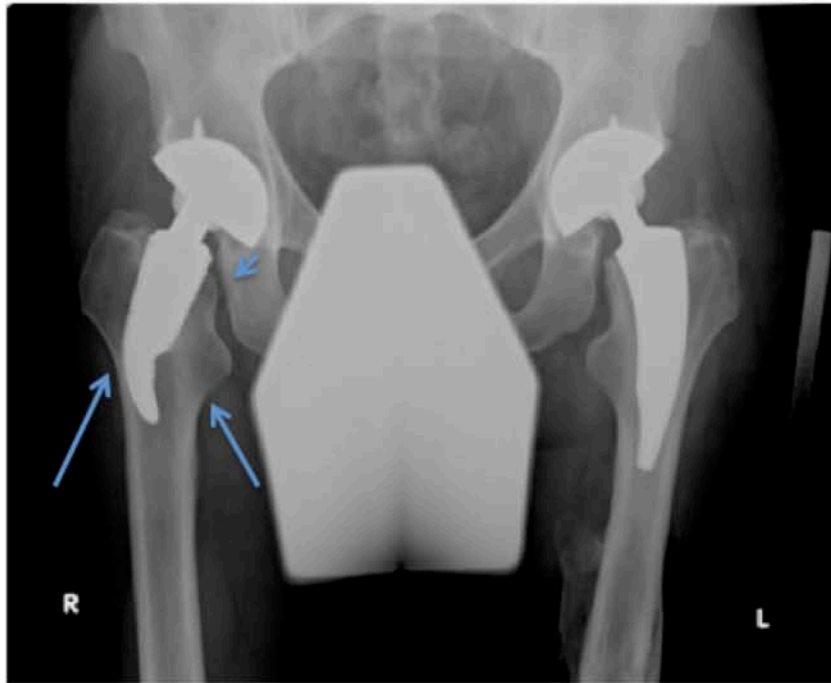


MAXIMUM OFFSET VARIATION WITH SIZE 3



CCD FROM 125° TO 145°
OFFSET VARIATION = 26.1

ESKA & NANOS Stems



ESKA

I have not seen
any long term
follow-up with
this stem

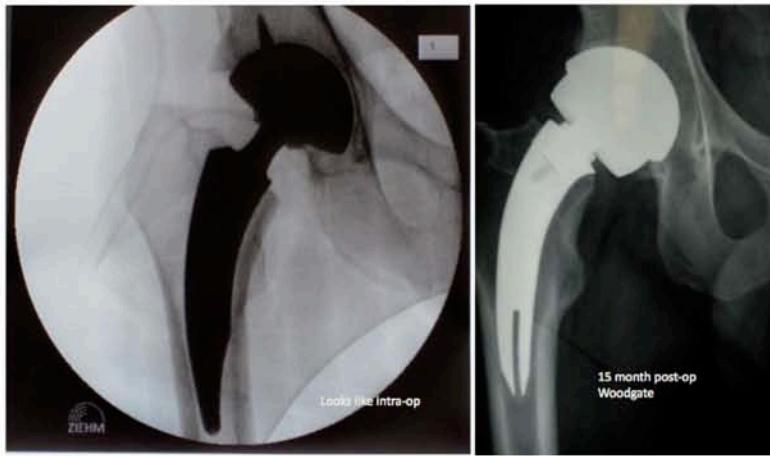


NANOS



You can start to see some distal bone remodeling with the ESKA stem.

Two good looking x-rays



NANOS goes slightly deeper into the canal MSA retains more medial & lateral neck
Both maintain good lateral structures. Question will be long-term bone remodeling.



Basic geometric shape for implant stability



I suggest that a curved trapezoidal shape with a proximal conical flair neck sparing with lateral T-back will demonstrate more torsional and axial stability



ESKA

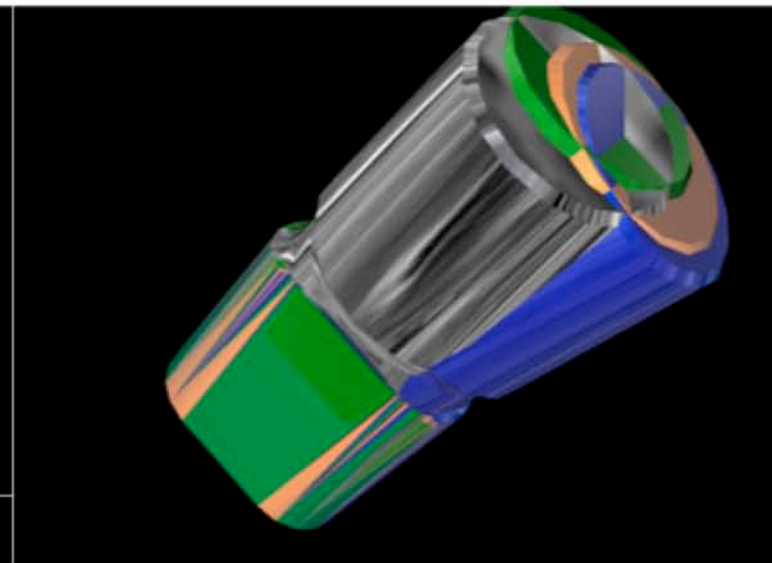
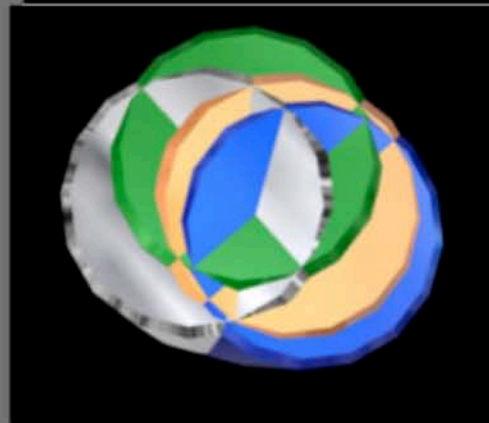
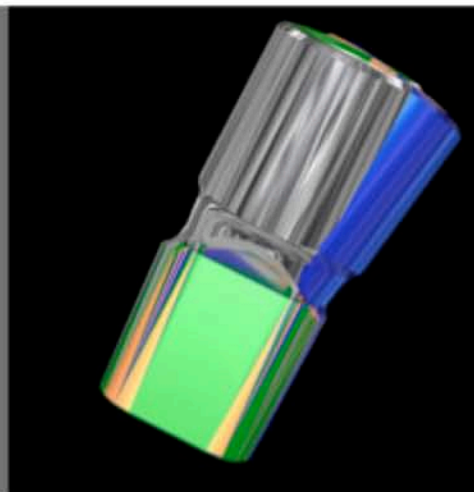


NANOS



Modular necks can be helpful

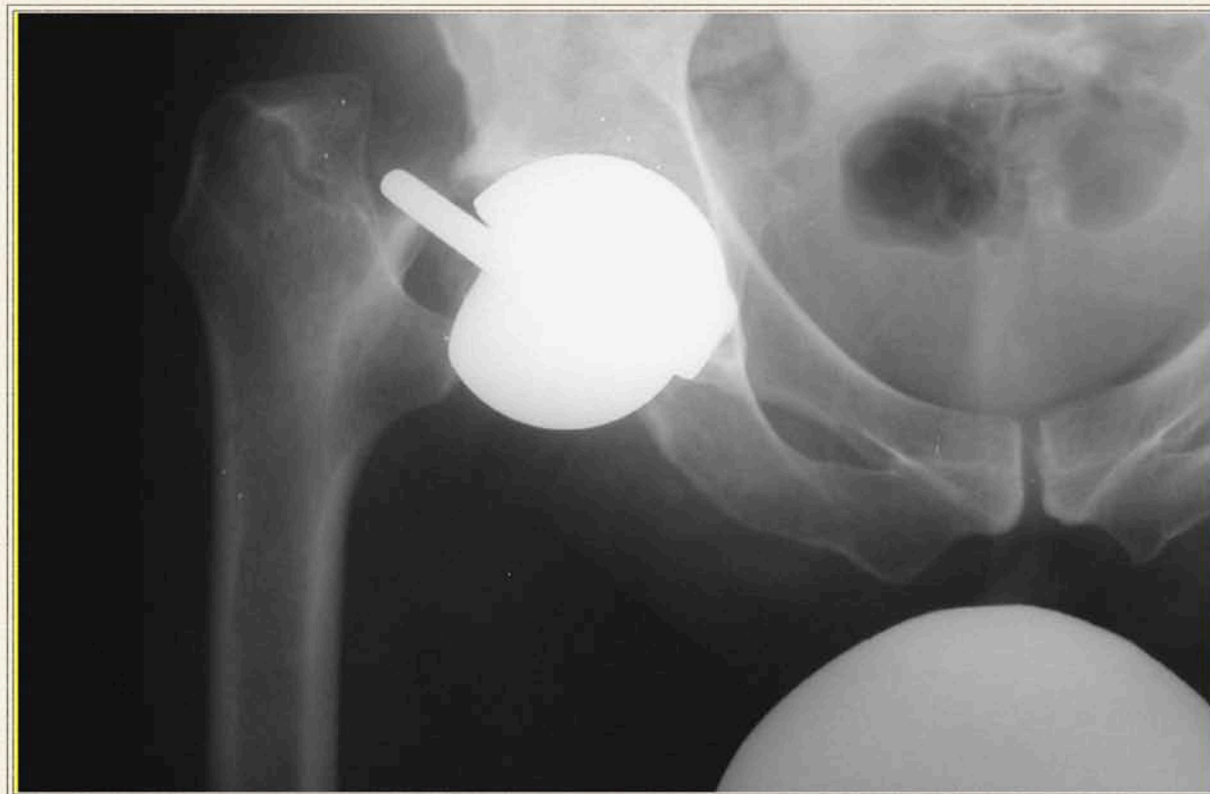
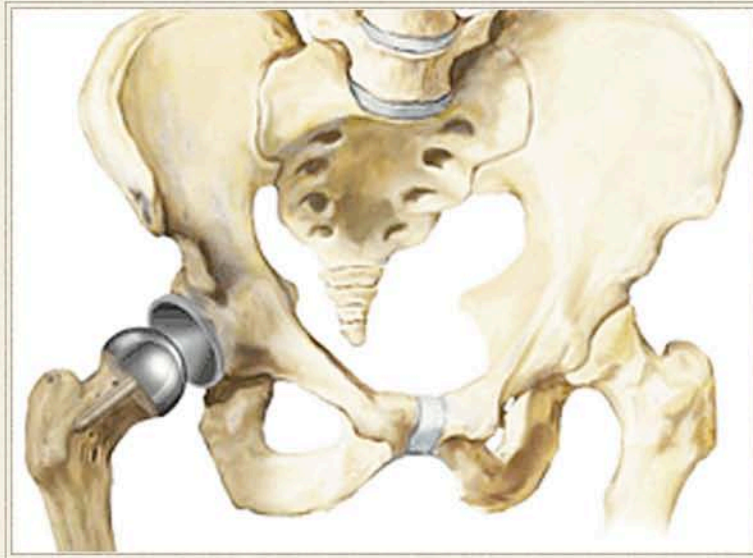
Need to design and test junction beyond established norms



- There is always concern with modular junctions but advantage is significant:
- Fine tune joint mechanics
- Aid in exposure in case of revision
- I believe we have a better modular neck junction (c.c.) than most of the competitive junctions/ in part because of neck sparing design

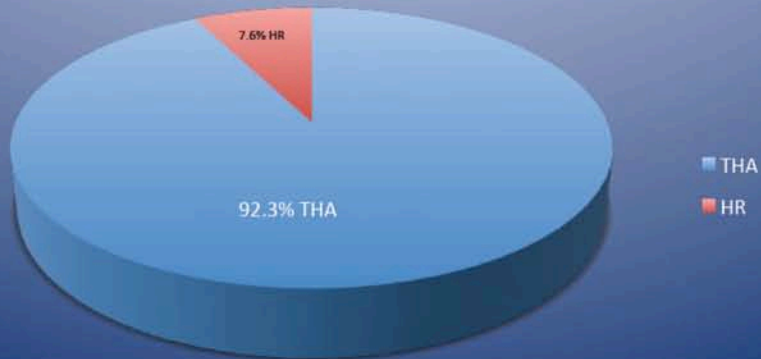
➤ I think and along with Au surgeon team & a number of U.S. surgeons we should add version modular neck (8-15°) for use when cup is slightly misaligned.



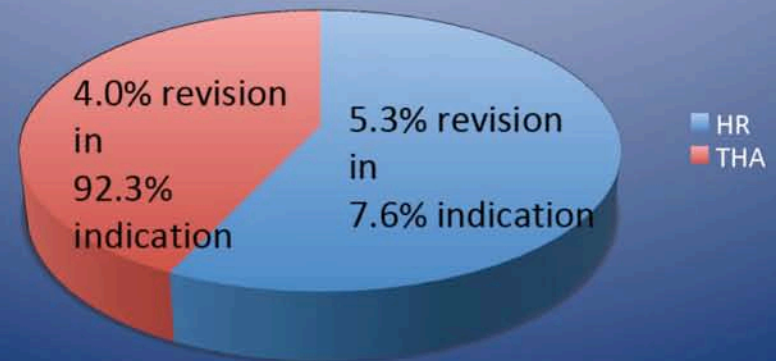


AU HR trending down! 2008 7% indication down from 9% 2005

All THA 2008 Australian Registry



Yearly Cumulative % Revision of PTHA VS. HR in OA Patients 8 Yrs



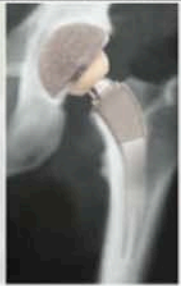
Resurfacing Hip Replacement

- Decreasing use
(8.9% of primary THR 2005)
(8.2% of primary THR 2006)
(7.6% of primary THA 2008)

Resurfacing compared to Conventional THR (OA)

- Resurfacing has a significantly greater risk of early revision compared to conventional hip
- Revision rate for diagnosis other than OA high.
- Males over 65 yrs old have almost a 4x risk of fracture $P < 0.0001$ HR=3.8, 95%CI (2.16, 6.72)

Females fracture at a significantly higher rate than males than males $PP < 0.0001$ HR=2.190, 95%CI (1.52, 3.16)



Summary

Lessons Learned

- All short stems are not neck sparing
- Neck sparing is possible with all surgical approaches
- Curved short stems (single incision) are easier with direct anterior approach vs. straight stems (two incision)
- Proximal conical flair provides compressive loads transfer and some flexibility on stem position with regard to vertical height
- Initial trend is to leave too much neck
- Initial trend is slight varus stem position (does not seem to matter)
- Trapezoidal stem shape provides excellent initial torsional stability
- Shape of stem and distal tip design allows some flexibility with regard to stem position i.e., (slight varus, neutral or valgus- does not seem to matter) Visual appearance historically not good
- Learning curve appears to be 2-3 cases
- Intra-operative x-ray is helpful for first few cases is the single best way to assure proper fit!
- The neck level of resection determines the stem size
- Don't hesitate to make secondary neck resection 5-6 mm to improve exposure or to ease stem insertion in small femurs
- New device so I suggest post-operative precautions (crutches etc. first 6 weeks)
- Anteverted necks should be consider being added to the system (can help if cup is slightly malpositioned (8°-15°)
- **Extremely encouraged at this point of clinical review**







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