

SURGICAL TECHNIQUE

**CEMENTED
FEMORAL STEM**

S U M M I TTM
C E M E N T E D H I P S Y S T E M



PRECISION TECHNIQUE

CEMENT MANTLE INTEGRITY

BIOMECHANICAL EXCELLENCE

INTRODUCTION

The Summit™ Cemented Hip System follows the classic Charnley heritage while incorporating advancements in stem design, which address enhanced torsional stability, greater offset options and optimized cement mantle. Cobalt chrome alloy was selected for the component as its greater rigidity transmits stress more evenly throughout the cement mantle. The patented centralization system is incorporated into the design to facilitate positioning and to promote an even cement mantle. The Summit Cemented Hip, combined with an advanced cement technique and state-of-the-art mixing equipment, addresses current and future needs of today's orthopaedic surgeon.

Surgeon Design Consultants

- *Daniel Berry, MD*
- *John Callaghan, MD*
- *David Dalury, MD*
- *David Fisher, MD*
- *William Jiranek, MD*
- *Tom Schmalzried, MD*
- *Richard Scott, MD*
- *Thomas Thornhill, MD*



PREOPERATIVE PLANNING

Preoperative planning enables the surgeon to prepare for the case and anticipate situations that may arise during surgery. A thorough preoperative plan includes the patient's history, physical examination and radiographic analysis.

Preoperative Planning Goals

1. Determine preoperative leg length discrepancy
2. Assess acetabular component placement and size
3. Determine femoral component size, position and fit
4. Assess femoral offset

Radiographs

For accurate templating, obtain high-quality radiographs using a standardized protocol with known magnification. Use magnification markers attached to the patient's leg at the level of the greater trochanter to verify magnification.

The Summit Cemented Hip System templates incorporate 20 percent magnification.

Obtain an anterior/posterior (A/P) view of the pelvis with both extremities in 15-degrees of internal rotation to position the head and neck parallel to the coronal plane. Obtain a direct lateral radiograph for use in determining adequate fill of the proximal femoral region.

Perform a clinical evaluation in conjunction with a radiographic analysis to determine preoperative leg length discrepancy and use both to determine intraoperative leg length management.

To estimate leg length discrepancy radiographically, draw a reference line through the bottom of the obturator foramina (Figure A). Measure the

distance from the lesser trochanter landmark to the reference line on each side. The difference between the two is the radiographic leg length discrepancy.

The tip of the greater trochanter may be used as an alternative reference mark in conjunction with the lines through the obturator foramina.

Determination of Leg Length Discrepancy



Figure A

PREOPERATIVE PLANNING cont.

Acetabular Cup Size and Position

Most sizing determinations are made using the A/P radiograph of the hip. Determine the optimal position for the acetabular component and estimate the size using the Pinnacle™ Acetabular Cup System template overlays. The acetabular teardrop can be referenced as the inferior margin of the acetabular reconstruction.

The goal in cementless acetabular fixation is to maximize bone contact. Once this is determined, mark the intended center of rotation of the bearing surface on the A/P radiograph (Figure B).

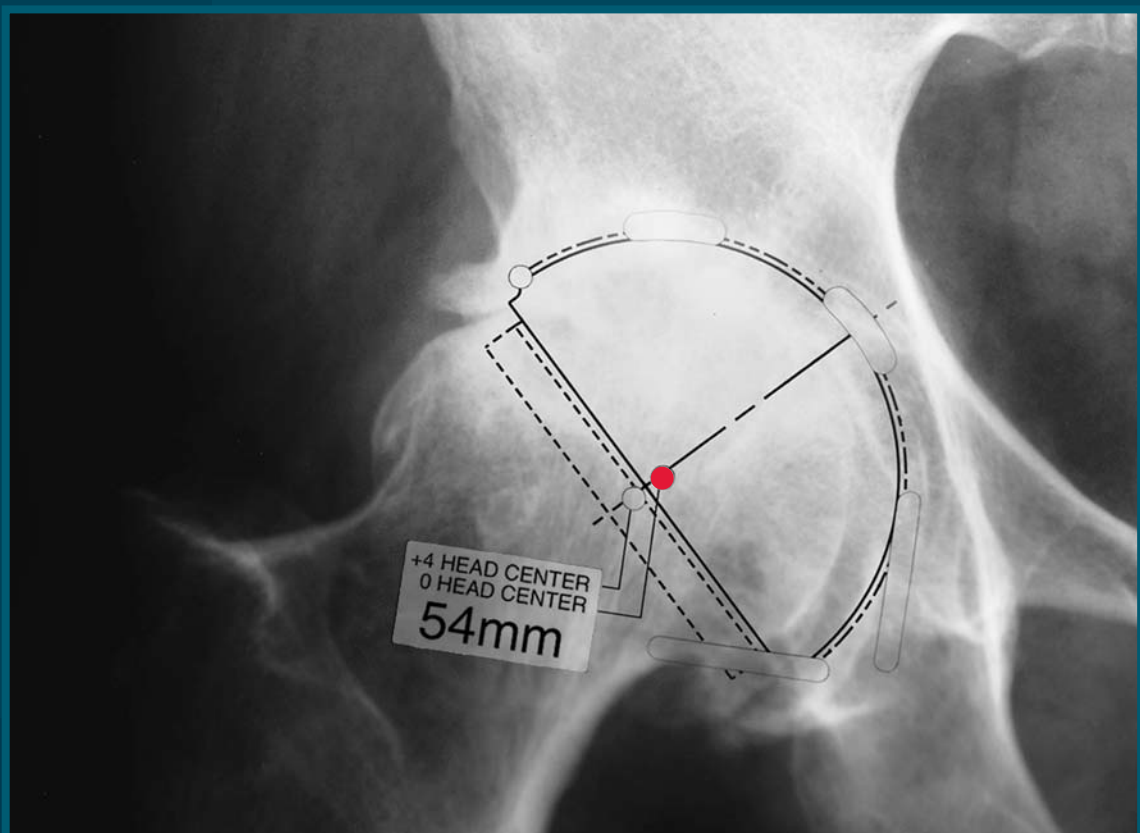


Figure B ● Cup center of rotation.

Cemented Femoral Component Selection

Select the femoral component template size and broach envelope that will fit the proximal femur and equalize leg lengths. The tapered geometry of the Summit Cemented broach envelope does not require distal canal fill.

Align the femoral template with the long axis of the femur. Draw the neck resection line at the point where the selected stem provides the desired amount of leg length.

The vertical distance between the planned center of rotation of the acetabular component and the center of rotation of the femoral head constitutes the distance the leg length will be adjusted.

The level of neck osteotomy depends on the stem size and the desired leg

length, with the goal being the use of a nonskirted modular head to optimize range of motion prior to impingement (Figure C). To help properly position the template on the lateral radiograph, estimate the distance between the tip of the greater trochanter and the lateral shoulder of the prosthesis using the A/P radiograph.

Verify that the stem size chosen in the A/P plane also fits in the lateral plane.



Figure C ● Head center of rotation.

PREOPERATIVE PLANNING cont.

Offset Requirements

The Summit cemented femoral components are available with standard and high offset options. Through templating and intra-operative trialing, determine which option restores proper offset by matching the cup's center of rotation with the desired head center of rotation (Figure D).

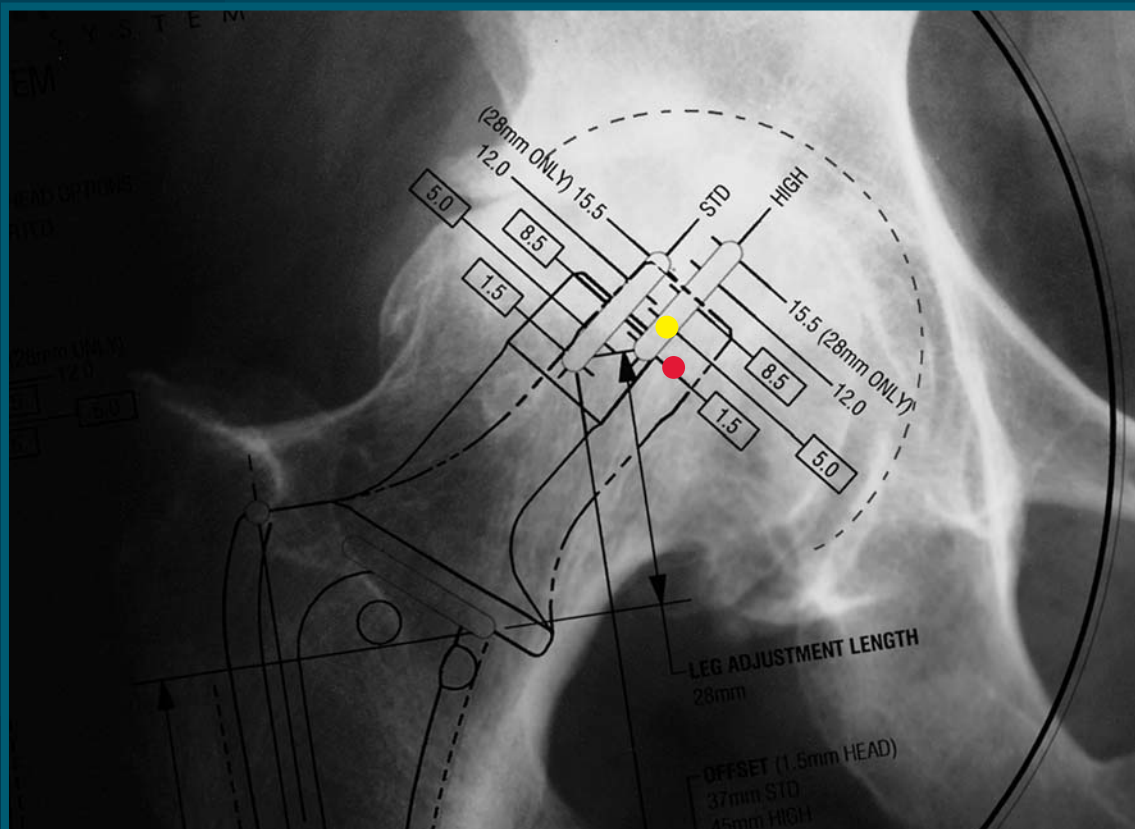


Figure D ● Head center of rotation.
● Cup center of rotation.

SURGICAL TECHNIQUE

The Summit Cemented Hip System surgical instrumentation accommodates all surgical approaches and incision lengths.

To begin, elevate the proximal femur and align the neck resection guide down the long axis of the femur. Determine the resection level by aligning the top of the guide with

the tip of the greater trochanter or by referencing a measured resection level above the lesser trochanter (Figure 1). Mark the resection line using electrocautery or methylene blue. Resect the femoral head.

If desired, make a conservative neck resection initially. The calcar planer may be used later to adjust the neck cut.

Femoral Head Resection



Figure 1
Neck Resection Level

ACETABULAR PREPARATION

Reaming and Alignment

Make sure the acetabulum is fully exposed and remove soft tissue from the acetabular rim.

Progressively ream the acetabulum until healthy subchondral bone is reached and a hemispherical dome is achieved (Figure 2).

Using the cup impactor, place a trial cup sizer into the reamed acetabulum

and assess its position and cortical bone contact.

The inferior rim of the trial cup should be level with the bottom of the teardrop. The trial cup angle of orientation should match that recorded during preoperative templating, which is normally 45 degrees of lateral opening (abduction) and 15-30 degrees of anteversion. Confirm this using the external alignment instrumentation (Figure 3).

Remove the cup impactor from the trial shell and place the desired liner trial into the cup trial.

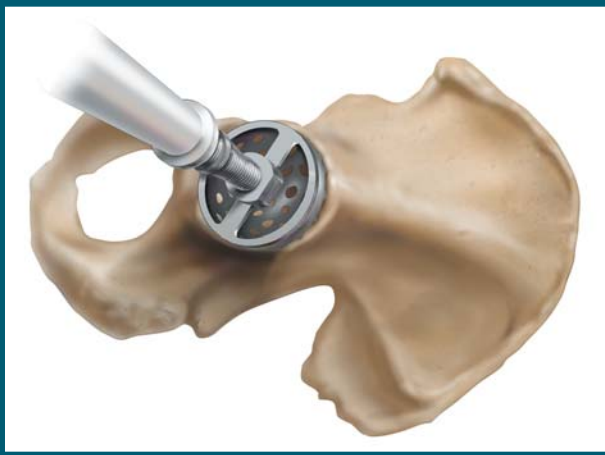


Figure 2
Acetabular
Preparation

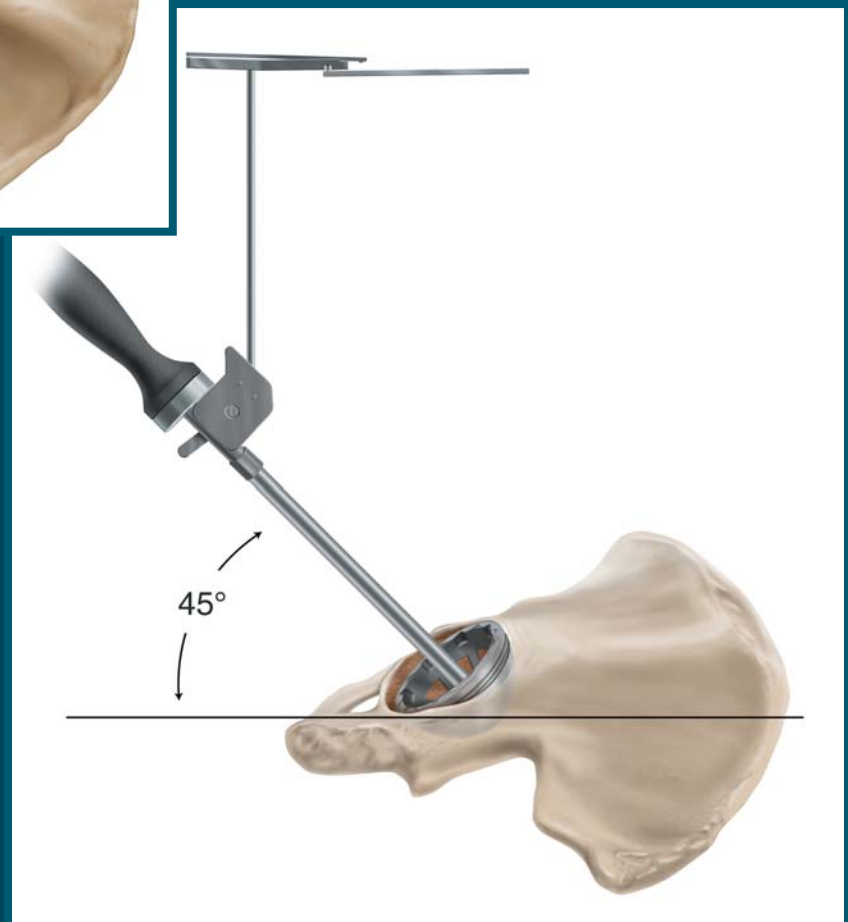


Figure 3
Cup Trial &
Position

FEMORAL PREPARATION

Initiate the pilot hole opening with the stepped IM initiator. Align the opening with the femoral canal.

To accomplish femoral canal alignment, place the IM initiator at the posterior margin of the neck resection, lateral near the piriformis fossa. Advance the

IM initiator until sufficient circumferential clearance for the box osteotome and canal probe is achieved (Figure 4).

Use a box osteotome to enter the femoral canal at the junction of the femoral neck and the greater trochanter (Figure 5).

Access Medullary Canal



Figure 4
Canal Initiation

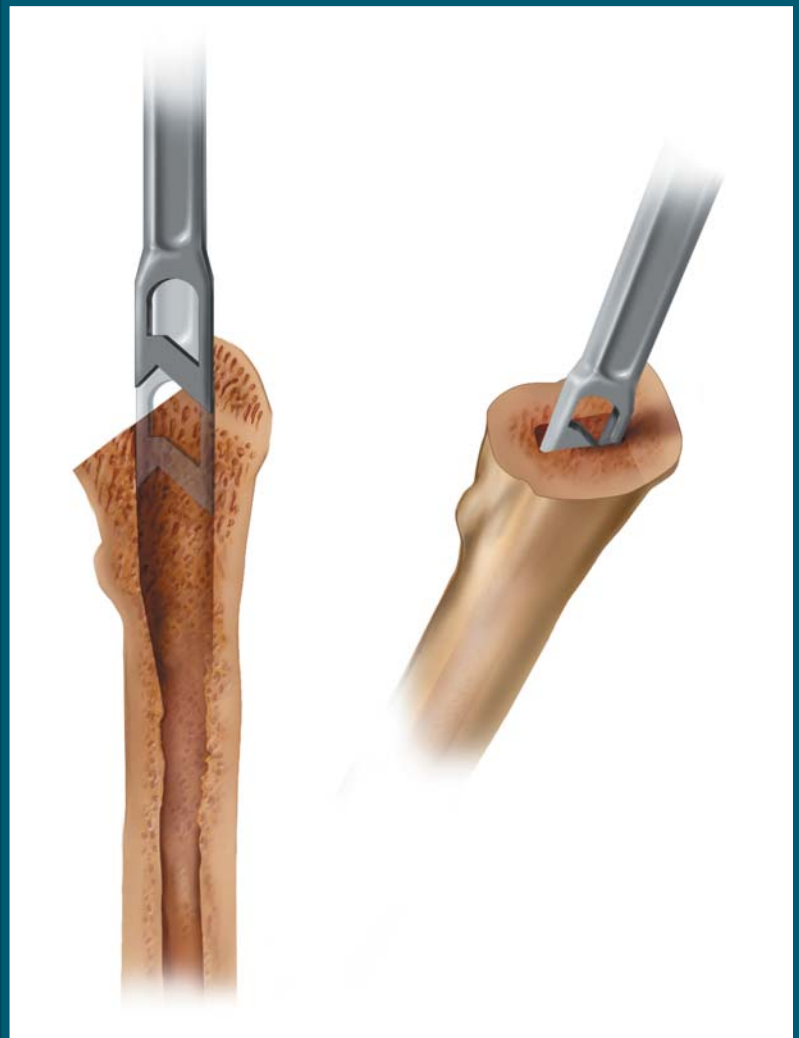


Figure 5
Canal Opening

FEMORAL PREPARATION cont.

Medullary Canal Opening

Utilize the tapered canal probe attached to the T-handle to establish a direct pathway to the medullary canal. Advance the canal probe to the point where the superior margin of the cutting flutes meets the neck resection (Figure 6). The canal probe should pass easily if proper alignment has been achieved. It is important to have circumferential clearance with the canal probe to avoid reaming in a varus orientation.



Figure 6
Canal Definition

Alignment Verification

The pattern established by the canal probe determines the route for the optional trochanteric reamer, tapered reamers and broaches. Take caution to ensure neutral alignment of the canal probe (Figure 7).

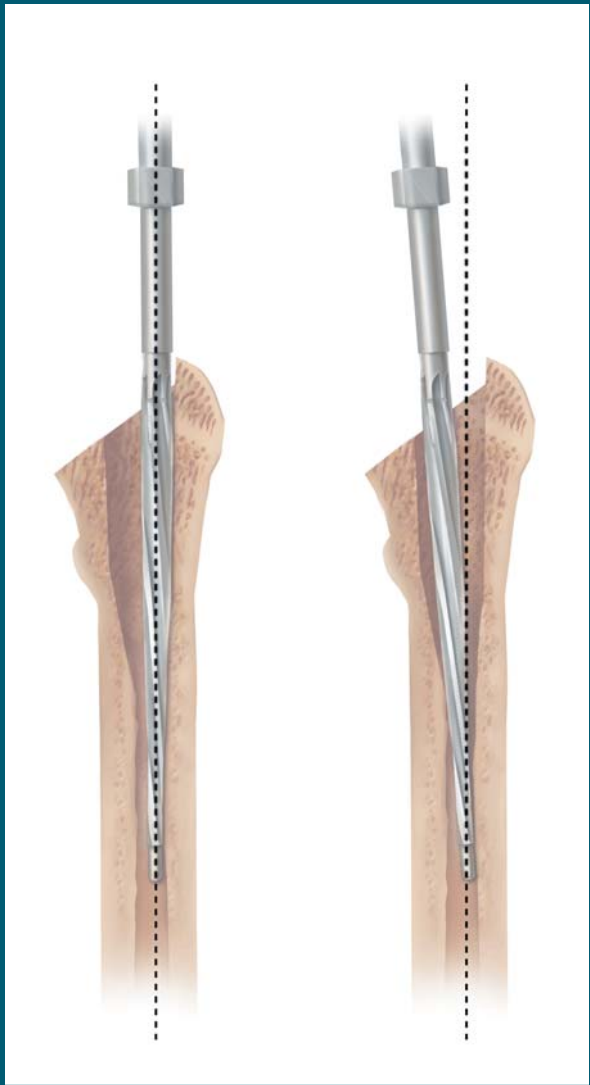


Figure 7
Canal Definition

Correct
Alignment

Incorrect
Alignment

FEMORAL BROACHING

Broaching the Femur

The deep, diamond-tooth pattern of the Summit broaches prepare the femoral envelope for optimal cement interdigitation into the cancellous/cortical bed. Proximal femur broaching should begin two to three sizes smaller than the preoperatively templated size. Attach the appropriate broach to the broach handle (Figure 8). The etched icon on the handle indicates the proper alignment of the broach to the handle. Engage the broach by pushing the broach handle lever to the upright locked position.

To ensure proper broach alignment, orient the broach laterally toward the greater trochanter. Ensure that any remaining superior lateral femoral neck remnants are cleared to avoid malalignment. There is one broach for every implant size.

Sequentially advance the broaches down the medullary canal to ensure proper alignment and anteversion.

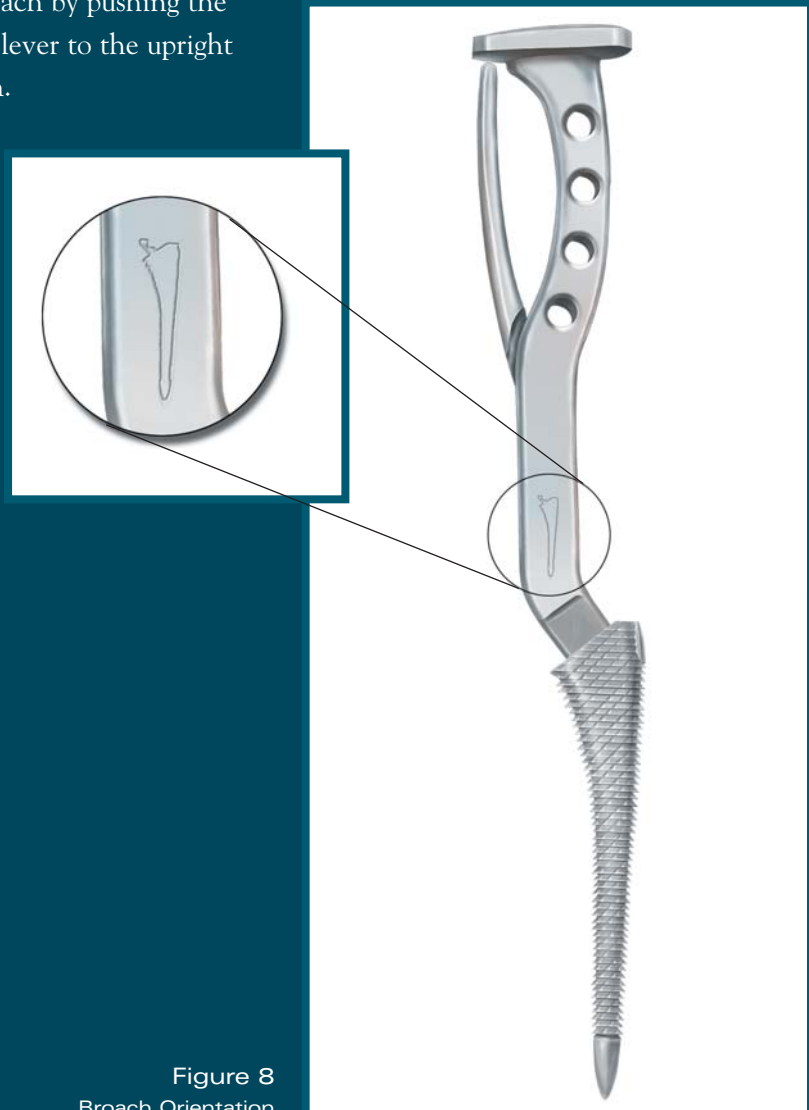


Figure 8
Broach Orientation

The final broach should fit and fill the proximal femur, with the top of the cutting teeth resting at the point of the desired neck resection (Figure 9).



Figure 9
Broach Impaction

The broach handle geometry is undersized to allow the broach to be countersunk. If the broach size is countersunk greater than 4 mm below the neck resection, re-evaluate the resection level (Figure 10). If the neck resection level is correct, the next larger size broach is recommended.

Unlock the broach handle by pulling the lever on the broach handle down. Remove the broach handle. The final broach will determine the implant size. For example, broaching to a size 5 indicates the implant selection will be size 5.



Figure 10
Broach Seating

Fit and Fill

FEMORAL BROACHING cont.

Broach Extraction

Due to the self-locking nature of the 3-degree taper, broaches are occasionally difficult to remove from the femoral canal. This may occur during sequential broaching or following trial reduction. If the broach cannot be easily removed from the canal using the broach handle, use the broach extractor.

To use the broach extractor, insert the tip into the slot on the lateral shoulder of the broach (Figure 11). Rotate the extractor 90 degrees to lock it in place. Use a mallet to extract the broach from the canal (Figure 12).



Figure 11
Broach Extraction



Figure 12
Broach Extraction

CALCAR PLANING

The Summit cemented stem is a collared design; therefore, calcar planing plays a direct role in leg length manipulation.

It is anticipated that the top of the collar on the final implant will rest at the same position as the top of the cutting teeth on the broach and trial neck collar. Calcar planing will help create a definitive landmark for stem insertion by milling a precise resection level.

Select either the small or large calcar planer and attach it to the power reamer. Place the planer over the broach stud and mill the calcar to the broach face. Make certain the planer is rotating before engaging the calcar to prevent the planer from binding on the calcar (Figure 13).



Figure 13
Calcar Planing

TRIAL REDUCTION

NOTE: Refer to the chart at the back of this surgical technique for detailed base offset, neck length and leg length adjustment information.

INSTABILITY can be attributed to three sources:

● **Soft tissue laxity** can result in an unstable joint. This can be resolved by increasing modular head length or by choosing the high offset option. In extreme cases, these solutions can be employed in conjunction with trochanteric advancement.

● Instability due to **component orientation** can occur. Correct this condition choosing a face-changing acetabular liner and positioning it to achieve the desired stability. If the face-changing liner fails, the acetabular shell may require repositioning.

● Where instability is due to acetabular osteophytes or to trochanteric prominence, relieve these areas. Substituting a longer modular head or selecting the high offset neck trial may be required to relieve **bony impingement**.

Use trial neck segments and trial modular heads to assess proper component position, joint stability, range of motion and leg length. Standard and high offset neck segments are available for each stem size. Offset increases 6-8 mm, depending on stem size, from the standard to the high offset option without altering leg length.

Perform trial reduction with a +5 Articul/eze[®] head trial to allow for one up or down adjustment in neck length without using a skirted femoral head.

With the desired neck segment and +5 modular head trial in place, perform a trial reduction and range of motion evaluation (Figure 14). With the hip in 90 degrees of flexion and 0 degrees of abduction, internal rotation should be at least 45 degrees with no tendency to dislocate. In extension, ensure full external rotation with no tendency to dislocate or impinge. Combined anteversion of the socket and femoral head should be approximately 45 degrees.



Figure 14

Standard Offset
Neck Trial

High Offset
Neck Trial

BROACH EXTRACTION

Note the broach size and offset option of the desired components. Dislocate the hip and remove the trial head, neck segment and broach. Remove the broach by attaching the broach handle and retroimpacting (Figure 15). If the broach is difficult to remove, it is recommended that the broach extractor be employed (Refer to Figures 11 and 12).



Figure 15
Broach Removal

CEMENTING TECHNIQUE

Canal Preparation

Remove any loose cancellous bone using a curette and rongeurs. It is essential that all debris is removed from the canal during the cleaning process. Irrigate the canal using pulse lavage with saline solution and a femoral brush (Figure 16). Before inserting the restrictor, dry the canal using a femoral sponge (Figure 17).



Figure 16
Debris Removal



Figure 17
Canal Drying

Size the distal femoral canal by selecting the appropriate distal sizing bullet (Figure 18). Match the femoral restrictor to the femoral stem length to determine depth of insertion. Select the appropriate sized cement restrictor (from the chart on the back page) and insert it into the canal (Figure 19).

The cement restrictor should be positioned approximately 1 cm distal to the distal femoral cement centralizer. Using the width of the canal as a reference, select the appropriate distal centralizer and assemble it to the prosthesis.

Cement Restrictor Insertion

NOTE: Stem length data is located in the chart at the back of this technique.



Figure 18
Canal Plug Sizing

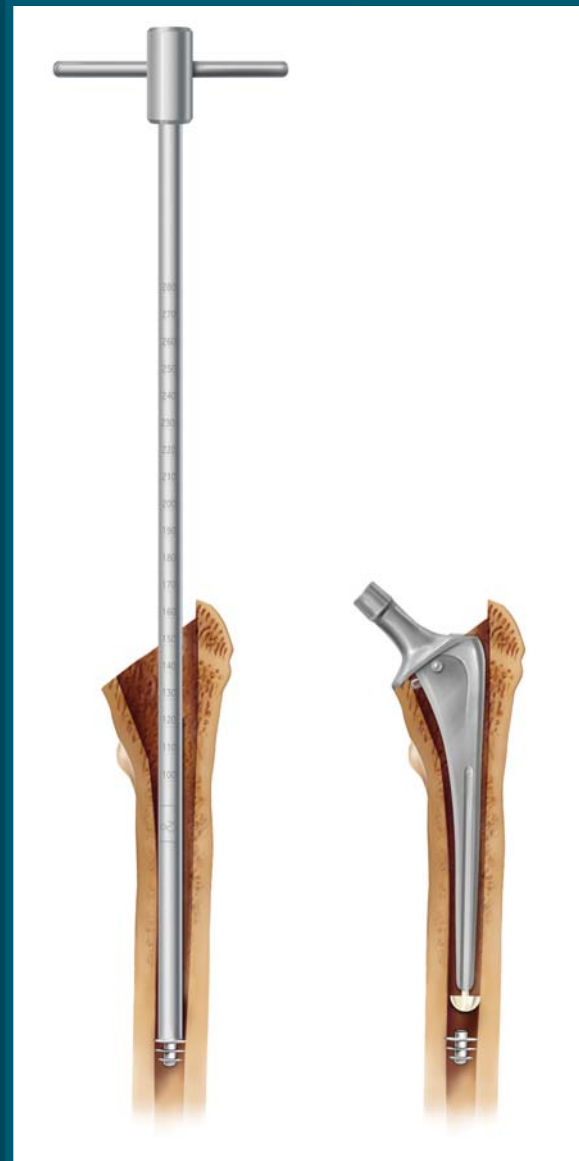


Figure 19
Determine
Seating Level

CEMENTING TECHNIQUE cont.

Vacuum Mixing Bone Cement

Vacuum mixing directly impacts the mechanical properties of acrylic bone cement and the longevity of the cemented total hip reconstruction. Incorrectly mixed bone cement results in greater porosity and unmixed powder.

Vacuum mixing may increase the fatigue, compression and flexural strength of bone cement by removing air pockets from the bone cement that

may form during mixing. Removing these voids produces stronger cement and potentially increases the longevity of the cemented total hip reconstruction.

Endurance[®] Bone Cement, mixed in a Prism[®] II Cartridge, is ideal for a cemented hip procedure. Pour two batches of cement powder into the cartridge, followed by two vials of liquid monomer (Figure 20). Replace the



Figure 20
Cement Mixing



Figure 21
Initial Vacuum Mixing

paddle and mix head on the cartridge and rotate the handle two to three times in each direction to disperse the monomer more evenly throughout the cement powder (Figure 21). Activate the vacuum and begin mixing by fully extending the handle up and down, one time per second (Figure 22). Mix for approximately one minute from the time all the liquid monomer is

added to the powder. Remove the paddle and mixing head from the cartridge and attach the nozzle. Ensure that the nozzle is tightly screwed onto the cartridge before attaching the cement gun (Figure 23).

Vacuum Mixing Bone Cement



Figure 22
Vacuum Mix



Figure 23
Cement Gun Set-Up

CEMENTING TECHNIQUE cont.

Retrograde Fill and Pressurization

Injecting cement into the femur using a cartridge mixing system is an effective technique for achieving full interdigitation of cement into surrounding cancellous bone. It is important to note that bone cement needs to achieve the proper viscosity before it is injected into the femoral canal. Optimum cement viscosity will resist blood pressure and avoid blood lamination within the cement mantle. Cement that is injected too early may be forced out of the pores of cancellous bone by inflowing blood, weakening the bond at the bone-cement interface. When using Endurance Bone Cement, it is important to inject the cement approximately two-and-a-half minutes after mixing is complete.

To apply the cement, place the tip of the nozzle against the cement restrictor and begin to inject cement in a retrograde fashion (Figure 24). Keep the tip of the nozzle embedded just below the surface of the advancing cement to minimize the formation of cement voids. Allow the force generated by the rising cement layer to slowly advance the nozzle superiorly toward the canal opening. Continue to inject cement until the canal is filled completely and the distal tip of the nozzle is clear of the canal.



Figure 24
Retrograde Fill

Place the universal proximal pressurizer onto the cement nozzle so that it is flush with the cartridge barrel. Quickly break or cut the nozzle and place the pressurizer against the canal opening to seal the canal (Figure 25). The cement should be pressurized for two

to three minutes (Endurance Bone Cement) allowing for optimal cement interdigitation into the surrounding anatomy. Continuous pressure should be maintained during this period of pressurization by injecting cement using short, repeated trigger strokes.



Figure 25
Cement Pressurization

INSERTION SELECTION

Summit Cemented Hip System implants can be inserted with either a threaded retaining inserter, a nonthreaded inserter or by hand. Both inserters provide rotational control during stem implantation.

If the retaining inserter is chosen, verify that it is assembled with the inserter shaft threaded into the inserter handle (Figure 26). Choose the stem size that matches the final broach and thread it into the inserter.

Ensure the tines on the inserter are aligned with the recesses of the inserter platform on the top of the implant (Figure 27). Fully engage the threads of the inserter into the implant to ensure the inserter is securely attached into the implant.

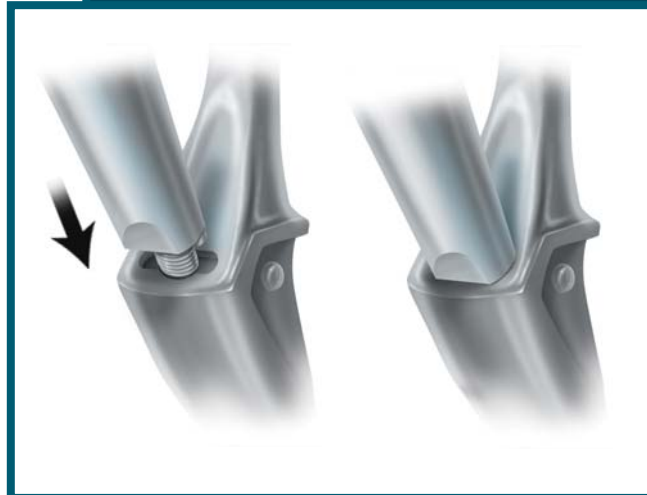
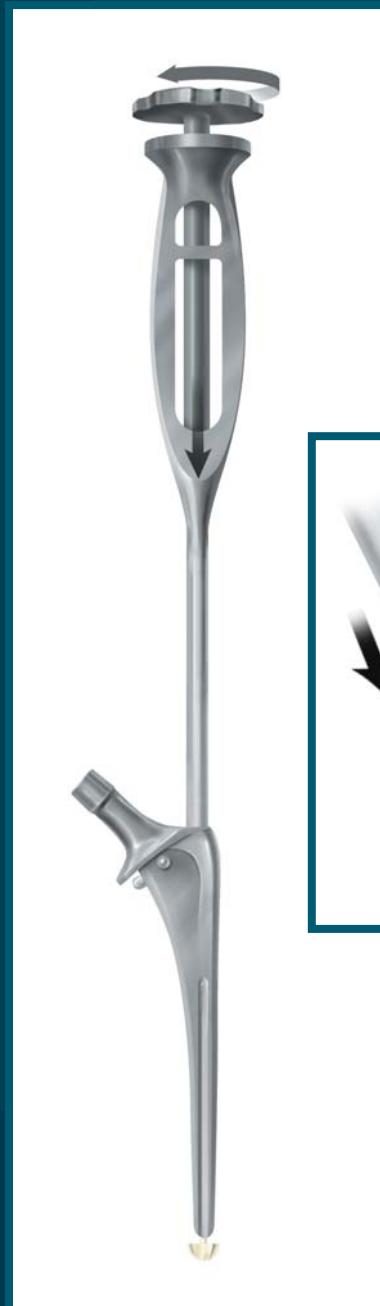


Figure 27
Threaded Retaining
and
Open Non-threaded

Figure 26
Threaded Retaining
Stem Inserter

CEMENTED STEM INSERTION

The prosthesis is introduced into the canal (Figure 28). Final seating against the medial cut femoral cortex is facilitated for proper biomechanical restoration and cement mantle

integrity (Figure 29). Excess cement is cleared from the collar area. Be sure to disengage the stem inserter well before the cement has hardened.



Figure 28
Final Stem Insertion



Figure 29
Neutral Stem Position

ACETABULAR SHELL INSERTION

Remove the trial acetabular liner components and implant the desired acetabular shell (Figure 30). Take care

to ensure cup orientation mimics the orientation of the trial component. Insert a trial liner into the shell implant.



Figure 30
Shell Insertion

FINAL TRIAL REDUCTION

NOTE: All measurements are based on a 28 mm +5.0 Articulate head, which is the middle length of non-skirted femoral heads.

Perform a final trial reduction using the trial acetabular liner and trial femoral head, selecting the optimal liner and modular head for implant stability and leg length (Figure 31).



Figure 31
Final Trial Reduction

ACETABULAR INSERT IMPLANTATION

Following the final trial reduction, remove the trial acetabular liner and insert the appropriate acetabular liner (Figure 32).



Figure 32
Liner Insertion

FEMORAL HEAD IMPLANTATION

Clean and dry the Articul/eze taper. Manually introduce the appropriate femoral head by firmly pushing and twisting the femoral head into place on the taper. Using the head impactor, engage the head with two to three light mallet taps (Figure 33).

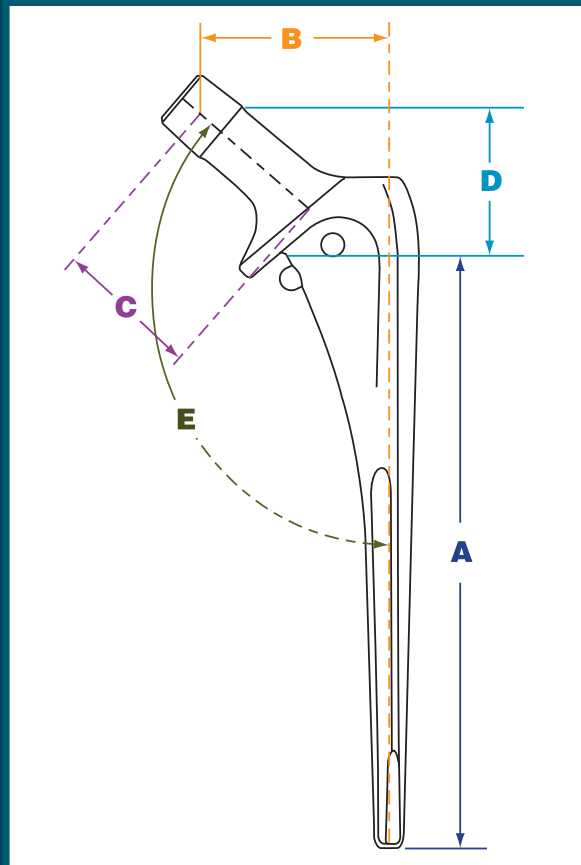


Figure 33
Head Impaction

SUMMIT CEMENTED STEM SPECIFICATIONS

NOTE: All measurements are based on a 28 mm +5.0 Articule/eye head, which is the middle length of non-skirted femoral heads.

NOTE: The superior aspect of the canal plug should rest 2 cm distal to the tip of the prosthesis.



	A	B	C	D	E
Size	Stem Length	Base Offset	Neck Length	Leg Adjustment Length	Neck Angle
2 Std	97 mm	38 mm	32 mm	28 mm	130°
3 Std	108 mm	38 mm	32 mm	29 mm	130°
3 High	108 mm	44 mm	36 mm	29 mm	130°
4 Std	114 mm	40 mm	34 mm	30 mm	130°
4 High	114 mm	48 mm	39 mm	30 mm	130°
5 Std	120 mm	40 mm	34 mm	31 mm	130°
5 High	120 mm	48 mm	39 mm	31 mm	130°
6 Std	127 mm	42 mm	36 mm	32 mm	130°
6 High	127 mm	50 mm	41 mm	32 mm	130°
7 Std	133 mm	42 mm	36 mm	33 mm	130°
7 High	133 mm	50 mm	41 mm	33 mm	130°
8 Std	139 mm	44 mm	38 mm	34 mm	130°
8 High	139 mm	52 mm	43 mm	34 mm	130°

Cementralizer Information

Cat. No.	Stem Size	Minimum Recommended Cementralizer (mm)
1376-46-000	2	8.5
1376-46-000	3	8.5
1376-47-000	4	9.25
1376-38-000	5	10.5
1376-20-000	6	11.0
1376-21-000	7	12.0
1376-22-000	8	13.0

SUMMIT HIP ORDERING INFORMATION

INSTRUMENTATION

General Instrumentation

Cat. No.	Description
2570-00-000	Universal Broach Handle
2570-00-002	Broach Extractor
2570-04-100	Calcar Planer-Small
2570-04-200	Calcar Planer-Large
2570-05-000	Retaining Implant Inserter
2570-05-100	Standard Implant Inserter
2570-10-000	Sterile Case Complete
2570-01-600	Universal Neck Resection Guide
2001-42-000	T-handle
2001-80-501	IM Initiator
2001-65-000	Femoral Head Impactor
2001-66-000	Replacement Tip
2611-20-000	Core Case #2 Tray
5460-02-000	Inserter Handle
85-3927	Femoral Rasp
2002-31-000	Anteversion Osteotome, Small
2002-25-000	Anteversion Osteotome, Medium
85-4673	Box Osteotome
2354-10-000	Canal Finder
2990-05-030	Summit Cemented Templates

Standard Neck Segment

Cat. No.	Size
2570-13-100	2/3
2570-13-200	4/5
2570-13-300	6/7
2570-13-400	8/9

High Neck Segment

Cat. No.	Size
2570-13-150	2/3
2570-13-250	4/5
2570-13-350	6/7
2570-13-450	8/9

Broach

Cat. No.	Size
2570-00-060	0
2570-00-070	1
2570-00-080	2
2570-00-090	3
2570-00-100	4
2570-00-110	5
2570-00-120	6
2570-00-135	7
2570-00-150	8
2570-00-165	9
2570-00-180	10

DePuy Cement Restrictor

Implant Cat. No.	Trial Cat. No.	Size	Trial Diameter (mm)	Restrictor Diameter (mm)
5460-10-000	5460-30-000	1	7.0	8.25
5460-12-000	5460-32-000	2	9.0	10.75
5460-14-000	5460-34-000	3	11.5	13.25
5460-16-000	5460-36-000	4	14.0	15.75
5460-18-000	5460-38-000	5	16.5	18.25
5460-20-000	5460-40-000	6	19.0	20.75
5460-22-000	5460-42-000	7	22.0	23.75

SUMMIT CEMENTED FEMORAL STEM

Standard Offset

Cat. No.	Size
1570-03-080	2
1570-03-090	3
1570-03-100	4
1570-03-110	5
1570-03-120	6
1570-03-135	7
1570-03-150	8

High Offset

Cat. No.	Size
1570-13-090	3
1570-13-100	4
1570-13-110	5
1570-13-120	6
1570-13-135	7
1570-13-150	8

Instrumentation and Implants

NOTE: All Summit Tapered Hip System femoral implants are compatible with the DePuy Articul/eze 12/14 taper femoral heads and Articul/eze "M" heads.

TOTAL HIP PROSTHESES, SELF-CENTERING™ HIP PROSTHESES AND HEMI-HIP PROSTHESES

IMPORTANT

This Essential Product Information sheet does not include all of the information necessary for selection and use of a device. Please see full labeling for all necessary information.

INDICATIONS

Total Hip Arthroplasty (THA) is intended to provide increased patient mobility and reduce pain by replacing the damaged hip joint articulation in patients where there is evidence of sufficient sound bone to seat and support the components. THA is indicated for a severely painful and/or disabled joint from osteoarthritis, traumatic arthritis, rheumatoid arthritis or congenital hip dysplasia; avascular necrosis of the femoral head; acute traumatic fracture of the femoral head or neck; failed previous hip surgery; and certain cases of ankylosis. Hemi-hip arthroplasty is indicated in these conditions where there is evidence of a satisfactory natural acetabulum and sufficient femoral bone to seat and support the femoral stem. Hemi-hip arthroplasty is indicated in the following conditions: Acute fracture of the femoral head or neck that cannot be reduced and treated with internal fixation; fracture dislocation of the hip that cannot be appropriately reduced and treated with internal fixation; avascular necrosis of the femoral head; non-union of femoral neck fractures; certain high subcapital and femoral neck fractures in the elderly; degenerative arthritis involving only the femoral head in which the acetabulum does not require replacement; and pathology involving only the femoral head/neck and/or proximal femur that can be adequately treated by hemi-hip arthroplasty.

CONTRAINDICATIONS

THA and hemi-hip arthroplasty are contraindicated in cases of: active local or systemic infection; loss of musculature, neuromuscular compromise or vascular deficiency in the affected limb, rendering the procedure unjustifiable; poor bone quality; Charcot's or Paget's disease; for hemi-hip arthroplasty – pathological conditions of the acetabulum that preclude the use of the natural acetabulum as an appropriate articular surface. Ceramic heads are contraindicated in revision surgery when the femoral stem is not being replaced or for use with any other than a polyethylene or metal-backed polyethylene cup. In the USA, ceramic heads are not approved for use with metal cups.

WARNINGS AND PRECAUTIONS

Ceramic coated femoral stem prostheses are indicated for uncemented press fit fixation.

CAUTION: DO NOT USE BONE CEMENT FOR FIXATION OF A CERAMIC COATED PROSTHESIS. Components labeled for "Cemented Use Only" are to be implanted only with bone cement. The following conditions tend to adversely affect hip replacement implants: excessive patient weight, high levels of patient activity, likelihood of falls, poor bone stock, metabolic disorders, history of infections, severe deformities leading to impaired fixation or improper positioning, tumors of the supporting bone structures, allergic reactions to materials, tissue reactions, and disabilities of other joints.

ADVERSE EVENTS

The following are the most frequent adverse events after hip arthroplasty: change in position of the components, loosening of components, fracture of components, dislocation, infection, peripheral neuropathies, tissue reaction.

U.S. Patent 5,314,489.

The Summit Cemented Femoral Stem is intended for cemented use only.



DePuy Orthopaedics, Inc.
700 Orthopaedic Drive
Warsaw, IN 46581-0988
USA
Tel: +1 (800) 366 8143
Fax: +1 (574) 371 4865

DePuy International Ltd
St Anthony's Road
Leeds LS11 8DT
England
Tel: +44 (113) 387 7800
Fax: +44 (113) 387 7890