Technique of Anterior Approach Total Hip Replacement using the Innomed Das/Seng Instrumentation

By Amal Das, MD
& Brian Send, MD

Video technique available to on VuMedi at: https://www.vumedi.com/video/dr-amal-das-anterior-approach-total-hip-arthrosplasty-final/

The Das/Seng Anterior Total Hip Instruments include:

The Innomed Das/Seng Anterior Approach instrument set includes the table mounted, controlled–release ratcheting hook hoist, allowing anterior approach hip replacement to be done using a standard OR table rather than a special traction. It allows for the direct measurement of leg lengths as well as evaluation of hip stability. The instruments are conveniently numbered according to the order of their use. All this greatly decreases the complexity of anterior approach total hip replacement. This system was designed with the surgeon experienced with the posterior or lateral approach wishing to learn the anterior approach in mind. Surgical tips and tricks are given in this technique guide to aid in direct visualization of the acetabulum and proximal femur to make it more like what the experienced posterior or lateral approach surgeon is used to.

The procedure has four phases:
Instruments required for each step

1) Exposure of the hip joint
   Retractors #1, 2 and 3.
2) Removal of the femoral head
   Retractors #1, 2 and 3.
3) Acetabular exposure, reaming and cup insertion
   Retractors #1, 2 and 3.
4) Femoral broaching and stem insertion
   Instruments #4and 5, and Retractors #6 and 7.

Prior to starting the procedure, place the patient supine on a radiolucent OR table which has the capacity to be jack-knifed such that the legs may be flexed 30° and the table placed in Trendelenburg. The patient is positioned on the bed so that the symphysis pubis is placed at the level of the break in the table. The table must allow for the C-arm to be passed beneath the table to get an AP view of the hip. Ideally there are four people scrubbed including:

1) The surgeon positioned on the operative side inferior to the hip.
2) The scrub technician manning the instrument tables.
3) The first assistant positioned on the operative side superior to the hip.
4) The second assistant positioned on the nonoperative side.


Figure 1

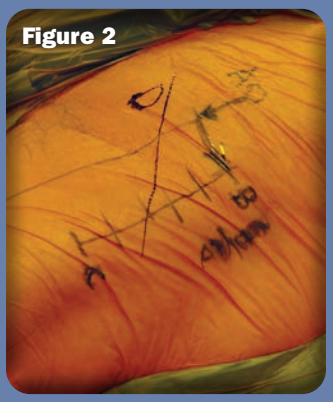


Figure 2


Figure 3

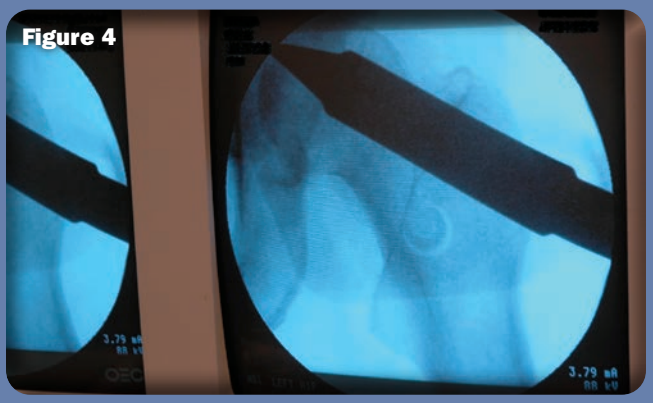


Figure 4

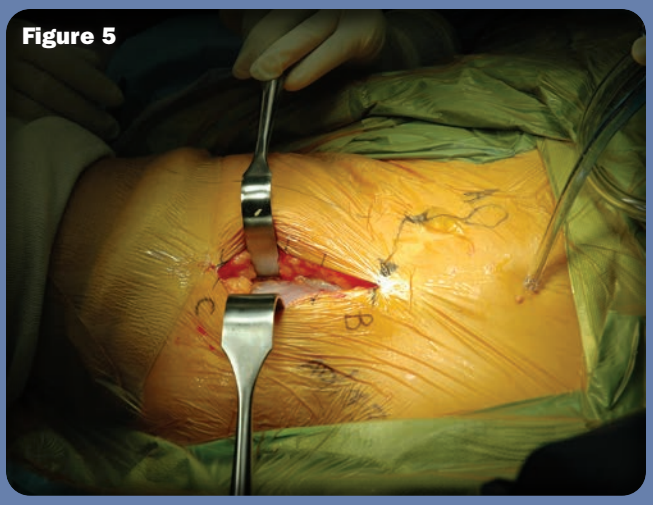


Figure 5

Phase 1.
Exposure of the hip joint.

Draw the skin incision as follows:

1. Mark the anterior superior iliac spine (labeled “A” on **Figure 1**).
2. Draw a line from the center of the patella up to the anterior superior iliac spine. All dissection should be kept lateral to this line in order to avoid the neurovascular structures (femoral vein, artery and nerve listed from medial to lateral). The femoral nerve, the lateral most structure, is the most vulnerable.
3. Mark a point 4 cm distal and 4 cm lateral to the anterior superior iliac spine. It is labeled “B” on **Figure 2**.

4) Mark a point 10 cm distal to point point B. It is labeled “C” on **Figure 2**. Draw a line from point B to point C. This will be the skin incision.

5) To be sure your skin incision line is not too far distal, which is a common error making acetabular visualization poor, check it by putting a retractor over the femoral neck as visualized by an AP C-arm image (**Figure 3 and 4**). Draw a line on the skin where the femoral neck is (labeled D on **Figure 2**). It should intersect the distal aspect of the skin incision. (See also the VuMedi video by myself (Amal Das) on anterior approach THA at https://www.vumedi.com/search/?q=Amal+Das).

Make the skin incision. Carry the incision down through the subcutaneous tissue to the fascia. Try to avoid the occasional branch of the lateral femoral cutaneous nerve seen exiting the fascia in order to avoid numbness of the skin over the anterolateral thigh. If a nerve branch must be sacrificed cut it sharply and bury the end deep to the fascia to avoid a painful neuroma.

The Smith-Peterson interval between the Sartorius (femoral nerve) medially and TFL (superior gluteal nerve) laterally will used to gain access to the hip although you never really get a good view of the sartorius. At this point you will be on the fascia overlying the tensor fascia latae muscle (TFL). It is recognized by its reddish color. It is reddish because the facia overlying the TFL is very thin so that one can actually visualize the muscle through the facia (**Figure 5**). Incise the facia over the TFL (**Figure 6**). The knick in the fascia seen here is extended the full length of the incision. Separate the superior leaf of the facia off the muscle with a pair of curved Metzenbaum scissors. Usually the facia is loosely adherent to the muscle and can be easily separated using the gloved index finger.

A Meyerding is used to retract the TFL laterally by the first assistant, exposing the rectus femoris muscle which is retracted medially (along with the sartorius muscle) by the second assistant using another Meyerding retractor. (This is best seen on the Vumedi video. https://www.vumedi.com/search/?q=Amal+Das).

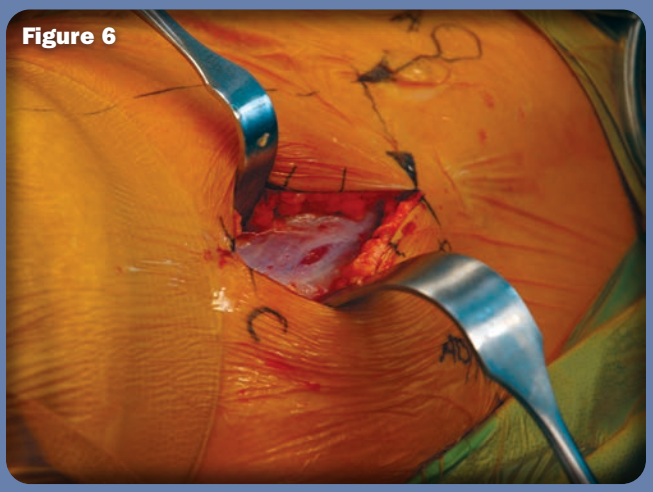


Figure 6

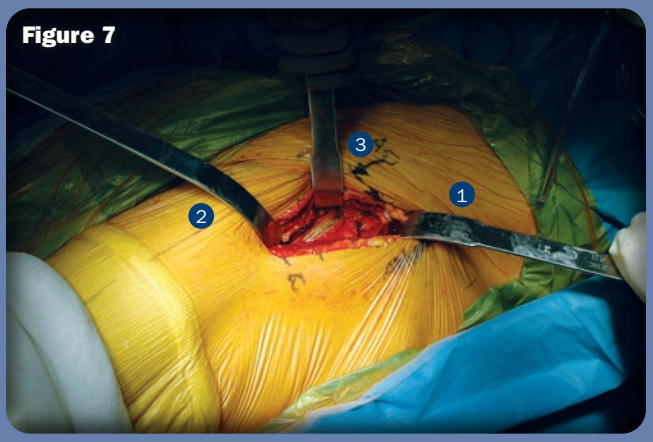


Figure 7

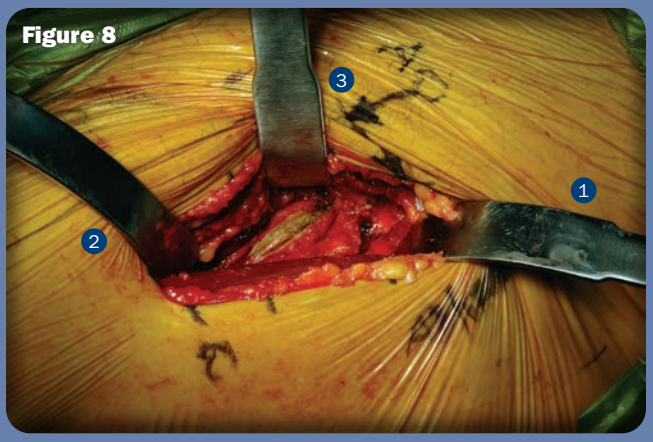
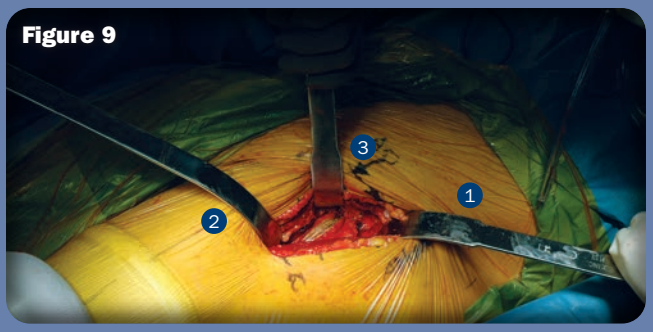
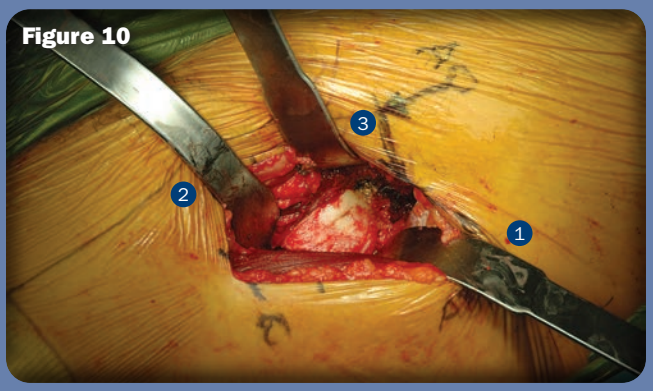


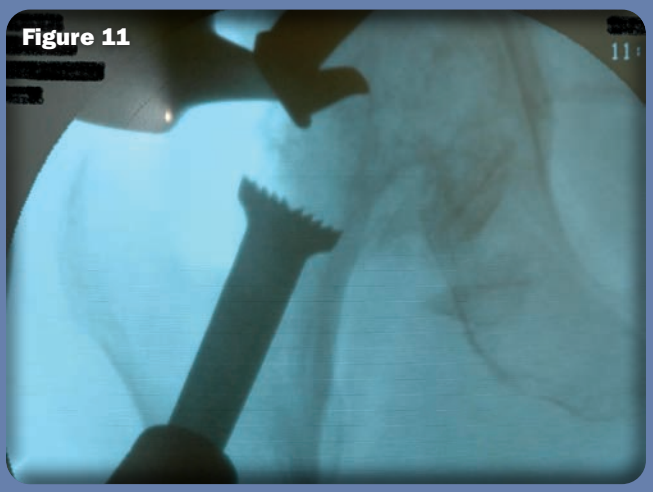
Figure 8

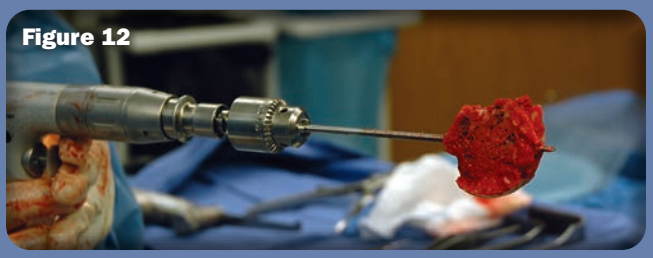
Running between the rectus femuris and the TFL is the ascending branch of the lateral femoral circumflex vessels. Using a tonsil type long handled hemostat the vessels are bovie electrcoagulated. These vessels bleed significantly occasionally causing one new to the anterior approach to be concerned that he or she has wandered astray into the femoral vessels. However, as long as one keeps their dissection lateral to the line drawn between the ASIS and the center of the patella, the femoral vessels are safe.

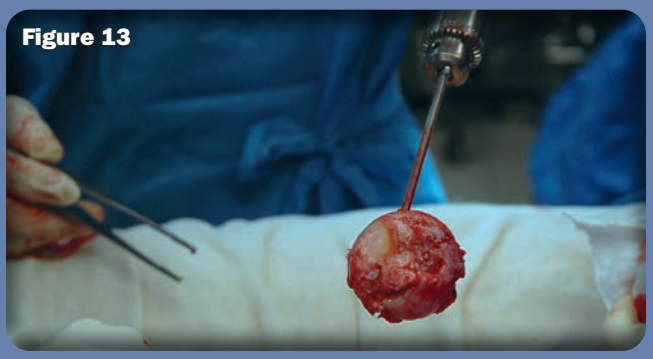
Having safely Bovied the ascending branch of the anterior femoral circumflex, the next task is to expose he hip joint capsule. Retractor #1 is placed extracapsularly superior to the femoral neck (or on the posterior inferior ilium as preferred by some). Retractor #1 is held by the first assistant. Just superior to the origin of the vastus lateralis and posterior to the rectus femoris is the hip joint capsule. Develop the interval between the capsule and the rectus femoris using a key elevator. Place retractor #2 extracapsularly around the inferior femoral neck. Retractor #2 is held by the second assistant. The rectus femoris will be adherent to the hip capsule superiorly. Separate the insertion of the rectus femoris from the hip capsule with the Bovie and then then elevate the rest of the rectus femoris off the hip capsule with a cobb elevator. Release the reflected head of the rectus femoris off the superolateral rim of the acetabulum using the Bovie. After having done this it is easy to see why rectus femoris tendinitis sometimes develops after anterior approach total hip arthroplasty. This is because a significant portion of its origin has been released. Only the ASIS origin remains to bear the load. The #3 anterolateral acetabular rim retractor is then placed over the superior aspect of the acetabular rim just medial to the junction of the ilium with the rim. Care must be taken to stay in direct contact with the bone when placing the retractor on the acetabular rim as it is close to the iliopsoas with its overlying femoral nerve here. Retractor #3 is also held by the second assistant along with retractor #2. You are now presented with a clear view of the entire hip capsule (see **Figure 7**.) This is a left hip. Retractor #1 is to the right. Retractor #2 is to the left. Retractor #3 is between the two. See also **Figure 8** which is a close-up of **Figure 7**. Phase one, exposure of the hip joint, is complete.







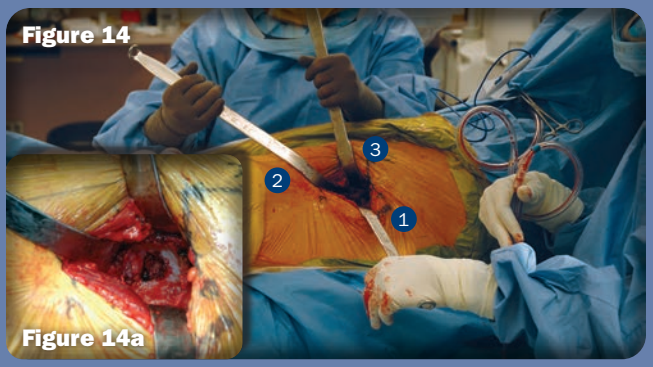


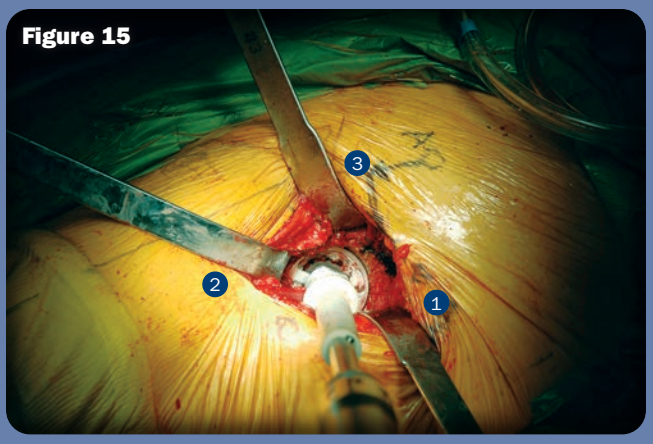


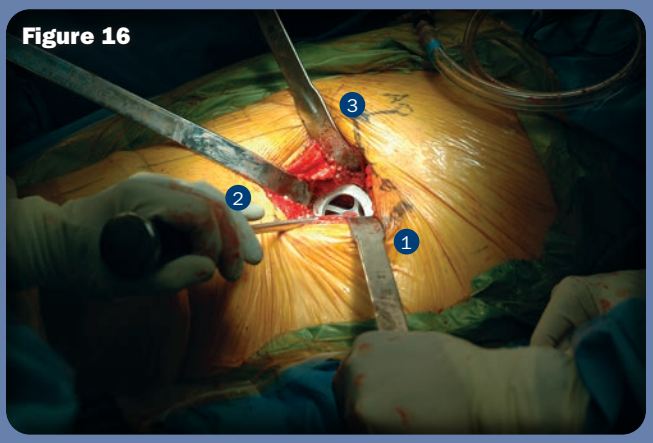
Phase 2.
Removal of the femoral head

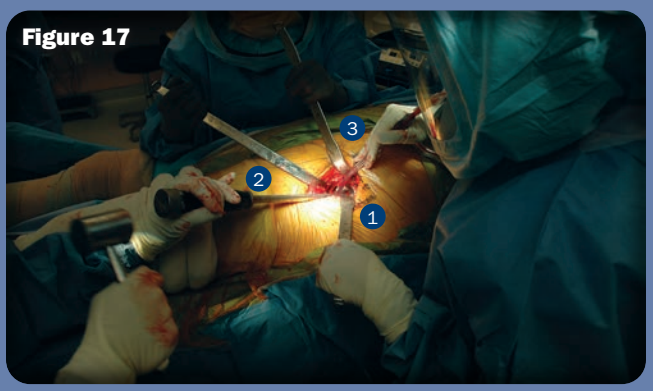
The hip capsule is incised longitudinally (**Figure 9**). A second incision is made into the capsule inferiorly turning it into a T-shaped capsular incision exposing the junction of the femoral neck with the greater trochanter (the "piriformis spike") greatly enhancing visualization. Seeing this landmark really helps the surgeon orient him or herself to where they are on the femur which is especially comforting to the surgeon new to the anterior approach. Place the #1 and #2 retractors intracapsularly along the superior and inferior femoral neck (**Figure 10**). As in phase 1 retractor #1 is held by the first assistant and retractor #2 is held by the second assistant. Release the posterior half of the capsular insertion on the acetabulum. This will markedly improve exposure of the acetabulum. Release the pubofemoral ligament from the medial calcar which will also improve acetabular exposure. Without doing these two steps it will be difficult to get the acetabular reamer in during phase 3 (Acetabular exposure, reaming and cup insertion). Return retractor number three to its original position on the superior acetabular rim. As in phase 1 retractor #3 is held by the second assistant.

You are now presented with exposure of the entire femoral neck. Place an oscillating saw blade on the femoral neck where the osteotomy should be (as determined preoperatively by templating. It is usually about a centimeter below the piriformis spike.) using a C-arm to verify the position (**Figure 11**). The soft tissues will make it difficult to get your blade medially enough. With experience one learns to angle the blade around the soft tissues. It may seem a bit awkward the first several cases but soon becomes natural. It is important to protect the soft tissues from the oscillating saw. The retractors placed as noted above will do this. Make the first cut using the oscillating saw. Make a second cut 1 cm superior to the first one and parallel to it. Remove the "napkin ring" shaped piece of femoral neck with a threaded Steinman pin (**Figure 12**). Removal of the "napkin ring" is difficult the first several cases and seems to require a lot of force but soon one learns to gently wiggle the napkin ring fragment with the attached Steinman pin several times and it comes out surprisingly easily. Next the femoral head which remains intra-articular is likewise removed using the Steinman pin. It too requires seemingly excessive force the first several cases but the same technique used to remove the napkin ring fragment also results in removal of the femoral head with little force (see **Figure 13**).









Phase 3.
Acetabular exposure, reaming and cup insertion

To be comfortable reaming the acetabulum you must be able to see it. If you are an experienced surgeon with the posterior or inferior approach you can get just as good a view of the acetabulum as you are used to by simply elevating the bed so the acetabulum is at eye level and rotating ("airplaning") the table about 15° to the nonoperative side so you can see the pulvinar. Then you will be comfortable with your orientation.

Place retractor #1 beneath the inferior rim of the acetabulum. As always retractor number one is held by the first assistant. Place retractor #2 over the anteromedial aspect of the acetabular rim with care being taken so as to remain in contact with the bone because this retractor is the closest to the femoral nerve. If it comes out as it frequently does because it's perch on the acetabular rim is somewhat tenuous, the second assistant holding it should not attempt to replace the retractor for fear of not keeping the retractor on the bone and thus injuring the femoral nerve since the second assistant stands on the contralateral side and thus has poor visualization. It should be replaced by the surgeon. Place retractor number three in its usual place as for phase 1 and 2 on the anterior superior acetabular rim. As always retractor #2 and 3 are held by the second assistant (**Figure 14** and **Figure 14a**).

With the retractors in place as described above, the labrum is excised as well as the pulvinar. When excising the pulvinar begin superiorly and subperiosteally remove it from the the acetabular notch with the Bovie, leaving a small cuff inferiorly to avoid cutting the obturator artery which can then retract causing worrisome bleeding. With the pulvinar removed the true medial wall of the acetabulum is visualized. The first reamer is directed straight medially to get down to the medial wall which improves coverage of the cup. Fluoroscopy is used to verify that the reaming is down to the teardrop (medial wall). Subsequent reamers are then used to expand the diameter until anterior and posterior contact are good (**Figure 15**). Insert a trial acetabular component to verify stability (**Figure 16**). Then implant the final acetabular component (**Figure 17**). Intraoperative fluoroscopy is used to assist with implant positioning (**Figure 18**). Bone screws may be inserted if needed, however keep in mind that the trajectory of the screws that may feel awkward compared to the traditional approaches. Insert the polyethylene bearing into the acetabular shell.

Figure 19

Figure 20

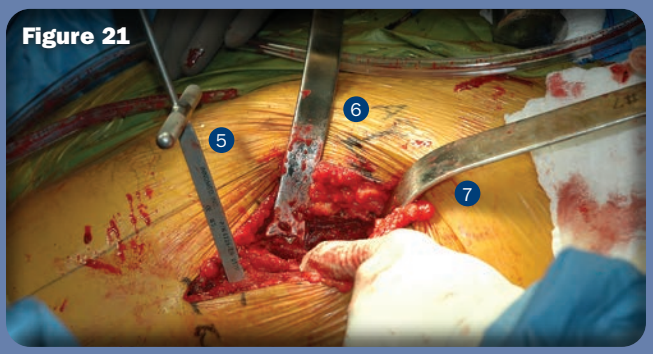


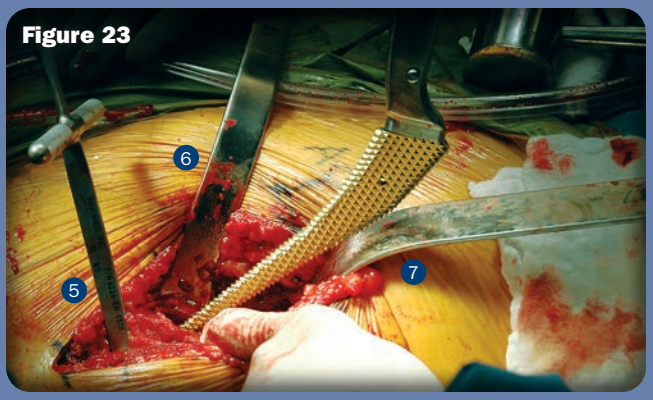
Figure 21

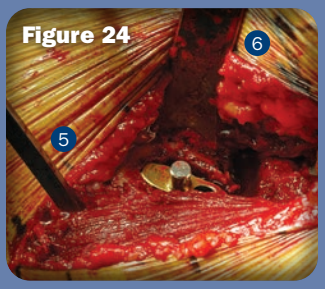
Figure 22

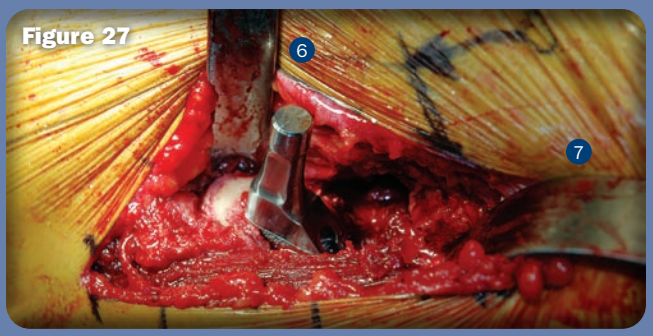
Phase 4.
Femoral broaching and stem insertion

Apply the table mounted hook hoist (instrument #4) to the table rail about 6 inches distal to the greater trochanter. Then insert the proximal femoral hook (instrument #5) around the proximal femur between the TFL and the vastus lateralis. It is much easier to apply the hook if the surgeon first inserts the gloved index finger in the interval where he intends to pass the hook, freeing up the few filmy adhesions between the greater trochanteric bursa and the periosteum. Lower the legs about 30° and place the patient in slight Trendelenburg to level the legs. Rest the contralateral foot on a mayo stand higher than the table so that the ipsilateral foot may later be placed beneath it (**Figure 19**). Attach the table mounted hook hoist (instrument #4) to the proximal femoral hook (instrument #5). Apply a minimal amount of anterior retraction on the femoral hook (instrument #5) by turning the crank on the table mounted hook hoist (instrument #4). This will retract the proximal femur anteriorly allowing safe broaching in stem insertion (**Figure 20**).

Place the femoral calcar retractor (instrument #6) around the femoral calcar. Notice that this retractor has teeth to avoid slippage of the retractor. This retractor will provide exposure of the calcar and also retract the proximal femur laterally. (Labeled #6 in figure 21). Place the greater trochanteric retractor (instrument #7) posterior to the greater trochanter. (Labled #7 in **Figure 21**). Release the posterolateral capsule from the greater trochanter allowing anterior translation of the proximal femur. Place the operative leg under the non-operative leg in a lazy figure four position (**Figure 22**). Add a few more cranks to the table mounted hook hoist (instrument #4) to further retract the femur anteriorly. With the proximal femur now mobilized anteriorly it can be easily broached (**Figure 23**). Once the templated size is







reached, release the anterior retraction on the table mounted hook hoist by depressing the lever for this purpose. Then release the hook from the table assembly and do a trial reduction (**Figure 24 and 25**). A big advantage of the Innomed Das/Seng instrumentation over a special traction table is that you can now measure the leg lengths directly (**Figure 26**). Another advantage is that you can directly check stability of the hip. Once satisfied with the leg length and hip stability a fluoroscopic view of the proximal femur with the broach, trial head and neck is taken to verify that the femoral component is the right size.

Then dislocate the hip. Reattach the proximal femoral hook (instrument #5) to the table mounted hook hoist (instrument #4). Turn the crank on instrument #4 for anterior retraction of the proximal femoral hook enough for removal of the trial broach and insert the femoral component (**Figure 27**). Release the anterior retraction on the table mounted hook hoist by depressing the lever. Remove the proximal femoral hook. Apply trial femoral heads and reduce the hip to get the correct neck length for hip stability and leg length. Apply the correct modular femoral head to the femoral stem trunnion (**Figure 28**). Reduce the hip. Level out the table. It is not necessary to close the hip capsule which makes closure easy. Close the fascia over the TFL. Close the subcutaneous fascia and skin.

Das/Seng Anterior Total Hip Instruments

Designed by Amal Das, MD and Brian Seng, DO

Retractor set with included table-mounted, controlled-release ratcheting elevator hook, specifically designed to help simplify anterior approach total hip arthroplasty

PRODUCT NO'S:
6226-00 [Set]
Set Includes / Available Individually:
1 6221 [#1 - Posterior Femoral Neck / Inferior Acetabular Rim Retractor] *Blade Width: 25 mm* *Blade Depth: 3" (7,6 cm)* *Overall Length: 14" (35,6 cm)*
2 6222 [#2 - Anterior Femoral Neck / Anteromedial Rim Retractor] *Blade Width: 31.5 mm, 10 mm @ Tip* *Blade Depth: 4.5" (10,2 cm)* *Overall Length: 15" (38,1 cm)*
3 6223 [#3 - Anterolateral Acetabular Rim Retractor] *Blade Width: 18 mm* *Blade Depth: 3.25" (8,3 cm)* *Overall Length: 10" (25,4 cm)*
4 6226-TA [#4 - Table Mounted Hook Hoist] ***This product number includes one 6226-RH Elevator Hook*** *Folds to approx: 21" x 5" x 5" (53,4 cm x 12,7 cm x 12,7 cm)*
5 6226-RH [#5 - Proximal Femoral Hook] *Blade Depth from T-Handle: 7.5" (19,1 cm)* *Overall Length: 9.25" (23,5 cm)*
6 6227 [#6 - Femoral Calcar Retractor] *Blade Width: 25 mm* *Blade Depth: 2" (5,1 cm)* *Overall Length: 14.5" (36,9 cm)*
7 6225 [#7 - Greater Trochanteric Retractor] *Blade Width: 25 mm* *Blade Depth: 1.5" (3,8 cm)* *Overall Length: 14.875" (37,8 cm)*
Optional Instruments (not included in set):
6226-EH [Flat Proximal Femoral Hook] *Blade Depth from T-Handle: 7.5" (19,1 cm)* *Overall Length: 9.25" (23,5 cm)*

USA MADE

5 *Proximal Femoral Hook*
#6226-RH

1 *Posterior Femoral Neck / Inferior Acetabular Rim Retractor*
#6221

2 *Anterior Femoral Neck / Anteromedial Rim Retractor*
#6222

3 *Anterolateral Acetabular Rim Retractor*
#6223

4 *Table Mounted Hook Hoist*
#6226-TA

6 *Femoral Calcar Retractor*
#6227

7 *Greater Trochanteric Retractor*
#6225

Lit. Number: IN-12-01, v7
July 2020

ISO 13485:2016

Scan to Launch Our Website

FREE TRIAL ON MOST INSTRUMENTS

INNOMED®

103 Estus Drive, Savannah, GA 31404
www.innomed.net info@innomed.net
912.236.0000 Phone
912.236.7766 Fax
Innomed-Europe Tel. +41 41 740 67 74
Fax +41 41 740 67 71
1.800.548.2362