Tissue Sparing THA

Adrian J Van Der Rijit 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
Tissue sparing of both hard and soft tissue.
Neck Sparing Curved Stems

Pipino/CFP™

ARC™ stem
based off the TSI™ Stem design patent pending

MSA™ Stem

Corin
Mueller and Thompson had the original curve right. Pipino and TSI have similar curves.
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™) saves more bone both medial and lateral. Micro-plasty requires more bone removal.
There are significant differences with short stems and some neck sparing designs. All are not equal.
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”
Lets call mid-level neck cut

Blue line slightly too low but would be fine
Lets call low level neck cut “C”
• Making cut too vertical or too horizontal can effect visual reference for preparation
Cup position is critical to the overall function of the reconstruction. Anteverted 8-15° modular necks could be helpful with slightly malpositioned cups.

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

Pipino uses 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.

Cup position is critical to the overall function of the reconstruction. Anteverted 8-15° modular necks could be helpful with slightly malpositioned cups.
A curved rasp needs to advance with lateral force on the handle about mid-stem down to reduce varus position.

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.
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!
Stem shape provides significant initial stability.
Pipino recommends
His stem has anatomical anteversion
designed into the stem

8° varus/valgus

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

opinion from notes in 2006

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 relates patient outcomes to reducing relapse, 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

You want conical flair slightly higher than cut
This cross section gives a good visual on stem placement

- 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 / Vaigus modular neck 8°
  - 129.5-145.5° neck shaft angle

S. Sydney

Too much varus

There is a learning curve 2-3 cases.
Intra-operative evaluation is important and conversion to a standard cementless stem can be done without compromise.

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 x-ray would have helped.

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
Pt has done very well out almost two years.
Only one modular neck available at that time.
Plenty of room to reset another 5-8 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.
We have learned from Pipino experience in both design and technique.

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 nail 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.
A simple reproducible set of instruments has evolved.
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.
We have design features that provide for some fine-tuning of stem position and reduction of potential stem placement problems.
You can start to see some distal bone remodeling with the ESKA stem.
The proximal conical flair is a significant feature that other stems do not have.
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
Hip Resurfacing is trending down.

**All THA 2008 Australian Registry**

- 92.3% THA
- 7.6% HR

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

- 4.0% revision in 92.3% indication
- 5.3% revision in 7.6% indication

**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 $P<.0001 \text{ HR}=3.8, 95\% \text{CI (2.16, 6.72)}$
- Females fracture at a significantly higher rate than males than males $P<.0001 \text{ HR}=2.190, 95\% \text{CI (1.52, 3.16)}$
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 considered being added to the system (can help if cup is slightly malpositioned (8°-15°)
- Extremely encouraged at this point of clinical review
Lessons Learned TSI™ Stem

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