PRODUCT RATIONALE

THE SOLUTION SYSTEM®
REVISION SURGERY

A COMPREHENSIVE SOLUTION FOR REVISION SURGERY
“Overcoming the problems that inhibit the long term success of hip revision surgery is now considered to be one of the most pressing problems facing orthopaedic surgeons today.”

Dr. Wayne Paprosky, 1998
The unparalleled success of total hip arthroplasty (THA) over the past 30 years has improved the quality of life for millions of people. However, as more patients are treated each year, including a greater number of high demand young patients, there has been a substantial increase in the number of procedures to revise failed implants. Revision surgery is rarely straightforward. Extensive metaphyseal bone loss, well fixed implants and cement lodged in the distal femur can all present difficulties in revision surgery.

In general, the results of cemented and cementless revision procedures fall short of those achieved for primary arthroplasty.

For every problem there is a solution

The Solution System® was developed to address problems encountered during revision surgery, from mild to severe bone loss.

A simple defect classification system, a comprehensive range of femoral and acetabular components, together with dedicated instrumentation, provide the surgeon with a complete range of answers.

Femoral stem design is based upon 20 years of clinical experience using extensively coated cementless implants. Results achieved using the Solution System are comparable with those reported for primary surgery.

“One hundred seventy patients have a mean follow-up of 13.2 years reveals survivorship of over 95%.”

Results using the Solution System®

- 95% survivorship at 13.2 years
- 82% bone ingrowth and 69% pain free at 5 years
- 97.6% survivorship at 8.2 years
- 97.7% survivorship at 5 years
- 99% stability at 4.4 years
The Solution System provides a simple defect classification, allowing the surgeon to identify femoral deficiencies, the appropriate procedure and the type of implant to be used.

Type 1
- The calcar region is supportive.
- Minor cancellous bone loss exists anterior/posterior - the metaphysis is intact.
- The diaphysis is intact.

Type 2
- The calcar is non-supportive.
- Cancellous/cortical structural bone is absent - the metaphysis is not intact.
- The diaphysis has minimal damage.

Type 3A
- The metaphysis is non-supportive.
- The diaphysis is non-supportive due to bone loss.
- Distal fixation over 4cm can be achieved near the isthmus.

Type 3B
- The metaphysis is non-supportive.
- The diaphysis is not intact due to severe bone loss.
- Distal fixation over 4cm can be achieved at the isthmus.

Type 4
- Extensive meta-diaphyseal damage exists.
- The cortices in the isthmus have been eroded - reliable distal fixation is not indicated.
- Alternative femoral fixation methods must be considered.
**Femoral Reconstruction**
The extensive range of cobalt chrome Solution System stems ensures that the anatomic requirements of each patient are met. The range includes:

**6 inch and 8 inch straight Solution System stems.**
- 10.5mm - 22.5mm diameters.
- A choice of two proximal triangles: standard; or MMA (Modified Medial Aspect) which is smaller in the medial/lateral dimension and is intended for patients with narrow proximal femora.
- Straight stems are used in cases with metaphyseal bone loss, and minimal or no diaphyseal damage.

**8 inch and 10 inch bowed Solution System stems.**
- 13.5mm - 22.5mm diameters.
- Accommodates the needs of patients with greater meta-diaphyseal bone loss and obvious femoral curvature.
- The 10 inch stem is used to obtain more distal anchorage.

**7 inch straight and 9 inch bowed calcar replacement stems.**
- 7": 12mm - 19.5mm diameter
- 9": 13.5mm - 19.5mm diameter
- Supplements the calcar region when there is severe metaphyseal bone loss, or loss of abductor tension.

**A COMPREHENSIVE RANGE OF FEMORAL STEMS**

The new 12/14 taper accommodates the complete range of Articul/eze head sizes in cobalt chrome and zirconia.

**Femoral Head Options**
The Solution System now features:
- 12/14 self-locking taper
- 22.225mm, 26mm, 28mm and 32mm Articul/eze® cobalt chrome femoral heads
- 26mm, 28mm and 32mm zirconia ceramic femoral heads.
- Zirconia offers twice the fracture toughness of alumina. It has a very fine particulate structure and a smooth surface finish, shown in laboratory testing, to generate up to 42% less polyethylene wear debris than alumina and 68% less wear debris than metal.11
The Solution System stem becomes mechanically stable when just 4-6cm of cortical contact is achieved in the diaphysis, where cortical bone is most reliable.15

AML® Hip Heritage of Proven Clinical Success

The Solution System shares its design rationale with the extensively Porocoat® porous-coated AML® Hip, an implant that has been in clinical use for more than twenty years and that has consistently produced results that have yet to be matched by any other cementless hip implant.12,13,14

The Solution System is a dedicated revision system, comprising implants and instruments, providing comprehensive and specific answers to a range of revision problems.

A RELIABLE PLATFORM FOR LONG-TERM SUCCESS

When a primary implant has failed, retrieval may reveal substantial deficiencies in the proximal third of the femur, the region which many cementless implants rely upon for fixation. Consequently, it can be difficult to gain initial fixation with a proximally fixed cementless stem, making long-term ingrowth and stability unlikely. Deficiencies in the proximal femur may also preclude cemented implantation without substantial reinforcement to the proximal femur.

Bone deficiencies in the proximal third of the femur may significantly limit the chances of initial stability for proximally fixed implants.
The Solution System femoral stems are designed to achieve strong cortical interlock in the mid-diaphysis of the femur, where undamaged cortical bone is most likely to be found.

The stem is symmetrical (parallel sided) making femoral preparation and implantation a straightforward and simple procedure.

When implanting a straight stem, the femur is typically underreamed by 0.5mm, but is reamed line-to-line to accommodate a curved stem.

The implant is driven into the diaphysis obtaining a "scratch fit" over 4-6cm providing mechanical stability - an essential factor for biological fixation to occur.
Porocoat Porous Coating - a unique fixation interface

The Solution System stems are extensively coated with Porocoat® porous coating. This unique and proprietary porous surface is composed of sintered metal beads that create a three-dimensional structure. As the stem is impacted, autogenous bone is “grafted” into the pores of the coating. The clinical performance of Porocoat has been demonstrated over twenty years, and retrieval studies continue to provide definitive evidence of extensive ingrowth. 15,18

**PROVEN, LONG-TERM, BIOLOGICAL FIXATION**

Porocoat porous coating Features:

- a pore size of 250 microns, documented in laboratory studies to be the optimum size for penetration of bone tissue; 16
- a porosity gradient that enhances the potential for ingrowth;
- superior bond strength at the substrate/implant interface; 16
- a coefficient of friction 33% higher than any other porous coating, significantly increasing Porocoat porous coating’s resistance to shear and tensile stresses. 17
Long-term clinical results demonstrate that the extensive coating of the Solution System stem increases the likelihood of long-term implant stability. This unique combination of mechanical implant stability and extensive biological ingrowth consistently produces successful, long-term clinical results in even the most demanding and complex revision cases.
The Solution System for Revision Hip Arthroplasty. Mid to Long Term Results.

170 patients with a mean follow-up of 13.2 years reveals survivorship of over 95%.


97.6% stem survivorship with 297 patients and 5-13 year follow up.

Krishnamurthy AB, MacDonald SJ, Paprosky WG. 5 to 13 Year Follow-up Study on Cementless Femoral Components in Revision Surgery. J Arthrop, Vol 12, No 8, 1997.

No fixation failures, 90.6% of stems bone ingrown and 92.6% patient satisfaction, with 86 femoral revision arthroplasties and a mean follow up of 3 years.


99% stability, in a series of 166 cementless revision arthroplasties with a mean follow up of 4.4 years.


97.7% stem survivorship, with 175 cases and an average follow up of 5 years.


82% of stems bone ingrown, with 297 patients and 5-15 year follow up.

Paprosky WG, Krishnamurthy A. Revision Total Hip Arthroplasty: Five to 15 Year Follow-up on Cementless Femoral Revisions. Orthopedics, Vol 19, No 9, September 1996.

Preoperative
This patient presented with a failed Muller type stem and apparent fracture at the femoral neck junction. The calcar is non-supportive, with erosion of the proximal femur extending down to the lesser trochanter. There is minimal damage in the diaphysis.

Postoperative
Immediately postoperatively the implant is stable, with good cortical contact distally. An 8” straight Solution System stem was used, with strut grafting to provide additional support to the proximal femur.

7 years postoperative
The Solution System implant is well fixed with good cortical contact and a well incorporated strut graft.

The patient was reported to be doing well at seven years and, now nine years post-operatively, the patient remains satisfied with the outcome.

Case study 2 - Defect type 2

Preoperative
This patient presented preoperatively with evidence of loosening, cement mantle failure and lytic lesions. The metaphysis is non-supportive, but the diaphysis shows minimal damage.

Postoperative
An 8” straight Solution System stem has been used to achieve distal fixation and implant stability.

4.5 years postoperative
Laterally the stem appears to be marginally undersized, but in the A/P view, the stem is well centralised and distal spot welds confirm implant stability.

Case study 3 - Defect type 3B

Preoperative
This patient presented preoperatively with a loose cemented implant and severe bone loss in the metaphysis. Part of the diaphysis is also non-supportive due to bone loss.

Postoperative
An 8” Solution System stem was used to obtain distal fixation below the level of the defect. Strut grafts were used to provide metadiaphyseal support.

8 years postoperative
Good implant-to-bone contact is apparent distally over at least 4-6cm. At 8 years the implant is stable and the strut grafts show signs of incorporation. At 10 years the patient remains satisfied with the revision arthroplasty.
Solution System Accessory Products

Solution System and Duraloc® Acetabular Cup

- Porocoat porous coating provides optimum pore size to encourage ingrowth
- The Duraloc 1200 Series cup provides multiple dome screw holes for fixation
- The +4 Deep Profile Solution System shell, available in sizes 56mm - 80mm, moves the center of rotation of the femoral head 4mm more laterally to address protusio indications
- Six peripheral screw holes (5mm screw holes) provide additional fixation where inadequate host bone provides support for the metal shell
- +4 Enduron™ polyethylene liners can be used with the Duraloc or Solution System shell to move the centre of rotation of the femoral head 4mm more laterally.

Control™ Cable Cerclage System

- 1.8mm cobalt chrome cable (18 inches in length) and sleeve are offered, packaged together
- Cable passer handle incorporates small or large inserts, depending on anatomical requirements
- Cable tensioner offers improved tactile feel combined with gauging to provide predictable tensioning
- Crimper offers a “stop” mechanism to verify consistent crimping

Protrusio Cage

- Available in commercially pure titanium alloy, allowing the implant to be custom shaped
- Available in sizes 52, 56, 60, 64, 68 and 72mm, left and right
- Multiple 6.5mm screw holes are offered to allow fixation in the acetabulum, the ilium and the ischium.
- Im planted using the Duraloc cup impactor
Moreland Cement Removal Instrumentation
- Facilitates complete cement removal from the femoral canal and acetabulum
- Femoral instrumentation includes various configurations of osteotomes, a stem extractor and multiple sizes of tamps and reverse curettes to remove distally fixed cement.
- Acetabular instrumentation includes curved osteotomes, punches and tamps to remove cemented metal-backed or all-polyethylene cups.

Solution System Instrumentation
- Femoral instruments include cement plug drills, bone tamps and thin shaft reamers to facilitate reaming beyond the anterior bow of the femur.
- Acetabular instruments include straight and angled bone tamps to fill acetabular voids, retractors and hand finishing reamers.

Please contact your local DePuy representative for additional information on these accessory products.

Moreland Cementless Removal Instrumentation
- Designed to disrupt biological fixation at the bone/implant interface
- Femoral instrumentation includes flexible osteotomes, fixed stem extractors and trephines to disrupt distal biological ingrowth.
- Acetabular instrumentation includes multiple sizes of curved osteotomes, taps to remove modular polyethylene liners, shell extractors and screw trephines.

Allogrip™ Bone Vise System
- Allows safe and efficient preparation of bone, for use in grafting procedures
- Holds the majority of femoral head sizes needed for graft reconstruction

Lere Bone Mill™
- Processes cortico-cancellous bone stock to a consistent particulate size
- Prepares bone slurry or paste for use in total joint arthroplasty
- Powered by compressed air or nitrogen
ORDERING INFORMATION

6" Straight Stems
1571-02-000 10.5mm, Standard, 12/14 Taper
1571-03-000 12.0mm, Standard, 12/14 Taper
1571-04-000 13.5mm, Standard, 12/14 Taper
1571-05-000 15.0mm, Standard, 12/14 Taper
1571-06-000 16.5mm, Standard, 12/14 Taper
1571-07-000 18.0mm, Standard, 12/14 Taper
1571-08-000 19.5mm, Standard, 12/14 Taper
1571-09-000 21.0mm, Standard, 12/14 Taper
1571-10-000 22.5mm, Standard, 12/14 Taper

7" Straight Calcar Stems
1571-42-000 10.5mm, MMA, 12/14 Taper
1571-43-000 12.0mm, MMA, 12/14 Taper
1571-44-000 13.5mm, MMA, 12/14 Taper
1571-45-000 15.0mm, MMA, 12/14 Taper
1571-46-000 16.5mm, MMA, 12/14 Taper
1571-47-000 18.0mm, MMA, 12/14 Taper
1571-48-000 19.5mm, MMA, 12/14 Taper
1571-49-000 21.0mm, MMA, 12/14 Taper
1571-50-000 22.5mm, MMA, 12/14 Taper

8" Straight Stems
1571-12-000 10.5mm, Standard, 12/14 Taper
1571-13-000 12.0mm, Standard, 12/14 Taper
1571-14-000 13.5mm, Standard, 12/14 Taper
1571-15-000 15.0mm, Standard, 12/14 Taper
1571-16-000 16.5mm, Standard, 12/14 Taper
1571-17-000 18.0mm, Standard, 12/14 Taper
1571-18-000 19.5mm, Standard, 12/14 Taper
1571-19-000 21.0mm, Standard, 12/14 Taper
1571-20-000 22.5mm, Standard, 12/14 Taper

8" Bowed Stems
1571-74-000 13.5mm, Standard, Left, 12/14 Taper
1571-75-000 15.0mm, Standard, Left, 12/14 Taper
1571-76-000 16.5mm, Standard, Left, 12/14 Taper
1571-77-000 18.0mm, Standard, Left, 12/14 Taper
1571-78-000 19.5mm, Standard, Left, 12/14 Taper
1571-79-000 21.0mm, Standard, Left, 12/14 Taper
1571-80-000 22.5mm, Standard, Left, 12/14 Taper

9" Bowed Calcar Stems
1573-03-000 13.5mm, Standard, 2.25 cm Platform, Left, 12/14 Taper
1573-04-000 15.0mm, Standard, 2.25 cm Platform, Left, 12/14 Taper
1573-05-000 16.5mm, Standard, 2.25 cm Platform, Left, 12/14 Taper
1573-06-000 18.0mm, Standard, 2.25 cm Platform, Left, 12/14 Taper
1573-07-000 19.5mm, Standard, 2.25 cm Platform, Left, 12/14 Taper
1573-13-000 13.5mm, Standard, 2.25 cm Platform, Right, 12/14 Taper
1573-14-000 15.0mm, Standard, 2.25 cm Platform, Right, 12/14 Taper
1573-15-000 16.5mm, Standard, 2.25 cm Platform, Right, 12/14 Taper
1573-16-000 18.0mm, Standard, 2.25 cm Platform, Right, 12/14 Taper
1573-17-000 19.5mm, Standard, 2.25 cm Platform, Right, 12/14 Taper

9" Straight Calcar Stems
1571-61-000 12.0mm, Standard, 1.5 cm Platform, 12/14 Taper
1571-63-000 13.5mm, Standard, 1.5 cm Platform, 12/14 Taper
1571-65-000 15.0mm, Standard, 1.5 cm Platform, 12/14 Taper
1571-67-000 16.5mm, Standard, 1.5 cm Platform, 12/14 Taper
1571-69-000 18.0mm, Standard, 1.5 cm Platform, 12/14 Taper
1571-71-000 19.5mm, Standard, 1.5 cm Platform, 12/14 Taper

10" Bowed Stems
1571-24-000 13.5mm, Standard, Left, 12/14 Taper
1571-25-000 15.0mm, Standard, Left, 12/14 Taper
1571-26-000 16.5mm, Standard, Left, 12/14 Taper
1571-27-000 18.0mm, Standard, Left, 12/14 Taper
1571-28-000 19.5mm, Standard, Left, 12/14 Taper
1571-29-000 21.0mm, Standard, Left, 12/14 Taper
1571-30-000 22.5mm, Standard, Left, 12/14 Taper

8" Bowed Stems
1571-24-000 13.5mm, Standard, Left, 12/14 Taper
1571-25-000 15.0mm, Standard, Left, 12/14 Taper
1571-26-000 16.5mm, Standard, Left, 12/14 Taper
1571-27-000 18.0mm, Standard, Left, 12/14 Taper
1571-28-000 19.5mm, Standard, Left, 12/14 Taper
1571-29-000 21.0mm, Standard, Left, 12/14 Taper
1571-30-000 22.5mm, Standard, Left, 12/14 Taper

Articul/eze Femoral Heads
Cobalt Chrome
1365-29-000 Cobalt Chrome 22.225mm +4
1365-30-000 Cobalt Chrome 22.225mm +7
1365-01-000 Cobalt Chrome 26mm +4
1365-02-000 Cobalt Chrome 26mm +7
1365-03-000 Cobalt Chrome 26mm +10
1365-11-000 Cobalt Chrome 28mm +1.5
1365-12-000 Cobalt Chrome 28mm +5
1365-13-000 Cobalt Chrome 28mm +8.5
1365-14-000 Cobalt Chrome 28mm +12
1365-15-000 Cobalt Chrome 28mm +15.5
1365-21-000 Cobalt Chrome 32mm +1
1365-22-000 Cobalt Chrome 32mm +5
1365-23-000 Cobalt Chrome 32mm +9
1365-24-000 Cobalt Chrome 32mm +13
1365-25-000 Cobalt Chrome 32mm +17
Articul/eze Femoral Heads - Zirconia

1365-41-000 | Zirconia 26mm +4
1365-42-000 | Zirconia 26mm +7
1365-43-000 | Zirconia 28mm +1.5
1365-44-000 | Zirconia 28mm +5
1365-45-000 | Zirconia 28mm +8.5
1365-46-000 | Zirconia 32mm +1
1365-47-000 | Zirconia 32mm +5
1365-48-000 | Zirconia 32mm +9

6" Straight Trial Stems

Use Excel™ broach and neck segment for trial reduction

7" Straight Calcar Trial Stems

2571-61-000 | 12.0mm, Standard, 1.5cm Platform, 12/14 Taper
2571-63-000 | 13.5mm, Standard, 1.5cm Platform, 12/14 Taper
2571-65-000 | 15.0mm, Standard, 1.5cm Platform, 12/14 Taper
2571-67-000 | 16.5mm, Standard, 1.5cm Platform, 12/14 Taper
2571-69-000 | 18.0mm, Standard, 1.5cm Platform, 12/14 Taper
2571-71-000 | 19.5mm, Standard, 1.5cm Platform, 12/14 Taper

8" Straight Trial Stems

2571-11-000 | 10.5mm, Standard, 12/14 Taper
2571-13-000 | 12.0mm, Standard, 12/14 Taper
2571-14-000 | 13.5mm, Standard, 12/14 Taper
2571-15-000 | 15.0mm, Standard, 12/14 Taper
2571-16-000 | 16.5mm, Standard, 12/14 Taper
2571-17-000 | 18.0mm, Standard, 12/14 Taper
2571-18-000 | 19.5mm, Standard, 12/14 Taper
2571-19-000 | 21.0mm, Standard, 12/14 Taper
2571-20-000 | 22.5mm, Standard, 12/14 Taper

2571-52-000 | 10.5mm, MMA, 12/14 Taper
2571-53-000 | 12.0mm, MMA, 12/14 Taper
2571-54-000 | 13.5mm, MMA, 12/14 Taper
2571-55-000 | 15.0mm, MMA, 12/14 Taper
2571-56-000 | 16.5mm, MMA, 12/14 Taper
2571-57-000 | 18.0mm, MMA, 12/14 Taper
2571-58-000 | 19.5mm, MMA, 12/14 Taper

8" Bowed Trial Stems

2571-74-000 | 13.5mm, Standard, Left, 12/14 Taper
2571-75-000 | 15.0mm, Standard, Left, 12/14 Taper
2571-76-000 | 16.5mm, Standard, Left, 12/14 Taper
2571-77-000 | 18.0mm, Standard, Left, 12/14 Taper
2571-78-000 | 19.5mm, Standard, Left, 12/14 Taper
2571-79-000 | 21.0mm, Standard, Left, 12/14 Taper
2571-80-000 | 22.5mm, Standard, Left, 12/14 Taper

2571-84-000 | 13.5mm, Standard, Right, 12/14 Taper
2571-85-000 | 15.0mm, Standard, Right, 12/14 Taper
2571-86-000 | 16.5mm, Standard, Right, 12/14 Taper
2571-87-000 | 18.0mm, Standard, Right, 12/14 Taper
2571-88-000 | 19.5mm, Standard, Right, 12/14 Taper
2571-89-000 | 21.0mm, Standard, Right, 12/14 Taper
2571-90-000 | 22.5mm, Standard, Right, 12/14 Taper

9" Bow ed Trial Cal car Stems

2573-03-000 | 13.5mm, Standard, 2.25cm Platform, Left, 12/14 Taper
2573-04-000 | 15.0mm, Standard, 2.25cm Platform, Left, 12/14 Taper
2573-05-000 | 16.5mm, Standard, 2.25cm Platform, Left, 12/14 Taper
2573-06-000 | 18.0mm, Standard, 2.25cm Platform, Left, 12/14 Taper
2573-07-000 | 19.5mm, Standard, 2.25cm Platform, Left, 12/14 Taper

2573-13-000 | 13.5mm, Standard, 2.25cm Platform, Right, 12/14 Taper
2573-14-000 | 15.0mm, Standard, 2.25cm Platform, Right, 12/14 Taper
2573-15-000 | 16.5mm, Standard, 2.25cm Platform, Right, 12/14 Taper
2573-16-000 | 18.0mm, Standard, 2.25cm Platform, Right, 12/14 Taper
2573-17-000 | 19.5mm, Standard, 2.25cm Platform, Right, 12/14 Taper

10" Bow ed Trial Stems

2571-24-000 | 13.5mm, Standard, Left, 12/14 Taper
2571-25-000 | 15.0mm, Standard, Left, 12/14 Taper
2571-26-000 | 16.5mm, Standard, Left, 12/14 Taper
2571-27-000 | 18.0mm, Standard, Left, 12/14 Taper
2571-28-000 | 19.5mm, Standard, Left, 12/14 Taper
2571-29-000 | 21.0mm, Standard, Left, 12/14 Taper
2571-30-000 | 22.5mm, Standard, Left, 12/14 Taper

2571-34-000 | 13.5mm, Standard, Right, 12/14 Taper
2571-35-000 | 15.0mm, Standard, Right, 12/14 Taper
2571-36-000 | 16.5mm, Standard, Right, 12/14 Taper
2571-37-000 | 18.0mm, Standard, Right, 12/14 Taper
2571-38-000 | 19.5mm, Standard, Right, 12/14 Taper
2571-39-000 | 21.0mm, Standard, Right, 12/14 Taper
2571-40-000 | 22.5mm, Standard, Right, 12/14 Taper

Articul/eze Trial Heads

2530-69-000 | 22.225mm +4
2530-70-000 | 22.225mm +7
2530-71-000 | 26mm +4
2530-72-000 | 26mm +7
2530-73-000 | 26mm +10
2530-81-000 | 28mm +1.5
2530-82-000 | 28mm +5
2530-83-000 | 28mm +8.5
2530-84-000 | 28mm +12
2530-85-000 | 28mm +15.5
2530-91-000 | 32mm +1
2530-92-000 | 32mm +5
2530-93-000 | 32mm +9
2530-94-000 | 32mm +13
2530-95-000 | 32mm +17

Articul/eze Instrumentation

2554-30-000 | Trial Neck Segment (12/14 Taper)
2573-60-000 | Calcar Cutting Guide (7" and 9" Stems)

Solution System Overlays

2994-03-015 | Overlays - 6" and 8"
2994-03-020 | Overlays - 7" Calcar
2994-03-025 | Overlays - 9" Calcar
2994-03-030 | Overlays - 8" and 10" Bowed
References:


5. Mulroy WF, Harris WH. Revision Total Hip Arthroplasty with Use of So-Called Second Generation Cementing Techniques for Aseptic Loosening of the Femoral Component. A Fifteen Year Average Follow-up Study. JBJS, 78A, 1996.


Rx only.