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Direct Anterior Total Hip Arthroplasty

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Abstract

The direct anterior approach to hip arthroplasty has become a popular technique. This technique, which was described almost 70 years ago, allows the surgeon to approach the hip through an internervous and intermuscular plane. Preliminary studies show that direct anterior hip arthroplasty may allow patients to recover faster with a lower dislocation rate. It is helpful to understand the history, scientific basis, and surgical technique of direct anterior hip arthroplasty.

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Total hip arthroplasty (THA) is one of the most successful orthopaedic surgical procedures because it has the ability to provide excellent pain relief, restore function, increase mobility, and correct deformity in patients with debilitating disease. THA is used to treat many different types of hip pathology, including osteoarthritis, posttraumatic arthritis, inflammatory arthritis, postseptic arthritis, osteonecrosis, and hip dysplasia. Approximately 250,000 primary THAs were performed in the United States in 2010, and it is expected that 500,000 THAs will be performed annually by 2030.[1]

Surgical techniques for THA continue to evolve as orthopaedic surgeons attempt to meet the increasingly high expectations of their patients. Current joint replacement patients are younger, more active, and demand higher function than the initial population the procedure was designed to treat. Patients, surgeons, and hospitals want to minimize the recovery period and complications associated with THA surgery. These efforts may hasten the patient's return to activities and employment, improve the use of hospital resources, and allow surgeons to treat more patients to meet the growing demand for this procedure. These goals can be accomplished by providing rapid functional recovery with a safe, reproducible surgical procedure that minimizes pain and soft-tissue injury.

Multiple approaches to the hip joint have been described, including medial, anterior, anterolateral, lateral and posterior approaches, with the latter four approaches used for THA. Each approach provides distinct advantages and potential risks for complications. Extensive modifications and variations to each THA approach have been made, with the goals of decreasing soft-tissue damage, allowing adequate exposure, and decreasing surgical risks.

The direct anterior approach to the hip is unique because it provides the only intermuscular and internervous exposure of the joint. This approach was first described for hip replacement in 1949 by Smith-Petersen[2] and has recently gained increased popularity because of the possibility for rapid patient recovery, decreased concern for dislocation, more accurate component positioning, and reliable restoration of limb length.[3-8]

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History

In 2009, Rachbauer et al[9] published a comprehensive history of the anterior approach to the hip. The first description of the anterior approach to the hip is credited to Hueter in 1881, who used it to resect the femoral head.[8] Smith-Petersen[10] subsequently used and further developed the approach, which provided a wide exposure to the anterior portion of the pelvis. The anterior approach to the hip is commonly referred to as the Smith-Petersen approach because of his interest in and use of the exposure. Smith-Petersen is also credited with performing the first joint replacement procedure through an anterior exposure.[2] In its early stages in the 1970s, the anterior approach was preferred by Wagner[11] for hip resurfacing procedures because it allowed preservation of the blood supply to the femoral head and intermuscular dissection. In the 1980s in France, Judet and Judet[12] used the anterior approach with a specialized fracture table to help position the leg. They preferred the anterior approach because it decreased damage to muscles and bone compared with other available techniques. Their technique was an extensile approach compared with modern standards; the tensor fascia lata was removed from the iliac crest with release of the reflected head of the rectus femoris.

Kennon et al[5] reported on 2,132 patients treated with the anterior THA approach. The authors describe a technique that does not require a specialized operating table and frequently uses multiple incisions to complete the procedure. Berger[13] and Berger and Duwelius[14] subsequently developed a minimally invasive two-incision technique that used an anterior approach with a small incision for cup preparation and placement and a small posterolateral incision for femoral preparation and component placement. The two-incision technique uses the Smith-Peterson interval for acetabular placement. The femur is placed through a separate gluteal stab wound. The technique is tedious and requires the extensive use of radiographic monitoring. Most advocates of the technique use a full beaded distal fixation stem, which may not be the stem of choice of some surgeons. Multiple studies have reported that the two-incision technique offers no benefits and concerns have been expressed about increased muscle damage and delayed recovery.[15-18] Many surgeons who reported on the two-incision technique subsequently abandoned it for other techniques. Despite the fact that this approach has lost popularity, a specialized retractor system and some instruments developed for the two-incision approach have been adopted for use in direct anterior THA.[14]

Encouraging outcomes reported in two large studies resulted in renewed interest in direct anterior THA using a specialized fracture table.[6,19] In a study of 1,037 patients, Siguier et al[19] reported a low dislocation rate of 0.96% with adequate component positioning. Matta et al[6] reported similar findings in a study of 437 patients. Over the past century, the direct anterior approach has been gradually modified and improved to provide an exposure that may reduce soft-tissue trauma and allow surgeons to accurately and reproducibly place arthroplasty components.

Anatomy and Approach

The classically described Smith-Petersen approach is an extensile approach to the hip that uses the anterior superior iliac spine (ASIS) as an anatomic landmark, with the incision extending superiorly and inferiorly.[2,10] The superior limb provides access to the iliac wing and supra-acetabular pelvis, with the inferior limb providing access to the hip joint. The current method of direct anterior hip arthroplasty uses the inferior limb of this classic incision (**Figure 1**).

This approach is the most direct approach to the hip with the least overlying fat, even in morbidly obese patients. The palpable osseous landmarks are the ASIS and greater trochanter (**Figure 2**). One technique used to plan the skin incision involves drawing a line between the osseous landmarks of the ASIS and greater trochanter, starting the superior incision at the halfway point of this line, and aiming it slightly posteriorly.[20] Another option is to measure 2 cm laterally and distally to the ASIS and extend the incision distally from this point, aiming it slightly posteriorly.[6] The lateral femoral cutaneous nerve (LFCN) is at risk during this approach. This structure exits medially to the ASIS and is protected by basing the incision slightly laterally (**Figure 3**).

The direct anterior approach is an intermuscular and internervous approach, with the superficial dissection carried out between the tensor fascia lata muscle (superior gluteal nerve) laterally and the sartorius muscle (femoral nerve) medially. The tensor fascia lata must be accurately identified. It has a deep blue coloration in relation to the white gluteal fascia and is located just posterior to it. The tensor fascia lata also can be identified by the posterior penetrating vessels. Proper identification is critical because confusing the sartorius muscle for the tensor fascia lata will bring the surgeon in close proximity to the femoral bundle, with the associated dangers of dissection in this area. After the tensor fascia lata is identified, its fascia is incised midline, and finger dissection is carried out deep and medially along the muscle belly to reach the deep intermuscular interval that lies between the gluteus medius muscle (superior gluteal nerve)

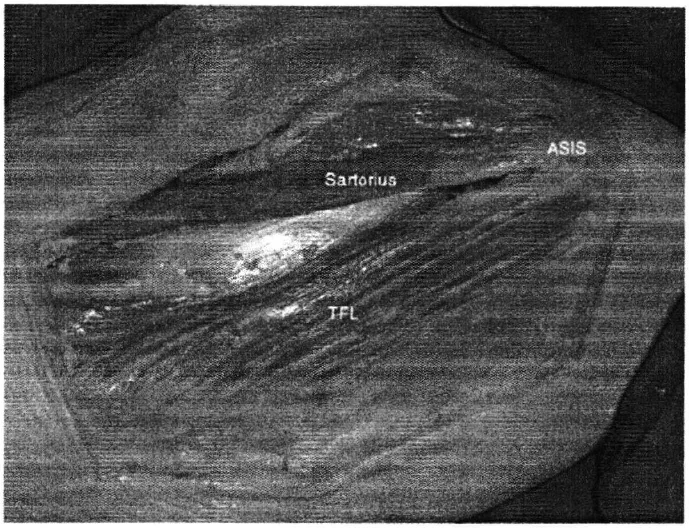

Figure 1 Photograph of the superficial hip anatomy important in making the incision using the direct anterior approach. TFL = tensor fascia lata muscle.

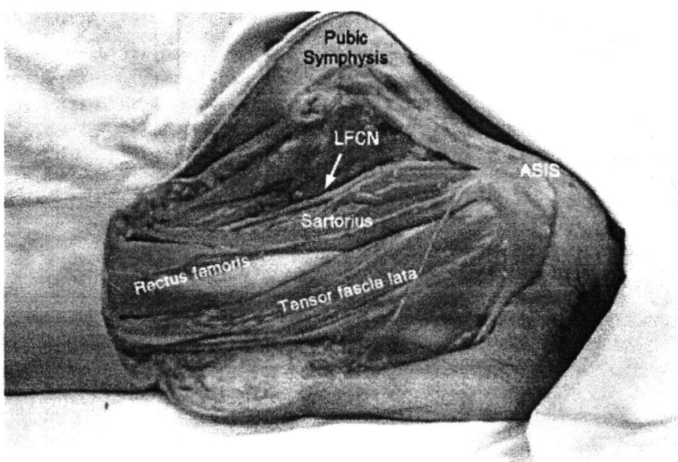

Figure 3 Cadaver dissection showing position of the LFCN (arrow) on top of the sartorius.

laterally and the rectus femoris muscle (femoral nerve) medially (**Figure 4**). The classic Smith-Petersen approach developed the interval between the sartorius and tensor fascia lata muscles, which placed branches of the LFCN at risk during dissection and retraction. This modification through the tensor fascia lata better protects the LFCN for the remainder of the procedure.

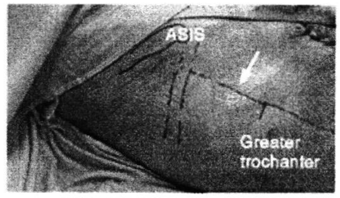

Figure 2 The location of the initial incision (arrow) is shown with the palpable osseous landmarks. The most proximal parallel line represents the anatomic landmark of the superior extent of the initial incision. The second parallel line is the preferred starting point for the incision when using the direct anterior approach.

An easily identified fat layer defines the deep interval and the ascending branch of the lateral femoral circumflex vascular bundle, which crosses the interval in this plane (**Figure 5**). The number and diameter of the vessels in the bundle are variable and must be ligated, stapled, or cauterized. Ligation is the most reliable option to prevent intraoperative bleeding and postoperative hematoma. A sharp Hohmann retractor is placed deep to the hip abductors on the outer portion of the hip capsule between the greater trochanter and superior femoral neck. The hip is then flexed 30° to relax the hip capsule and allow placement of a blunt Hohmann retractor under the medial femoral neck. The reflected head of the rectus femoris attaches to the anterior hip capsule and acetabular rim and is elevated off of the capsule with a Cobb elevator or electrocautery to expose the capsule. This retraction and dissection provides excellent exposure of the anterior hip capsule; capsulotomy and intra-articular exposure are then performed (**Figure 6**).

Surgical Technique Using a Specialized Table

Many instruments are available for direct anterior hip arthroplasty, includ-

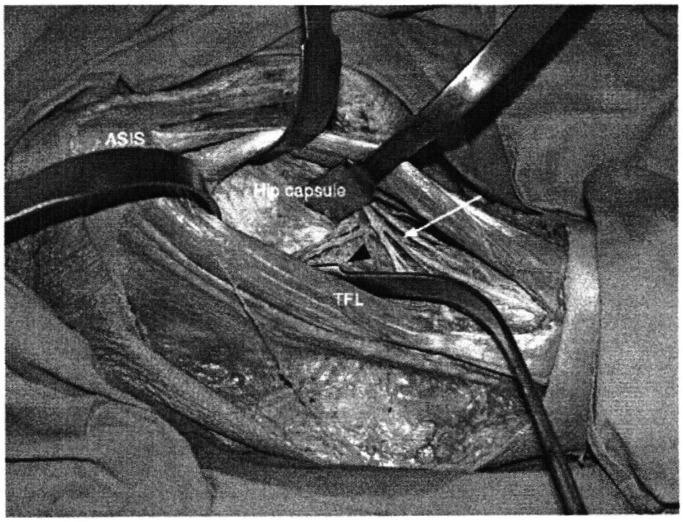

Figure 4 Cadaver photograph of the deep dissection anatomy. Arrowhead points to the rectus femoris. Arrow points to the deep branch of the femoral nerve to the rectus femoris. TFL = tensor fascia lata muscle.

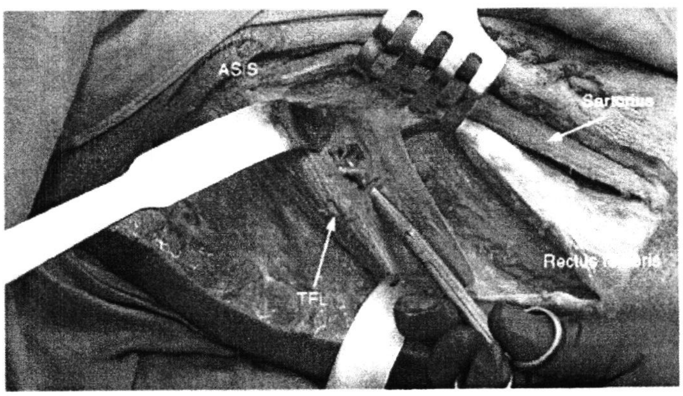

Figure 5 Cadaver photograph showing ligation of the lateral circumflex vessels. TFL = tensor fascia lata muscle.

ing specialized retractor sets, implant positioning guidance systems (computer navigation and fluoroscopic grid), and specialized orthopaedic tables to facilitate patient positioning. Many techniques also are available to perform the procedure based on the surgeon's preference and available resources. The specialized orthopaedic table is not required for direct anterior hip arthroplasty, but it is preferred by many surgeons (**Figure 7**).

The use of a specialized orthopaedic table allows for control of rotation, abduction, flexion, and traction of the surgical extremity and has a wide range of potential positions. Fluoroscopy also can be use to aid in intraoperative component positioning and limb-length determination. When using this specialized table, however, the leg cannot be freely tested for stability in the traditional manner, and the table is a mechanical device that can cause injury if not used with care. The cost and availability of the table are also potential drawbacks.

The patient is positioned supine on the table with a perineal post, and both legs are placed in the provided boots to secure the limbs. The nonsurgical hip is placed in a neutral position in all planes; this can be verified with fluoroscopy. Fluoroscopy also may be used during the procedure for assistance with limb-length and offset determinations. Gentle traction with fluoroscopy can be used to level the pelvis at this point in the procedure. Sequential compression devices are placed on both extremities, and the operative leg is draped in a sterile fashion.

After exposing the anterior hip capsule, a capsulotomy is performed, and an anterior capsulectomy also may be performed or the capsule can be tagged and preserved for repair at closure. The Hohmann retractors placed outside the capsule can now be placed within the capsule on the superior and inferior femoral neck. Several options are available for the femoral neck osteotomy. Matta et al[6] describe a technique to dislocate the hip prior to the osteotomy. The authors prefer to cut the neck in situ and subsequently remove the femoral head because of concerns about the increased torque placed on the operative leg with the dislocation technique. The in situ resection is performed using a long, narrow oscillating saw blade and can include one osteotomy or two parallel resections in a napkin-ring fashion to provide more space for removing the femoral head (**Figure 8**). Preoperative templating is referenced to determine this resection level. Gentle traction on the operative leg can assist in removing the femoral head; a Steinmann pin or power corkscrew device is placed into the head for removal.

The acetabulum is now prepared with component placement. Using gentle traction, the leg is positioned in 45° of external rotation. This facilitates exposure of the acetabulum and moves the greater trochanter posteriorly. A blunt Hohmann retractor is retained in the same position around the medial femoral neck. An acetabular retractor is placed directly inferior to the fovea against the transverse acetabular ligament. The anterior retractor is placed at the 9-o' clock position, and the anterior musculature is mobilized (**Figure 9**). Several stab incisions can be made into the posterior capsule to increase mobility if it is under tension, and a posterior retractor can be placed within the capsule around the posterior acetabular rim if needed for further exposure. Next, the foveal tissue and labrum are removed under direct visualization. The acetabulum is reamed in 10° to 15° of anteversion, with 40° to 45° of anteversion (**Figure 10**). Reaming is directly visualized, and fluoroscopy is then used for the final reaming to set the component size and depth. The selected implant is sized and impacted into position under fluoroscopic guidance, with screw insertion if needed. A curved acetabular inserter can be used to facilitate adequate soft-tissue clearance (**Figure 11**). The final liner is inserted, appropriate seating is verified, and any exposed osteophytes are removed from the acetabular rim (**Figure 12**).

The proximal femur is then exposed in preparation for insertion of the femoral stem. Traction is released on the leg, and it is returned to a position of neutral rotation. A femoral hook, which attaches to a connector

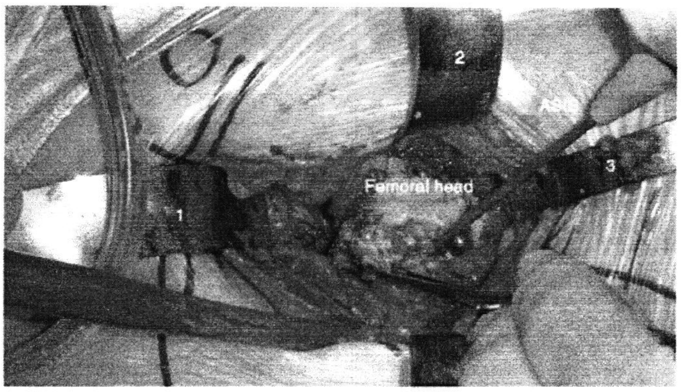

Figure 6 The capsule is resected. (1) Medial neck retractor. (2) Anterior retractor. (3) Superior neck retractor.

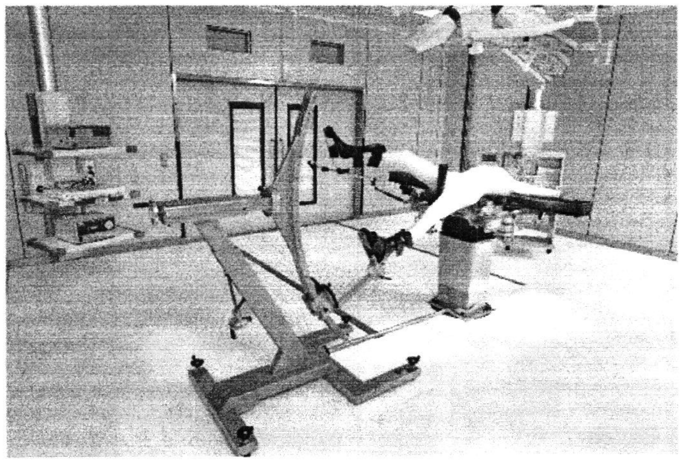

Figure 7 Photograph of the specialized orthopaedic table.

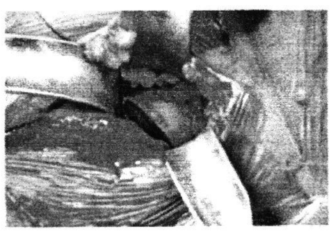

Figure 8 Intraoperative photograph of osteotomy of the femoral head before removal.

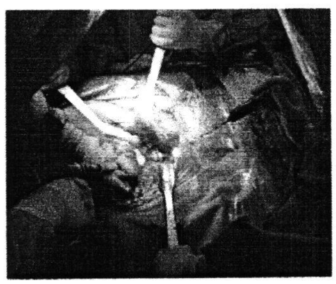

Figure 9 Position of the acetabular retractors.

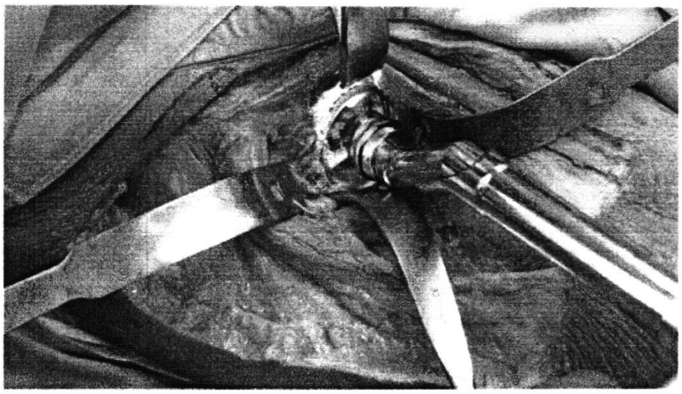

Figure 10 The acetabulum is reamed.

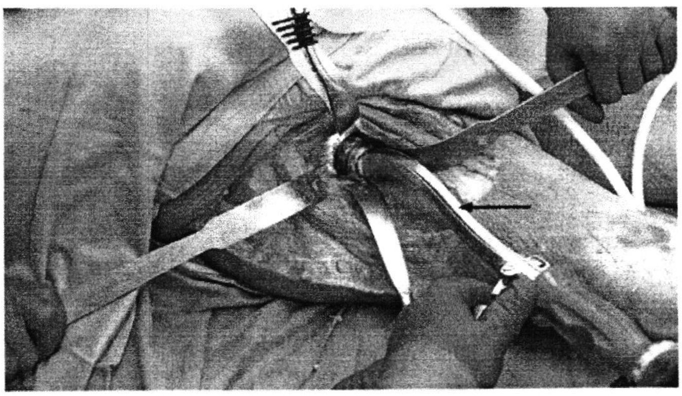

Figure 11 Placement of the cup. A curved acetabular inserter (arrow) facilitates insertion.

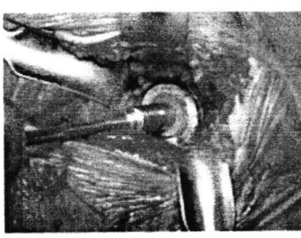

Figure 12 The final liner is inserted.

arm on the surgical table, aids in exposing the proximal femur. The connector arm can then be elevated to deliver the femur anteriorly, providing clearance for broach and stem insertion. Prior to the placement of this device, the superior and the medial capsules are removed. A bone hook is used to place anterior tension on the proximal femur to assess mobility; further releases of the piriformis, obturator internus, and gemelli can be performed in a sequential fashion. The posterior capsule, obturator externus, and quadratus femoris are always preserved. After adequate mobility is obtained, the S-hook is placed below the vastus lateralis ridge on the posterior femur, and the leg is externally rotated 90°, adducted, and extended. The hook is attached to the connection bracket on the table and the hook is elevated. Undue tension should not be placed on the hook because of the risk of a proximal femoral fracture. Adequate releases (as described) must be performed to prevent complications and allow for adequate exposure.

The femur is prepared by removing any remaining lateral femoral neck; this is followed by broaching the femoral canal. This chapter's authors prefer to use an offset broach handle, which greatly facilitates access to the femoral canal by providing adequate soft-tissue clearance. There is a risk of femoral canal perforation laterally if the broach handle cannot be brought down to the appropriate position because of soft-tissue impingement. A short, taper-fit stem is routinely used because it allows for ease of insertion and preparation. Preoperative templating is helpful in determining the stem size. The broach also is assessed intraoperatively for adequate stability and canal fill. Proximal or distal mismatch as seen in a Dorr type A femoral bone can be addressed using flexible reamers distally. Stem designs that require femoral reaming are technically more challenging to use in direct anterior hip arthroplasty because of the difficulty with reaming and the increased concern for femoral fracture with stem insertion.

The final broach is impacted into position with the placement of a trial head and neck. The hip is reduced by removing the hook, the leg is internally rotated to neutral with release of traction, and the femoral head is guided into the acetabulum.

Limb length and femoral offset are evaluated with fluoroscopy. A typical surgical fluoroscope can only image one hip at a time; however, new, large-diameter fluoroscopes can display an entire pelvic image. Several methods have been described for evaluating the position of the implant. With standard fluoroscopy, the image of the contralateral hip can be obtained and printed, and the same process can be performed on the operative extremity. The two printed images are then laid over one another, with proper limb length and offset determined by direct comparison with the contralateral extremity.[6] Another option with a standard or large-diameter machine is the use of a fluoroscopic grid. The grid is placed on the surgical table prior to the procedure and provides visible reference lines for determining offset and limb length on fluoroscopic images. This method has been shown to increase the percentage of acetabular components placed in the so-called safe zone and allows improved restoration of limb length and offset in comparison with fluoroscopy alone.[21] If desired, the leg can be removed from the traction spar to allow for stability testing. The leg must be appropriately draped to prevent contamination of the sterile field. The hip is dislocated by replacing the hook and applying traction and external rotation. Trial components can be removed with impaction of the femoral prosthesis, placement of the femoral head, and reduction of the hip.

The wound is irrigated, and anterior capsular closure is performed if a capsulectomy was not performed. The fascia lata interval is closed in a running fashion and is followed by subcutaneous and skin closure with the surgeon's preferred method. The patient is allowed to immediately bear weight as tolerated. Hip precautions are not required.[22]

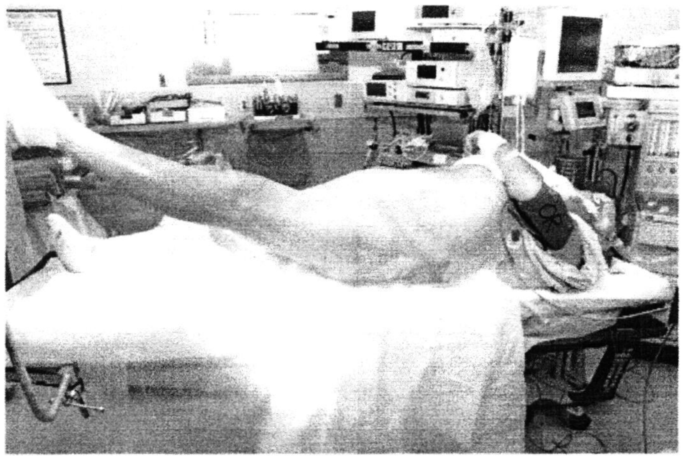

Figure 13 Photograph of a patient on a standard operating room table. The table is turned around to allow extension of the hip for femur insertion.

Surgical Technique Using a Standard Table

The use of a standard table for direct anterior THA has several advantages over a specialized table. There is no increased cost associated with the purchase of a specialized table, the operative extremity is not attached to the table and can be examined with ease, and there is no need for a nonsterile staff member to control the leg. The table must be radiolucent if fluoroscopy is used during the procedure or the advantage of fluoroscopy is lost.

With a standard operating table, direct anterior THA is performed in a similar manner as the procedure using a specialized table, but a slightly different setup is required (**Figure 13**). The patient is positioned supine with the hip joint at the level of the table break. This position allows the hips to be hyperextended during femoral preparation. A perineal post can be used if preferred. The post secures the patient on the table during the procedure but makes adduction of the leg more difficult. An arm board is attached to the contralateral side of the bed to support the nonoperative leg in an abducted position and allows for adduction of the operative extremity during femoral preparation. The surgeon has the option of draping only the operative extremity or both extremities into the sterile field. Inclusion of both legs allows the operative leg to be crossed under the nonoperative leg and facilitates femoral exposure. It also allows for quick limb-length measurement by palpation of the bilateral malleoli. This chapter's authors routinely drape only the operative leg and place compression stockings with a sequential compression device on the nonoperative leg.

The exposure and acetabular preparation with cup insertion is carried out as previously described. The leg is then placed in a figure-of-4 position and the medial capsule is released until the lesser trochanter is completely seen. The leg is then returned to a neutral position, and a bone hook is used to verify adequate mobilization of the proximal femur to provide clearance of the acetabulum. This requires release of the superior capsule and frequently the piriformis. The distal portion of the surgical table is then dropped 40°, allowing for hyperextension of the hip with the addition of the Trendelenburg position to keep the foot of the bed

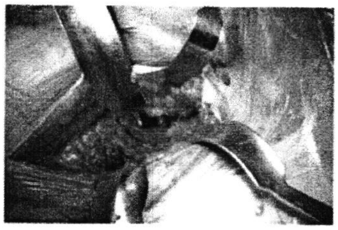

Figure 14 Position of the retractors for femoral preparation.

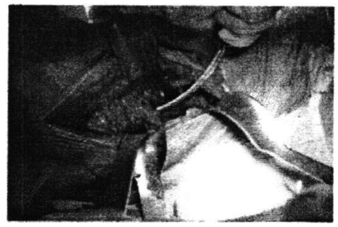

Figure 15 A curved canal finder is used to open the femur prior to broaching.

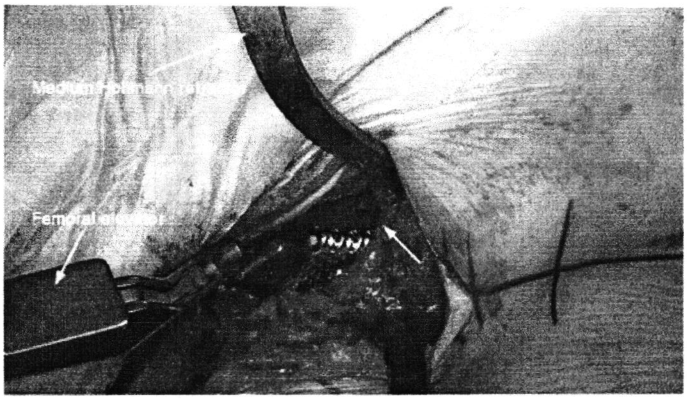

Figure 16 Double-offset broaching is preferred for femoral preparation because it allows adequate soft-tissue clearance, provides a better angle for alignment with the femoral canal, and minimizes the need for femoral elevation. The arrow points to the medial aspect of the femoral neck.

from dropping too close to the floor. The contralateral limb is abducted onto the arm board and the operative limb is adducted and externally rotated with the knee kept in extension. Further adduction can be obtained if both legs are draped into the field by allowing the operative limb to cross under the contralateral limb. A bone hook is used to pull the proximal femur anteriorly and laterally to clear the acetabulum; a specialized femoral retractor is then placed behind the greater trochanter to assist with soft-tissue retraction and hold the femur in position (**Figure 14**). Care must be taken with this retractor because it is not meant to elevate the femur but to retract soft tissue; excessive force on the retractor can damage the tensor fascia lata. A second retractor is placed proximal to the lesser trochanter in the calcar region to retract the medial soft tissues; a retractor can be placed laterally if necessary. A retraction system has been described for the proximal femur that attaches to the surgical bed and provides an elevation arm similar to the S-hook used with the specialized table.[23]

A box osteotome is used to remove any remaining lateral femoral neck, and the femoral canal is identified using an angled curette (**Figure 15**). A curved rasp or opening broach is then used to remove lateral bone in the region of the greater trochanter. Double-offset broach handles are preferred for femoral preparation because they allow adequate clearance of soft tissues, provide a better angle for alignment with the femoral canal, and minimize the need for femoral elevation[24] (**Figure 16**). Broaching is completed, and a trial head and neck are placed. The foot of the bed is leveled, and the Trendelenburg position is then removed from the table. The hip is reduced with gentle traction and internal rotation by the assistant, with the surgeon directly guiding the femoral head into the acetabulum. Limb length can be assessed by bringing the ankles together and palpating the malleoli. Fluoroscopy can be used to assess implant alignment, offset, and limb length. Hip stability and range of motion are also assessed at this time.

The hip is then dislocated with gentle traction on the leg and a bone hook around the femoral neck pulling anteriorly, laterally, and distally. Retractors are again placed, the trial head and neck are removed, and a bone hook is used to elevate the proximal femur. The table is then positioned to allow extension of the leg. The final implants are inserted with reduction of the hip joint. The hip can then be assessed clinically and fluoroscopically if desired. Closure is carried out as previously described (**Figure 17**).

Results

There has recently been renewed interest in direct anterior hip arthroplasty because of the potential for rapid recovery with less soft-tissue damage. A study comparing gait analysis in patients treated with the anterolateral approach and the direct anterior approach found that patients treated with the direct anterior approach had an earlier return to a normal gait pattern and substantially improved gait parameters.[25] Patients treated with the direct anterior approach have less pain, substantially more improvement in functional outcome scores, and quicker recovery in comparison with those treated with the lateral approach.[3,26] In a clinical comparative study of 182 consecutive patients (195 hips), Nakata et al[8] reported a faster functional recovery, with limp resolution and independent ambulation, along with increased accuracy of component placement in the direct anterior approach group (99 hips) compared with those treated with the posterior approach (96 hips).

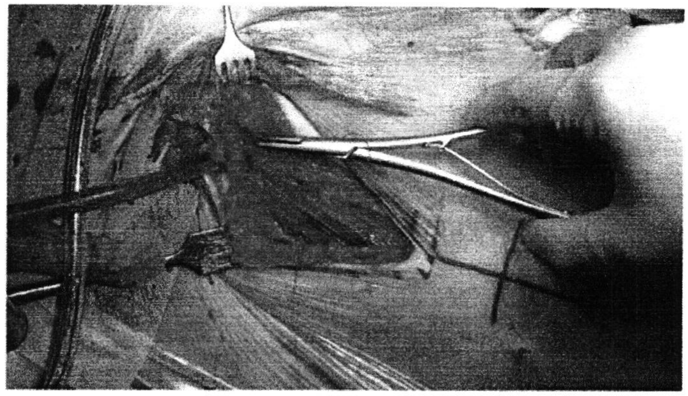

Figure 17 Closure of the tensor fascia lata with running suture.

The improved recovery seen in direct anterior THA is attributed to the use of an intermuscular and internervous interval, with no muscle splitting as required in other approaches. A cadaver study by Meneghini et al[27] compared muscle damage between the posterior and anterior approaches and found increased muscle damage to the gluteus minimus in the posterior group, increased tensor fascia lata and rectus femoris damage in the anterior group, and similar damage to the gluteus medius in both groups. A 2011 study quantitatively compared the presence of inflammatory markers and markers of muscle damage in patients treated with direct anterior and posterior hip arthroplasty and found the group treated with the posterior approach had significantly increased levels of creatine kinase ($P < .01$), which was consistent with increased muscle damage, although the clinical importance of this is unclear.[4] This finding supports the hypothesis that direct anterior hip arthroplasty has the potential for less muscle damage than other hip approaches.

The risk of dislocation after arthroplasty exists in all approaches. Special hip precautions have been routinely advocated for 6 to 12 weeks to prevent dislocation after THA. There is a higher risk of dislocation in the first 3 months after surgery as the capsule and supportive soft tissues of the hip joint heal.[28,29] Hip precautions result in increased costs because of the need for specialized assistive devices and aids and limit the patient's range of activities during the first months of recovery. Several large series have reported dislocation rates of 0.6% to 1.3% for direct anterior THA[5,6,19,30]; these rates are generally lower in comparison with those reported for other approaches.[28,29] Because hip precautions are not necessary to prevent dislocation with the anterior approach, the patient can return to his or her normal activities without concerns about dislocation, no dislocation precaution education is needed, and costs are decreased because no special equipment is required.[22]

There is a learning curve associated with the direct anterior approach for THA. Seng et al[26] reported on the learning curve in a high-volume arthroplasty practice. They found a substantial decrease in surgical time after treatment of the first 37 patients over a 6-month period. The initial patient selection was highly selective, with the procedure performed only on thin women with a high femoral neck offset; difficult cases, such as those involving muscular men or obese patients, were avoided. Masonis et al[31] examined a single surgeon's initial consecutive series of 300 THAs using the direct anterior approach and found substantial improvement in surgical and fluoroscopy times and minimization of limb-length discrepancy after treatment of the first 100 patients. A similar investigation, which evaluated 81 patients treated with direct anterior THA, reported improving surgeon proficiency over time, with a substantial decrease in surgical and fluoroscopy times and estimated blood loss.[32] A large, multicenter study of 1,152 patients reported a substantial decline in the complication rate after a surgeon performed 100 THAs using a single-incision anterior approach.[30] There is a well-defined learning curve associated with a surgeon performing 40 to 100 THAs with the direct anterior approach. Most of the studies were conducted in high-volume centers in which hip arthroplasty was routinely performed.

Specific complications are associated with each THA approach; the specific risks of the direct anterior approach have been well characterized. The most frequent intraoperative concerns are LFCN injury, lower extremity fracture, and implant malalignment.

The LFCN is at risk of injury during exposure and during retraction. This risk has been minimized by modification of the exposure with dissection through the fascia of the tensor fascia lata instead of between the tensor fascia lata and sartorius muscles. Most studies have reported rates of LCFN neurapraxia at or below 1%.[26,30,32,33] In a study of patients treated with the anterior approach, Goulding et al[34] reported LFCN neurapraxia in 53 of 60 patients (88%) at the first follow-up, with complete resolution after 12 months in only a few patients. Despite the high rate of neurapraxia, no functional limitations were identified in these patients.

Fracture of the operative extremity can occur during the femoral portion of the procedure and with manipulation of the leg on the specialized table. Femoral perforation can occur during preparation or implant insertion because of inadequate exposure and the inability to obtain in-line access to the femur.[26,30] The greater trochanter can be fractured by excessive traction on the elevation hook or manipulation. The femoral calcar also can be fractured during implant preparation and insertion. Ankle fracture has been caused by excessive torsion on the extremity with the use of a specialized table.[6] This chapter's authors recommend the use of specialized broaches and instrumentation for direct anterior THA to minimize the risk of femoral perforation and prefer an implant that is conducive to this approach (reduced distal geometry and lateral shoulder).

The primary postoperative concerns are hip dislocation and hematoma formation. Because the dislocation rate is low, this chapter's authors do not recommend the routine use of hip precautions with the direct anterior approach. Hematoma risk can be minimized by proper ligation of the lateral femoral circumflex vascular bundle and obtaining intraoperative hemostasis. Barton and Kim[35] provide a thorough description the complications of the direct anterior approach to hip arthroplasty and recommendations to minimize their occurrence.

The concept of direct anterior hip arthroplasty is not novel, and there are several centers that have been performing arthroplasty through this approach for decades with excellent outcomes.[5,6,36] The indications for the direct anterior approach extend beyond THA and can be used for trauma, head resurfacing, revision arthroplasty, infection, and impingement.[37,38]

Summary

The direct anterior approach to THA is attracting renewed interest because of the desire for faster recovery in high-demand patients, the ability to avoid hip precautions, and the surgeon's ability to reproducibly restore limb length and offset with accurate component placement. It is a technically demanding procedure with a well-defined learning curve.

This chapter's authors recommend advanced preparation such as cadaver dissection, attendance at a course on direct anterior THA, or consultation with a surgeon who is experienced with the approach. When initially performing the procedure, patients should be carefully selected. The ideal patient is a thin woman with high femoral offset, which minimizes the soft-tissue envelope and provides adequate clearance of the femur and acetabulum. More technically difficult cases, including the treatment of muscular men, obese patients, and those with posttraumatic arthritis or atypical anatomy, should be avoided until the surgeon gains experience in the direct anterior approach. There has been some evidence of improvement in short-term outcomes associated with direct anterior THA, and it may provide quicker functional recovery with less soft-tissue damage, although further randomized controlled trials are needed.

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