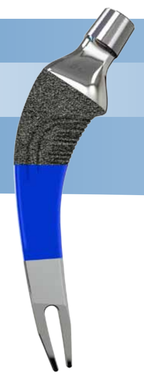
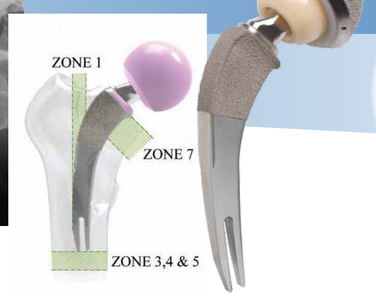
15th EFORT Congress 2014 London, UK • 4-6 June
A combined congress with British Orthopaedic Association sessions
Abstract ID: EFORT14-4564





The Science Behind a Short (Neck Preserving) Curved Stem Total Hip Replacement

By: ***Timothy McTighe, Dr. H.S. (hc)****
Declan Brazil, PhD, Adrian van der Rijt, M.D.; John Keggi, M.D.; Louis Keppler, M.D.; Robert Kennon, M.D., Terry Clyburn, M.D. and Edward McPherson, M.D.

Introduction

Over the past 10 years, the orthopaedic community has witnessed an increased interest in more conservative surgical techniques for hip arthroplasty. During this time, second-generation hip resurfacing and minimally invasive surgery (MIS) enjoyed extensive marketing attention. After a decade of this renewed interest, both of these methods for THA have met with serious concerns. As hip resurfacing numbers decline, both patients and surgeons are looking for other potentially successful conservative treatments to THA. This search has recently focused surgeon interest toward short-stem designs.

Examples of Short Stem Designs

In the past 10 years the influx of short stems has made it difficult to compare results.

JISRF Stem Classification System

The Joint Implant Surgery and Research Foundation (JISRF) has developed and advocated a stem classification system by primary stabilization contact regions to help identify, differentiate, and catalog stems for total hip replacements.

Zones

1. Head Stabilized
A. Hip Resurfacing
B. Mid-Head Stem

2. Neck Stabilized
A. Short Curved Stems
B. Short Lateral Engaging Stem
C. Neck Plugs or Neck Only

3. Metaphyseal Stabilized
A. Taper Stems
B. Bulky/Fit and Fill Stems

4. Conventional Metaphyseal/Diaphyseal Stabilized

Historical Review of THA Conservative Cementless Implants

Modern-Day Conservative Implant Designs For Tha Started In Europe With The Introduction Of The Thrust Plate In 1978. Similar To The Philip Wiles Hip Replacement From 1938.

Wiles performed A total of (6) replacements. 1 explanted stem (1960s) is in the archives of the BOA on loan to the Hunterian Museum at the Royal College of Surgeons

Thrust Plate 1978
Arnold H. Huggler & Hilaire A. C. Jacob

Little Know Work Neck Sparing Stem Design from Brazil

João de Azevedo Lage (born December 3rd, 1920 and died In July 25th, 2001)

Lafayette de Azevedo Lage, MD (Son)
Second generation orthopaedic surgeon

"Lage Prosthesis", 1956 as Endo to Bi-Polor to THA
His son Lafayette stopped using the device in May 2001
Many Stems are still functioning today!

Two Significant Designers that impacted and influenced designs of short stem.

Pipino (1979) & Morrey (1982)

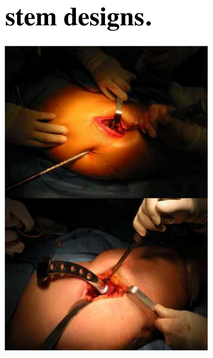
Pipino first presented the femoral neck-conserving **Biodynamic™** hip prosthesis for cementless fixation in 1979.

c.c. material with sintered beads
(Howmedica/Stryker Orthopaedics)

In 1982, B. F. Morrey **Mayo Clinic Stem** designed a short (60 mm), double-tapered titanium alloy short femoral stem with a modular head.

Titanium alloy with proximal fiber mesh pads.
(Zimmer)

The growing interest in the Anterior Approach has also influenced the development of short stem designs.



K. Keggi Experience
40 + years
Dual incision for 30+ years
Helpful with heavy patients for femoral canal preparation and insertion of modular stems.
K.Keggi
All short stems designs including neck preserving can be done with a single anterior incision.
J. Keggi (2010)

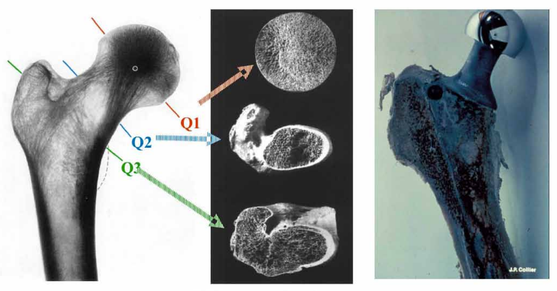
Potential Advantages of Short Curved Stems

- Preservation of Tissue (Hard & Soft)
- Less Blood Loss
- Reduced Thigh Pain (end of stem)
- Easier Stem Preparation and Insertion
- Reduced OR Time
- Reduced Hospital Time (Now being done as outpatients in selective centers.)
- Reduced Instrumentation (1 pan)
- Reduced Stem Inventory (sizing 6-7 stems)
- Reduced Rehabilitation
- Easier Explanation if Necessary
- Easier Revision (conversion to Primary Stem length)
- Overall Reduction in Health Care cost

1. OR time reduced ($3,000 per hr.)
2. Less inventory (neck preserving)
3. Less instruments (trays cost on average $250-$300 per tray to recycle)

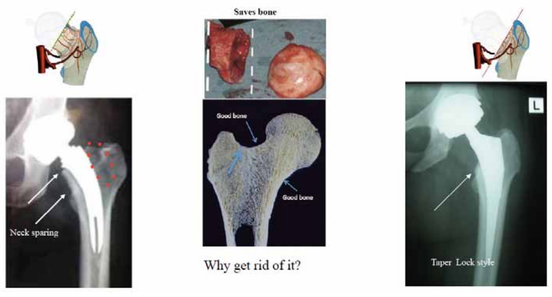
Short curved neck preserving stem.
Saves significant bone.

Architectural changes in the proximal femur after THA continues to be a problem.



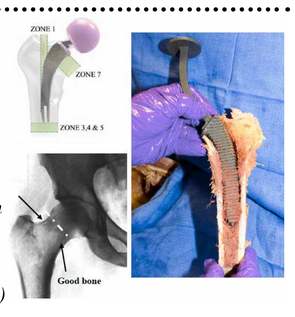
We can do better

Neck Sparing Stem vs. Conventional Stem



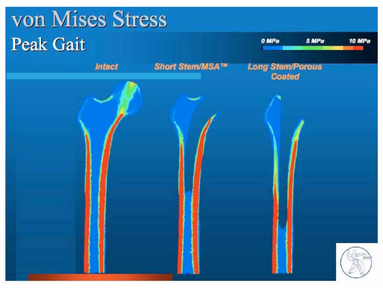
Neck Retention

- Provides better blood flow vs. hip resurfacing *(Pipino)*
- Provides better axial and torsional stability vs. conventional THA *(Freeman & Whiteside)*
- Provides for more tissue sparring approaches *(Pipino)*
- Potential for less blood loss *(Pipino)*
- Potential for quicker rehab *(Pipino)*

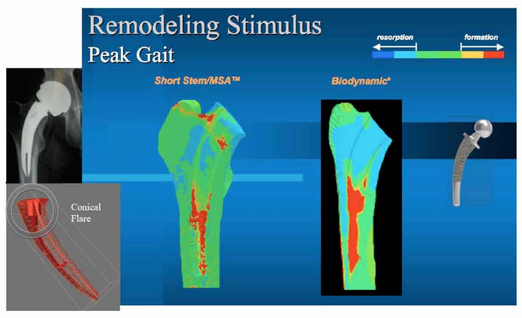


FEA modeling has demonstrated better potential for bone remodeling for the Short Curved Neck Sparing compared to previous porous coated stems (AML style).

McTighe, Brazil, Turnbull, Harrison, et al., AAOS 2008



FEA modeling for short curved neck preserving stem with a proximal novel conical "Flare" has demonstrated better potential for bone remodeling compared to previous short stem "Biodynamic™".



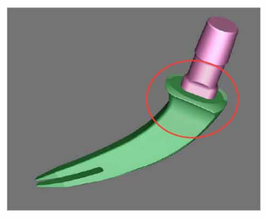
McTighe, Brazil, Turnbull, Harrison, et al., AAOS 2008

1994 Design Concial Collar Straigth Stem

McTighe, et al., Patent Issued 1998 #5,725,594

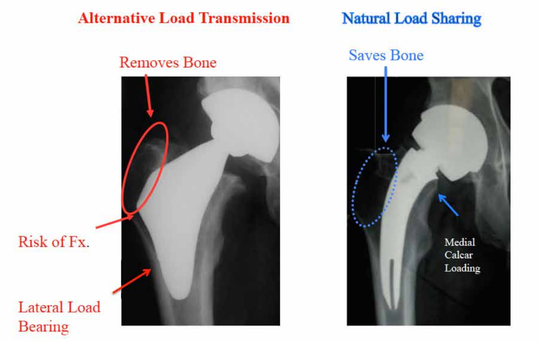
Conical Flair Designs work to offload hoop tension into compressive loads.

Intrinsic™ Stem / Primaloc™



Conical Flare on MSA™ / ARC™ / TSI™

Not all short stems are equal in design philosophy or function.



Short Curved Neck-Stabilized Stems (JISRF Classification 2a.)

C.F.P.™ by Link, 1996. Longest follow up of short curved neck preserving stems in the literature.

Historical Lage Hip Brazil 1956-2001

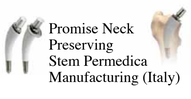
Nanos™ Neck Preserving Stem By Smith & Nephew, International

Corin Mini Hip™ International 2008 & U.S. 2010

MSA™ by Global, Au 2007

ARC™ by Omni, U.S. 2010

TSI™ by Signature Orthopaedics, Ltd., 2104

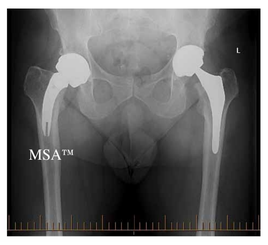


Promise Neck Preserving Stem Permedica Manufacturing (Italy)

RESULTS:

Three (3) reported cases of high metal ions resulting in pain (pseudo tumors) requiring revision surgery. All three cases had Metal on Metal Bearings.

1 case MSA™ and 2 Cases ARC™



A.Prof William L. Walter
(1 case MSA™)

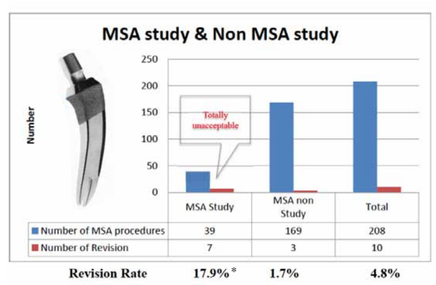
Adrian van der Rijt, MD
78 CASES / 1 REVISION =1.2%

Design - Curved, short, neck loading femoral stem.

Proximal

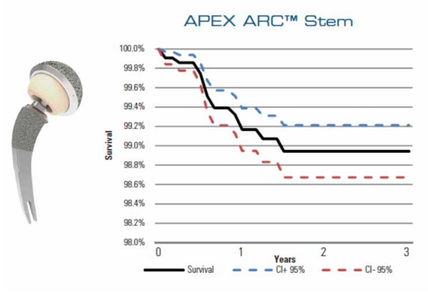
- Trapezoidal, taper cross-section
- Proximal titanium/HA porous coating zone in femoral neck
- Torsional stability further enhanced by lateral T back
- Proximal conical flare transfers compressive loads to medial calcar
- Modular neck + head
- Distal polished implant

The revision rate within the study was 17.9%, compared with 1.7% outside the study (and thus 4.8% overall). *P. Hannaford*



*Higher failure due to surgical technique learning curve resulting in short term aseptic loosening.

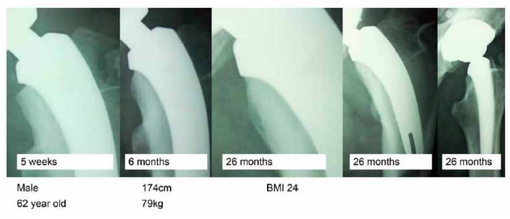
The survival estimate is above 98.6% This report does not account for non-reporting or competing events that preclude revision such as death. *Omnilife science™*



Dense new bone growing up to conical flare

The design philosophy of neck retaining implants achieves osseo integration in a very small area of femoral neck, maintaining physiological load, bone stock and function. The preservation of the femoral neck reduces both torsional and axial bending moments providing improved mechanical environment of the implant.

Adrian van der Rijt, MD (February 3, 2014)



REVISION RATES

- 78 Australia MSA™ Stems by: Adrian van der Rijt

1 revision (for aseptic loosening) = 1.2% Revision Rate

- 169 Australia MSA™ Stems total non-study = (3 Revision) = 1.7% Revision Rate
- 39 Australian Study had 7 Revision =17.9%
- 208 Combined total = 4.8% Revision Rate
- 576 USA ARC™ stems by:

J. Keggi, MD; L. Keppler, MD; R. Kennon, MD; T. Clyburn, MD; E. McPherson

576 ARC™ stems = 10 revisions

(2 aseptic loosening, 2 infections, 2 chronic dislocations, 1 cup resulting removal of neck/replaced with new neck, 2 aseptic loosening, 1 neck disassociation,) = 1.7% Revision Rate TSI Study Group

- 2,825 USA ARC™ stems since April 2010. 98.6% survival = 1.4% Revision Omnilife science
- Overall World Wide Survival with removal of AU study = 1.5% Revision Rate
- Worldwide Survival Rates with AU Study Removed = 98.5%

Conclusion

Short Curved Neck Stabilized Stems

Our combined experience with the MSA™ and ARC™ Neck Stabilized stems has been rewarding.

For a first generation new design concept with new developmental instrumentation has provided a safe, effective and reliable construct for our younger more active patients.

Improved bone remodeling has been impressive.

Retaining the femoral neck has significant mechanical advantages and we have not seen the problems associated with other model neck stem designs.

Note: There is a short learning curve but very definitive.

We are encouraged and continue to use and evaluate these devices.

References:

Additional references can be found at http://www.jisrf.org/tissue-sparing-implant-jisrf.html and http://www.reconstructivereview.org

* Executive Director
Joint Implant Surgery & Research Foundation
46 Chagrin Shopping Plaza, #117 • Chagrin Falls, OH 44022
www.jisrf.org • tmct@jisrf.org