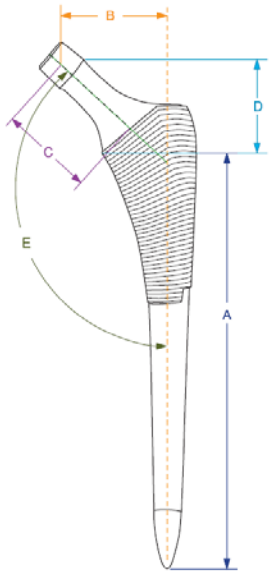
DIAMOND Cementless Hip System

INTRODUCTION

1. Titanium sprayed stem proximal, load transfer takes place superior to the metaphyseal/diaphyseal junction.
2. Grit blast, mid-shaft osteointegration, and best anti-rotation.
3. Distal grit-blasted surface, tapered distal geometry, reduces thigh pain.
4. Optimzed neck geometry, the ROM increases into 132°, reduces the potential dislocation of impacting.
5. Polished to reduce debris generation, should impingement occur. Diaphyseal bone preserved for future revisions.
6. Nearly 1\3 of the prothesis titanium sprayed, load transfer takes place superior to the etaphyseal/diaphyseal junction, preserves diaphyseal bone for future revisions.

SPECIFICATIONS



Materials：All shell and prosthesis are made of titanium alloy.
The surface coating：The shell and the proximal prosthesis are titanium sprayed.
Package: Sterile package.

Item No.	A	B	C	D	E
	Stem Length	Base Offset	Neck Length	Rappelling	Neck Angle
1	125	36	31	27	130^{o}
2	130	38	32	28	130^{o}
3	135	38	32	29	130^{o}
4	140	40	34	30	130^{o}
5	145	40	34	31	130^{o}
6	150	42	36	32	130^{o}
7	155	42	36	33	130^{o}
8	160	44	38	34	130^{o}

SURGICAL TECHNIQUE

The DIAMOND Hip Prosthesis can be implanted using all of the usual operative approaches. However, posterior access with the patient in the lateral position is particularly suitable. The awl for the DIAMOND Prosthesis has a straight stem, which is introduced into the axis of the medullary cavity. With the posterior approach, when the hip and knee are flexed, the way to the medullary cavity is free without the need for temporary removal of the greater trochanter and without the instrument exerting pressure on the muscles. With the lateral, transgluteal and anterior approaches, retraction of the muscles is more difficult. Moreover, with the posterior approach, the incision is smaller and there is less blood loss with the patient in the lateral position. This is particularly apparent in obese patients. The incision or resection of the posterior joint capsule is a critical point in the posterior approach. Posterior dislocation of the prosthesis can occur more readily during the healing phase if the prosthetic cup and/or the stem are placed in insufficient anteversion. This problem can be counteracted by a test reduction before definitive fixation of the DIAMOND Hip Prosthesis, but nonetheless, this phenomenon requires particular care. In borderline cases, it can be useful to position the leg in slight external rotation and to avoid hip flexion greater than 60 degrees during the postoperative period.

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).

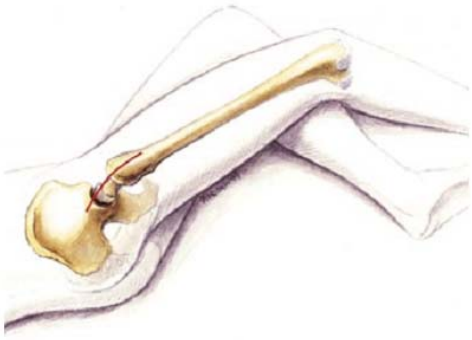


Fig. A

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).

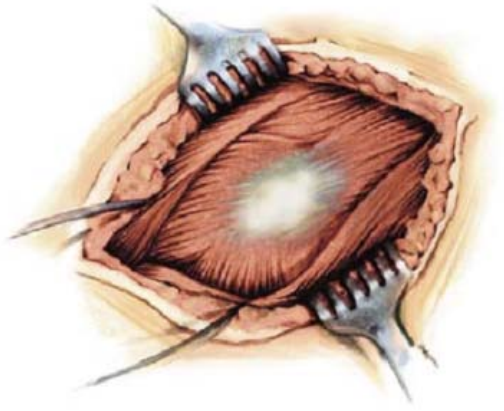


Fig. B

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

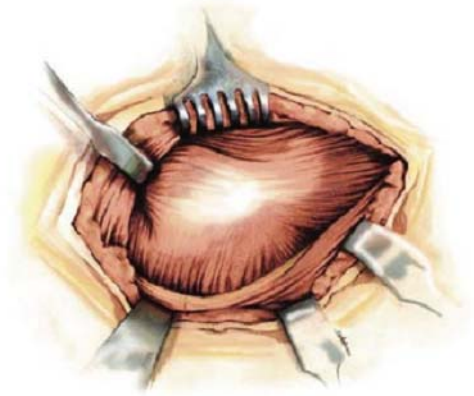


Fig. C

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).

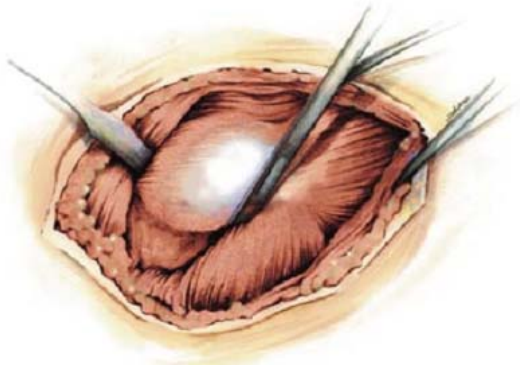


Fig. D

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).

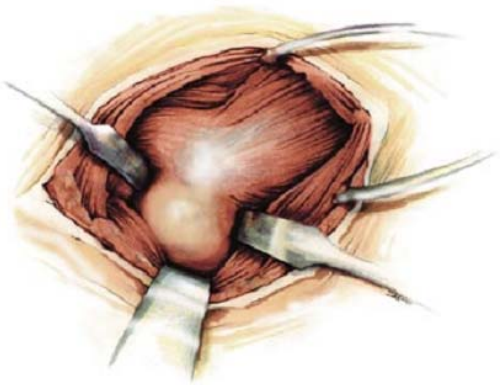


Fig. E

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).

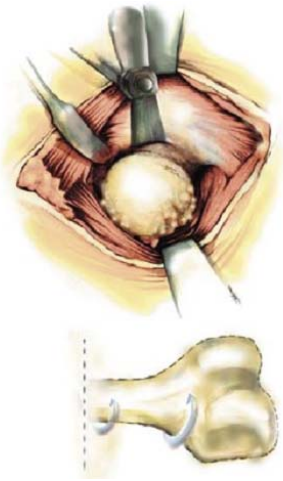


Fig. F

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.

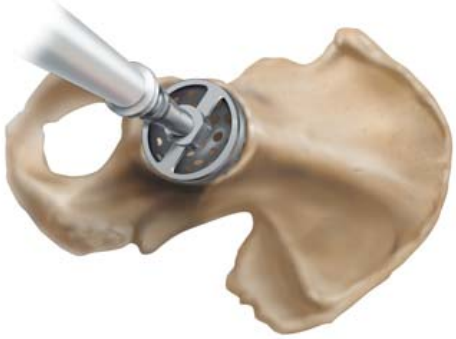


Figure 2

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.

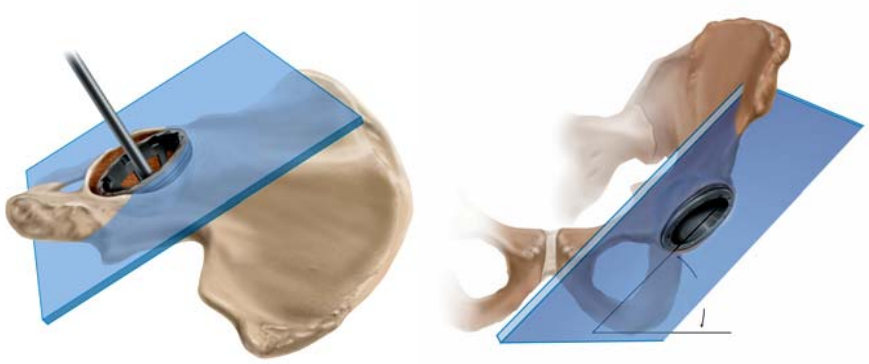


Figure 3

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 circumfer- ential clearance for the box osteotomeand canal probe is achieved (Figure 4).

Figure 4

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

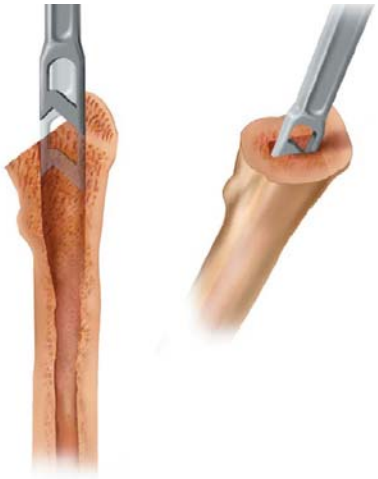


Figure 5

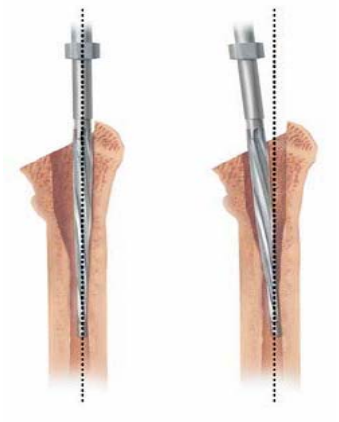
Medullary Canal Opening

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

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).



Correct Alignment Incorrect Alignment
Figure 7

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).

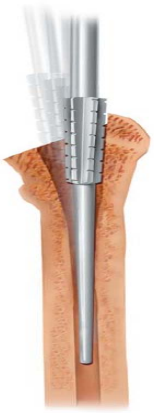


Figure 8

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).

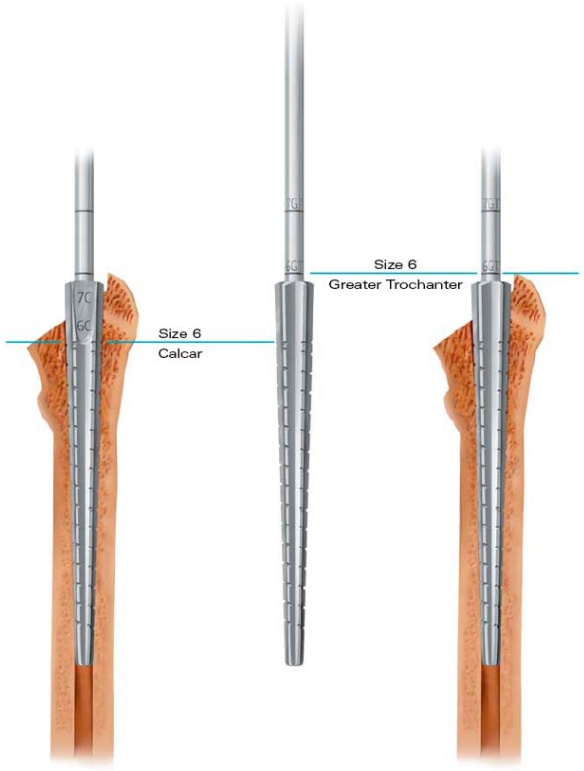


Figure 9

Size 6/7 Tapered ReameGreater 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.

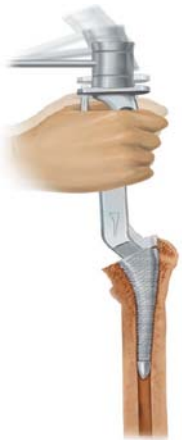


Figure 10

Figure 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.

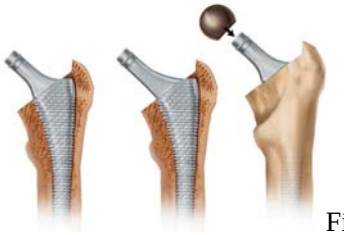


Figure 13

ACETABULAR SHELL INSERTION

Remove the trial acetabular liner components and implant the desired acetabular shell (Figure 14). Take care to ensure cup orientation mimics the orientation of the trial component. Insert a trial liner into the shell implant.

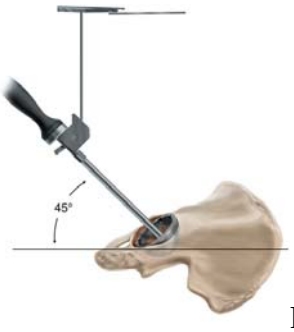


Figure 14

SCREW INSERTION

The Sector shell has three screw holes and is designed for insertion with screws.

Quickset Acetabular Screw Instruments are recommended for screw insertion. Two medial holes alternatives are placed to enable screw placement up the posterior column in either the right or left hip. The single lateral screw provides additional access to the ilium.

Select holes where the prosthesis is to be anchored with cancellous screws so that the screws lie within a safe quadrant. The safe quadrant is defined by two lines from the anterior-inferior iliac spine through the center of the acetabulum and posterior by a line from the sciatic notch to the center of the acetabulum (Figure15).

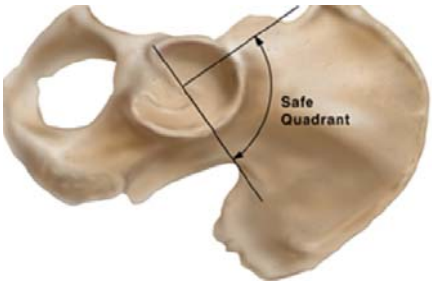


Figure15

The drill bit is controlled by the drill guide as it passes through selected holes into the acetabulum (Figure16).The screw angle may vary by as much as 34 degrees (Figure17). The effective lengths of the four drill bits available are for 25, 35, 45 and 70 mm. By seating the drill bit completely into the guide, holes corresponding to the effective length of the drill bit will be created.

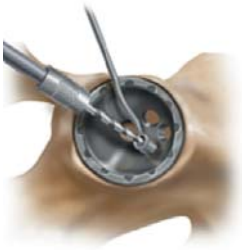


Figure16

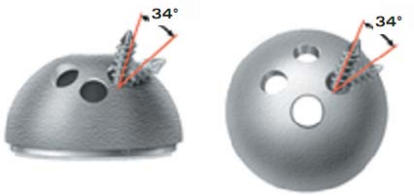


Figure17

Verify hole depth using the Quickset depth gauge. Alternating colors on the depth gauge represent 10mm increments (Figure18).

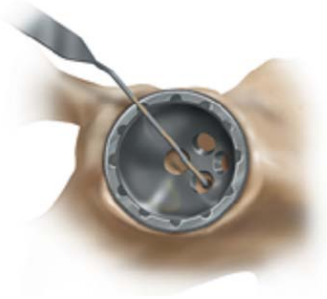


Figure18

Insert 6.5mm Pinnacle Cancellous bone screws using a hex head screwdriver (Figure19 and20).The 6.5 mm self-tapping screws have four-point cutting flutes with a blunt tip to reduce the risk of neurovascular injury (Figure21).

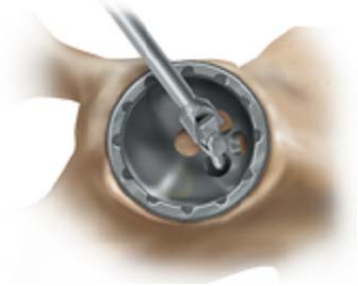


Figure19

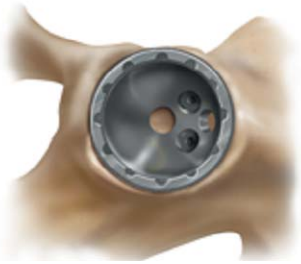


Figure20

Figure21

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 22). 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.

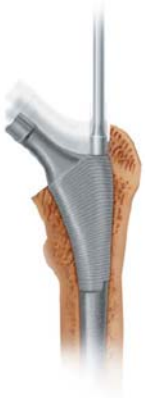


Figure22

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 23).

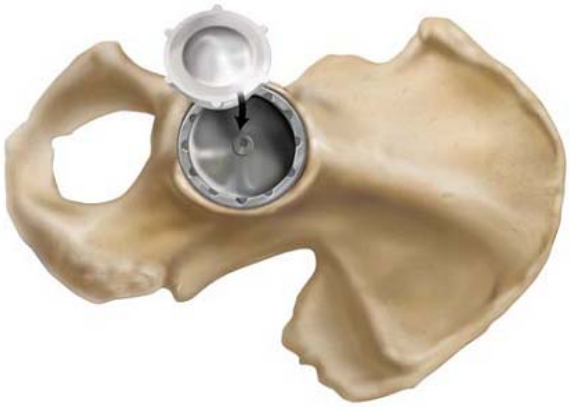


Figure 23

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 24).

Figure 24

POST-OPERATIVE MANAGEMENT

Since minimal movement at the bone-implant interface is essential for ingrowth and biological fixation, keep the patient on a protected weight-bearing schedule for approximately twelve weeks. This should include a six week interval on two crutches and a second six week interval on either one crutch or one cane. The duration of protected weight bearing is dependent upon the following three factors:

1. The patient's bone quality and, in particular, the intrinsic strength of the femoral and acetabular bone stock.
2. An estimate of the tightness of fit of the two components at the time of surgery.
3. The appearance of the immediate post-operative x-rays.

Extremely rigid initial fixation is necessary for bone adaptation.