DIFFICULT HIP REPLACEMENT SURGERY: PROBLEMS AND SOLUTIONS

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A SCIENTIFIC EXHIBIT AT THE 1989 AACIS MEETING
LAS VEGAS, NEVADA

INTRODUCTION

In the last few years, total hip replacement surgery has become increasingly more sophisticated and demanding as we encounter more difficult and unusual situations.

Understandably, cases involving difficult hip replacement do not lend themselves to scientific review with meaningful, statistical analysis. They do, however, give an opportunity to discuss experiences with certain interesting and unusual problems.

This exhibit shows how two separate joint replacement centers, in collaboration with an implant manufacturer, have developed surgical solutions to the following hip reconstruction problems:

- Primary THA
- Revision THA
- CDH THA
- Takedown of Arthrodesis
- Femoral Angular Deformity
- Conversion/Rctrievability

The S-ROMTM modular multi-component hip system is now the first choice for difficult hip problems at both Baulkham Hills Private Hospital and Orthopaedic Arthritic Hospital.

There are several different femoral problems in total hip replacement which can be overcome by component design.

SIZE

Femurs come in a variety of sizes, with some femurs being very small or tiny, such as in high CDH cases. In these situations, the diaphyses are usually reamed vigorously These patients are frequently young and may be very active thereby subjecting the femoral component to high loads. Therefore, the component must be made of a superalloy, Because they are young, it is preferable to insert the implant without cement. Porous coatings, however, damage the metallurgy, weakening the implant. One solution is to use a modular two-part stem, with the porous coating being applied to the proximal sleeve which then locks in place by means of a Morse-type taper. The sleeve is weakened, but because once locked in place on the stem, it is subjected to uniform non-cyclic hoop stress and, therefore, fracture of the sleeve is unlikely

In addition, a two-part stem system allows the surgeon great versatility at the time of surgery of fitting the proximal femur while filling the distal canal. (Figures I & 2)

A proportionately long, stiff stem inserted tightly into a femoral canal can result in “end-

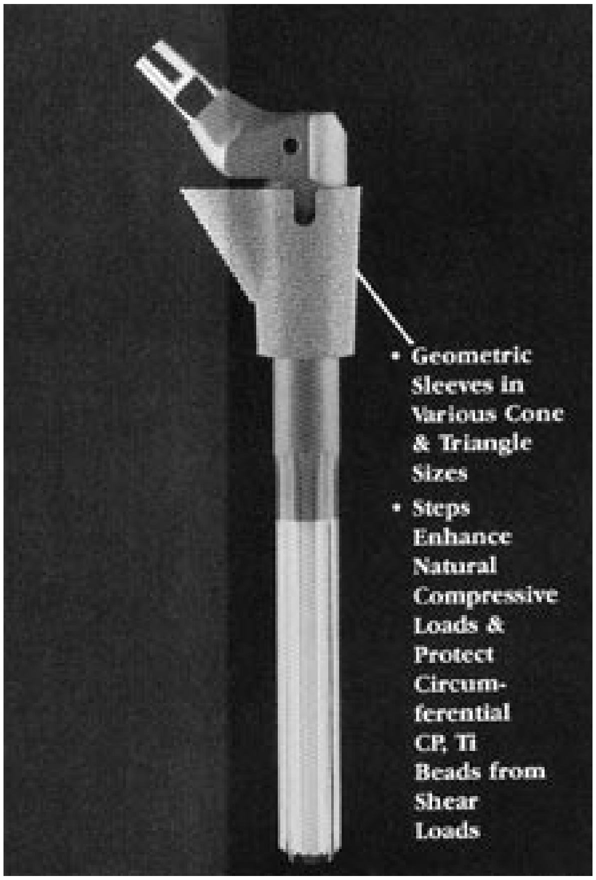

Figure 1.

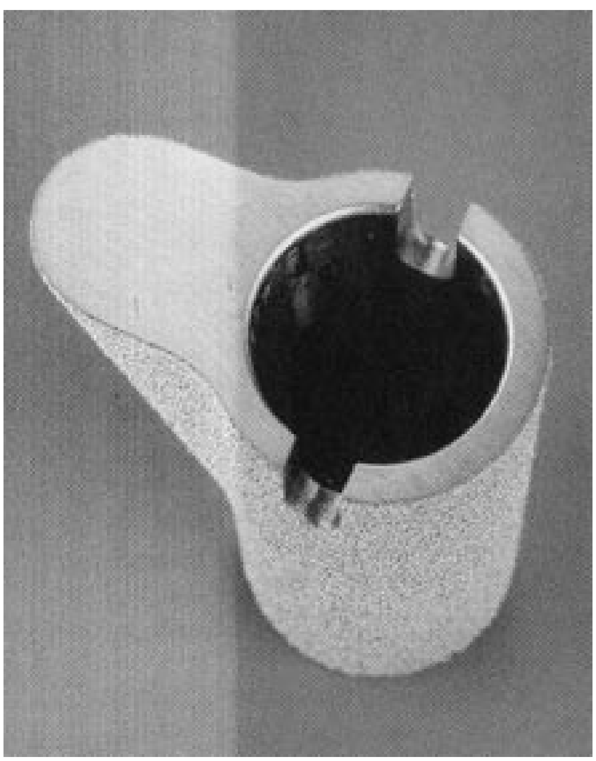

Figure 2.

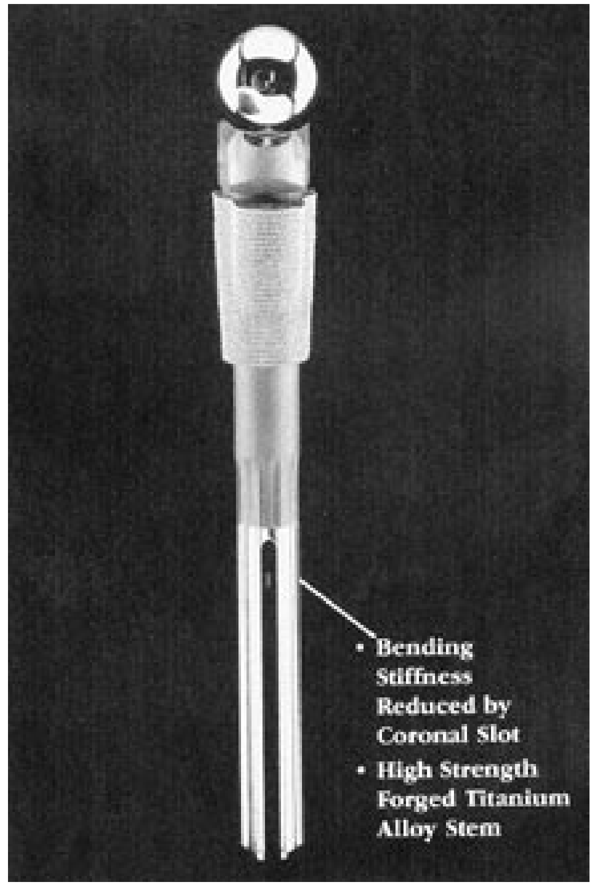

Figure 3.

stem pain" due to differential movement between the implant and the bone. This may be accentuated by vigorous reaming. As the direction of movement of the femur is into the anterior bow, the stem tip is split in the coronal plane. This decreases bending stiffness and appears to eliminate "end-stem pain". (Figure 3)

FEMORAL ANTEVERSION

Abnormal femoral anteversion in CDH cases is common and may be extreme. This makes uncemented total hip replacement difficult. If maximum metaphyseal fill is achieved, the prosthesis ends up too anteverted. Insertion in correct version means poor metaphyseal fill. Use of a fixation sleeve eliminates this problem. The sleeve is inserted for maximum fill and the stem is locked into the sleeve in the appropriate version. Maximum fit can therefore be achieved. (Figure 4)

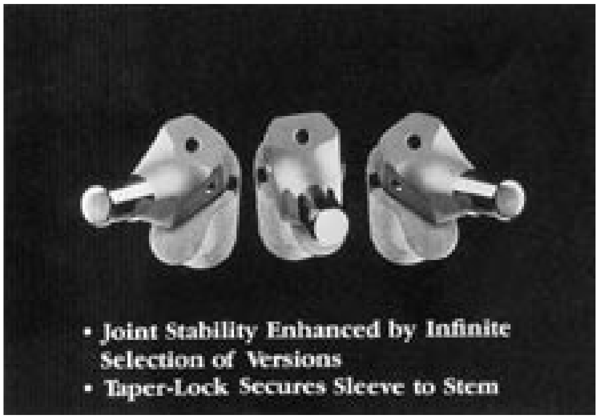

Figure 4.

EMSIONS

Proximal bone loss makes revision surgery difficult. If loss is not too severe, the sleeve can be set out at any angle to rest on the patient's own bone (which can rapidly hypertrophy) rather than allograft bone, which takes a long time to reconstitute. A long neck revision component, with a range of modular neck lengths, allows proper leg length adjustment.

In the deficient proximal femur it is difficult to achieve rotational stability of the implant. In this situation the prosthesis must be stabilized distally. Distal stability is preferable over distal fixation. Distal stability is necessary to allow proximal allograft bone to reconstitute. However, if distal fixation is achieved, proximal loading might be bypassed. With little or no proximal support, huge rotary loads are applied to the distal end of the prosthesis. These are resisted by fluting the distal stem like a Sampson nail and reaming to the minor diameter so that the flutes engage the cortex. (Figure 5)

Fluting must extend a fair way proximal to allow cortical engagement even in very deficient femurs. If necessary, the whole medulla of the distal femur, as it begins to flare above the knee, can be filled with pure cancellous allograft. Obviously, such a long stem necessitates an anterior bow of 70 to 100, beginning at the 200 mm level and the distal end of the stem is designed in the shape of a clothespin which helps minimize anterior femoral perforation.

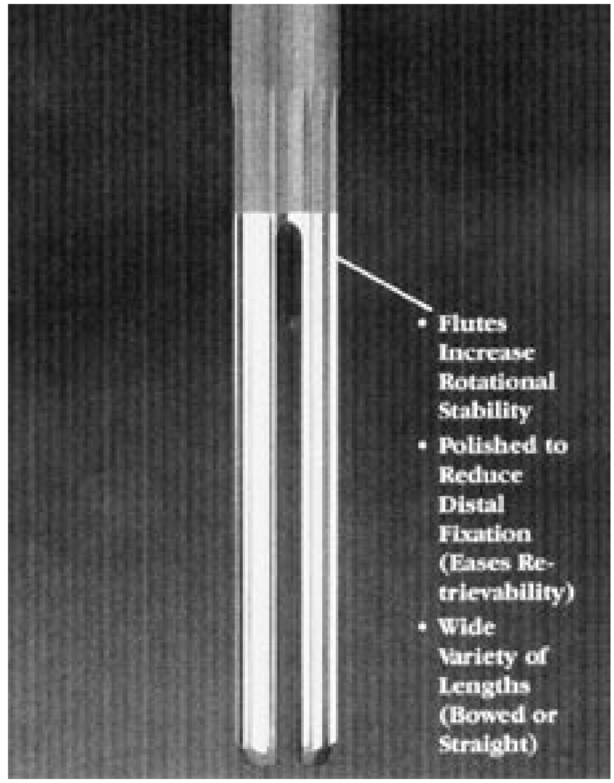

Figure 5.

This clothespin-effect also minimizes "end-stem pain".

ROTARY AND ANGULAR DEFORMITIES

Rotary or severe angular deformities, and the occasional revision which requires retrieval of a fully porous coated implant, are treated by femoral osteotomy. The sleeve can be securely fixed in the proximal host bone at the orientation that best fits the bone. The stem is inserted into the taper lock sleeve and the proximal bone. This combination is then implanted in the distal bone, where the fluted stem provides rotational stability. The same situation pertains where massive bulk allografts of the proximal femur are used. The proximal stem and sleeve may be attached to the allograft by means of bone cement. The junction between the allograft and host bone is cementless along with the fixation of the distal portion of the stem.

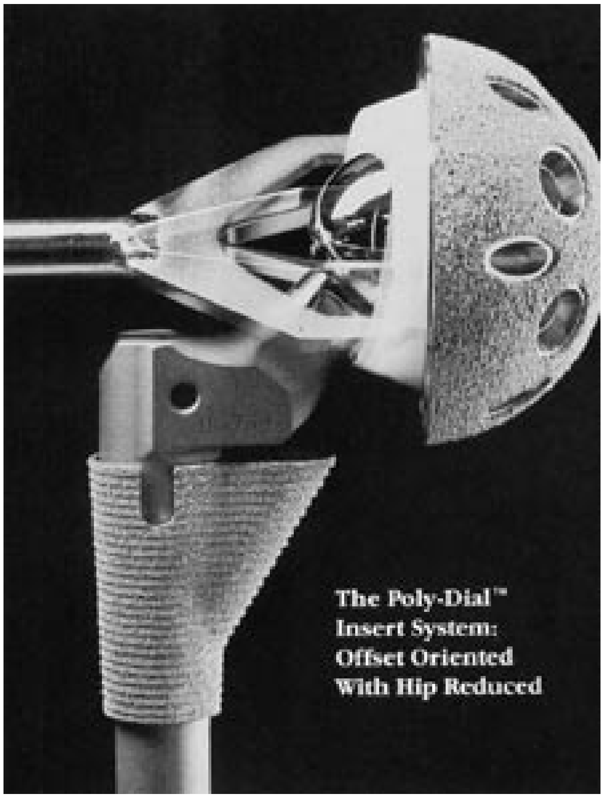

Figure 6.

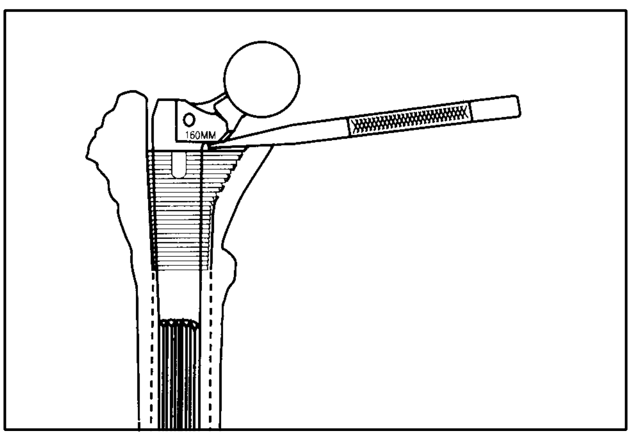

Figure 7.

CONVERSION/RETRIEVABBLITY

One of the main difficulties in hip surgery is conversion or retrievability of implants.

Conversion is the need to adjust or reposition some components. Example, dialing a polyethylene offset after the femoral head has been reduced to increase hip stability. (Figure 6)

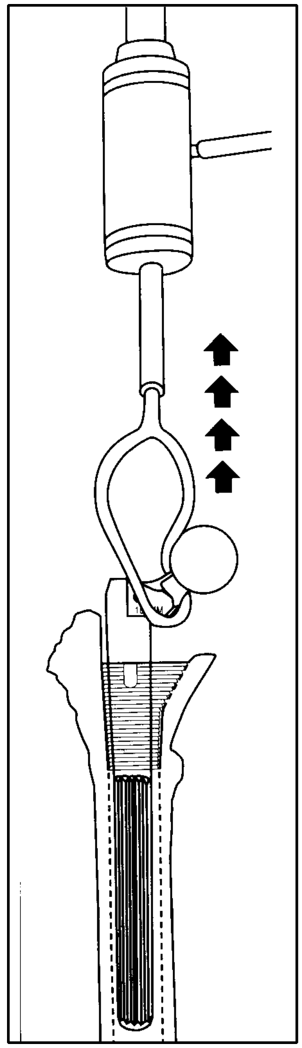

Figure 8.

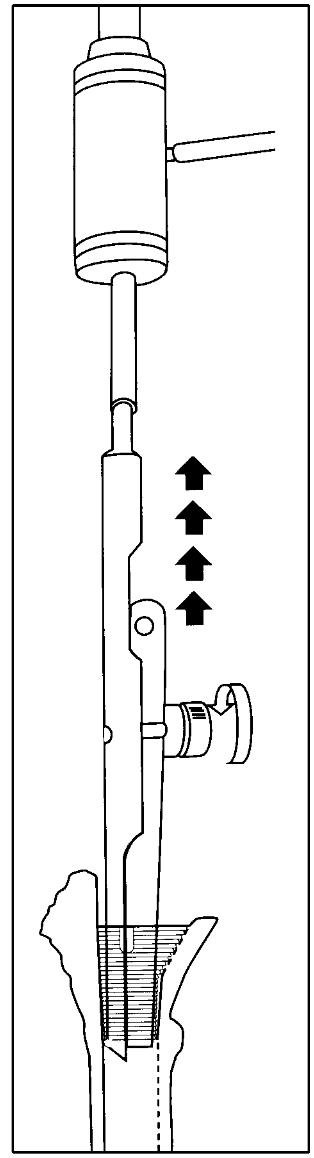

Figure 9.

Any implant inserted into a young person may fail in time. if the fixation does not loosen or the implant does not break, then the plastic bearing will eventually wear out. It is desired, therefore, that revision should be possible with minimal bone destruction. To minimize chances of distal osteointegration, i.e., direct apposition of the bone to the distal stem, the distal portion of the stem is highly polished. A stem can be separated from the sleeve by means of wedges and the hip retrograded with a slaphammer. Ready access to the proximal sleeve then permits loosening with flexible osteotomes or a high-speed burr and removal in retrograde fashion with a proximal sleeve extractor and slaphammer. (Figures 7, 8 & 9)

EXAMPLES OF DIFFICULT CASES

PRIMARY CASE

Problem:
"Fit & Fill"
• Large Metaphysis
• Narrow Canal

Solution:
True Modularity
• Large Proximal Sleeve
• Small Diameter Stem

REVISION CASE

Problem:
Stability
• Deficient Proximal Femur
• Osteolytic Bone
• Fracture

Solution:
True Modularity
• Calcar Replacement with Proximal Sleeve
• Fluted Stem
• Long Stem

SPECIAL CASE

Problem:
Joint Stability
- Offset
- Femoral Version

Solution:
True Modularity
- 135' Neck Shaft Angle
- Infinite Neck Version Selection

RESULTS

Baulkham Hills Private Hospital
New South Wales, Australia

62 Implanted

S-ROM™ Threaded Cups (over the last 20 months)	37 Primary OA 25 Revisions

77 Implanted

S-ROMT1 Stems (over the last 20 months)	39	Aseptic Loosenings
	8	Primary OA
	5	Infected Primaries
	11	CDH
	4	Girdlestone Conversions
	8	Fusion Takedowns
	2	Distorted Femoral Anatomies

Results to date are encouraging. Patients are ambulating well with greater stability and less discomfort than other primary non-cemented replacements (from our unit). Two revision cases had to be revised: one for recurrent dislocations, which required a simple adjustment or conversion of the Poly-Dia tm insert angular orientation and retroversion of the stem, and the second for a loosened acetabular cup.

We avoid the use of cement in revision surgery by using this system. We are also able to use allograft bone and to reduce our average operating time. Incidence of "end-stem pain" with standard stem is zero.

RESULTS

Orthopaedic Arthritic Hospital
Toronto, Ontario, Canada

339 Implanted

S-ROMT' Threaded Cups	194	Primary OA
(1-4 years,	15	Rheumatoid Arthritis
average 2.6 years)	20	AVN
	10	Other
	100	Revisions

241 Implanted

S-ROM Stems	114	Primaries
(1-4 years,	56	CDH
average 2.6 years)	15	Fusion Takedowns
	6	Femoral 0steotomies with Revision
	37	Revisions
	13	Girdlestone Conversions

It is too early to give conclusive clinical results. However, our patients are not complaining of thigh pain and are ambulating as well as patients with cemented hips. We are encouraged with our early clinical results and continue to use this system.

The first case was revised due to a femoral shaft fracture below the tip of the stem. The stem was retrieved and exchanged for a cemented prosthesis.

The second case was revised due to a very comminuted femoral shaft fracture, resulting in femoral component sinkage. Stem was retrieved and exchanged for a larger S-ROMT" stem.

The third case was revised due to a reactivation of sepsis; and implant was removed.

The fourth case was a revision of a prior revision treated with a S-ROMT1 threaded acetabular component with allograft. It was revised 21/2 years post-operatively due to aseptic loosening. *Interesting note.-* the stem was removed for improved exposure for the acetabulurn and then reinserted in the same sleeve.

Findings in the above four cases: all proximal sleeves were firmly fixed in the bone and locked to the stem. No evidence of fretting or metallic debris was found upon removal of the stem from the sleeve.

Incidence of "end-stem pain" with standard stem is zero.

To date, no cups have failed in primary situations.

*Note: Porous coated devices are approved for cemented use only

S-Rom is a trademark ofjoint Medical Products Corp.