

# The Anterior Approach for Total Hip Arthroplasty: Background and Operative Technique

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The first hip Arthroplasty performed through this approach was by Robert Judet in 1947 at Hospital Raymond Poincare in Garches outside Paris. A Judet acrylic prosthesis was implanted. Judet referred to the surgical approach as the “Heuter Approach”. A published reference for this however is unknown and Heuter may refer to Heuter Volkmann and the approach for drainage of a tuberculosis hip abscess. The approach can also be called the “Short Smith-Pete” because it follows the interval of the Smith-Petersen distal to the anterior superior iliac spine.

The surgery was facilitated by operating on the Judet Table with the patient in the supine position. The Judet Table was originally designed by Henri Judet, also an orthopedic surgeon and Robert Judet’s father. The reasons for Judet’s choice of this approach for hip arthroplasty are several: 1) The hip is an anterior joint, closer to the skin anterior than posterior 2) The approach follows the anatomic interval between the zones of enervation of the superior and inferior gluteal nerves lateral and the femoral nerve medial 3) The approach exposes the hip without detachment of muscle from the bone.

Today Thierry Judet, the son of Robert Judet continues to use this approach as well as the Judet table for hip Arthroplasty. Prof. Thierry Judet, Chief of Orthopedics at Hospital Raymond Poincare, has used this approach and table for over 20 years and more than 2000 cases. It has been the preferred technique for primary and revision hip Arthroplasty at Raymond Poincare since 1947. It has been used for a great variety of prosthesis including the Judet acrylic, the Judet uncemented, conventional cemented, partial femoral head resurfacing and total hip surface replacement. The original approach was slightly longer and extended onto the iliac crest and also more distally. The tensor fascia lata muscle was partly detached from the crest. Over time the incision has to a degree shrunk but the interval remains the same.

While this history of the Anterior Approach for THA has been little known in the orthopedic world, the history of Charnley’s experience is widely known. Charnley implanted the first consistently successful THA in the 1960’s. He also positioned the patient supine though used a more standard flat topped operating table with the leg draped free and manipulated by a scrubbed assistant. This approach necessitated a trochanteric osteotomy. Because of recognized complications of this osteotomy, the posterior approach was later adopted by many surgeons with the patient necessarily positioned in the lateral position. Because of problems with hip dislocation however following the posterior approach some surgeons later adopted the anterolateral Harding approach. The disadvantage of the Harding approach however is the necessity of detachment of the gluteus minimus and a portion of the gluteus medius from the greater trochanter which can lead to a delay in functional recovery or in a minority of cases incomplete healing of the abductors to the trochanter.

The anterior approach however, preserves posterior structures that are important for preventing dislocation while preserving important muscle attachments to the greater

trochanter. It is obvious that lack of disturbance of the minimus and medius insertions facilitates recovery of a normal gait while the posterior rotators provide active stability. The surgeon should also consider the role of the gluteus maximus and tensor fascia lata muscles as abductors and pelvic stabilizers. These two muscles insert on the fascia lata/iliotibial band which joins them and together form a “deltoid of the hip”. Lack of disturbance of this “hip deltoid” is a further benefit of the anterior approach.

I first saw this THA technique in 1981 when I visited Emile Letournel in Paris to study acetabular and pelvic fracture surgery. Letournel had been Robert Judet’s resident. I observed the patient placed supine on the Judet Table. The leg was not draped free but the foot placed in a boot and manipulated by a mobile spar that was operated by an unscrubbed assistant. I recall being quite impressed but a little confused and I did not pursue this technique. My main interest at the time was pelvic and acetabular fracture treatment and when I performed THA I continued to use the posterior approach. In 1996 I was approached by a patient who had had one hip replaced by this technique in France but now lived in the US and required replacement of the other hip. He was very enthusiastic about the anterior approach because of the lack of muscle disturbance and the rapid recovery he had experienced and requested that I replace his other hip by the same technique. This led me to reconsider the value of this technique and its potential benefits of reduced dislocation risk and enhanced recovery rate. At the time I frequently used the Judet table for acetabular fracture surgery. I replaced this man’s hip using the anterior approach on the Judet table and began my own series of patients. I proceeded slowly at first with only 20 to 30 cases per year but I now use this approach frequently and for all primary hip arthroplasties.

As I began in 1996, the Judet-Tasserit table which was used for this technique was out of production and no longer available for purchase. As I became more and more convinced of the value of the technique I wanted to be able to teach it and facilitate its dissemination. The outgrowth was my bringing ideas for design of a new table to OSI and enlisting their support for a table and teaching Ant THA. Starting with a “clean sheet of paper” we had the chance to focus our efforts on a new and improved design to facilitate this procedure as well as pelvic surgery. The result of our collaboration is the PROfx table first available in April 2003 and the HANA table available in August 2005.

My own concept of minimally invasive is that it is more important what we do under the skin than the specific length of the incision. Stretching, contusing and abrading tissue is not what I consider minimally invasive. The main advantage of this approach is that it is not necessary to detach or split any muscle from the pelvis or the femur and the “hip deltoid” is not disturbed. The result is that there is an immediate stability of the hip that obviates the need for dislocation precautions. Also, there is a rapid recovery of function. I believe another advantage of the technique as I apply it is use of the image intensifier for immediate information regarding acetabular position and femoral length and offset. Accuracy of component position and leg length is thereby enhanced. The supine position

that is preferred for this approach facilitates the accuracy of acetabular position as well as assessment of leg length.

For surgeons not familiar with THA through the anterior approach it is easy to appreciate the straightforward acetabular access. The femoral access however is less easy to conceptualize. The femoral access is greatly enhanced by a special orthopedic table. The original table designed and used in France was the Judet/Tasserit table. Today the OSI PROfx/HANA tables are, I believe, new and improved surgical tools. With the patient positioned supine the leg is not draped free but is attached to a mobile spar that can apply traction, rotate the leg, and angulate the leg in all directions. External rotation of the leg to 90 degrees and hyperextension of the hip to 30 degrees allows femoral preparation and prosthesis insertion in a somewhat anterior to posterior direction. The table also elevates the proximal femur to enhance access. The anterior approach is the approach used for acetabular component insertion with the minimally invasive 2 incision technique. With use of the table however, a second posterior incision becomes unnecessary.

Either cemented or uncemented components can be implanted through this approach. Femoral components that require straight reamers however are more difficult to place and not as applicable to this approach.

I have used this approach for primary THA for the past 9 years and now use it for all primary cases unless there is an acetabular posterior defect that requires posterior graft and plate fixation.

The following images depict typical operative steps for the anterior approach for hip replacement. I consider the OSI PROfx/HANA tables and femoral broaches with an offset handle to be essential instruments for minimizing soft tissue trauma.

The question is often asked: Is the specialized orthopedic table necessary for use of this approach? Kristaps Keggi of Waterbury, Connecticut has used an anterior approach for over 3000 hip replacements while operating on a standard table. It is Dr Keggi's practice however to frequently utilize secondary incisions for acetabular and/or femoral preparation. Also it is Keggi's practice to split the tensor (which I believe is more traumatic), and routinely excise the entire capsule and detach the posterior rotators to obtain adequate femoral mobility for femoral preparation and prosthesis insertion. Though I have seen that it is possible to use the anterior approach without the table, the table obviates the need for secondary incisions. Additionally it is my impression that femoral access is significantly more difficult without the table. Improving the femoral access not only eliminates secondary incisions but also reduces muscle trauma that can result from forceful retraction.

I prefer use of the image intensifier to improve the accuracy of acetabular position as well as leg length and offset. Total image time averages less than 30 seconds. The

surgeon and team experience negligible x-ray exposure if they stand one meter away while imaging. If the surgeon prefers, the operation can be performed without the image intensifier utilizing the normal measures for assessing leg length (pre-op templates, prosthesis relation to femoral landmarks, soft tissue tension, and patella palpation).

Most small incision surgery techniques are advocated only for selected patients. The most common criterion is a body mass index (weight in kg / height in meters<sup>2</sup>) of less than 35. I use the anterior approach for all patients, certainly high BMI patients are more difficult but incisions over 10 cm are infrequent and 12 cm is almost always the maximum necessary. Small incision surgery of obese patients through the anterior approach is possible partly because the subcutaneous fat over the anterolateral proximal thigh does not increase in thickness as dramatically as it does posteriorly or laterally.

As we endeavor to minimize the soft tissue invasion, I think it is useful to consider: Which patients need the most help in dislocation prevention and functional rehab, the thin and fit patient or the obese and deconditioned patient?

## SURGICAL TECHNIQUE

After administration of general or regional anesthesia both feet are placed in the boots. The patient is placed in the supine position on the PROfx or HANA table, a perineal post is placed and the boots attached to the table. It is normal to use the leg support for the leg that will not be operated and no leg support for the hip to be operated. The hip that will not be operated is placed in neutral or mild internal rotation (to maximize offset), neutral extension and slight abduction and will serve as a radiographic reference for the operated side. The jack that will raise and lower the femoral hook is placed near the side of the patient so that the hook bracket will lie roughly parallel to the long axis of the patient. Avoiding external rotation of the hip to be operated will make the external landmarks of the hip more reliable and enhance the landmark of the natural bulge of the tensor fascia lata muscle. The table should be leveled with the “return to level” button on the hand control. It is normal for the patient’s arms to be placed roughly perpendicular outward and not over the chest. Pneumatic compression “boots” are applied to the legs for intra-operative DVT prophylaxis.

The normal team consists of: the surgeon, his assistant, the anesthesiologist, the scrub nurse, circulating nurse/table operator and x-ray tech. The following description refers to actions that may be taken by the various team members

Though the incision is normally small (8 to 10 cm) I prefer to drape a relatively wide area from just proximal to the iliac crest to the junction of the middle and distal thirds of the thigh. I believe that draping a relatively wide area around the incision enhances the sterility by making the vinyl skin covering less likely to detach and thereby allow mobility of the drape edges. Also, the wider draping allows additional extensile access if

necessary. Following draping with paper drapes, the surgeon makes a hole in the drapes overlying the table jack post. The square tubular receptacle of the hook bracket is placed through the drape hole and over the post. The hole is sealed with a vinyl drape.

The normal incision starts 2-3 cm posterior and 1-2 cm distal to the anterior superior iliac spine. This straight incision extends in a distal and slightly posterior direction to a point 1-3 cm anterior to the greater trochanter. On thinner patients the bulge of the tensor fascia lata muscle marks the center of the line of the incision. After incision of the skin and subcutaneous the tensor can be seen through the translucent fascia lata. I place a vinyl circumferential skin retractor (Protractor) undermining slightly the fat layer off the underlying fascia. Incise the fascial lata in line with the skin incision over the tensor where the fascia lata is translucent and anterior to the denser tissue of the iliotibial tract. Continue the fascial incision slightly distal and proximal beyond the ends of the skin incision.

Lift the fascia lata off the medial portion of the tensor and follow the interval medial to the tensor in a posterior and proximal direction. Dissection by feel is most efficient at this point and the lateral hip capsule can be easily palpated just distal to the anterior inferior iliac spine. Place a cobra retractor along the lateral hip capsule to retract the tensor and gluteus minimus laterally and retract the sartorius and rectus femorus muscles medially with a Hibbs retractor. The reflected head of the rectus that follows the lateral acetabular rim will be visible. A small periosteal elevator placed just distal to the reflected head and directed medial and distal elevates the iliopsoas and rectus femorus muscles from the anterior capsule. The elevator opens the path for a second cobra retractor placed on the medial hip capsule.

By this technique a view of 180 degrees of the circumference of the hip capsule is obtained within a few minutes and if I have a new visitor I like to comment, "This is the easiest approach to the hip." As with most approaches however, proper placement of the incision and following the correct initial interval can facilitate the entire procedure or doom the surgeon to a prolonged struggle. I think that most initial mistakes with the skin and fascial incisions are too anterior and medial. An approach too medial along the extrafascial junction of the tensor and sartorius endangers the lateral femoral cutaneous nerve and makes it easier to follow a wrong deep interval that is too medial. One also should avoid approaching too lateral and posterior but by doing this, the surgeon may actually use a different though less ideal approach and the surgery will still be possible and facilitated by the table. A little too lateral splits the tensor as Keggi does, more posterior goes posterior to the tensor (Watson-Jones) or transgluteal (Harding).

Assuming the ideal skin and fascial incision, wrong directions are still possible. These wrong directions are rare for me now but I am frequently reminded of them as I assist those learning the approach. The lateral cobra may go too lateral and between the tensor and gluteus minimus or split the minimus. The medial cobra may go too far from the

anterior capsule and anterior to the rectus. If the neck is very short or in a protrusio situation it is possible to erroneously place the cobra retractors around the proximal shaft. If necessary, check where you are with the image.

The medial and lateral retraction of the cobras brings the lateral femoral circumflex vessels into view as they cross the distal portion of the wound. These vessels are clamped, cauterized and transected. Further distal splitting of the aponeurosis that overlies the anterior capsule and vastus lateralis muscle and at times excision of a fat pad enhances exposure of the capsule and the origin of the vastus lateralis. The anterior capsule may be either excised or opened as flaps and repaired as part of the closure. I prefer to retain the capsule in most cases. Open the capsule with an incision that parallels the antero lateral femoral neck. The proximal portion of this incision crosses the anterior rim of the acetabulum and the reflected capsular origin of the rectus femoris. The distal portion exposes the lateral shoulder of the femoral neck at its junction with the anterior greater trochanter. The intertrochanteric line is identified by the junction of the capsule and the origin of the vastus lateralis muscle. Detach the distal anterior capsule from the femur at the anterior intertrochanteric line. Place suture tags on the anterior and lateral capsule at the distal portion of the incision that separates them. Place the cobra retractors intra capsular medial and lateral to the neck. Base of the neck exposure is facilitated by a Hibbs retractor that retracts the vastus and distal tensor.

A narrow Hohman retractor is now placed on the antero-lateral acetabular rim. With this exposure the antero-lateral labrum is excised and often an associated osteophyte. Distal traction on the extremity will create a small gap between the femoral head and the roof of the acetabulum. A femoral head skid is placed into this gap and then placed in a more medial position. The traction is partially released. Externally rotate the hip about 20 degrees and then insert a femoral head cork screw into the head in a vertical direction. As the extremity and hip are externally rotated and leverage applied to the skid and cork screw, the hip is dislocated anteriorly and the femur externally rotated 90 degrees. To facilitate dislocation the table operator applies moderate external rotation force to the rotation wheel at the foot of the table. The primary force for dislocation and rotation however should come from the surgeon applying direct force to the proximal femur with the hip skid and femoral head cork screw. Femoral external rotation can also be aided by a scrubbed assistant grasping the femoral condyles. If the patient is very osteoporotic, undue force from the rotation wheel can fracture the tibia or ankle. If the hip is unusually difficult to dislocate, check for adequate capsular release and osteophyte excision and extend the hip slightly. Dislocation can also be impeded by the ligamentum teres. The ligament can be severed by passing the tip of a 20 mm curved osteotome medial to the head.

After dislocation, place the tip of a narrow Hohman retractor distal to the lesser trochanter and beneath the vastus lateralis origin. Detach the capsule from the medial neck and expose the lesser trochanter and the medial posterior neck. During exposure of

the posterior and medial neck, keep in mind that Hohman retraction of the vastus protects the enervation of this muscle which comes from medial and at a surprisingly proximal location. Happily however this muscle is also enervated more distally. Internally rotate and reduce the hip.

Replace the cobra retractors around the medial and lateral neck and retract the vastus origin and distal tensor with a Hibbs. Cut the femoral neck with a reciprocating saw at the desired level and angle as indicated by the pre-op plan. I use the junction of the lateral shoulder of the neck and greater trochanter as the indicator for the level of the cut and usually place the lateral portion of the cut slightly distal to this point. Laterally the line of the cut begins at the intertrochanteric line though diverges from it slightly as it courses medially and distally. A cut that exactly follows the intertrochanteric line will cut the medial neck at the upper border of the lesser trochanter which is usually more distal than desired. I like to cut the medial portion of the neck first taking care to not cut the posterior greater trochanter with the saw. The neck cut is completed with an osteotome that divides the lateral neck from the medial greater trochanter and is directed posterior and slightly medial to avoid the posterior greater trochanter. I find that the level of the neck cut is a little more difficult to judge than from posterior and you can make a check with the image if desired. I have experimented with cutting guides but now simply “eyeball” the cut. Extract the head with the corkscrew. Light traction will distract the neck osteotomy and facilitate this extraction.

The original technique of Robert Judet is to cut the neck with the hip dislocated. The level of the cut is in this case judged by the level of the lesser trochanter and made in a medial to lateral direction. This technique introduces some danger of continuing the cut into the greater trochanter. The cut is completed by an osteotome to the supero-lateral neck.

I began Anterior THA by cutting the neck in situ and then extracting the head. The advantage is that it avoids the dislocation step. The disadvantage is that the head is more difficult to extract and at times the head must be sectioned to remove it. I also find that the dislocation step increases the rotational mobility of the femur and thereby enhances femoral exposure for later broaching and prosthesis insertion. Some US surgeons who have adopted this technique however cut the neck in situ without prior dislocation.

Throughout the procedure the surgeon will find that the tensor fascia lata muscle is potentially vulnerable to injury. Take care not to lever too hard on this muscle with retractors. During cutting of the neck the relatively dull side of the oscillating saw blade will cut the muscle if it contacts it. Levering the femoral head skid through wide angles can also lacerate the muscle. As the cut femoral neck is extracted the sharp bony edge can also lacerate the muscle and I protect the muscle with the retractors. Attention to this muscle needs to continue during the acetabular reaming and insertion and femoral broaching phases. If an initial injury to the muscle fibers is avoided the muscle seems to

hold up well through the procedure. On the other hand an early laceration to the surface of the tensor seems to hurt its capability to resist further damage. The PROfx or HANA table however, makes preservation of the soft tissues easier by its external and internal control of the femur and thereby makes leverage against the soft tissues less necessary for exposure.

The acetabulum is now visualized and prepared. External rotation of the femur of about 45 degrees usually facilitates acetabular exposure. Light traction also limits femoral interference however too strong traction will tighten the iliopsoas and pull the femur into an anterior obstructing position. I prefer a bent Hohman retractor over the distal anterior rim of the acetabulum to retract the anterior muscles. Take care to place the tip of this retractor on bone and not into the anterior soft tissues. I place a Cobra retractor with the tip on the mid posterior rim. Excise the labrum circumferentially. A transverse release of a prominent band of inferior capsule will facilitate later placement of the acetabular liner. I usually begin reaming under direct vision and later check with the image intensifier to confirm depth of reaming and adequate circumference. The indicators of torque and acetabular appearance are also used.

I insert the acetabular prosthesis with a curved handle inserter that reduces pressure on the distal wound. Distal wound pressure can also be reduced by slight extension and adduction of the extremity. I use the image intensifier to watch the position and progressive seating of the prosthesis. Most experienced surgeons can easily recognize a properly positioned cup on x-ray (40-45 degrees abduction and 15-25 degrees anteversion) and good position can be achieved consistently with the image technique. If there is a tendency toward cup position error from anterior it will be to place the cup too vertical and/or too anteverted. Prior to using image control, confirm that the pelvis is level with a midline image view. Symmetry of the obturator foramina or centering of the coxyx to the symphysis confirms a level pelvis. If the pelvis is not level the table can be tilted to compensate as needed. In some cases the patient's lumbar lordosis will increase in comparison to the pre op x-ray. This will be evident when the superior-inferior dimension of the obturator foramina has decreased and the foramina now have a "squinty eyed" appearance. The pre op appearance will return after tilting the image tube in a 5 or 10 degree caudad to cephalad direction. It is also useful to rotate the image picture on the screen to a "level" position. The liner is inserted in the normal fashion and prior excision of labrum and the inferior capsule release will facilitate this. Use an osteotome or rongeur to excise projecting osteophytes.

The use of the image intensifier during the procedure will vary according to the surgeon's preference. It was not used by Robert Judet or currently used by Thierry Judet. To use it for reaming is probably most controversial but I prefer it; especially to judge the depth of reaming. I would advocate it for acetabular positioning and also to check leg length with the femoral trials. The procedure however, can be done completely without it while relying on the traditional methods of pre-op planning, guides, relation to bony

or Steinman pin landmarks as well as soft tissue tension. The image however improves my accuracy. Computer guidance is currently emerging and is not inconsistent with this approach. Possibly my hospital will allow funding for computer guidance in the future however I have placed the funding for the table as a higher priority. Also, at present the x-ray is the final judge as to whether computer guidance led to the correct result and I like having this final answer immediately.

Following acetabular insertion the gross traction control on the leg spar is released and the femur internally rotated to neutral. The vastus ridge is palpated and the femoral hook placed just distal to this and around the posterior femur. The femur is now externally rotated 90 degrees and the hip hyperextended and adducted. This position is achieved by rotating the wheel at the end of the leg spar, dropping the leg spar to the floor and adducting it. Remember to release the gross traction lock to minimize the chance of a hyperextension stretch to the femoral nerve. The hook is now attached to the most convenient hole on the bracket.

For proximal femoral exposure I use a long handled cobra with the tip on the posterior femoral neck and place the tip of a trochanteric retractor over the tip of the trochanter. The proximal femur is now raised by the femoral hook until the tissues come under moderate tension. It is important to feel the tension by manually lifting the hook up and down as the jack raises the hook. You should be able to manually lift the femur higher than the level the hook has raised it and the tension should approximate the magnitude one would usually pull with a bone hook. Too much tension can cause a fracture of the greater trochanter. The hook should be thought of more as a support that keeps the femur from falling posterior than as a strong traction device.

Following this initial maneuver the posterior ridge of the greater trochanter may lie posterior to the posterior rim of the acetabulum. The femur needs to be mobile enough so that lateral and anterior displacement brings the posterior edge of the trochanter lateral and anterior to the posterior rim of the acetabulum. The lateral capsular flap and its tag suture will be clearly visible distal to the trochanteric retractor and attaching to the remnant of the lateral neck. Detachment of this flap from the base of the neck in an anterior to posterior direction facilitates visualization of the medial greater trochanter and enhances femoral mobility. Use a rongeur to excise the remnant of the lateral neck.

Keep in mind that the obturator internus and piriformis tendons insert on the anterior superior greater trochanter and not in what is commonly called the “piriformis fossa”. The obturator externus however inserts at the “piriformis fossa” which is the sulcus formed by the junction of the posterior medial greater trochanter and the neck. After release of the lateral capsule place the tip of the trochanteric retractor closer to the upper border of the trochanter to retract the gluteus minimus muscle and piriformis and obturator internus tendons. These 2 tendons are often found medial to the posterior tip of the trochanter and it is ideal to “flip” them over the posterior tip. Depending on the requirements for

femoral mobility, the surgeon may choose to release one or more of the short external rotator tendons and release of the obturator internus tendon particularly when it can't be flipped over the posterior tip of the trochanter is most common. I prefer however to preserve all tendon attachments and I strive in particular to preserve the attachment of the obturator externus tendon because its medial pull on the proximal femur is an important active restraint against dislocation.

Also many prostheses such as the Zimmer Alloclassic which I have used require some cutting into the medial aspect of the trochanter for broach and prosthesis insertion and this cutting can enter an area of external rotator tendon insertion. In general prostheses with less prominence in the proximal lateral area will be easier to insert, allow preservation of the rotator attachments and present a lower risk of trochanteric fracture. I currently prefer the DePuy Corail femoral stem because it meets these requirements and the broaching is easiest.

The applicability of a stem to the anterior approach however is most determined by the instrumentation required. Stems that require straight reamers are least applicable because they require the most anterior mobilization of the femur to get a "straight shot" down the canal. This extra femoral mobilization by capsular release and short rotator release is counter to the concept of sparing bony attachments. The most applicable stem instrument systems are "broach only" and have an offset broach handle that does not interfere with the proximal soft tissues and prominence of the anterior superior iliac spine.

The tip of the first broach enters the neck near the posterior medial cortex. It is possible to perforate either the posterior or lateral femoral cortex and the initial entry should guard against this. Getting the broach on track can also be aided by an assistant pushing the distal thigh in a medial direction. If in doubt, use the image to confirm the broach position. Assess femoral rotation and broach anteversion. Palpate the patella to determine femoral rotation. Visualizing the neck cut also indicates femoral rotation and broach anteversion. The plane of broach/prosthesis anteversion should be roughly parallel to the plane of the posterior neck cortex.

When the broaching is complete, a trial reduction is made with the neck length estimated from the pre-op template. The femur hook jack is lowered and the hook removed. The hip is flexed to the neutral position, traction applied and the hip is reduced with internal rotation and if necessary a push on the femoral head. The traction is released and image views of the two hips compared. The opposite hip image is placed on the right screen and the operated hip image on the left. If the length and offset does not need obvious adjustment, I typically instruct the x-ray technician to print both images on transparencies. I then go to the x-ray view box to compare these two transparencies by overlying them. If the length and offset are not correct, appropriate adjustments are made (change in neck length or offset, further seating of broach, or insertion of next size broach). I usually also view the fit of the broach in the proximal femur to check for

alignment and fill. When comparing image views of the two hips, it is best to have both hips in comparable positions as far as flexion, abduction-adduction, and rotation. These position adjustments are easily made and held with the table.

When overlying the transparencies of the two hips to judge leg length and offset, I first align the two femurs. For equal leg length, the image of the proximal extent of the acetabular prosthesis should extend slightly proximal to the image of the opposite femoral head to account for the loss of joint space and reaming into the roof. After superimposition of the femurs it is also useful to compare the pelvic landmarks (assuming comparable hip positions). At times you are left with questions as to what is best. The opposite hip may be a total hip that was made too long. Should you now make this new THA too long or restore it to its previous anatomic length? Careful assessment of the pre-op x-rays may show a congenital length discrepancy such as in dysplasia. How much should you lengthen? Alternatively the pre-op leg lengths may be equal, indicating that the arthritic hip was once longer before loss of the cartilage space and bony wear of the head equalized the leg length. Is it then proper to restore the length to the previous inequality? If the opposite side is arthritic and slightly shortened but asymptomatic should you make the THA slightly longer (restore it to its previous length) and anticipate the patient will soon desire the other side to be done?

During the trial phase I check for hip stability in extension and external rotation with the traction released. I watch the hip rotate as the table operator maximally externally rotates the hip. In the majority of cases he will be unable to dislocate it with this maneuver. I rarely check for posterior stability but this can be checked by an unscrubbed assistant unhooking the traction boot from the table and flexing and internally rotating the hip. Check for impingement with osteophytes and excise appropriately. Soft tissue tension can also be checked by manually pulling in the normal manner. In general however I feel that it is best to rely on the x-ray for length and offset decisions rather than soft tissue tension and intra op stability. Very tense soft tissues can be a tip off that you have made an incorrect interpretation of the x-rays and the leg is too long. On the other hand many patients have relatively lax soft tissues including females, hips with early arthritis, and osteonecrosis of the head and I prefer not to go beyond normal length or offset for the purpose of increasing soft tissue tension.

After the decision is made for the femoral prosthesis the femoral hook is replaced behind the proximal femur, traction applied to distract the head and the hip dislocated with external rotation and at times a bone hook around the femoral neck. The femur is then placed in to the preparation position (90 degree external rotation, hyperextension, adduction, and proximal elevation). The femoral prosthesis is then inserted in the normal fashion. The appropriate length permanent head can be placed at that time or a second trial performed if desired. With the hip flexed to neutral the acetabulum is visualized prior to reduction to ensure that it is clear of bone or cement fragments. Another transparency printed with the image intensifier confirms leg length and offset and

serves as the immediate post-op x-ray. Prior to discharge, x-rays will be obtained in the radiology department.

A check is made for bleeding and the wound irrigated. The closure is simple. The anterior and lateral capsular tag sutures are tied together and further capsular closure performed if desired. The fascia lata is closed with a running suture, followed by subcutaneous and skin. I prefer deep and subcutaneous hemovac.

Following surgery the patient does not follow anti dislocation precautions. He is encouraged to weight bear immediately and use his hip and discard external support as symptoms permit.

From Nov 1996 to April 2005 I performed 657 primary Anterior THA including 67 bilateral. This series of 657 anterior approaches is unselected and consecutive. The surgeries were performed on the Judet/Tasserit table until 2003. Beginning in 2003 the PROfx table became available and is now preferred. The average age is 66 and ranges from 29 to 91. The average operative time is 1.2 hours. Average blood loss is 345 cc's. The median hospital time is 4 days and the mode is 3 days. There were 2 early anterior dislocations and one posterior dislocation that were reduced closed and did not recur or require revision. The median time to doing some ambulation without external support is 8 days. The median time for doing all ambulation without external support is 15 days. It is my impression that pain is reduced and the recovery rate greatly enhanced. Consult Ant THA slide show at [www.hipandpelvis.com](http://www.hipandpelvis.com) for more detailed statistics.

During 2005 the Anterior THA Research Collaborative was formed. This is a multicenter study group formed to objectively evaluate the results of this technique.

Besides benefiting the patient, a goal of surgical technique development should be to make the technique as easy and reproducible as possible. It is my belief that once learned this soft tissue sparing technique is easier than the majority of small incision techniques and can be performed by many surgeons with reproducible results and a low complication rate. Learning the technique however requires focus and dedication to detail.

I find the anterior approach advantageous for essentially all patients undergoing hip replacement. The hardest cases are muscular males who are also obese though I think this difficulty applies to all approaches. I would only caution the surgeon regarding anterior hip replacement in patients with previous acetabular fracture associated with posterior heterotopic ossification (not yet excised) and/or pelvic deformity or posterior acetabular defects. The anterior approach is also applicable for insertion of a variety of cemented and uncemented femoral stems provided the proper broach handle and insertion instruments are available.



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