

DIAMOND Cemented Hip System

INTRODUCTION



IRENE Cemented Hip System incorporates 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 IRENE 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.

SURGICAL TECHNIQUE

1. Place the patient in lateral position. The skin incision is 3cm posterior to the intertrochanteric ridge, running in the direction of the fibers of the gluteus maximus and fascia lata (Fig. A).



Fig. A

2. The gluteus maximus and the fascia lata are split in the direction of the fibers. By retracting the gluteus maximus, the greater trochanter and short external rotators are exposed (Fig. B).

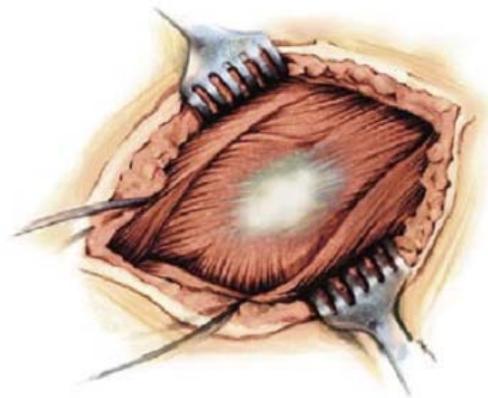


Fig. B

3. The sciatic nerve is identified. Division of the tendon of gluteus maximus is very rarely necessary

(Fig. C).

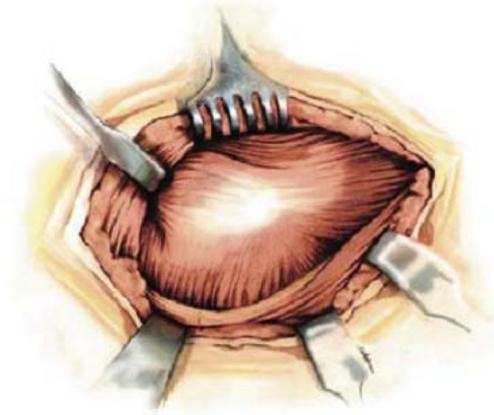


Fig. C

4. The short external rotators including the piriformis muscle are detached from the greater trochanter. Slight internal rotation of the leg facilitates the dissection. The hip joint is then exposed (Fig. D).

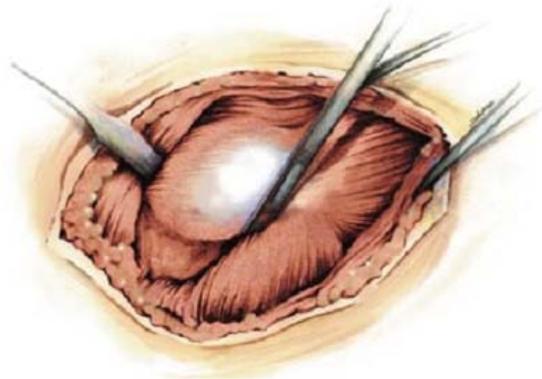


Fig. D

5. After exposure of the hip joint, Hohmann retractors are inserted at the cranial and caudal margins of the femoral neck and the posterior hip capsule is incised or resected. Another Hohmann retractor with a sharp tip is then inserted under the posterior rim of the acetabulum. The head of the femur can be carefully dislocated by a combined movement of internal rotation, flexion and adduction. The resection line is then marked according to preoperative planning. If dislocation cannot be achieved, even after further soft tissue attachment, an in situ osteotomy of the femoral neck is performed (Fig. E).

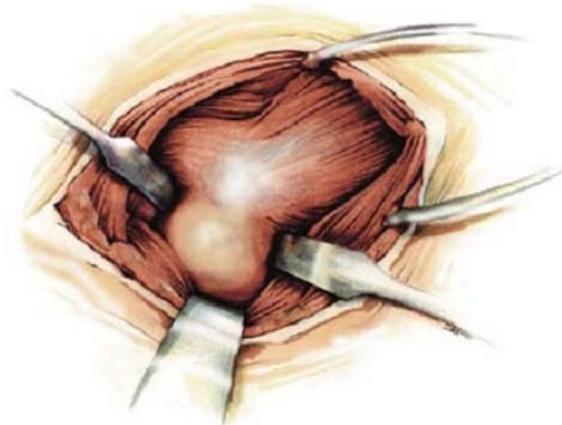


Fig. E

6. Perform an osteotomy of the femoral neck at the marked site 45 degrees to the femoral axis. The osteotomy with the oscillating saw should involve only the medial 2/3 of the cross section of the femoral neck so that the saw does not run into the greater trochanter. The remaining third is divided with a chisel along the medial surface of the trochanter in the direction of the femoral shaft (Fig. F).



Fig. F

Femoral Head Resection

The DIAMOND Hip System surgical instrumentation was developed to accommodate all surgical approaches.

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.



Figure 1

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.



Figure 2

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.

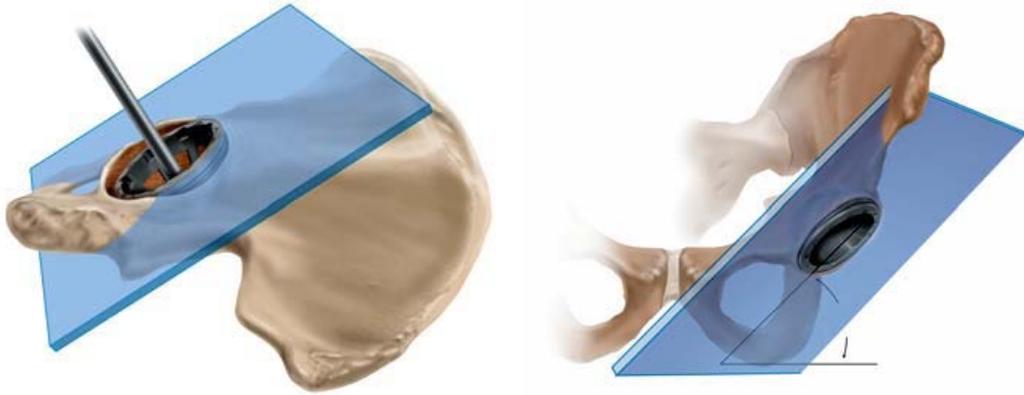


Figure 3

FEMORAL PREPARATION

Access Medullary Cana Initiate the pilot hole opening with the stepped IM initiator. The opening should be aligned 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).



Figure 4

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 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

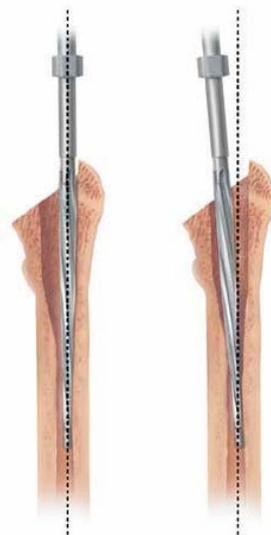


Figure 6

Alignment Verification

The path established by the canal probe will dictate 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



Correct Incorrect

Alignment Alignment

Optional Trochanteric Reaming

To aid neutral stem alignment, the optional trochanteric reamer may be used to lateralize the proximal entry point for the subsequent taperedreamers and broaches. Attach the trochanteric reamer to the T-handle or a power reamer and insert it into the canal. Advance the trochanteric reamer until the cutting region of the reamer is aligned with the greater trochanter. Direct the cutting region of the reamer laterally into the greater trochanter to widen the canal entry point (Figure 8).



Figure 8

Dual Reference Options

Calcar Referencing

When referencing from the calcar, use the distal reamer depth reference lines for the desired femoral component for reamer depth gauging. The reamer depth reference line for the desired size should align with the medial neck resection at the cortical-cancellous margin of the calcar.

Greater Trochanter Referencing

When referencing from the tip of the greater trochanter, use the proximal reamer depth referencing lines for the desired femoral

component for reamer depth gauging. The reamer depth reference line for the desired size should align with the tip of the greater trochanter (Figure 9).

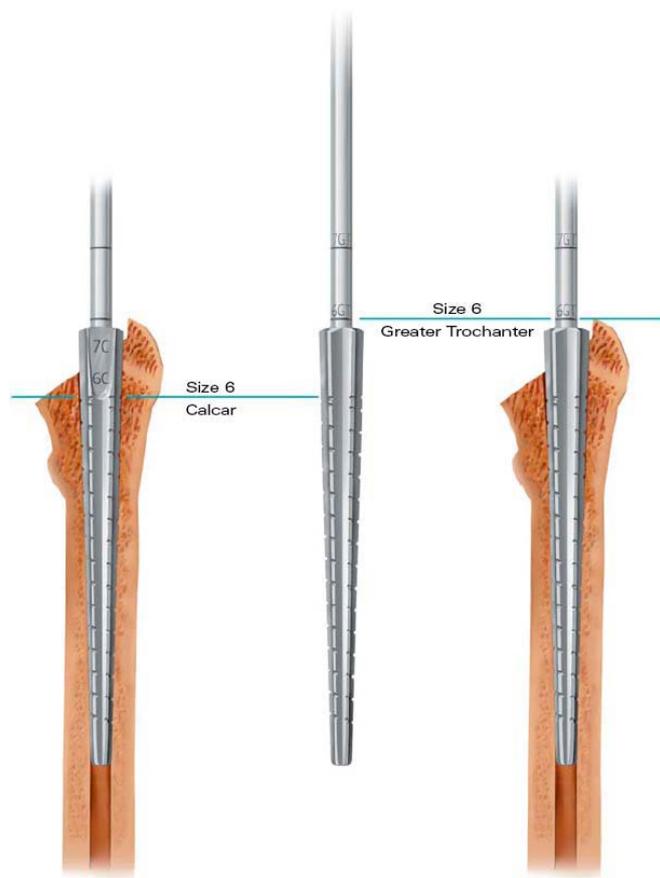


Figure 9

Size6/7 Tapered

Reamer Greater Trochanter

Referencing Size 6

Fit and Fill

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. The final broach should feel rotationally stable (Figure 10). The broach handle 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 11). If the neck resection level is determined to be correct, the next larger size broach is recommended. Additional tapered reaming may also be required. Unlock the broach handle by pulling the lever on the broach handle down. Remove the broach handle.

Figure 10



Figure 10



Figure 11

CALCAR PLANING

The DIAMOND Hip System stems are collarless designs; therefore, calcar planing is optional. It is anticipated that the top of the Porocoat Porous Coating on the final implant will rest at the same position as the top of the cutting teeth on the broach. 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. This will prevent the planer from binding on the calcar (Figure 12).



Figure 12

TRIAL REDUCTION

Trial neck segments and trial modular heads are available 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 13). 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, there should be full external rotation with no tendency to dislocate or impinge. Combined anteversion of the socket and femoral head should be approximately 45 degrees.



Figure 13

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. Before inserting the restrictor, dry the canal using a femoral sponge.

Size the distal femoral canal by selecting the appropriate distal sizing bullet. Match the femoral restrictor to the femoral stem length to determine depth of insertion. Select the appropriate sized cement

restrictor and insert it into the canal. 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.

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. Pour two batches of cement powder into the cartridge, followed by two vials of liquid monomer. Replace the 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. Activate the vacuum and begin mixing by fully extending the handle up and down, one time per second. 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.



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 . 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.

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. The cement should be pressurized for two to three minutes 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.

IMPLANT INSERTION

After the final acetabular shell is in place, introduce the hip stem to the medullary canal. Rotate the stem into its proper orientation and advance the stem into the canal using hand pressure (Figure 14). The implant should meet resistance 10-15 mm above the desired final seating position. Advance the stem into position with moderate blows from the mallet. The implant is fully seated when the top of the Porocoat Porous Coating is at the level of the top of the broach teeth and the implant is stable. If the stem stops moving with moderate mallet blows and is greater than 2 mm above the desired seating position, remove the implant and repeat the

reaming and broaching steps. Excessive force should not be needed to seat the stem.

Figure 14



CEMENTED STEM INSERTION

The prosthesis is introduced into the canal (Figure 15). Final seating against the medial cut femoral cortex is facilitated for proper biomechanical restoration and cement mantle integrity (Figure 16).

Excess cement is cleared from the collar area. Be sure to disengage the stem inserter well before the cement has hardened.



Figure 15



Figure 16

ACETABULAR SHELL INSERTION

Remove the trial acetabular liner components and implant the desired acetabular shell (Figure 17). Take care to ensure cup orientation mimics the orientation of the trial component. Insert a trial liner into the shell implant.



Figure 17

FINAL TRIAL REDUCTION

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.

ACETABULAR INSERT IMPLANTATION

Following the final trial reduction, remove the trial acetabular liner and insert the appropriate acetabular liner (Figure 18).



Figure 18

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 several mallet taps (Figure 19).



Figure 19