INTERNATIONAL SOCIETY FOR TECHNOLOGY IN ARTHROPLASTY

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The First 1,200 (1,790) U.S. Short Curved Neck Stabilized Stems

(Adjusted Number)

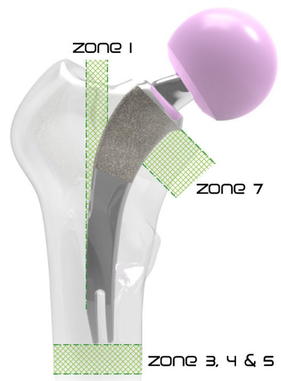
by
Timothy McTighe*
John Keggi**, Louis Keppler,** Tony Aram**, Charles Bryant**, Corey Ponder**,
Frank Schmidt**, Bradley K. Vaughn,** Edward McPherson**, Declan Brazil**

Introduction:

AML® Stem

Architectural changes occurring in the proximal femur after THA continues to be a problem. Proximal stress shielding occurs regardless of fixation method. The resultant bone loss can lead to implant loosening and or breakage of the implant[6].

We are seeing younger patients with higher levels of physical activity as compared to just a decade ago. A tissue sparing total hip stem provides for less tissue damage, a quicker rehab and leaves behind more infrastructure in case of future revision surgery.



TSI™ Stem
Apex ARC™
Omnilife Science

Why Save the Femoral Neck?

Asked and answered by M.A.R. Freeman in 1986[1].

- **Significant Mechanical Advantages[1,2,3]**
  1. **Bone structure of the neck is not reduced in strength in OA[1]**
  2. **Natural joint mechanics is maintained and provides better axial and torsional stability vs. conventional THA (Whiteside, Freeman & Pipino)[2]**
  3. **Stress is reduced on the implant by 35% compared to monoblock[3]**
- Saves both Hard & Soft Tissue[1,4]
  1. **Provides more structure for revision surgery[2,4]**
- Maintains blood supply to the proximal femur [1]
- Reduced OR time & blood loss[4]
- Quicker Rehab [4]
- Easier Explantation & Conversion[4]

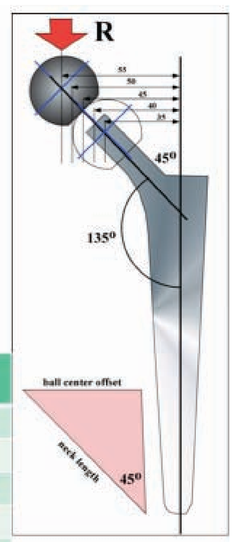
Retention of the femoral neck reduces both torsional moment and axial moment at the stem bone interface.[1] (Shorter Fulcrum / Cantilever)

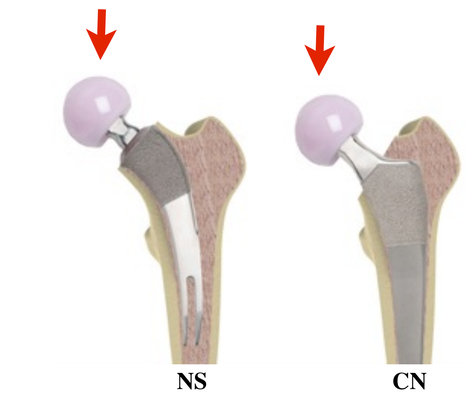
- 1mm increase in femoral offset increases torque by 8%
- 1mm increase in head/neck length increases torque by 6%

Neck Retention provides enhance torsional resistance

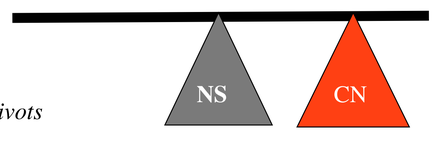
•8% per 1mm increase in true lateral ball-center offset
•6% per 1mm increase with the ball's neck-length size adjustment.

offset	Neck-length	Nm
35 mm	49.50	84
40 mm	56.58	96
45 mm	63.65	108
50 mm	70.72	120
55	77.79	132





The support on which a lever pivots



Fulcrum

Material:

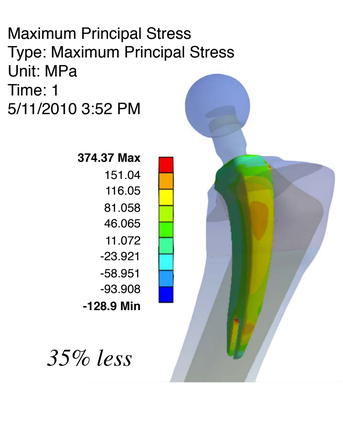
There have been 1,790 stems implanted with this novel neck sparing stem design since April 2010 to October 2012 with 1,200 from the primary surgical team. This included the limited introduction while fine-tuning of surgical instruments. Typical patient profile showed two-thirds being female with an age range overall between 17 to early 90s. 90% were treated for OA. This stem has been used in all Dorr bone classifications (A, B, &C)

Two surgical approaches were used, the single anterior incision and posterior incision. The ARC™ short curved stem was used with a variety of cementless cups with a variety of bearing surfaces (MoM, CoC, CoP, MoP).

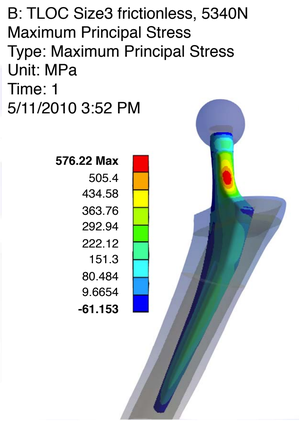
The titanium stem comes in six sizes 0-5 and features a c.c. modular neck that is available in the following styles: Neutral, 8° Varus / Valgus, 12° Varus / Valgus, & 12° Anteverted/ Retroverted.

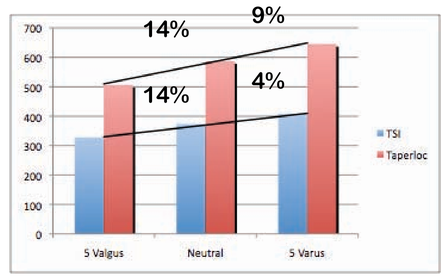
ARC™ Neck Sparing Stem

Note: There has been recent concern raised over modular necks in conventional cementless stem designs[5]. Neck sparing stems reduce principal tensile stress in the stem 35% compared to monoblock conventional cementless stems[3]. Note: Not all modular tapers are equal in design and performance.



35% less



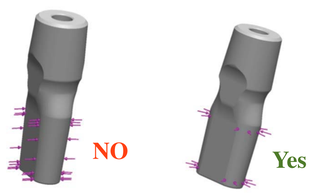


*The effect of Varus tilting of Stem **was much less for the neck stabilization stem** compared to the monoblock design.[3]*

Optimizing Modular Neck Interface

Less stress means less chance of movement on modular surfaces

- Neck Sparing Design reduces stress by 35%
- c.c. increases fatigue resistance by 83% vs. Ti modular
- c.c. increases fatigue resistance by 18% over monoblock Ti stem



- Taper designed to engage on the rounds, not the flats (reduce / eliminate micro movement)
  - Prevents potential for neck to "toggle"
  - Provides 3-dimensional stabilization of the modular neck in the stem

Stem Distribution

Size 0 = 4% new size
Size 1 = 21%
Size 2 = 36%
Size 3 = 26%
87% of the time size 0-3 is used
Size 4 = 10%
Size 5 = 3%

Neck Distribution

Neutral Standard = 33%
Neutral Long (+3.5mm) = 3%•
Total Neutral Necks = 36%

8° Varus/Valgus = 19%
8° Varus/Valgus Long (+3.5mm) = 3%•
Total Varus/Valgus = 22%

12° Varus/Valgus = 17%

12° Version = 25%•
(Anteverted Posterior Approach)
(Retroverted Anterior approach)
Angled Necks Total = 64%

**New Stem Size*

Results:
On all 1,790 Stems

Stem Explants = 8
Dislocations = 3
(2 traumatic)
(1 chronic)
Aseptic Loosening = 2
(1 traumatic subsidence)
Infections = 2
Mismatched Heads to cups = 1 neck stem disassociation = 1
Leg Length Discrepancy +/- 7mm = 10
Calcar Fxs not wired = 6
Calcar Fxs wired = 3
Hip Pain = 3 being followed
Subsidence > 5mm = 6
1 had neck exchanged to longer neck
Neck exchanges = 3
(2 for cup revisions)
Intra-op perforations = 3
(No treatment- anterior approach)
Intra-op Calcar Fxs resulting in stem bail out = 5
Note: No pseudo tumors, no signs of elevated metal ions. No problems to-date with modular necks.

99.5% survival at 29 months

Summary:

We are encouraged with our initial clinical / surgical observations (patients are happy) and we believe the potential and real benefits warrant not only further evaluation but expanded evaluation of this tissue conserving approach to THA. This is equivalent to recent results presented at recent European Hip Society. [7]

References:
1. Freeman, *"Why Resect the Neck?"* BJBJS 1986
2. F. Pipino, A. Keller, *"Tissue-sparing surgery: 25 years experience with femoral neck preserving hip arthroplasty"*; J Orthopaed Traumatol (2006) 7:36-41 DOI 10.1007/s10195-006-0120-2
3. Brazil, McTighe *"FEA Analysis of Neck Sparing vs. Conventional Cementless Stem"* JISRF Recon Rev Oct 2011
4. McTighe, Brazil, et al. *"Design Rationale and Early Clinical / Surgical Observations with a Short Curved Tissue Sparing Hip Implant"* JISRF Recon Rev Oct 2011
5. McTighe, Brazil *"Memorandum -Modular Necks-"* July 2012 JISRF Pub www.jisrf.org
6. McTighe, Woodgate, van der Rijt, et al. *"Neck Sparing Total Hip Arthroplasty Lessons Learned"* Poster IOF World Congress May 2010 Florence, Italy www.jisrf.org
7. R. van de Rijt et al. "Early Experience with MSA™ Neck sparing Stem via Anterior Lateral Approach" oral paper European Hip Society Milano, Italy 2012

*Joint Implant Surgery and Research Foundation
Chagrin Falls, OH
www.jisrf.org

** JISRF Tissue Sparing Implant Study Group