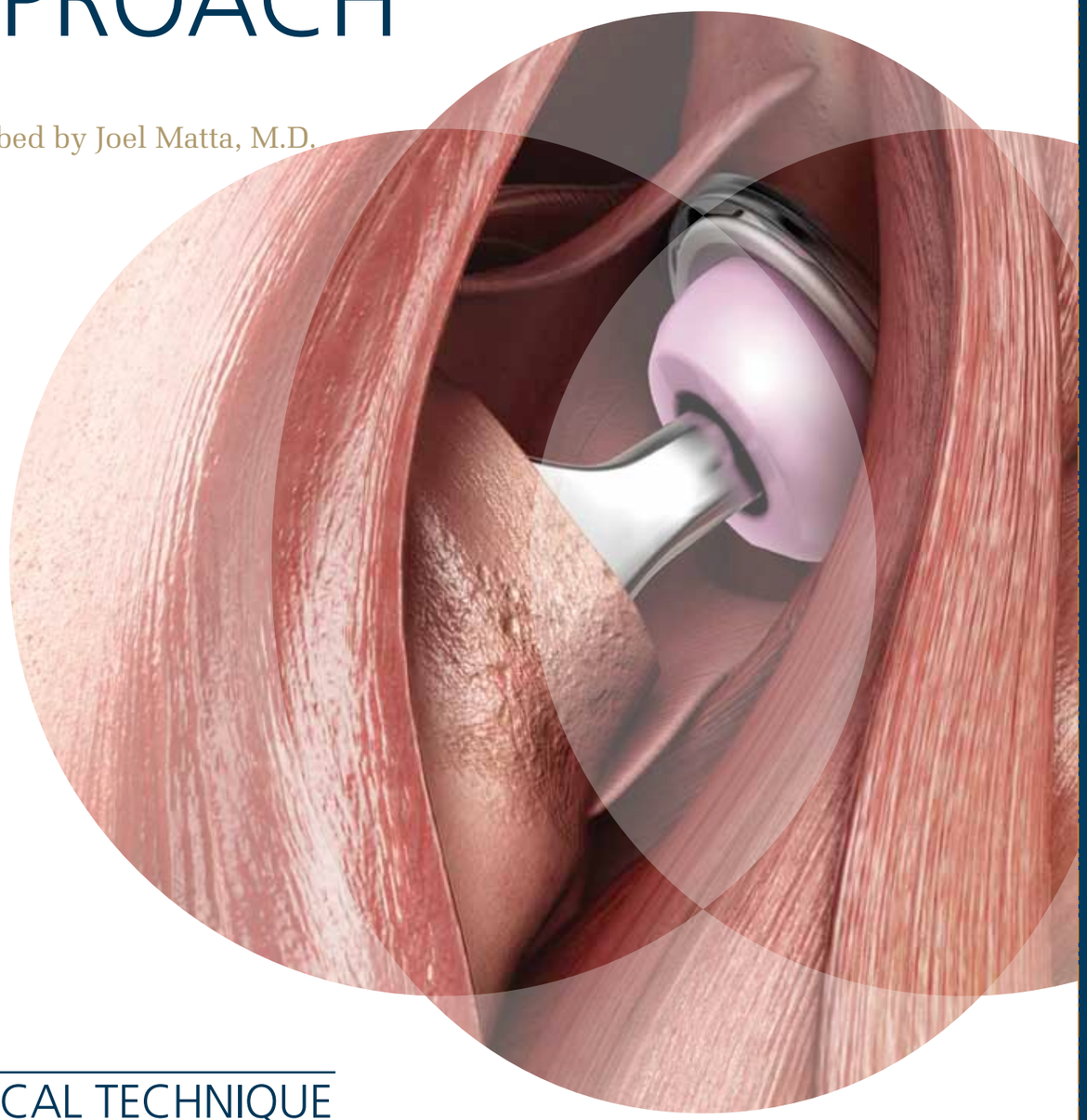
DePuy Synthes
JOINT RECONSTRUCTION
COMPANIES OF Johnson&Johnson

THE ANTERIOR APPROACH

as described by Joel Matta, M.D.



SURGICAL TECHNIQUE

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ANTERIOR APPROACH PHILOSOPHY

Minimally invasive or tissue-sparing orthopaedic procedures have gained attention as patients demand shortened recovery time and accelerated rehabilitation. Development of efficient, repeatable, tissue-sparing total hip replacement procedures is important.

The Anterior Approach Surgical Technique for Total Hip Replacement is described by Joel Matta, M.D., who has brought the Anterior Approach technique as it is known today into the United States. This approach is an advanced application of the Smith-Petersen approach using the PROfx®, hana® or hana SSXT® tables from Mizuho OSI®. These tables help to streamline the technique, creating a reproducible procedure that minimizes soft-tissue releases and eliminates the need for secondary incisions to accommodate instrumentation or the femoral component. The technique does not cut any muscles, but separates them to allow access into the hip joint. The result is that muscles are spared during surgery. With these advantages, the Anterior Approach provides the potential for a quicker recovery compared to traditional hip replacement surgery.

Anterior Approach Education Program

DePuy Synthes Joint Reconstruction has collaborated with Joel Matta, M.D., to build a comprehensive training and education program around the Anterior Approach. This program features Anterior Approach Courses offering hands-on cadaveric training, didactic lectures and interactive discussion. Surgical technique papers, surgical technique videos, specially designed Anterior Approach instrumentation, marketing materials and a field specialist further augment DePuy Synthes Joint Reconstruction's comprehensive Anterior Approach program.

Anterior Approach Resources

Additional resources for surgeons, patients and OR Staff can be found at www.DePuy.com/AnteriorApproach including an interactive 3D animation for surgeon and OR staff education.

*The hana® table is not a *DePuy Synthes Joint Reconstruction* product, nor is it the only table that can be used for this approach. This surgical technique still applies when using other tables.

ABOUT JOEL MATTA, M.D.

Joel Matta, M.D., brought the Anterior Approach to the United States from Europe and has advanced the technique through training and education. The CORAIL® Total Hip System and the Anterior Approach surgical instruments were designed in conjunction with Dr. Matta and a team of other surgeons. Having performed over 3,000 plus, Anterior Approach hip replacements, Dr. Matta has also been instrumental in the training of many orthopaedic surgeons in the technique, and serves as chairman of *DePuy Synthes Joint Reconstruction's* Anterior Approach Courses.

Dr. Matta is founder and chairman of the Anterior Total Hip Arthroplasty Collaborative (ATHAC, www.athac.org), the founder and director of the Hip & Pelvis Institute at Saint John's Health Center in Santa Monica, CA, and the author of over 100 publications and videos and hip replacement and pelvic surgery.

Dr. Matta is a consultant for *DePuy Synthes Joint Reconstruction,* and receives royalties as the designer of the PROfx®, hana® or hana SSXT® tables which are manufactured by Mizuho OSI.

Joel Matta, M.D.

hana® TABLE

Allows Precise Control of Patient Position, Manipulation and Traction

Proven performance for Anterior Approach to total hip procedures.
Allows bilateral hip replacement for qualified patients.

Extensive Imaging Capability

Un-restricted C-Arm access.
Radiolucent 35 inch (89 cm) cantelevered top section.

Radiolucent leg spars for uninterrupted imaging.

The hana® table allows the surgeon to perform Total Hip Arthroplasty through a single anterior approach incision, without detachment of muscle from the pelvis, or femur. The table allows hyperextension, abduction, adduction and external rotation of the hip for femoral component placements, a positioning option not possible with conventional tables. Minimizing the disturbance to the lateral and posterior soft tissues provides immediate stability of the hip after surgery.

OR Team Engineered

Facilitates OR Team performance.

Proprietary features make pre-operative and intra-operative protocol easier than a standard OR table

Suited to the Newest Technologies

Supports tissue-sparing techniques for MIS procedures.

Provides new level of surgical assistance for surgeon and OR team.

Rotation Lock

Fine Traction

Gross Traction

Internal/External Rotation

PATIENT SET-UP AND DRAPING

Before transferring the patient to the hana® table, it is recommended that the patient's feet be secured into the boots. Apply web roll around the foot, then self-adherent wrap (Coban™) around the upper ankle. With the boot liner out of the shell, position the foot inside the liner. Secure the tongue and the Velcro® strap then place the foot into the boot. Ensure that the heel drops down into the shell. Affix the buckle straps and securely tighten the foot. Test the stability of the boot on the foot by holding the ankle while pulling on the boot handle.

Position the patient on the hana table in preparation for surgery. Typically, the patient's arms are placed roughly perpendicular outward and not over the chest. Arms placed on the chest can interfere with femoral preparation later in the procedure.

1. Use a clear U drape (non sterile) around operative area and towards the foot (Figure 1). A towel wrapped over each boot reduces the chance of perforation through the curtain.

2. Place two extra large drapes over the lower extremities starting distal to operative area. Place two large drapes across the top of the patient (Figure 2).

3. Staple three towels around operative area, one on each side of the incision area and one medial to the incision area (Figure 3).

Figure 1

Figure 2

Figure 3

4. Apply an impervious U drape with adhesive around the operative area and extending over the legs. Apply another in the opposite direction over the head.

5. Place a split drape with adhesive proximal and distal to the operative area.

6. Cover exposed skin with iodine incise drape (Figure 4).

7. Cut a small hole in the drape for the femoral hook lift, place the hook bracket on the lift and seal with iodine incise drape (Figure 5).

Figure 4

Figure 5

ROOM SET-UP

The OR is set up such that the instruments are on the operative side of the patient. Generally, the use of 2 back tables (A), 1 Mayo stand (B) and 1 basin stand (C) is sufficient, creating an L-shaped area.

The C-Arm (D) is positioned on the non-operative side, perpendicular to the patient. A typical OR team will consist of the surgeon, physician's assistant, anesthesiologist, scrub nurse, circulating nurse/table operator and X-ray technician (Figure 6).

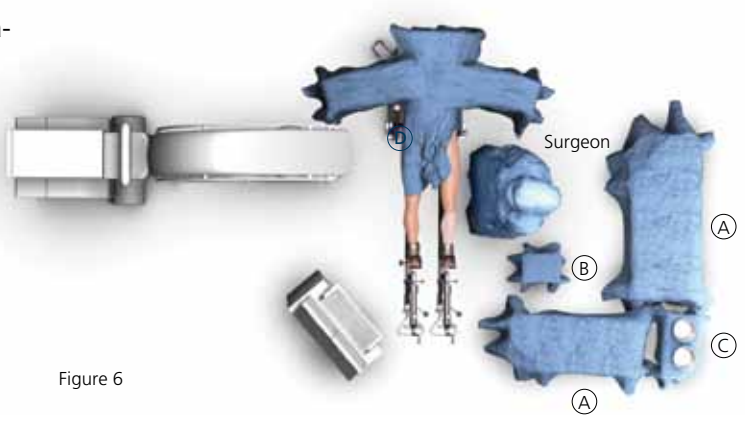


Figure 6

INCISION AND INITIAL EXPOSURE

Mark the locations of the iliac crest, greater trochanter and the anterior superior iliac spine (ASIS) (Figure 7). Start the incision approximately 3 cm lateral and 1 cm distal to the ASIS, and continue in a posterior and distal direction toward the anterior border of the femur. The incision will be 8-9 cm and parallels the fibers of the tensor fascia lata muscle.

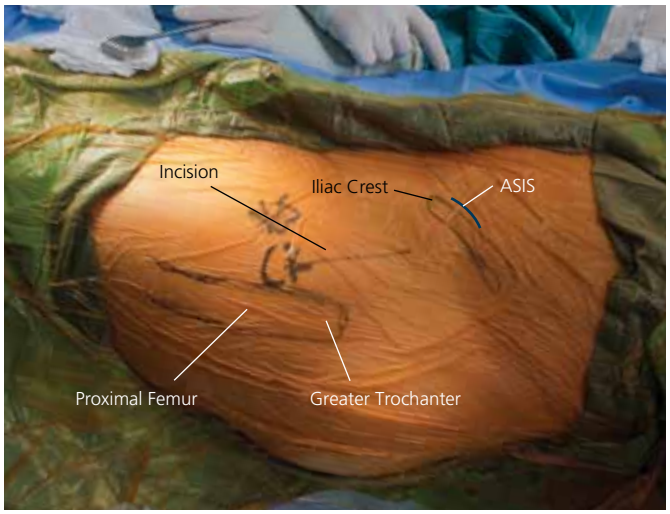


Figure 7

The tensor fibers are visible through the translucent fascia (Figure 8).

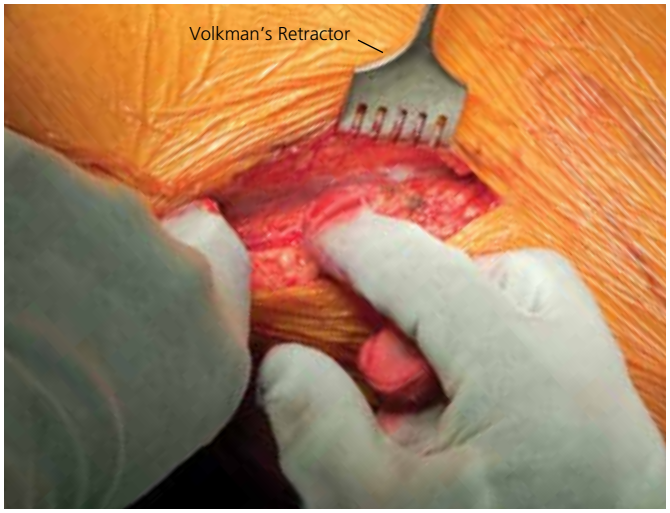


Figure 8

A soft tissue protector (Protractor®) may be inserted into the wound. Incise the fascia over the tensor and parallel to its fibers. Extend the fascial split beneath the skin proximal (toward the ASIS) and distal (Figure 9).

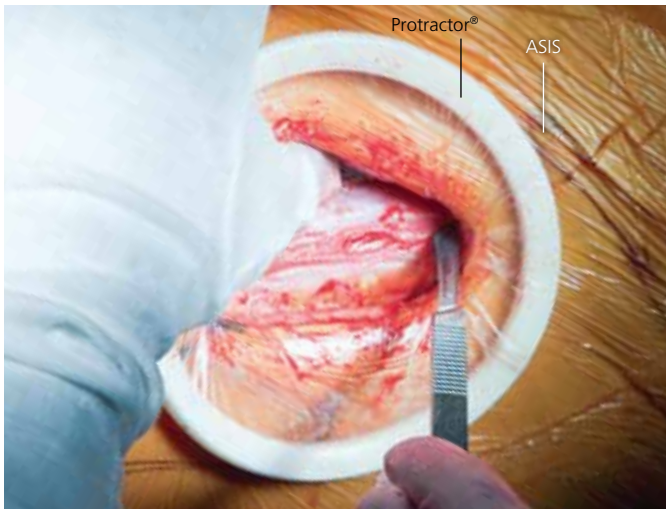


Figure 9

Coagulate the vessel that perforates the fascia.

The fascial incision is typically between the anterior two-thirds and posterior one-third of the tensor muscle (Figure 10). Avoid splitting the iliotibial band, which lies along the posterior border of the tensor. Splitting this will lead to the muscle interval posterior to the tensor commonly known as the Watson-Jones approach.

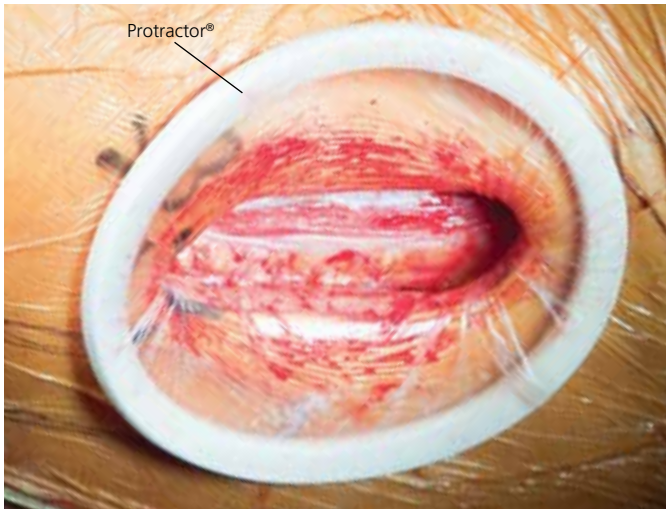


Figure 10

Lift the anterior tensor flap with an Allis Clamp and using your finger, bluntly dissect inside the tensor sheath, anterior and medial to the tensor muscle.

The location and obliquity of the incision along with the deep dissection within the tensor sheath, protects the lateral femoral cutaneous nerve.

Place a Hibbs Retractor (Cat. No. 2598-07-180) medially to aid visualization. Palpate the ASIS and move your finger distal and lateral to palpate the anterior hip capsule. Place a blunt-tipped Cobra Retractor (Cat. No. 37-4106) lateral to the hip capsule and locate the origin of the rectus femorus. Retract the tensor and gluteus minimus laterally. Use the Hibbs Retractor and retract the sartorius and rectus femorus muscles medially (Figure 11).

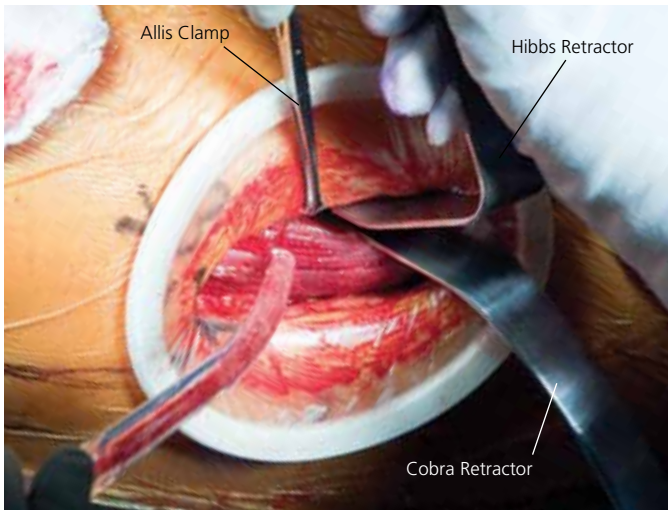


Figure 11

To elevate the iliopsoas and rectus femorus muscles from the anterior capsule, pass a Key/Cobb elevator posterior to the origin of the rectus femorus and anterior to the hip capsule, directing it medial and distal (Figure 12).

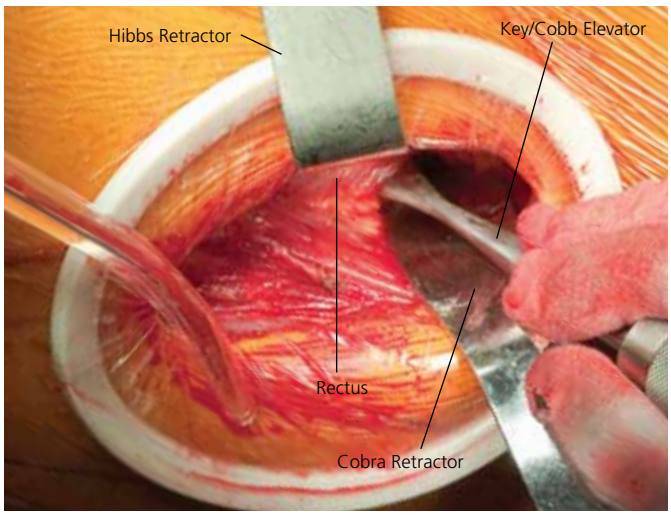


Figure 12

Place the tip of the MI Narrow Curved Hohmann Retractor (Cat. No. 2598-07-190) on the antero-medial hip capsule to retract the rectus femorus and sartorius medially. As the Hohmann and Cobra retract medially and laterally, use your finger to tease the fascia lata off the distal tensor to enhance exposure and avoid rupture of the tensor fibers (Figure 13).

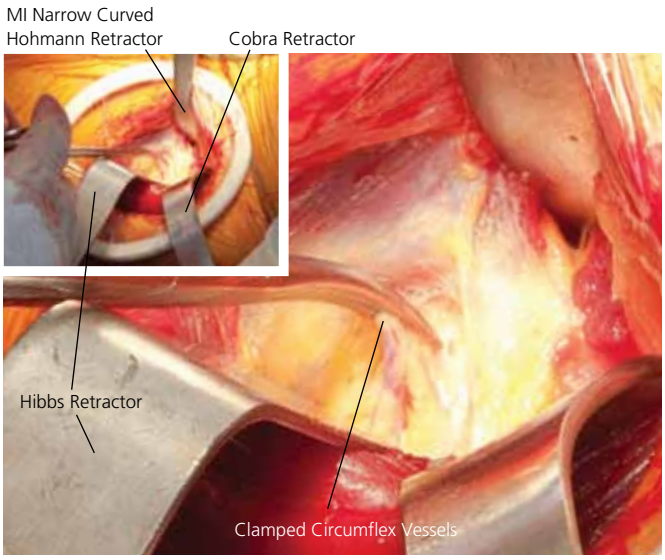


Figure 13

Retract the tensor laterally with a Hibbs Retractor to facilitate visualization of the anterior capsule. Dissect distally to enhance exposure. The lateral femoral circumflex vessels are also now visualized distal to the hip capsule. Cut and tie, or cauterize both sides of the vessel, taking care to cauterize all of the branches (Figure 14).

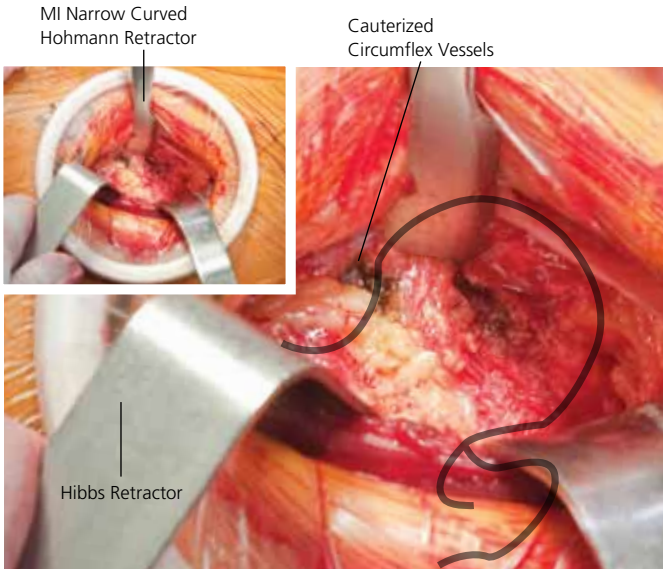


Figure 14

CAPSULAR EXPOSURE

For more mobility of tensor muscle, release the fascia layer distal to the cauterized vessels. Retract the tensor to visualize the fibers of the vastus lateralis muscle.

Cut the capsule parallel to the neck at the junction of the anterior and lateral/superior capsule; continue down to the base of the neck, until reaching the inter-trochanteric line.

Ensure that the lateral shoulder (saddle) of the neck is visible where the lateral portion of the neck joins the tip of the greater trochanter (Figure 15).

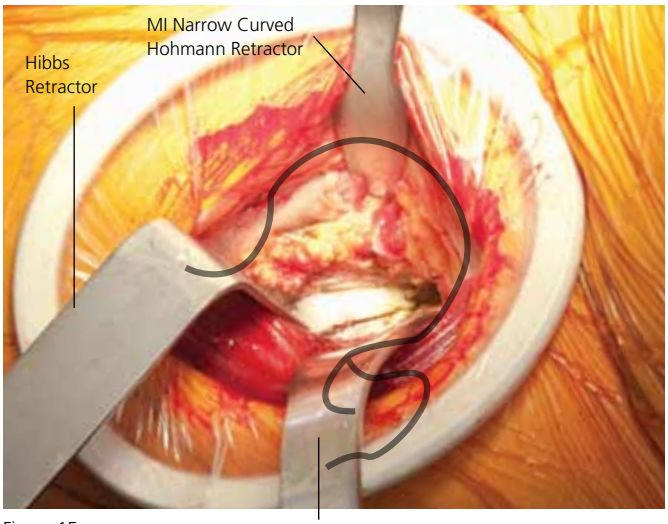


Figure 15

To retract the capsule, position a suture tag into the lateral edge of the anterior capsule (Figure 16). From the distal extent of the capsular incision, cut at a right angle medially along the intertrochanteric line (junction of the anterior capsule and the origin of the vastus lateralis muscle).

Cut the anterior capsule off the base of the neck. This ensures visualization and mobility of the femur during femoral preparation. Place a sharp-tipped Cobra Retractor (Cat 2598-07-200) under the anterior capsule and around the anterior neck. Detach the capsule from the intertrochanteric line area.

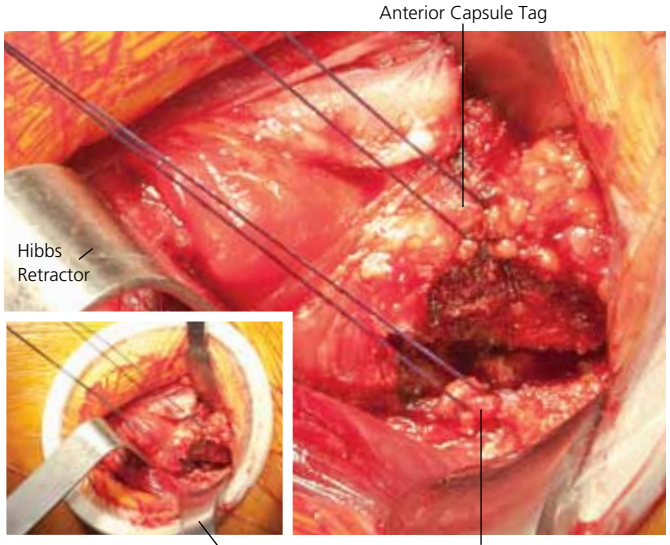


Figure 16

Watch for and cauterize bleeders along the intertrochanteric line. Place a tag suture on the cut edge of the lateral capsule, near the greater trochanter. Place the lateral cobra inside the lateral capsule along the lateral neck. Slide the tip of a small Hohmann Retractor (Cat. No. 2598-07-190), under the anterior capsule and over the anterior rim.

Locate and remove the labrum to visualize the bony rim of the acetabulum. The labrum is often ossified (acetabular osteophyte), if so, excise with an osteotome, failing to do so may make inserting the Bone Skid difficult. Request gross traction be applied and lock. Using approximately 3-4 turns of fine traction, the femoral head will pull away from the acetabulum (Figure 17).

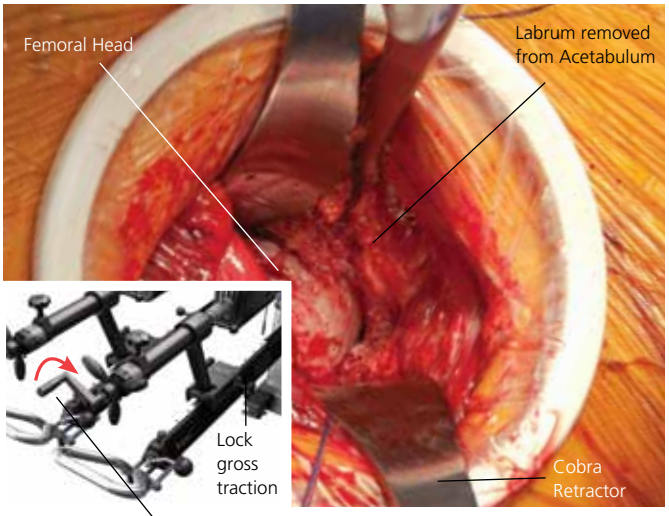


Figure 17

Push the Murphy Bone Skid (Cat. No. 2004-00-000) between the superior head and acetabular roof and "lever" to loosen the soft tissues. Remove the Skid.

Request the operator to remove 2 turns of fine traction. Place the Murphy Bone Skid between the femoral head and anterior rim (Figure 18). Mobilize the head and externally rotate the hip approximately 20 degrees.

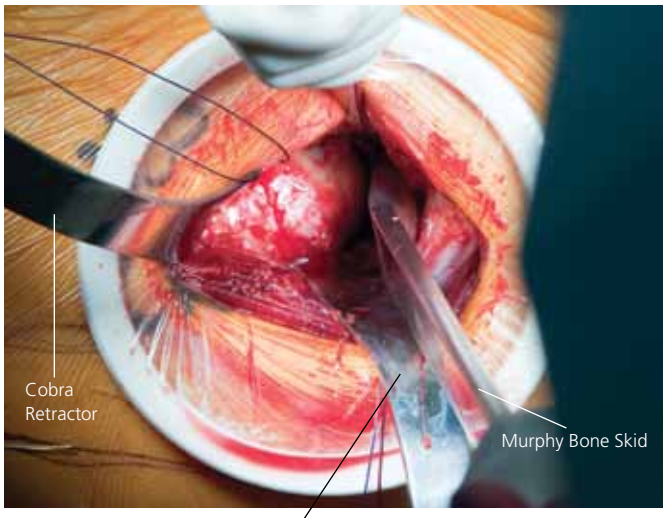


Figure 18

DISLOCATION

Under power, insert the Modular Head Ball Remover (Cat. No. 2125-00-600), or Corkscrew, into the femoral head in an anterior to posterior direction and attach the Excel T-Handle (Cat. No. 2001-42-000) (Figure 19).

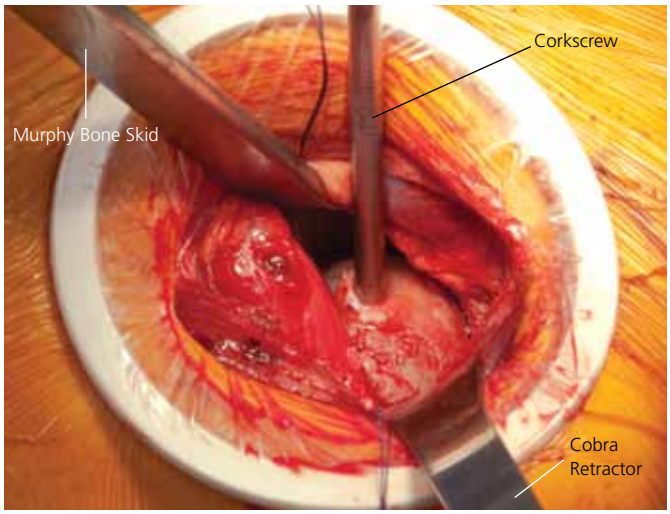


Figure 19

Unlock the rotation on the table. Using leverage from the Murphy Bone Skid and by pulling and rotating with the corkscrew dislocate the head anterior and lateral (Figure 20).

Figure 20

DISLOCATION AND FEMORAL HEAD RESECTION

Remove the Murphy Bone Skid and place Cobra Retractors medial and lateral to the neck. Using a small Hohmann Retractor to slide under the muscle, with the tip around the lesser trochanter, retract the vastus origin. Release the capsule off the medial and posterior-medial neck (Figure 21). This dislocation and capsular release will later enhance femoral mobility and access.

Identify and coagulate bleeders near the base of the neck. Unlock the table rotation and internally rotate the leg to reduce the hip. The neck cut should be based on the preoperative templating. Most often, the lateral portion of the neck cut comes near the lateral shoulder of the neck, by the junction of the greater trochanter. This can be used as an indicator for the neck cut.

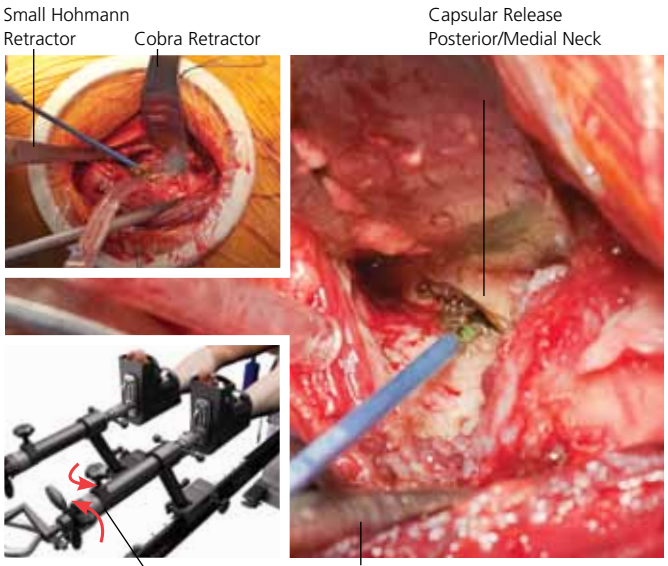


Figure 21

Using a Hibbs Retractor to protect the tensor from the Oscillating Saw Blade, aim in a medial direction so the excursion of the saw does not come into contact with the posterior greater trochanter. Make the cut using the saw. Use an Osteotome with the blade parallel to the long axis of the body to finish the cut (between the greater trochanter and the base of the neck) (Figure 22).

Note: **An in-situ neck cut may also be performed, if preferred. A neck cut following dislocation is described here since dislocation can aid with femoral mobility.**

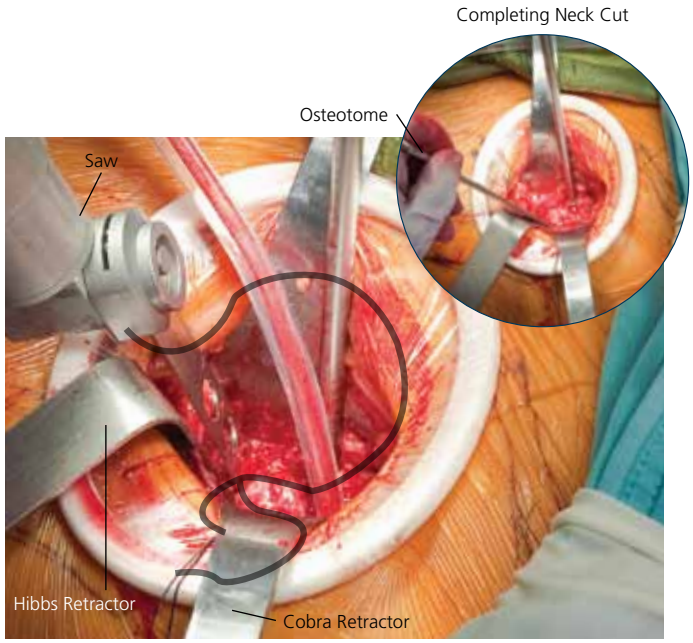


Figure 22

FEMORAL HEAD RESECTION

Prevent sharp edges from catching on muscles by rotating the head to bring the uncut side out first (Figure 23).

Externally rotate the hip about 45 degrees. Pull up on the tag suture attached to the anterior capsule and place an MI Narrow Curved Hohmann Retractor under the capsule and over the inferior part of the anterior rim. Place a Cobra Retractor over the mid-portion of the posterior rim with the tip outside of the labrum, but inside of the capsule.

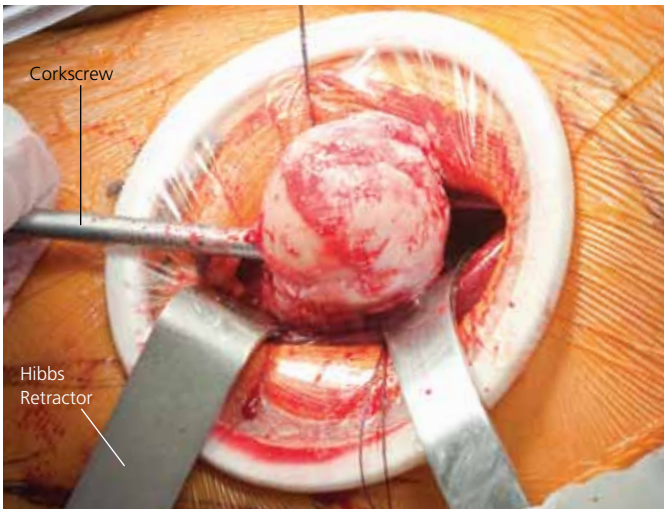


Figure 23

Cut the inferior capsule transversely to allow a little release, excising inferior capsule if needed. With a knife, excise residual posterior, and if present, anterior labrum (Figure 24).

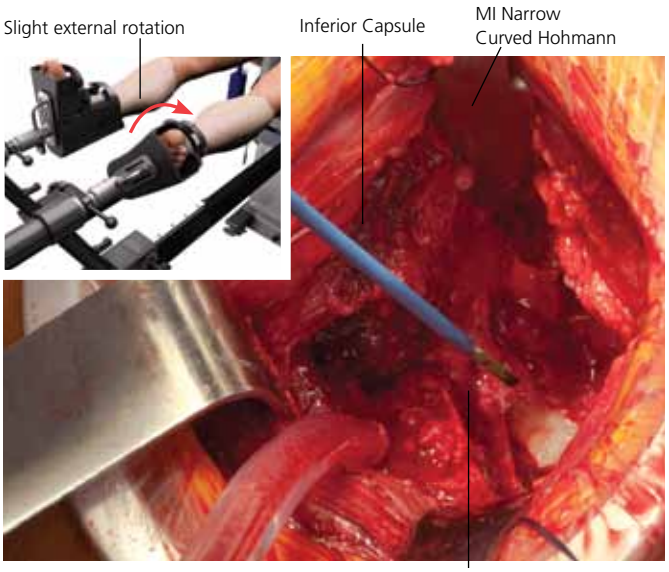


Figure 24

ACETABULAR REAMING

Begin reaming the acetabulum by aiming the reamer anterior to posterior, and proximal. Medialize with the reamer aimed medial and slightly posterior and superior (Figure 25). Sequentially ream in 1-2 mm increments. Check progress by visualizing the acetabulum and by checking with the C-Arm. Look for and control bleeding near the obturator foramen.

Before reaming to the final templated size, it is recommended that the reamer position be checked with fluoroscopy. Generally, the cup should be placed at the patient's anatomic center of rotation. Rotate the C-Arm image (A/P view) on the screen until the pelvis image appears level (when the transverse anatomic line is horizontal). With the image centered over the midline, the coccyx should be pointing right at the symphysis, and the obturator foramina should look identical. You may need to orbit and rainbow the C-Arm to accomplish this.

Figure 25

After leveling the image and pelvis, center the image over the operative acetabulum. The image of the reamer shows where the cup will be centered (Figure 26). The cup should have a good circumferential fit.

Tip: **A cup that is too large may lack purchase and an overhanging anterior edge may impinge on the iliopsoas tendon.**

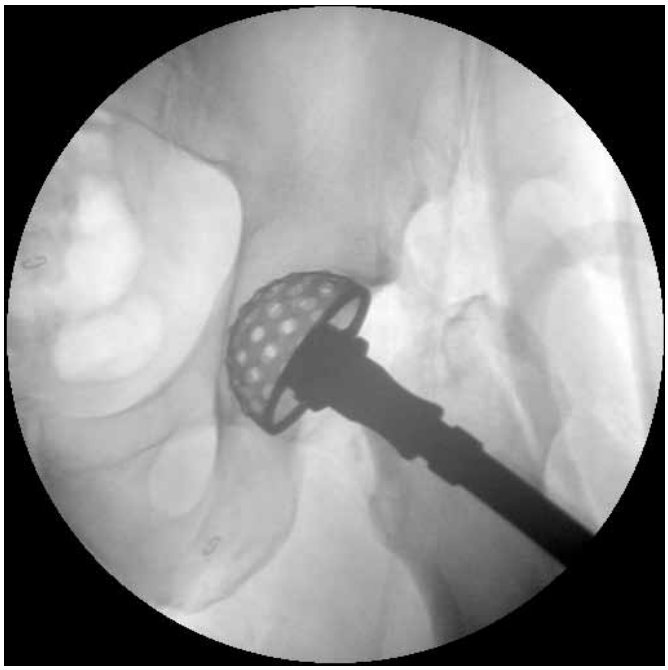


Figure 26

ACETABULAR REAMING

When you have reamed to the appropriate size, you can insert the PINNACLE® Trial or Cup (trial liner optional). After confirming alignment and position, remove the trial and insert the final prosthesis. For surgeons unaccustomed to the supine position, it is common to place the cup with too much inclination and anteversion. The correct insertion orientation is typically more parallel to the floor and long axis of the body than expected. Check for proper placement of the final component with the C-Arm. Aim for a targeted 40-45 degrees of inclination and 15-20 degrees of anteversion (Figure 27).

The angle and proportions of the image of the ellipse of the rim of the cup indicates inclination and anteversion.

Note: **See front pocket for transparency of an ellipse for comparison.**

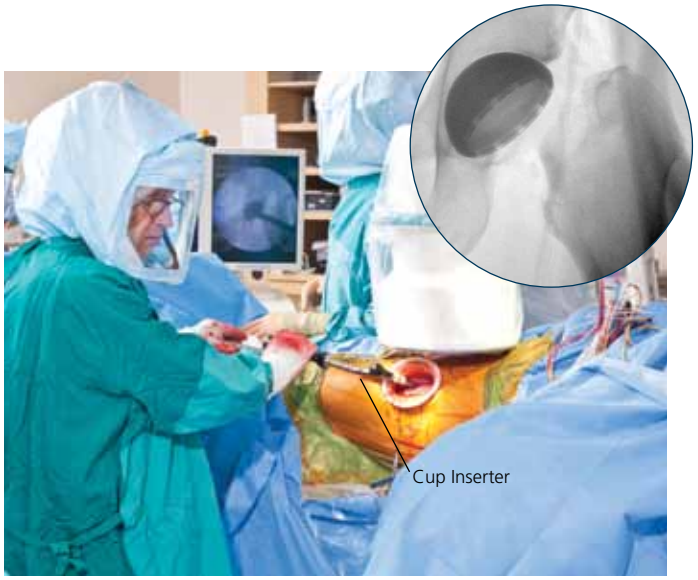


Figure 27

Place the final component into position and impact the Cup. Before inserting the Cup Liner, check the Acetabular Retractors. A Cobra Retractor should be placed over the mid-portion of the posterior rim. Detach the Cup and insert the Liner into the Cup, seating it into the Cup (Figure 28). Impact the Liner and perform a final check of the Cup and Liner placement under X-ray.

Figure 28

FEMORAL PREPARATION

Internally rotate the femur to the neutral position. Palpate the vastus tubercle, and place the tip of the bone hook (either the right or left, corresponding to the operative hip) just distal to the vastus tubercle and around the posterior femur (Figures 29 -30).

Do not force external rotation of the femur. Very forceful external rotation can cause a lower extremity fracture. If the patient is elderly and osteoporotic, it is often safest for the surgeon to grasp the foot boot with its overlying drape. The surgeon then applies extremity torque that he or she is comfortable with and the unscrubbed table operator locks the position. In many cases, initial femoral external rotation is short of 90 degrees, but subsequent soft tissue releases will allow 90 degrees of femoral external rotation.

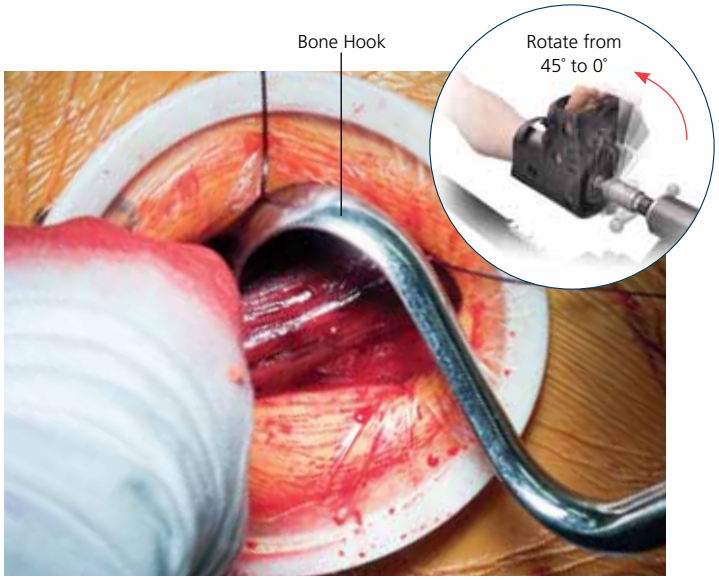


Figure 29

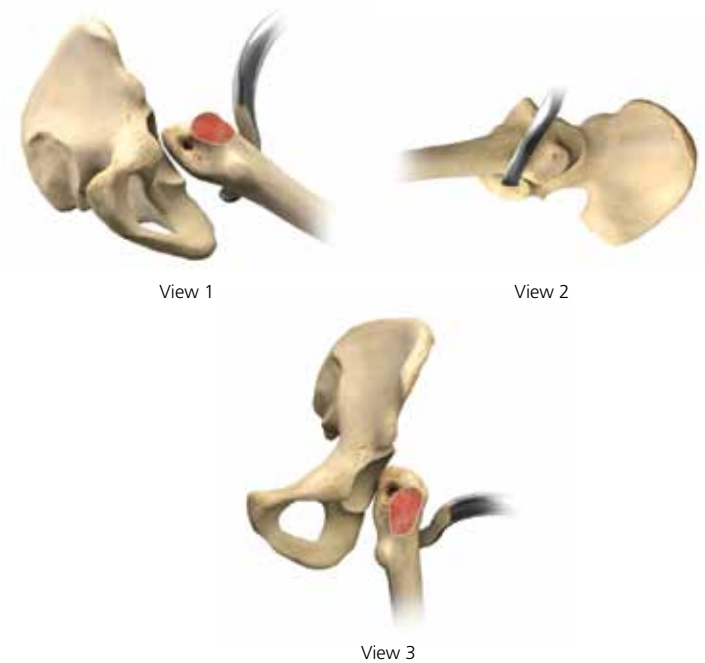


Figure 30

Lift up on the femur with the bone hook and pull laterally away from the acetabulum. From the table, unlock the gross traction – using no traction at this stage. Externally rotate the foot approximately 110-120 degrees, this will result with the femur rotating approximately 90 degrees. Lock the rotation wheel, unlock gross traction and extend and adduct the leg (Figure 31).

Foot EXTERNALLY rotated 110-120 degrees (Rotation of femur 90 degrees)

Figure 31

Place a Cobra or Muller Retractor (Cat. No. 2176-10-000) along the posterior cortex of the femur. Next, place a Trochanteric Retractor (Cat No. 2598-07-240) over the tip of the greater trochanter, and outside the hip capsule (Figure 32).

Place the bone hook into the bracket on the table and manually lift the Hook. Lift the femur and raise the jack to bring the bracket up to hold the Hook.

Note: **Use the table bracket as a shelf, not as a lift for the bone hook and femur.**

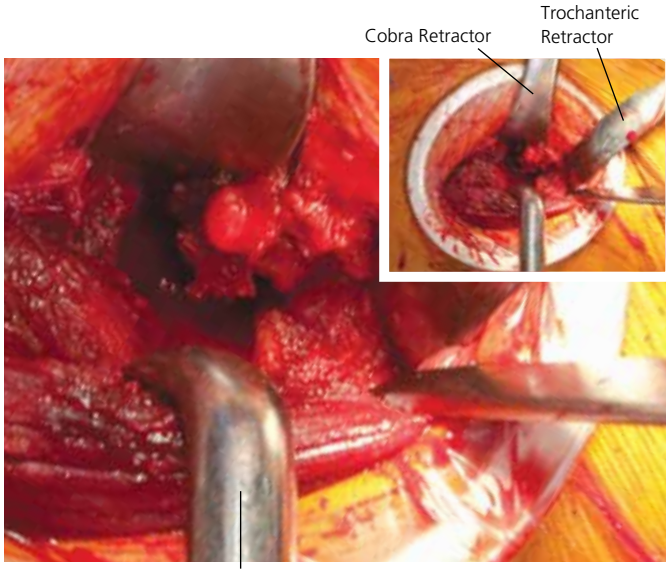


Figure 32

Detach the lateral capsule anterior to posterior from the inside of the greater trochanter, into the piriformis fossa. Pull up on the suture attached to the anterior capsule to facilitate this (Figure 33).

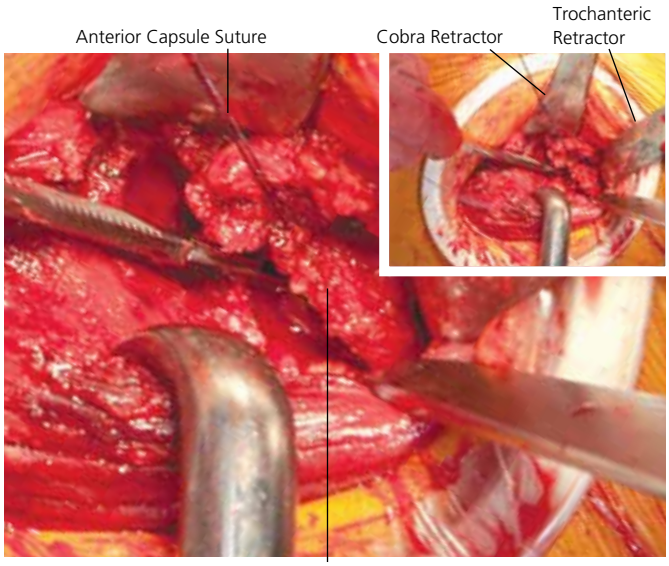


Figure 33

Cauterize the region of the retinacular vessels along the posterior superior neck. The piriformis and obturator internus tendons insert on the anterior portion of the greater trochanter. Typically, the piriformis tendon lies superior to the anterior greater trochanter. The obturator internus tendon typically lies medial to the tip of the greater trochanter. Further release of the capsule from the medial trochanter tip and partial or total release of the internus tendon provides full exposure of the medial trochanter tip and enhanced femoral mobility

At this point you will see some fibers of the capsule and may see some of the obturator internus tendon. If you need to see more of the inside of the greater trochanter, incise along the inner surface of the greater trochanter to enhance visualization (Figure 34).

A manual lateral and anterior pull on the Bone Hook (after soft tissue release) can give further femoral exposure. This position is maintained by raising the hook bracket. At this point, further femoral rotation, if necessary, may be possible. The strong insertion of the obturator externus tendon is seen in the piriformis fossa and should be preserved. The obturator externus pulls the femur in a medial direction and thereby has an important anti-dislocation function.

Use a Long-Handled Rongeur (Cat. No. 2598-07-690), to remove the lateral neck remnant and if necessary, to get more lateral into the inside of the greater trochanter (Figure 35).

Figure 34

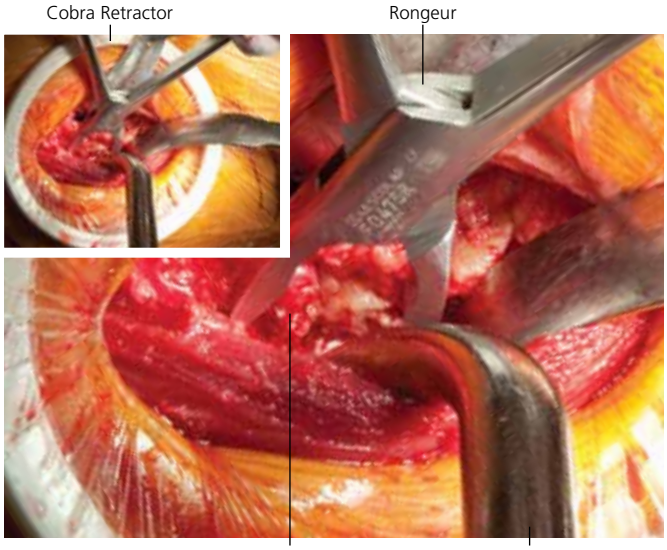


Figure 35

FEMORAL BROACHING AND TRIALING

BROACHING

Start the CORAIL® Total Hip System broach insertion near the calcar, by pushing the smallest size compaction broach by hand (Figure 36).

Orient the broach such that the plane of the broach is parallel to the posterior cortex. Sequentially broach to the proper size with the broach attached to the selected broach handle. This will progressively enlarge the metaphyseal cavity by compacting and shaping the cancellous bone until the level of the neck resection is reached. Check the depth of broach insertion in relation to the tip of the greater trochanter and match this to the templated pre-operative plan.

Broaching should continue until complete stability is achieved with the last size broach used without reaching cortical contact in the femoral canal, ensuring cancellous bone preservation. The size of each CORAIL broach is the same as the corresponding implant without the 155µ thick HA (hydroxyapatite) coating.

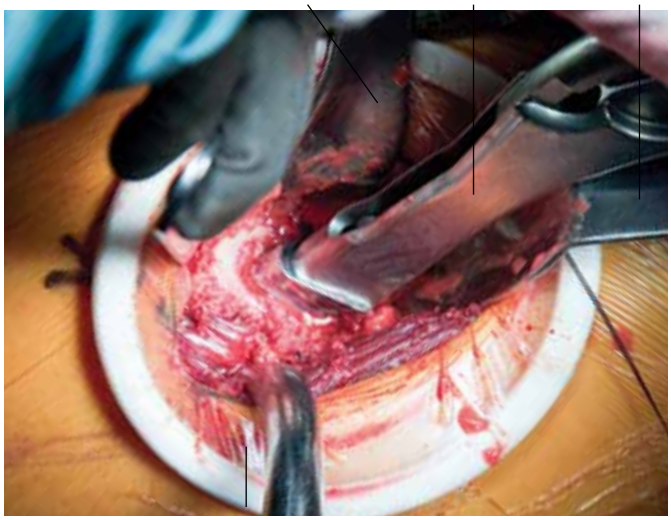


Figure 36

Tip: **If you impact a broach and it does not fully seat in the canal, it is recommended that you go back to the previous size broach and re-establish the broach envelope of cancellous bone to accept the smaller size implant. The CORAIL implant's design allows you to go back to the smaller size if needed.**

TRIALING

Place the appropriate trial neck and head onto the broach (Figure 37). Lower the bracket and take out the retractors and femoral hook. Use the table to bring the leg back to neutral position. Pull back on the gross traction and internally rotate the leg to reduce the hip.

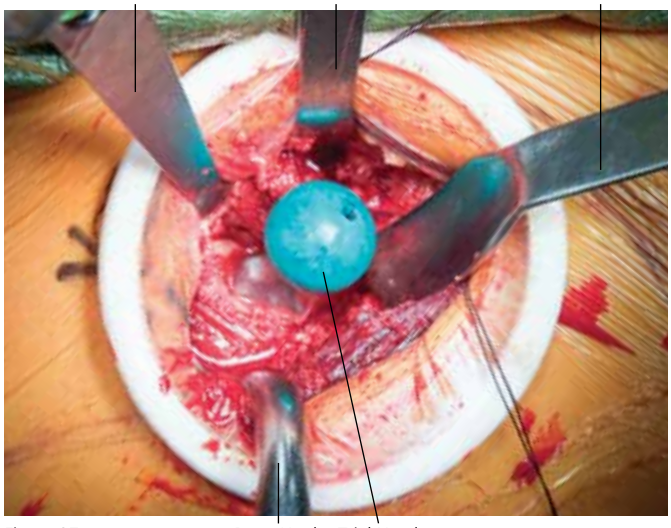


Figure 37

FEMORAL TRIALING

Check the leg length and offset with the X-ray. Position the hips identically to get accurate comparison views. The table is very helpful for making and holding small adjustments of abduction and rotation to maximize the accuracy of comparison X-rays. Take an X-ray of the non-operative hip to be used as a control. Then take a picture of the operative hip for comparison (Figure 38).

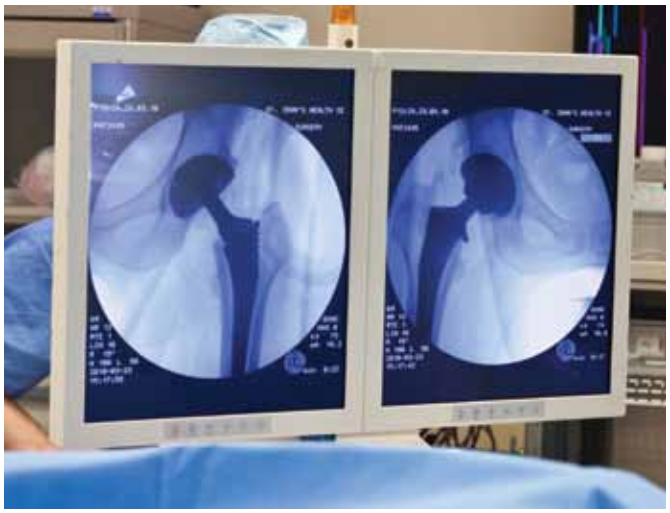


Figure 38

With the two prints, check femoral offset and leg length by overlaying the X-rays (Figure 39).

Tip: **Take a distal X-ray to check stem direction and correct sizing in the canal.**

Figure 39

FINAL IMPLANTATION

Return the femur to the preparation position (dislocate, externally rotate, extend and adduct). Re-establish the femoral exposure with the retractors and elevate the femur with the bone hook. If the trial reduction was satisfactory, with good broach size and position, and accurate length and offset, then plane the calcar. Place the MI Calcar Planer (assemble Shaft 2570-04-500, and Mill Disc-2001-47-000 Small, 2001-48-000 Medium, or 2001-49-000 Large) onto the broach trunion and mill the calcar to the broach face, allowing the implant collar (if used) to seat flush against the calcar. Make certain the calcar planer is rotating before engaging the calcar to prevent the planer from binding on the calcar.

If during trial reduction, it was determined that adjustments were needed, make the necessary adjustments to correct broach size, inserter depth, neck length or offset. Significant adjustments should be checked with another trial.

Place the final CORAIL implant by hand into the prepared canal until 1-2 cm of HA coating is visible.

Impact the stem with light blows until it is seated using the Anterior Inserter (Cat. Nos. 2598-07-460, Modular Inserter Handle, and 2598-07-440, CORAIL/TRI-LOCK Bone Preservation Stem Anterior Inserter Shaft). Place the final head onto the stem and impact. Using the hana table, complete the final reduction (Figure 40).

Take a final X-ray and perform wound closure by tying the two sutures together and irrigating out. Close the fascia, subcutaneous tissue and skin (Figure 41).

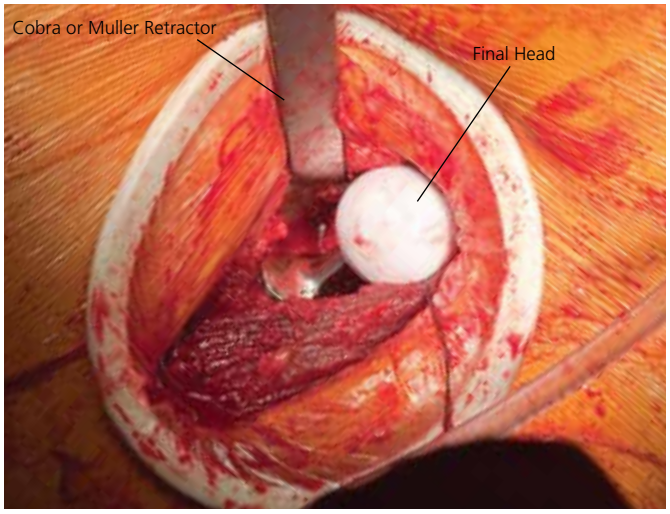


Figure 40


Figure 41

HINTS AND TIPS

CORAIL Tips

- The use of the collared CORAIL stem can help control for subsidence, especially in Type C bone.
- The CORAIL is a cancellous impaction broach and stem, and it does not fit and fill. You should not have to use aggressive mallet blows to seat the broach or the stem, wrist motion is usually sufficient. Be particularly careful in Type A bone where the cancellous bone is usually dense, and do not try to force too large of a size in this type of bone.

Approach Tips

- For your first Anterior Approach cases, select your patients carefully. The most difficult patients are the heavy, muscular males that have short femoral necks, or morbidly obese patients. As you become more comfortable with the technique, you will find that you can expand your patient selection. Many surgeons use the Anterior Approach on all patients, once they are through the initial learning curve.
- Orthopaedic surgeons are accustomed to palpating bone, cutting to the bone and following it. The Anterior Approach may produce some initial unfamiliarity because it is more of a pure soft tissue approach and relies on recognition of soft tissue landmarks.
- Be meticulous with exposure of the lateral neck/top of the trochanter. It improves access to the femur and makes it easier to avoid varus implant placement.
- Early in the learning curve, the main difficulty is mobilization of the femur. Some surgeons recommend excising the anterior capsule, which may help with a large patient. Some surgeons will do this routinely and it may help early in the learning curve.
- Some surgeons start the case with the hip in slight flexion, which can help to relax the rectus.

Incision Tips

- For the surgeon unfamiliar with the approach, the incision will appear more lateral than expected. The incision should go over the belly of the tensor fascia lata muscle and lateral to the interval between the tensor and sartorius. This preserves the lateral cutaneous nerve of the thigh and allows access inside the tensor sheath. If you are too medial to the tensor sheath, there is the potential for damage due to muscle enervation. If you are too lateral, the operation can still be performed through a different interval. The tensor may be split, which is an approach used by Keggi. The Watson-Jones interval is further lateral and posterior to the tensor.
- If the incision is too distal, the first Cobra may not be placed correctly. You should be able to feel the anterior innominate bone through the incision, and this generally requires that the proximal incision cross the groin crease. To find the superior lateral neck for the first retractor placement, feel with your finger as you dissect the medial border of the tensor off its sheath proximally until you can feel the anterior border of the bone. Follow it deep until you feel the superior neck, and place the cobra here.
- Make sure the lateral circumflex vessels are cauterized during the approach.

Dislocation Tips

- Excise the anterior hip capsule in a trapezoidal shape, with the wide part of the trapezoid along the femoral inner trochanteric line and the narrow part at the acetabular rim.
- With the hip skid, start superiorly between the roof and the head. Generally, four turns of traction are needed. The next step is to re-insert the skid between the anterior wall and the head, and take off two turns of traction to relax the anterior structures. Use a curved osteotome or a long, curved scissor to sever the ligamentum if you experience difficulty placing the hip skid.
- Posterior capsule release followed by an internus and piriformis release will expose most hips.
- Externus releases are rarely needed, and are difficult because of the intimate contact with the fossa and posterior bone.

Neck Cut Tips

- Cutting the neck from anterior to posterior introduces the possibility of the saw inadvertently cutting the posterior greater trochanter. Guard against this by aiming the saw somewhat medial and cutting the calcar area first. Next, cut only the anterior neck more lateral and finally cut the lateral shoulder of the neck with an osteotome in a posterior and medial direction. A small bridge of the bone in the posterior neck near the greater trochanter may be left uncut but it will fracture and the spike left can easily be trimmed later.
- It is difficult with the Anterior Approach to re-cut the neck. With other techniques, you may have learned that if the neck cut is long, you can always come back. With the Anterior Approach, a long neck cut will challenge you the rest of the case, making it difficult to get reamers and the cup into the acetabulum. Take your time, cut the neck at the right length the first time through, which means you must know where the inferior trochanter is before the osteotomy.
- While cutting the neck, take care not to cut the greater trochanter, which is a posterior structure. If the hip is slightly externally rotated, it can endanger the trochanter when the saw comes through the posterior cortex. Some surgeons finish the superior lateral cut with the osteotome to protect against cutting the trochanter.
- To help avoid fracture of the greater trochanter, some surgeons release the capsule when extended, and rotate the femur to mobilize better for rotation and elevation before releasing external rotators.
- Once the hip is dislocated anteriorly, you can use a small Hohmann to retract the vastus lateralis from the calcar and then release the inferior medial capsule from the neck. With the corkscrew still in place and the hip dislocated anteriorly, perform a sub-capital femoral neck resection with a long, narrow saw blade.
- Because the corkscrew is still attached to the head and the head is anterior, you simply remove the head and internally rotate the hip to about 30 degrees of external rotation. Next, complete the neck cut and remove the remaining neck segment at the desired level of neck resection.

Head Removal Tips

- Some surgeons remove the head with a segmental cut in the femoral neck without dislocating the hip.
- When removing the head, use a Hibbs retractor and a Cobra to protect the tensor from the sharp, cut edge of the neck.

Acetabular Preparation Tips

- When reaming, keep traction on, with the leg externally rotated about 60 degrees to help keep the femoral neck out of the way.
- If you are having difficulty getting the acetabular reamers into the acetabulum, make sure the femoral neck cut is not too long.
- Be careful reaming the acetabulum, as the tendency is to ream too anteriorly. You can reduce anterior retractor tension when inserting reamer, and during reaming, to allow centralization of reamer and avoid preferential anterior reaming.
- If needed, you can place the reamer into the acetabulum, and then attach the power.

Cup Insertion Tips

- Cup insertion is straightforward, and it is recommended that you use fluoroscopy, starting with a true A/P pelvis view to verify your landmarks.
- Most of the errors in positioning the acetabular component are placing it too abducted and too anteverted. After proper placement, the correctly positioned acetabulum will often appear in the wound to be more horizontal and less anteverted than expected. This effect is accentuated if the patient's lumbar lordosis increases when supine under anesthesia on the orthopaedic table, as is often the case. An increase in lordosis is easily identified with an image view of the obturator foramina showing a decreasing superior-inferior dimension.

Femoral Preparation Tips

- Some surgeons recommend incising the piriformis to expose the femur and get to the true piriformis fossa for the starting point into the femur.
- Access to the femur requires patience and a stepwise approach. Many surgeons release the capsule from the medial femoral neck after dislocating the head. If you choose to not dislocate and cut the neck in situ, this capsular release can be performed after head removal and with the femur externally rotated. Release the band of capsule just inferior to the acetabulum. The femur is placed in the preparation position with the table with successive external rotation (approximately 120 degrees), hyperextension, adduction, and proximal elevation with the hook. First, the lateral capsule is released from the lateral neck remnant and medial greater trochanter, which is typically enough to allow the femur to displace lateral and anterior. The bone hook is progressively raised as the femur mobility allows. Do not force the bone hook up, because it will risk a fracture of the greater trochanter.
- If further femoral displacement is needed you can progressively release the tendons of the obturator internus, piriformis, and obturator externus. An obturator externus tendon release is rarely necessary and is least desirable because it has the most medial anti-dislocation pull on the femur. At times the femur will not initially rotate externally to 90 degrees but will after release of the lateral capsule.
- The femoral elevation hook should not be thought of as a strong traction device. The hook is a support that keeps the femur from falling posterior from a position that you can manually create by pulling on the hook. Feel the tension on the hook and make sure that you can still manually lift the femur a little higher than the hook supports it.
- Ensure that all traction is off the operative leg before placing it in extension and external rotation.
- Do not force the proximal femur up if it resists. Instead, release the posterior superior capsule, and try to pull the femur away from the acetabulum. The posterior part of the greater trochanter tends to get caught on the posterior rim of the acetabulum. If you try to force it up, you will risk fracture of the trochanter.
- You can enter the femoral canal with a Kuntcher Awl or the Canal Finder (Cat. No 9400-80-001). It has just the right bend and gets the entry in the right alignment under fluoro. It has helped some surgeons when they first started on the learning curve and may help avoid violation of the canal.

Femoral Broaching Tips

- Broaching is straightforward, but be cautious of a patient with a flexion contracture, as the femur may be sitting straight out instead of down, and you can broach out the back of the femur if you are not careful.
- Femoral anteversion is judged by palpation of the patella and visualization of the neck cut. The plane of the broach should be roughly parallel to the plane of the posterior neck cortex. Most femurs have very little anatomic anteversion.
- The broach handle should be up against the patient's side to avoid having the broach perforate the posterior part of the proximal femur.

C-Arm Tips

- The purpose of the image intensifier is to enhance the accuracy of the cup placement and femoral length and offset compared to standard techniques. Use your standard cues for orientation of the acetabular component and use the image as your check. Place the femoral trial according to the pre-operative template and intra-operative bony landmarks (greater and lesser trochanter) and then make a check with the C-Arm.
- Capture a true A/P pelvis view and note how many degrees of orbit are present. Once the acetabular component is impacted, view the hip using continuous fluoro while orbiting the fluoro laterally. When the posterior rim of the acetabular component is superimposed on the anterior rim of the shell lock the orbit. Note how many degrees of orbit are present. This number minus the initial number from the A/P will be the anteversion angle of the cup. It is very important to start the procedure with a balanced pelvis where the coccyx lines up with the symphysis pubis.
- Check your stem version with the femur as the reference. Using the final broach as your guide, reduce the hip and balance the pelvis under fluoro to assure the center of the coccyx is in line with the symphysis. Orbit the fluoro beam to obtain an A/P of the hip and proximal femur. Using continuous fluoro, unlock the table rotation, manipulate the operative leg at the knee or foot while viewing the image screen. When rotating from external to internal you will observe the femoral stems anterior surface is at its maximum medial to lateral diameter (when using a tapered stem) and relative foot position. If the foot is externally rotated, then your stem is retroverted. If the foot is internally rotated 10 to 15 degrees, then your stem is well-rotated. If, however, you have the foot extremely internally rotated, then your femoral stem is excessively anteverted.

Stability Checking Tips

- Check hip stability with 60 degrees of external rotation and 50-60 degrees of extension.
- Take the boot out of the spar, grasp the foot with the sterile drapes that are covering it and put the leg in a ROM test, and/ or your preferred checks.

Retractor Tips

- Use a Sorrel Retractor (2598-07-210) placed over a lap sponge over the tensor muscle and attach it to a weight (2598-07-230). It obviates the need for an assistant to retract the tensor posteriorly with a Hibbs retractor.
- The long-handled Cobras are good for obese patients and allow the hands of the assistant to be out of the way while broaching.
- Take care when using the anterior acetabulum retractor – do not use a long pointed tip, and stay on the bone to avoid injury to the femoral nerve.

PREVENTING INFECTION IN OBESE PATIENTS

Joel Matta, M.D.

There has been concern expressed regarding the possibility of wound infection for obese patients undergoing Anterior Total Hip Arthroplasty (ATHA). I will give my thoughts which may be useful because my personal series documents only one deep infection in over 1350 primaries. This patient was not particularly obese but had psoriatic arthritis with skin lesions adjacent to the operative site.

Obesity by itself is of course an infection risk because of the thick, poorly vascularized sub-cutaneous layer. Posterior and lateral approaches with their fat layer - thicker than anterior - certainly pose their own risks. The major concern and observed problem from anterior, however, has been an overhanging pannus with a deep skin crease.

Surgery should not be performed, particularly ATHA, if the skin fold has observed inflammation, skin breakdown, or evidence of fungal infection. "Goopy stuff" in the fold and redness are obvious warning flags. I have had patients that needed a dermatologic consult pre-op. This led to topical medications and dressing material in the fold.

I think prepping and draping methodically and carefully is very important. In extreme cases the abdomen can be taped toward the opposite side. Assuming the skin is clean and in good condition, I shave local and adjacent pubic hair. The main goal is to have adhesive vinyl drapes that stick and remain stuck during the prep and throughout the procedure.

I don't think that vinyl drape application is as simple as it seems to many in the OR and I harp on the details of this to nurses and assistants. Another principle is that making your drape border far from the wound edges enhances sterility because there is less likelihood that unsticking of the drapes will make a window to surrounding unsterile areas. I make an outline of tincture of benzoin where the sticky edge drapes. Allow the benzoin to dry prior to vinyl border drape application. Proximal this outline is above or at the iliac crest and distal at mid thigh, and posterior, posterior to the greater trochanter by 7 to 10 cm. The medial border should be as medial as possible without being deep in the skin crease between the pubic prominence and the thigh.

I find if the medial drape is too medial it is very difficult to keep it firmly attached during the prep. When the border vinyl drapes are placed on the benzoin border they should not be placed under tension. If anything, place the skin under slight tension so that the vinyl edge will sit down and in the concavities and folds and stay there. The biggest problem I see is that the person applying pulls the vinyl drape and it does not go into and firmly attach to the depths of the concavities and folds. No tension during application! The prepping must also not create detachment of the vinyl drape border.

Once the vinyl drape border is established I don't let the subsequent drapes make the exposed surgical area smaller. After placing some sheets above and below, I staple towels to the skin along the vinyl border and then apply split sheets above and below. The splits are not placed on the skin but on the bordering towels and leave a small margin of the towel border visible.

The most important step follows, which is getting the Betadine® impregnated skin vi drape properly applied. The prepped area must be dry. Again don't stretch the drape, stretch the skin. An assistant needs to pull the pannus proximally to flatten out the fold as much as possible. The vi drape is then patted first into the concavities and then outward over the convexities. At the completion the vi drape if applied properly should look wrinkled not tense and smooth. If pulled under tension, it will pull away from the concavities during the case and open the widow to unsterile areas. You may need a bigger vi drape than you think because of stretching out the skin and following the concavities of the obese. If there are air bubbles under the vi drape, puncture them. Don't "walk them to the side" with your fingers. When you do this you unstick and restick areas of the vinyl making it lose some of its adhesiveness which makes it more likely to detach during the surgery and open a window to groin or other bacteria.

Probably my details, like the towel border and U drapes, are individual to my routine and not essential. However, a firmly attached border with benzoin and maintaining intimate vi drape attachment during the surgery is essential. An additional benefit of this technique is that the vi drape usually turns the fold into a more gentle concavity and helps hold the pannus up.

Begin the incision lateral enough and you will usually avoid the worst of the pannus fold. Usually my incision is not longer than 10 cm, but make it as long as necessary. I prefer the Protractor because it helps protect the skin and sub cut. Like any other surgery, being gentle with soft tissues and hemostasis is important in preventing infection. I have started using the Tissue Link AquaMantis which I think helps down in corners and hard to reach bleeders. I think it helps with capsule bleeding. Get adequate femoral mobilization so that the tensor doesn't get ripped. Femoral mobilization combined with adequate incision length will also limit broach and handle trauma to the tissues.

Deep and sub cut drains are optional according to preference and bleeding at the end. After closing the fascia, I like to put only one running layer of 2-0 in the sub cut. I don't like to try to approximate the dermis at this point because the wound tends to split sub cut sutures that are very superficial. For the sub cut I think that usually less is better because a lot of suture just crushes the fat leading to drainage. I then prefer a running sub cut that is resorbable. Secure the suture ends well with benzoin and Steri-Strips™ pinching the free ends of the suture. Dermabond® is the last layer, then a dressing after the Dermabond dries.

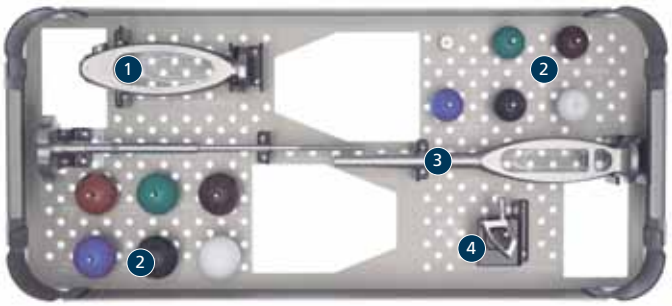
After surgery, it is probably best to keep a dressing in the skin fold to help prevent maceration. Do not allow the nurses to place tape on the Steri-Strips or the tape will pull them off.

I think that some obese patients will inevitably get some proximal wound maceration and the skin may open some in this area but the problem seems to remain superficial and it gradually heals. If the wound opens a little in this area, I do not try to close it.

No tubs or swimming pool (just showers) for the first 2 weeks and possibly longer if there is a wound problem.

ORDERING INFORMATION

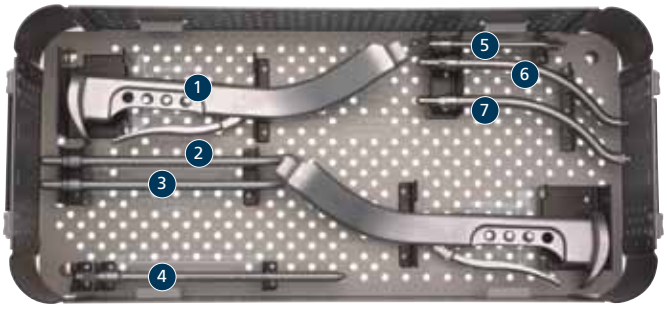
TSS Core Case 1		
1.	2598-07-460	Universal Stem Insert Handle
2.		Trial Heads – Two Sets Per Case
3.	2598-07-570	Retaining Stem Inserter (2 pcs)
4.	2598-07-530	Modular Box Osteotome



Insert

1. Any two handles:

2570-00-000	SUMMIT® Universal Broach Handle
9522-10-500F	CORAIL AMT Straight Broach Handle
9522-11-500	CORAIL AMT Curved Broach Handle
2598-07-540	Long Posterior Broach Handle
2001-97-000	Optional Version Control Rod (for Posterior Broach Handle)
2598-07-550	Extra Curved Broach Handle
2598-07-350	Anterior Broach Handle - Left
2598-07-360	Anterior Broach Handle - Right



Base

2.	2598-07-470	CORAIL/TRI-LOCK Posterior Stem Insert Shaft
3.	2598-07-480	SUMMIT Posterior Stem Insert Shaft
4.	2598-07-435	Bullet Tip Stem Insert Shaft
5.	2598-07-430	Standard Straight Stem Insert Shaft
6.	2598-07-450	SUMMIT Anterior Stem Insert Shaft
7.	2598-07-440	CORAIL/TRI-LOCK Anterior Stem Insert Shaft

2598-07-390	Tissue Sparing Femoral Core Case 1 Complete
2598-07-410	Lid
2598-07-411	Insert
2598-07-400	Base

Modular Box Osteotome 2598-07-530

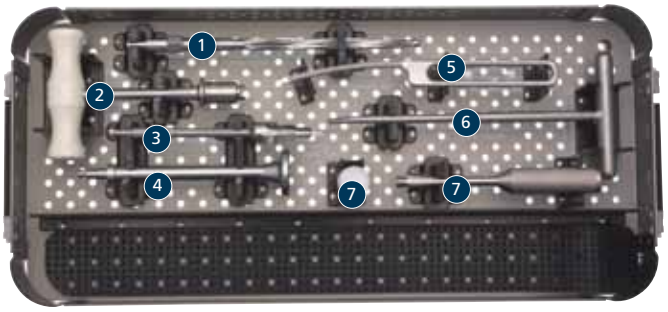
Dual Offset Anterior Approach Broach Handle
Left 2598-07-350, Right 2598-07-360

Extra-Curved Broach Handle 2598-07-550
Suitable for multiple surgical approaches.

Other broach handle options:	
2570-00-000	SUMMIT Universal Broach Handle
9522-10-500F	CORAIL AMT Straight Broach Handle
9522-11-500	CORAIL AMT Curved Broach Handle

Technique-specific femoral component inserters:	
2598-07-460	Universal Stem Inserter Handle
2598-07-440	CORAIL/TRI-LOCK Bone Preservation Stem Anterior Inserter Shaft
2598-07-450	SUMMIT Anterior Inserter Shaft
2598-07-430	Standard Straight Inserter Shaft
2598-07-470	CORAIL/TRI-LOCK Bone Preservation Stem Posterior Inserter Shaft
2598-07-480	SUMMIT Posterior Inserter Shaft
2598-07-435	Bullet Tip Inserter Shaft

TSS Core Case 2	
1.	2354-10-000 Muller Awl Reamer w/Hudson End
2.	2001-42-000 Excel T-Handle
3.	2001-80-501 IM Initiator Sized
4.	9400-80-007 MI Calcar Reamer Small (Shielded)
5.	85-3927 Femoral Rasp
6.	9400-80-001 Canal Finder
7.	2001-65-000 Femoral/Humeral Head Impactor



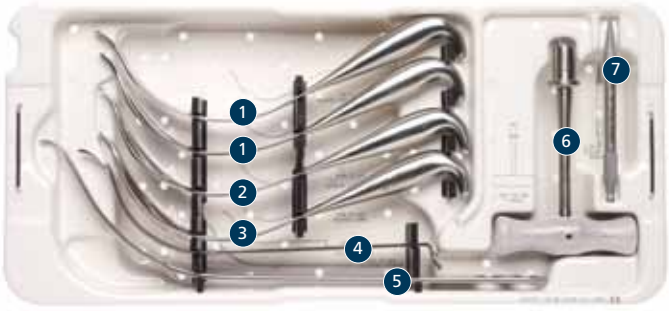
2598-07-420	Tissue Sparing Femoral Core Case 2 Complete
2598-07-422	Lid
2598-07-421	Base

Optional Replacement Part:	
2001-66-000	Replacement Tip for Femoral Head Impactor

Calcar Planer	
2570-04-500	MI Calcar Reamer Shaft
2001-47-000	Calcar Mill Discs – Small
2001-48-000	Calcar Mill Discs – Medium
2001-49-000	Calcar Mill Discs – Large

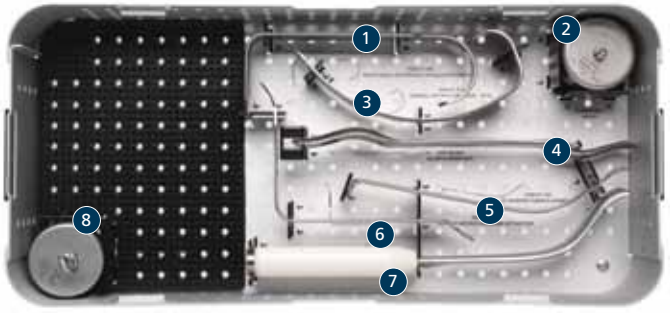
Anterior Approach Instrumentation

1.	37-4106	Blunted Serrated Cobra (2)
2.	2598-07-200	MI 2-Incision Sharp Cobra (Serrated Point)
3.	2598-07-260	Blunted Cobra
4.	2598-07-240	Single Prong Soft Tissue Retractor
5.	2181-10-000	Hohmann Retractor Narrow/Curved (120 degree)
6.	2001-42-000	Excel T-Handle
7.	2125-00-600	Modular Head Ball Remover



Insert

1.	2598-07-180	Right Angle Posterior Capsular Retractor (Hibbs)
2.	2598-07-230	Sorrel Retractor Weight 2lbs
3.	32598-07-210	Sorrel Incision Retractor Blade Wide
4.	2004-00-000	Murphy Bone Skid
5.	2598-07-190	MI Narrow Curved Hohmann
6.	2598-07-110	MI Gluteus Medius Retractor (Right Angle Hohmann)
7.	2176-10-000	Muller Type Retractor
8.	2598-07-220	Sorrel Retractor Weight 2.5 lbs



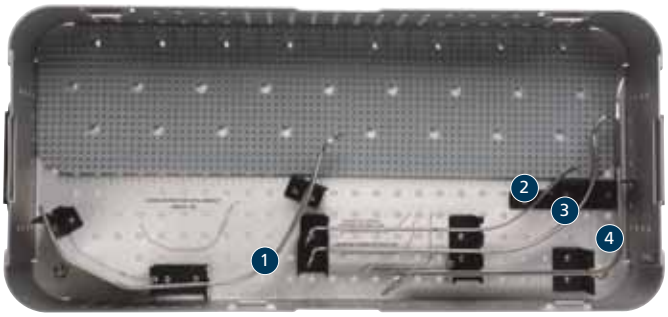
Base

2598-07-310	Anterior Approach Case Complete
2598-07-320	Lid
2598-07-340	Insert
2598-07-330	Base

MI Retractor Kit		
1.	2598-07-650	MI XL Femoral Neck Elevator
2.	2598-07-625	Inferior Posterior Capsular Retractor Right
3.	2598-07-626	Inferior Posterior Capsular Retractor Left
4.	2598-07-180	Right Angle Posterior Capsular Retractor
5.	2598-07-120	Blunt Right Angle Posterior Capsular Retractor
6.	2598-07-150	Sciatic Nerve Retractor
7.	2598-07-140	Superior Capsular Retractor
8.	2598-07-170	Anterior Hohmann

Insert

1.	2598-07-130	MI Cobra Retractor with Armrest
2.	2598-07-190	MI Narrow Curved Hohmann
3.	2598-07-160	MI Narrow Cobra
4.	2598-07-110	MI Gluteus Medius Retractor (Right Angle Hohmann)

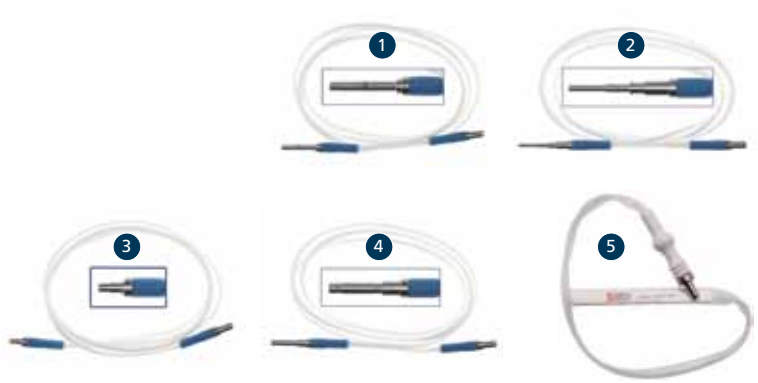


Base

2598-07-500	MI Retractor Case Complete
2598-07-520	Lid
2598-07-515	Insert
2598-07-510	Base

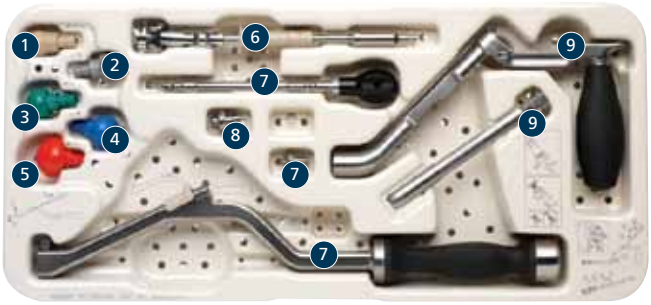
Lighted Retractors

1.	2598-07-940	Cable with Olympus Adaptor
2.	2598-07-930	Cable with Storz Adaptor
3.	2598-07-910	Cable with ACMI Adaptor
4.	2598-07-920	Cable with Wolf Adaptor
5.	2598-07-900	Lightstrips (Package of 5)



MAcS Acetabular Set

1.	9200-10-024	Impactor Tip 22.225 mm
2.	9200-10-025	Impactor Tip 26 mm
3.	9200-10-026	Impactor Tip 28 mm
4.	9200-10-027	Impactor Tip 32 mm
5.	9200-10-028	Impactor Tip 36 mm
6.	2598-08-160	Angled Drive Shaft Dual Coupling
7.	9200-10-029	Angled Acetabular Inserter
8.	9200-10-023	Bantam Adaptor
9.	2598-08-150	Angled Reamer Driver Housing Assembly
	9200-10-017	**MAcS Case Complete**



Inserter Replacement Parts (not shown):

9200-10-088	Spring
9200-10-089	Button
9200-10-091	Lock Catch
9200-10-093	Standard Adapter

Optional Impactor Tips (not shown):

2217-50-060	Impactor Tip 40 mm
2217-50-061	Impactor Tip 44 mm
2217-50-062	Impactor Tip 48 mm

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.

Intended Use/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.

Porous-coated Pinnacle Acetabular Cups are indicated for cementless applications. Self-Centering Hip Prostheses and Hemi-Hip Prostheses are intended to be used for hemi-hip arthroplasty where there is evidence of a satisfactory natural acetabulum and sufficient femoral bone to seat and support the femoral stem.

The Cathcart is not intended for use in total hip arthroplasty.

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; nonunion 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 without inner titanium sleeves are contraindicated in revision surgery when the femoral stem is well fixed and is not being replaced.

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, wear or fracture of components, dislocation, infection, peripheral neuropathies, tissue reaction.

Limited Warranty and Disclaimer: DePuy Synthes Joint Reconstruction products are sold with a limited warranty to the original purchaser against defects in workmanship and materials. Any other express or implied warranties, including warranties of merchantability or fitness, are hereby disclaimed.

WARNING: In the USA, this product has labeling limitations. See package insert for complete information.

CAUTION: USA Law restricts these devices to sale by or on the order of a physician.

Not all products are currently available in all markets.

DePuy Synthes JOINT RECONSTRUCTION *People inspired*™

COMPANIES OF Johnson & Johnson

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