Design Considerations for a Modular Neck in Total Hip Arthroplasty

By:

Timothy McTighe¹, Kristaps J. Keggi, M.D.², H. M. Reynolds, M.D.³, Milton Smit, M.D.⁴, John Keggi, M.D.², Hugh U. Cameron, M.B., Ch. B.⁵, Bernard Stulberg, M.D.⁶

Introduction:

THA continues to improve but complications still occur. Dislocation and osteolysis continues to be a significant problems. The causes for dislocation can be multi-factorial, and include: mal-positioned components, soft tissue laxity, and impingement of component-on-component or on fixed obstructions such as osteophytes. Weakness of the abductor muscles due to improper reconstruction can also be a contributing factor. In countering these factors, stability is often achieved at the expense of limb lengthening.

What are the Goals of THA?

Eliminate Pain New Hip

Restore Function · Reproduce Hip Mechanics 1. Femoral Offset 2. Neck Length 3. Version Angle



Two Remaining Significant Problems in THA

Dislocation

- Reports from 2-8% · Higher in Posterior Approach
- · Higher in Sm. Dia. Heads
- Higher in Revisions >20%
- Osteolysis · Eccentric Poly Wear
- · Result Lytic Lesion (4 year post-op)



Discussion:

Current Dislocation Costs Estimating a conservative 2% dislocation rate, there would be a corresponding 6,000 dislocated hips each year.

• Non-operatively treated - 4 500 (75%) - \$6,000 Cost: relocation, brace, x-rays, rehabilitation

· Operatively treated - 1,500 (25%) - \$25,000 Cost: operation, brace, and rehabilitation

\$6,000 x 4,500 = \$27 million \$25,000 x 1,500 = \$37.5 million

Total cost of dislocations per year in the United States, \$64.5 million

"Wright Medical Web Site

Stem Designs



R-120[™] - Cemented



Technique is the same as any standard fixed neck cement or cementless stem.



Alfa II[™] - Cementless

Dislocation Treatment Trends



Big heads are helpful for impingement problems, however do not aid in soft tissue laxity. Constrained sockets are indicated for soft tissue laxity but not indicated for mechanical instability. Surgical navigation is promising to reduce implant alignment problems and dual offset stems are helpful for restoring joint mechanics but increase inventory costs.

Intrinsic Modular Indexable Neck (IMIN[™])

IMIN™ Modular Neck Design





Neck Positions for 8° 2 3 8° 135° 7° 138° 4° 141°

Version Angle Neck Shaft Angle 4° 128° 7° 130° 0° 127°



0° 142°



Benefit: blood loss reduction





"Despite a number of improvements in femoral stem neck geometry and increasing femoral head sizes up to 36mm, dislocation continues to be a significant problem after THA" - Dr. Amstutz

Surgical Technique: continued

Anterior Mini-Dual Incision

Implant orientation is a significant part of surgical technique. The mini-incision places a higher demand on implant positions. Proximal modular stems provide adjustments reducing the risk of implant discrepancy, and soft tissue laxity.



Fine Tuning Joint Mechanics





The Advantage of Proximal Modular Necks: With the trials in place the surgeon can verify joint stability and range of motion without disrupting the implant/bone interface. If necessary, the surgeon can also fine tune the joint mechanics by adjusting the modular neck





Insertion of Neck & Head

Head neck insertion can be done by assembling head onto neck and inserting as a single unit.



Another approach is to insert the modular neck first then assemble the head onto the neck then impacting

Valgus Neck Shaft Angle

Varus Neck Shaft Angle 123° (position 0) (Same pt., same implants, different neck positions)

147° (position 6)



Post-op X-Rays







Ways to Reduce Dislocation

- · Do not use skirted necks or modular trunnion necks
- · Constrained sockets (not indicated for impingement problems)
- Reduce Use of Angled Poly Inserts
 Navigation System (Digital \$60,000 / Image 250,000)

mechanics.

Summary

- · This modular neck design aids in fine tuning joint mechanics
- Works with all surgical approaches
- Allows for femoral stem insertion first (aids in reducing blood loss)
- · Allows for ease and access in case of revisions
- · Allows for replacement of ceramic heads by replacement of modular neck
- · Reduces chances of mechanical impingement of implants especially with mini-incision surgical approaches

Clinical Summary

Primary Total Hips

- 270 stems implanted since 1/02
- (136 cementless / 134 cemented)
- **3** Revisions
- 1 traumatic fx. Greater Trochanter
- 1 cup revision (mod. neck removed for access)
- 1 dislocation (mod. neck revised and indexed)
- 0 Stem Revisions
- 0 intra-op fractures
- 2 GI Bleeds
- 0 infections
- No significant leg length inequalities (+/- 5mm) +50% indexed to positions other than 0

Poster Exhibit October 2003 Berlin, Germany



Arthritis Research Society International 17000 Commerce Parkway, Suite C Mt. Laurel, NJ 08054, USA Tel.: +1/856/439-1385 Fax: +1/856-439-0525 Email: oarsi@oarsi.org



Joint Implant Surgery and Research Foundation Executive Directo

17321 Buckthorne Drive Chagrin Falls, OH 44023 440-543-0347

ww.jisrf.org

(1) Joint Implant Surgery & Research Foundation, 17321 Buckthorn Dr., Chagrin Falls, OH 44023

(2) Department of Orthopaedics & Rehabilitation, Yale University School of Medicine, Keggi Orthopaedic Foundation, 1201 West Main St., Waterbury, CT 06708

(3) Jackson Arthritis Center 3300 Webster Street Suite 1202 Oakland, CA 94609 (4) Orthopedic Associates of Kankakee

400 S. Kennedy Drive

Suite 100 Bradley, IL 60915

Early Clinical/Surgical Impressions

however, we are extremely encouraged

op dislocations and help restore joint

No long term data available at this point,

that this device will aid in reducing post-

(5) 43 Wellesley St. East #318 Toronto Ontario #318, Toronto, Ontario, Canada M4Y 1H1 (6) Cleveland Center for

Joint Reconstruction 1730 W. 25th Street Cleveland, Ohio 44113

Femoral Stem & Cup in Place w/o Neck



Restore Hip Mechanics





