The Role of Modularity in Primary THA - Is There One?

By Louis Keppler, M.D.*, Hugh U. Cameron, MB, ChB, FRCS§, Timothy McTighe, Dr. H.S. (hc)Δ

Introduction

Modularity or multi-piece stems are becoming commonplace in hip revision surgery with virtually all implant companies offering one version or another. The role of modularity would therefore seem to be firmly established for revision, but what of primary cases?

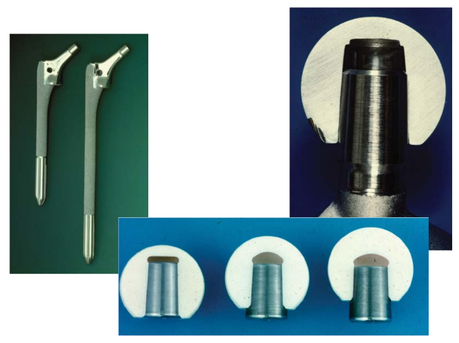
This study is a follow-up to previous work with a further ten years of cases reviewed. The real question we face does the benefit of modularity pay higher dividends than the potential risk factors. We believe this review will provide guidance for others surgeons to aid in their decision making process.

For almost two decades the two senior authors have been using a proximally modular stem in primary cases. The S-Rom® stem has basically not changed since 1986.

The stem design is a monoblock titanium alloy (maximum strength potential). The distal flutes historically were design off the Sampson™ IM Rod system. The Sharp flutes provide excellent distal torsional stability while reducing chances of distal fixation. It is the design intent of this device to provide proximal fixation and distal torsional stability. An additional feature of the stem is the distal coronal slot. This provides for dual benefits, the first is to reduce hoop tension during stem insertion thus reducing distal fractures of the femur. And second (found out only after the fact during clinical reviews) was the slot reduces distal bending stiffness hence end of stem pain has not been a problem (exception > 15mm dia. stems).

The Role of Modularity in THR

Modular means that the stem has 2 or more parts which can be joined. Does that means any stem with a modular head is a modular stem? Not in today's definition. This poster is limited to the femoral side and includes two or more modular parts.

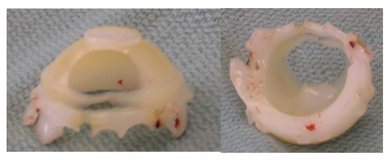


Modular Heads

Two Remaining Significant Problems in THA

#1 Dislocation
- Reports from 2-8%
- Higher in Posterior Approach?
- Higher in Sm. Dia. Heads
- Higher in Revisions >20%

#2 Wear Debris/Lysis



Material

955 (S-Rom®) primary cases in a combined series performed by two surgeons at separate centers. 2-17 year follow-up (mean 11.5 yrs.)

HC: 517 cases (278 females/239 males) mean age 55; 162 CDH; Mod. Watson-Jones approach; 26 lost to follow-up; 28mm head (1986 stem design)

LK: 438 cases (237 females/201 males) mean age 68; 98 lost to follow-up (older pts./ relocation of practice); 32mm head (1986 stem design); Posterior approach

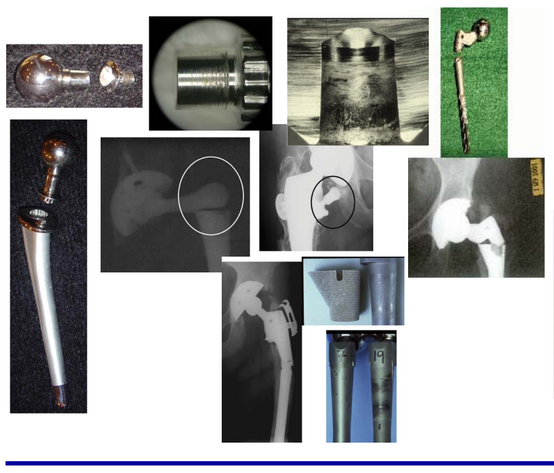
Note: variety of cups used

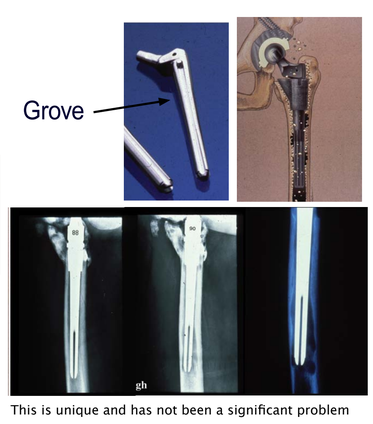
S-Rom® Evolution

- Monoblock stem
- Stable Geometric Shape (Prox. Cone & medial triangle distal flutes)
- Variety of fit & Fill Sleeves
- Distal coronal slot
- Precise (modular) instrumentation

Modular Designs That Have Come and Gone

Modular Failures & Concerns - Increased Risk?

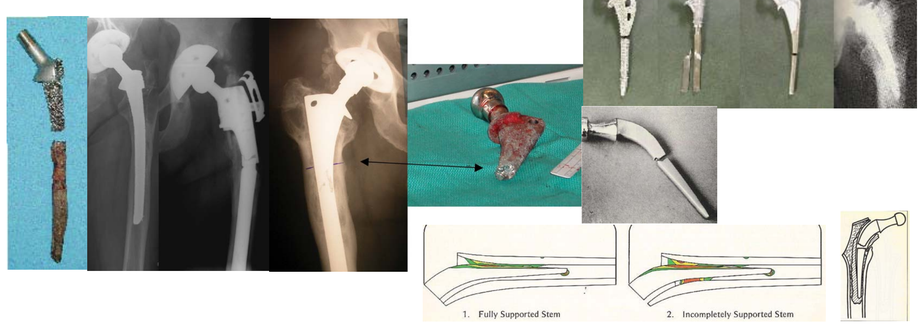




This is unique and has not been a significant problem

Unsupported Stems Will Fail Regardless of Fixation/Design

(cement/cementless/monoblock/modular)

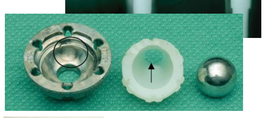


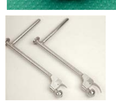
Bechtol described failure mode in 1970's

Examples of problems:

Poly Wear

If delay too long before revision poly wear thru & cup damage

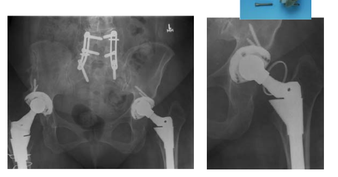




Helpful for cup revisions

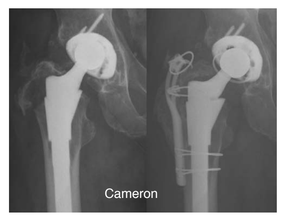
Constrained liner - 28mm

Skirt on neck made it very vulnerable to mechanical failure.



Fractured greater trochanter through osteolytic cyst

2 hook plate
1 wired
1 compression screws

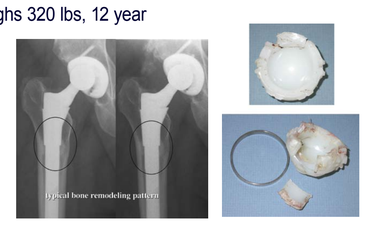


Shorten stem

• 3 cases of closed femoral canal
• Customize Ti. Cuts easily with metal cutting burrs

Constrained liner - 28mm

Male, 36, weighs 320 lbs, 12 year



Osteolysis

HC: Distal to sleeve - 3; 2 primaries; 1 revision. LK: Distal to the sleeve - 0. Data suggests that the sleeve acts as a seal, reducing poly particles from passing distally. HA Sleeve: 114 currently being reviewed. Will this function as well ?

Sleeve acts as a seal

Dislocations

HC: 6 total; 3 closed reductions; 2 open reductions; 1 stem removed/ new stem inserted into sleeve (30-36mm neck). Note: Extensive trial reductions/does not take routine x-rays.

LK: 5 total; 2 closed reductions; 3 open reductions (constrained sockets).

Note: routinely takes intra-operative x-rays/ generally results in fine-tuning of fit.

Stem Revisions

HC: 5 total; 1 for aseptic loosening; 2 late sepsis; 2 early bone fractures.

LK: 4 total; 0 for aseptic loosening; 4 late sepsis.

Note: 5 pts. Required onlay grafting for significant progressive end of stem pain (+15mm dia. stems)

Lessons Learned

HC: Small dia. head greater wear problems; Routine now 32mm c.c. head; Large/active males metal-metal bearings; Neutral liner; Smaller incision; type C bone (cement stem).

LK: 36mm ceramic head w/cross-link poly; + 4mm lateral offset poly (for increased poly thickness & offset); Hand reaming (better feel for bone); Neutral liner; Routine posterior capsule closure (added security); Smaller incision (average 7cm); type C bone (does not use S-Rom, uses a taper cementless stem).

Since the advent of the S-Rom® (1984) prosthesis it has been clear that modular (stem/ sleeve) approaches can be used to successfully address implant stability especially fit & fill problems.

Final Comments

The long-term results for this series has demonstrated the S-Rom stem to be safe and effective for primary THA. Initial concerns over fretting and fatigue failure of the modular junction has not been observed.

The lack of aseptic loosening (1 stem) clearly demonstrates this design provides initial stability leading to long term fixation.

The main problem appears to be cup/liner related and lack of distal lysis suggest the porous sleeve does act as a barrier to migrating poly debris.

We continue to use and recommend this device.

* HORIZON® ORTHOPEDIC
Advancing the Quality of Life!
Cleveland, OH

§ SUNNYBROOK & WOMEN'S
Orthopaedic & Arthritic Institute
Toronto, Ontario

Δ JISRF Joint Implant Surgery and Research Foundation
17321 Buckthorne Drive
Chagrin Falls, OH 44023
440-543-0347
www.jisrf.org

New Zealand Orthopaedic Association Annual Scientific Meeting 2-5 October 2005

Poster Exhibit
2005