LIMITED INCISIONS FOR TOTAL HIP ARTHROPLASTY

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Limited Incisions for Total Hip Arthroplasty

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CHAPTER 1

SINGLE-INCISION ANTERIOR APPROACH FOR TOTAL HIP ARTHROPLASTY: SMITH-PETERSEN APPROACH

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Hip replacement surgery has become one of the most successful interventions in modern medicine. The clinical results frequently show well over 90% good or excellent outcomes.1,2 Recently, an increased emphasis has been paid to surgical approaches that lessen trauma to soft tissue and bone, potentially allowing a much quicker recovery. This has resulted in several modifications of existing techniques as well as the establishment of new techniques. Modification of the posterior and anterolateral approaches has resulted in decreased incision length and less detachment of the muscles from bone; however, the general principal of these approaches has stayed the same. The main advantages of these techniques are the familiarity to surgeons and the possibility of extensile exposure when needed. Two-incision techniques were developed with the intention of allowing each component to be placed in an optimal position with the least amount of soft-tissue damage. These approaches usually require intraoperative radiography since direct visualization of the femur often is not possible and visualization of the acetabulum may be suboptimal.

Total hip arthroplasty (THA) through a single-incision anterior approach is a less invasive technique because it does not adversely affect any of the major muscle groups around the hip joint, consisting of the hip extensors, abductors, and short external rotators.3 Hip extensors are vital to activities of daily living such as getting out of a chair, walking upstairs, getting in and out of a car, and rising from the toilet. The abductors are critical for proper gait. The short external rotators are dynamic stabilizers of the hip joint; therefore, they are important to hip stability. Although the hip flexors are also important, they are rarely sufficiently affected during surgery to hinder hip function.

The first hip arthroplasty performed through a single anterior incision was by Robert Judet in 1947 at Hospital Raymond Poincare in Garches outside of Paris, France. The patient was supine on the Judet table that was designed by Judet’s father, Henri Judet in 1940.4,5 Judet referred to the surgical approach as the “Heuter approach.” A published reference for this, however, is unknown, and “Heuter” may have been a reference to “Heuter Volkmann,” the approach for drainage of a tuberculous hip abscess. The approach also can be called the “Short Smith-Pete” because it follows the Smith-Petersen interval distal and lateral to the anterior superior iliac spine. Judet used the anterior approach for several reasons: (1) the hip is an anterior joint, closer to the skin anterior than posterior; (2) the approach follows an internervous plane between the superior and inferior gluteal nerves lateral (tensor fascia lata) and the femoral nerve medial (sartorius); and (3) the approach exposes the hip with minimal detachment of the muscular attachments.

This anterior approach preserves posterior structures that are important for preventing dislocation while preserving abductor muscle attachments to the greater
trochanter. The gluteus maximum and tensor fascia lata muscles also remain undisturbed and function as hip abductors and pelvic stabilizers, inserting on the fascia lata/iliotibial band complex to form the "deltoid of the hip." Preservation of this "hip deltoid" and the attachments of the gluteus minimus and medius facilitate earlier functional recovery and avoid postoperative abduction weakness.

Acetabular access is easy to appreciate through the anterior approach; however, femoral access is more difficult. This has lead to other techniques that often require a separate incision for implantation of the femoral stem. With the single anterior incision, access to both the acetabulum and femur is facilitated by a special orthopaedic table or table attachment used to control leg positioning during the procedure. The original table used in France by Judet was the Judet/Tasserit table. This table is no longer manufactured, which led to the design of the OSI PROfx table (Figure 1). We currently use the OSI PROfx and HANA (OSI, Union City, CA) tables, and the tables have the additional feature of the femoral jack and hook device to facilitate femoral exposure. Other devices, such as the arch table extension and the medacta table extension, are available. One of the authors has some experience with the arch table extension; the other devices are only included for the sake of completeness. In this chapter, we will review patient selection criteria, surgical technique, pearls and pitfalls, and early to midterm clinic results of the single-incision anterior approach using a special operating table.

Patient Selection

Although the single-incision anterior approach with a specialized surgical table for hip replacement can be performed in most patients, certain patients are not considered appropriate candidates for this approach. Patients with severe heterotopic bone, ipsilateral below-knee amputation, an ipsilateral hinged knee prosthesis, or severe dysplasia requiring femoral osteotomy should undergo hip arthroplasty via a different surgical approach. In severe heterotopic bone, femoral exposure and mobilization may be very difficult. In below-knee amputation, a proximal tibial pin may be attached to a Kirschner traction bow that attaches to the table spar, but this adds complexity to the procedure. Although ipsilateral total knee arthroplasty is not an absolute contraindication, a hinged knee may rotate out around the rotating platform. Caution should be used since we do not have any experience with this particular situation. Although acetabular dysplasia in need of bone grafting can be done without difficulty by fixing the graft with either screws or a plate, a femoral shortening osteotomy can be difficult. Acetabular work (ie, bone graft with screw fixation) is relatively easy, but the difficulty with dysplastic hips is on the femoral side. Dyplastic hips that require femoral shortening osteotomy are difficult to correct and require a separate incision. Therefore, we feel that dysplasia with the need for femoral shortening osteotomy is a contraindication. Femoral dysplasia without femoral shortening is acceptable. The advantage of using the anterior approach in dysplasia includes preser-
vation of the musculature, radiographic control of reaming that allows the surgeon to more accurately and confidently medialize the reamer, and the ability to confirm being in the true rather than a false acetabulum. Previous radiation to the hip region also may cause difficulty with exposure and femoral mobilization. Although some surgeons promote the anterior approach for hip revisions (K. Keggi, MD, personal communication, 2004), it is more difficult because of the inability of extensive exposure of the femur and not having direct visual access of the intramedullary canal. Acetabular exposure actually may be easier since the Smith-Petersen approach is the only true extensive approach to the hip because it follows the only true interneural and intermuscular plane. We actually prefer the anterior approach particularly for some difficult acetabular problems and acetabular revisions when the femoral component will be left undisturbed. Polyethylene liner exchanges can be done through the anterior approach with little or no difficulty.

Factors that make the anterior approach more difficult are: (1) increased body mass index (BMI), especially in men (Figure 2), (2) large, muscular men, (3) patients with large trochanters that have a “hook” medial to the intramedullary canal (Figure 3), and (4) hips with very small offset and a broad iliac wing. Severe osteopenia can increase the risk of intraoperative fracture at the calcar or the ankle. The ideal patient is a woman with reasonable offset and BMI and with good bone quality. Hemi-arthroplasty also can be performed, but placement of the unipolar or bipolar head sometimes may be difficult because of soft-tissue constraints. Manipulating the leg spar may be of great assistance.

PREOPERATIVE PATIENT EDUCATION

As with all surgical procedures, preoperative patient education is paramount. Routine surgical complications should be discussed as it relates to hip arthroplasty and devices used. Additional points should be discussed as they appear to be unique to the anterior approach, including an increased incidence of lateral thigh numbness that usually resolves within a few months, an occasional seroma requiring aspiration, and a higher incidence of trochanteric bursitis if femoral offset is increased over normal because the iliobial band is not “released” with the anterior approach. The numbness is most likely caused by the stretching or cutting of a small superficial branch exiting laterally off the lateral femoral cutaneous nerve (Figure 4). Most patients are very accepting of the slight decrease in feeling over the lateral thigh, especially if they have been properly educated prior to surgery. Lateral cutaneous nerve palsy does not appear to occur with proper placement of the skin incision and with avoidance of aggressive medial retraction of soft tissue. Postoperative seroma is easily treated with aspiration and a spica dressing. It usually occurs in thin female patients and rarely requires more than one aspiration. Trochanteric bursitis occurs more commonly and is easily treated with a steroid injection and physical therapy. Preoperative education is important to reduce patient anxiety should these problems occur. For surgeons unfamiliar with this approach, potential complications related to the learning curve may need to be discussed. If the anterior capsule is repaired, the patient is instructed to avoid external rotation in hyperextension for 6 weeks. We also review with patients the “extreme” posterior precautions that include the combination of hyperflexion, adduction, and more than 45° of internal rotation.

SURGICAL TECHNIQUE

Although the single-incision anterior approach can be performed without a special surgical table, our main experience is with the use of a specialty surgical table. We also believe that the technique is significantly facilitated by the use of a specialty table (Figure 1) or the use of special devices to position the extremity (Figure 5). Dis-
cussion of the surgical technique will be limited to the technique that we perform on the OSI PROfx table.

**Patient Positioning**

After preoperative templating of radiographs, the patient is placed in the supine position on an orthopedic table. The operative leg is placed in a leg-holding device that allows controlled positioning of the leg in space during surgery. The leg is not draped free but is attached to the leg spar to allow traction, rotation, extension, and adduction (Figure 1). The contralateral hip is placed in neutral rotation, extension, and abduction-adduction to serve as a radiographic control for the operated side. The operative leg is set in slight internal rotation to enhance the landmark of the natural bulge of the tensor fascia lata muscle. Pneumatic compression boots can be applied to both legs for intraoperative deep venous thrombosis (DVT) prophylaxis.

**Exposure**

The incision is placed 2 cm posterior and 2 cm distal to the anterior superior iliac spine (ASIS). This straight incision is extended in a distal and slightly posterior direction to a point 2 to 3 cm anterior to the greater trochanter (Figure 6), for a total of 6 to 10 cm. The subcutaneous tissue is undermined to allow the placement of the retractor or protractor for the protection of the skin and to avoid maceration of the skin edges. The aponeurosis of the tensor fascia lata is incised in line with the skin incision and the direction of the muscle fibers. The interval between the tensor and sartorius is developed by blunt dissection with the index finger around the medial aspect of the tensor within the sheath of the incised aponeurosis. Continued blunt dissection along the medial tensor in the posterior and proximal directions allows palpation of the lateral hip capsule. A cobra retractor is placed along the superolateral hip capsule. A Hibbs retractor is used to retract the sartorius and rectus femoris medially, exposing the reflected head of the rectus. More distally in the wound, electro bovie cautery is used to incise the fascia over the rectus femoris to isolate the lateral femoral circumflex vessels which are then tied with a free tie or carefully coagulated. These vessels can bleed briskly and attention to detail avoids extensive blood loss (Figure 7). The precapsular fat is then identified and excised for adequate visualization of the capsule. Again, adequate coagulation of precapsular vessels is necessary to avoid excessive bleeding. The reflected head of the rectus and the iliocapsularis muscles are gently lifted off the capsule and a second cobra retractor is then placed on the medial hip capsule (Figure 8). Alternatively, a Hibbs retractor can be used to avoid retraction of the rectus and iliocapsularis until after the arthroscopy is done. Additional distal splitting of the aponeurosis that overlies the anterior capsule enhances the exposure of the origin of the vastus lateralis muscle.
CHAPTER 1

FIGURE 5

Examples of devices that assist in holding the leg in the desired position. A, Medacta table extension. B, Arch table extension.

FIGURE 6

The incision is placed 2 cm posterior and 2 cm distal to the anterior superior iliac spine (ASIS). This straight incision is extended in a distal and slightly posterior direction to a point 2 to 3 cm anterior to the greater trochanter for a total of 6 to 10 cm.

The lateral femoral circumflex vessels are ligated with free tie or carefully coagulated. These vessels can bleed briskly, and attention to detail avoids extensive blood loss during the surgery.

The capsulotomy is done in an L-shaped or upside down T-shaped fashion (Figure 9). The distal portion of the lateral capsule is detached from the sulcus between the anterolateral neck and greater trochanter and from the superior acetabular rim next to the insertion of the reflected head of the rectus. The distal portion of the medial flap of the capsule is detached from the femur at the anterior intertrochanteric line down to the lesser trochanter. Frequently there is brisk bleeding from the cut edges of the capsule. The medial and lateral flaps are

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tagged to assist with retraction, especially during acetabular reaming and for subsequent repair. The cobra retractors are now replaced inside the capsule, exposing the femoral neck.

**Hip Dislocation**

Preliminary hip dislocation before the neck osteotomy is not essential; however, it can greatly facilitate exposure of the posterior and medial neck and improve mobilization of the femur for subsequent preparation. Infrequently, dislocation may be difficult because of protraction or previous acetabular fracture, or massive acetabular osteophytes. In these unusual cases, the neck is cut in situ. To dislocate the hip, a narrow Hohmann retractor is placed on the anterolateral acetabular rim to allow excision of the anterolateral labrum, anterolateral osteophytes, and/or ossified labrum with an osteotome, thereby exposing the articulation. Distal traction on the extremity creates a small gap between the femoral head and the roof of the acetabulum. A femoral head skid (Aesculap, Central Valley, PA) can be placed into the gap. By sliding it medially, the ligamentum teres can then be released, thereby freeing up the femoral head of all attachments. The traction is then partially released, and external rotation of the limb allows the hip to be dislocated anteriorly. External rotation of the femur is accomplished by rotation of the leg spar rotation wheel. If the patient is very osteoporotic, undue force from the rotation wheel can fracture the tibia or ankle. For this reason, two modifications were incorporated to aid in the dislocation procedure. The scrubbed surgical assistant can aid dislocation by grasping the femoral condyles and applying additional rotation, therefore decreasing the torque applied to the distal extremity. Preferentially, a femoral head corkscrew can be placed into the head before dislocation and can be used to pull and externally rotate the femoral head. By combining the corkscrew and skill and unlocking the table rotation control, the head can be dislocated without applying any distal rotational force to the extremity. After dislocation, the hip is externally rotated 90°. A narrow Hohmann retractor is placed distal to the lesser trochanter and beneath the vastus lateralis origin. The medial capsular flap is retracted medially to expose the hip capsule which remains attached to the medial and posterior femoral neck. This capsule is then released, exposing the lesser trochanter down the posterior aspect of the femoral neck. The hip is reduced back into the acetabulum by internal rotation, and the neck cut is completed in situ. This dislocation procedure should be fairly easy if adequate capsule is released initially. If the surgeon feels that excessive torque is required to dislocate the hip, an in situ neck osteotomy should be done.
Neck Osteotomy and Extraction of the Femoral Head

With the cobra retractors placed around the medial and lateral neck, a reciprocating saw can be used to safely osteotomize the femoral neck at the templated level (Figure 10). The neck cut is completed with an osteotome that divides the lateral neck from the medial greater trochanter, and should be directed posterior and slightly medial to avoid fracture of the greater trochanter. The femoral head corkscrew is used to remove the head with care, protecting the tensor from laceration by the sharp edge of the neck as it is extracted. Alternatively, a double osteotomy may be done by adding a second osteotomy approximately at the level of the articular cartilage border of the femoral head. With the assistance of a threaded Steinmann pin, the wedge and the head are easily removed. Care must be taken not to plunge with the saw blade because this can result in a cut into the posterior wall of the acetabulum. If extensive bleeding at the osteotomy site is encountered, bone wax can be placed on the osteotomy site.

Acetabular Cup Insertion

Acetabular cup insertion is facilitated with a curved or offset handle inserter that reduces pressure on the distal wound and avoids placing the component too vertically. The tendency with this technique is to place the cup in a too antverted and vertical position because of the soft-tissue interference with the cup inserter. To ensure accuracy of component position, image intensification can be used to verify the abduction angle and anteversion as the prosthesis is sequentially seated (Figure 11). Anteversion can be difficult to judge if the patient is not positioned carefully on the operative table. Finger palpation of the native acetabular rim can be a secondary check for accurate acetabular cup placement. The appropriate liner is then inserted and any overhanging acetabular osteophytes are removed with a curved ½-inch osteotome.

Femoral Exposure

Femoral exposure is the most challenging step and is aided by the leg-holding device and a femoral hook. The hook attaches to a hook bracket which is attached to the operating table. It is designed to facilitate exposure of the femur through the small anterior incision. After acetabular insertion, the gross traction control on the leg is used to release all the traction and the femur is internally rotated to neutral. The femoral hook is placed just distal to the vastus ridge and around the posterior femur. The femur is externally rotated 90°, hyperextended, and adducted with the assistance of the leg-holding device. This maneuver should be slow and deliberate to ensure that the greater trochanter is not caught behind the posterior acetabular wall. The hook is then attached to the most convenient hole on the bracket, which is attached to a jack on the table. Elevation of the jack causes the hook to deliver the proximal femur anteriorly, aiding femoral preparation. Sequential releases of the posterior capsule are essential and will facilitate femoral mobilization.

Five sequential releases allow reproducible femoral exposure and are as follows: (1) Superior capsular: the superior capsular release is done from the superior acetabulum rim in a subperiosteal fashion. The initial inverted T incision can be converted into an H-type incision to improve femoral exposure. (2) Inferior capsular: capsule is released from the inferior neck along the
FIGURE 10

With the cobra retractors placed around the medial and lateral neck, a reciprocating saw can be used to safely osteotomize the femoral neck at the templated level. A, Oscillating saw cutting the femoral neck. B, Dotted line indicates the osteotomy site.

FIGURE 11

To ensure accuracy of component position, image intensification can be used to verify the abduction angle and anteversion during reaming and placement of the acetabular component. A, Radiographic visualization during reaming. B, Radiographic visualization during acetabular cup insertion.

intertrochanteric line, if not done during the dislocation step or as described earlier. Bleeding can be encountered. (3) Piriformis recess: further releases may be necessary along the piriformis recess. (4) Posterior capsular: capsule can be released along the posterior neck of the femur. The tip of the greater trochanter can then be delivered through the posterior lateral capsule release and past the posterior wall of the acetabulum. As the femur is elevated, the surgeon should monitor the tension on the leg during elevation of the hook because too much tension may cause fracture of the trochanter. (5) Short external rotators: rarely, the short external rotators need to be released along the piriformis recess and the posterior femur.

A cobra or Ranawat retractor is placed with its tip on the posterior femoral neck, and a trochanteric retractor (bent Hohmann or 90° Hohmann) is placed over the tip of the trochanter. The lateral capsular flap may need to be detached from the base of the neck in an anterior to posterior direction, further facilitating exposure of the
medial greater trochanter and enhancing femoral mobility. Any lateral neck remnant is excised with a rongeur.

**Femoral Broaching**

Although any stem can be used with this approach, stems requiring straight reamers for canal preparation are more difficult because they require more mobilization of the femur to allow access down the canal. We prefer systems that offer an offset broach handle, which are easily introduced into the proximal femur without further release of the soft tissues. If further mobilization of the femur is necessary, it can be accomplished with additional release of the capsule and infraspinatus with sequential releases of the obturator internus and piriformis tendons. Further mobilization of the femur should not be accomplished with further elevation of the hook past a point of excessive tension on the leg because this can lead to fracture of the greater trochanter. Slight Trendelenburg can also assist to gain additional clearance for the broach handle. The obturator internus tendon inserts inside the internal lip of the posterior aspect of the greater trochanter, and in difficult cases it may be released to allow additional immobilization of the femur. Likewise, release of the piriformis may be done in extreme cases. The release of these rotators is preferred over the release of the obturator externus, which exerts a more medial pull and which we consider to be most important in hip stability.

Broaching is accomplished with the tip of the broach entering the neck near the posterior medial cortex (Figure 12). Care must be taken to ensure that the broach is not in excessive anteversion, which may occur if the femur is not externally rotated enough. It is possible to perforate the posterior or lateral femoral cortex because of the interference of the patient’s soft tissues on the broach handle (Figure 13). Broaching is continued to an appropriate size based on intraoperative feel, insertion length, and preoperative templating. The appropriate trial neck and head are placed onto the broach as determined by the preoperative templating, and by its observed relationship to the tip of the greater trochanter. After the hook is lowered and removed, a trial reduction is done to confirm proper limb lengthening and hip stability. The hip is easily reduced with internal rotation and slight traction.

**Final Review: Hip Stability and Closure**

The limb length and offset determination can be confirmed with an intraoperative AP pelvis radiograph or with the use of an image intensifier (Figure 14). An image of the contralateral hip should be obtained and printed, and then placed on the screen. The operated hip is imaged, and the rotation, abduction, and flexion are adjusted to position the hip equivalent with the contralateral side. The image is printed, and the two images are compared by superimposing the transparencies. The bony landmarks of the femurs are aligned, and the pelvic landmarks compared. With the trial components inserted, anterior hip stability is checked in extension and external rotation by applying rotation to the leg to 85° of external rotation. Posterior stability also can be tested by removing the boot from the leg spar, flexing the hip to 90°, internally rotating to 45°, and adducting to 20° (Figure 15). If the hip dislocates during manipulation, it is necessary to check for acetabular osteophytes that may cause impingement. Once the trial components are chosen, the hook is placed around the posterior femur, traction is applied, and the hip is dislocated with slight traction and external rotation. The femur is repositioned into the preparation position (90°+ external rotation, hyperextension, adduction, and hook elevation). The trial components are removed and the final components are inserted. The image intensifier is used to confirm position of the acetabulum and correctness of the limb length and offset. Inevitably there may be some variability of soft-tissue tension between individuals, and with the anterior approach it does not appear to be necessary to create an abnormal increased offset or increased limb length to tension the soft tissues.

The wound is checked for bleeding and the anterior and lateral capsular tag sutures are tied together. Additional capsular closure may be done if desired. The fascia lata is closed with a running suture, followed by subcutaneous and skin closure. We place both deep and superficial drains.

**Pitfalls to Avoid in Surgical Technique/Common Errors**

This section covers common pitfalls, how to avoid complications, and how to deal with complications when they occur.

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FIGURE 12

Broaching is accomplished with the tip of the broach entering the neck near the posterior medial cortex. A broach-only system with an offset broach handle facilitates the preparation of the femur. A, Offset broach handle to facilitate entering the femoral canal. B, Insertion of the final implant.

Dislocation and Limb-length Inequality

The incidence of dislocation using the anterior one-incision approach is very low because of the preservation of dynamic hip stabilizer (short external rotators). Nevertheless, prevention by proper placement of components and intraoperative stability testing is important. An intraoperative radiograph will not only confirm proper placement of components for hip stability, but it also gives valuable information about offset and limb length. Because of the increased stability of the anterior approach, leg lengthening to gain stability is rarely necessary. Because the patient is in the supine position, a high quality radiograph can be obtained.

Intraoperative Crack, Periprosthetic Fracture, and Lateral Perforation

Intraoperative Calcar Crack
An intraoperative calcar crack of the proximal femur can occur with aggressive broaching. Although we find that cerclage wires can be passed around the proximal femur without extending the 10-cm incision, the approach can be extended distally and laterally, elevating the vastus to expose more of the femur as needed. A small crack can be treated with one cerclage wire above the lesser trochanter. Extension past the lesser trochanter may require a second wire (Figure 16). Manipulating the leg in the reduced position with the leg-holding device greatly facilitates the passage of the cerclage wire/cable.

Periprosthetic Fracture
An acute postoperative fracture is somewhat more challenging but also can be treated without much additional exposure. If noted intraoperatively, an additional separate lateral incision over the vastus lateralis can be made and two additional wires can be passed. The implant should be removed prior to placement of the wire and reinserted once confirmation of anatomic reduction of the fracture is confirmed. The same approach can be used if the fracture is noted in the first few weeks. Conversion to a more fully coated straight stem that can be inserted via the anterior approach is possible, but it will require slightly more releases around the femur (Figure 16). If no perforation occurred during surgery, four cerclage wires should be sufficient. The postoperative course should be modified to touch-down weight bearing for at least 6 weeks.

Lateral Perforation
If lateral perforation occurs during broaching (Figure 17), it must be noted early to avoid broaching up and
**FIGURE 13**


**FIGURE 14**

The leg length and offset determination can be confirmed with an intraoperative AP pelvis radiograph (A) or with the use of an image intensifier (B). The image is printed, and the two images are compared by superimposing the transparencies.

**FIGURE 15**

With the trial components inserted, (A) anterior hip stability is checked in extension and external rotation by applying rotation to the leg to 85° of external rotation. B, Posterior stability can be tested by removing the boot from the leg-holding device, flexing the hip to 90°, internally rotating to 45°, and adducting to 20°.

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Radiographs representing two separate patients that required additional fixation for intraoperative fractures. A. Radiograph showing an intraoperative fracture that was noted to have extended distally. The treatment included removal of the stem with placement of three cerclage wires. Although the stem had slight subsidence initially, it went on to stable fixation and an excellent result. B. The patient sustained a fall in the hospital on the second postoperative day and was noted to have a fracture that propagated distally. The patient required a return to the OR to remove the original stem, followed by stabilization of the fracture with four cerclage wires and reimplantation with a longer revision-type stem.

Increasing the size of the perforation. If a lateral perforation is suspected, the image intensifier can be used for confirmation. The postoperative regimen may be modified to touch-down weight bearing, but no other treatment is necessary. An intraoperative radiograph should be obtained to ensure that no other fractures occurred.

Unstable Acetabular Component

Due to the unfamiliarity with this approach, in the early learning curve occasionally it may be difficult to obtain a stable cup. This may result from excessive reaming anteriorly or posteriorly. It is advisable to intermittently palpate the anterior and posterior wall with the index finger between reamers to ensure concentric reaming. If the cup appears to be unstable, downsize the reamer and medialize the reamer to the teardrop. If difficulty continues, a suboptimal version may gain cup stability by increasing acetabular cup coverage. Multiple screws also may be necessary for supplemental fixation. In this case, a lipped or face-changing liner may be needed to obtain a stable hip joint. A slight compensation in version during femoral broaching may also avoid future instability.

Postoperative Care Including Physical Therapy and Pain Management Protocols

Provided that the patient has adequate bone quality, weight bearing as tolerated is allowed after surgery with minimal postoperative restrictions. Walking with the aid of a crutch, cane, or walker is based on individual patient
Figure 17

Lateral perforation occurred during broaching. The breach was redirected and the patient was kept on touch-down weight bearing for 4 to 6 weeks.

ability. Gait training and stair ambulation during the patient’s hospital stay is monitored and instructed by physical therapists. Drains are discontinued on the first or second postoperative day. Most patients are discharged on postoperative day 2 or 3. Transfer to skilled nursing is rarely necessary unless there are social issues. Outpatient physical therapy is only ordered if requested by the patient or if the patient’s progress in the hospital is slow. Follow-up visits include first 2 weeks postoperative, 6 weeks postoperative (only if patient has difficulty at the 2-week visit), 3 months or 6 months, and annually thereafter. Dr. Matta’s protocol is 6 weeks, 1 year, and then at 2-year intervals after surgery.

Pain protocol includes regional anesthesia whenever possible and an intraoperative injection of ketorolac tromethamine (30 mg), ropivacaine (2 mg/kg), morphine (5 mg), and epinephrine (0.6 mL [1:1,000]) after closure through the drain tube. Pain management is avoided for the first 4 hours postoperatively. It is important to note that we have observed two cases (out of 410 cases) of a 12-hour temporary foot drop postoperatively, most likely due to this cocktail of local anesthetic affecting the sciatic nerve. We do not directly inject into the capsule or musculature around the hip joint. Patients will receive a morphone PCA but are encouraged to start using oral pain medication as soon as possible. They are sent home with a prescription of narcotics. Patients also receive indomethacin for 10 days to avoid the formation of heterotopic bone formation. Dr. Matta’s protocol does not include wound injections, although morphine may be used with the spinal. Postoperatively, the patient typically receives only oral narcotics and is not prescribed the use of a PCA or indomethacin.

Clinical Results and Complications

Dr. Matta’s series of 437 consecutive, unselected patients who had 494 primary total hip arthroplasty surgeries done through an anterior approach on an orthopaedic table from September 1996 to September 2004 were reviewed. The Judet/Tessier table was used until the PROfix table became available in January 2003 and was used subsequently. There were 54 hybrid and 442 uncemented hips in the 437 patients (57 bilateral). The average patient age was 64 years. Radiographic analysis showed an average abduction angle of 42°, with 96% in the range of 35° to 50° abduction. The average cup anteversion was 19°, with 93% within the target range of 10° to 25°. Postoperative limb-length discrepancy averaged 3 ± 2 mm (range, 0 to 26 mm). Three patients sustained dislocations for an overall dislocation rate of 0.61%. No patients required revision surgery for recurrent dislocations. There were 17 surgical complications, including one deep infection, three wound infections, one transient femoral nerve palsy, three greater trochanter fractures, two femoral shaft fractures, four calcare fractures, and three ankle fractures. In reference to the three ankle fractures, they occurred over a 2-month period in 2003. The fractures occurred when Dr. Matta changed his technique from cutting the neck in situ to dislocating the hip prior to cutting it. All three fractures occurred in elderly women with osteoporosis when attempting to dislocate the hip with torsion applied to the leg. Following these occurrences, the technique for dislocation was changed to the current femoral head skin, femoral head cork screw combination, and no or minimal distal leg torque. Since this change, the complication has not recurred. Surgical time averaged 75 minutes (range, 40 to 150 minutes), and the average blood loss was 350 mL (range, 100 to 1,300 mL). The mean hospital stay was 3 days (range, 1 to 17 days).
CONCLUSION/DISCUSSION

For a new technique to be successful, it has to be safe, reproducible, applicable to most patients, and teachable. We feel that the anterior approach on the orthopaedic table is a minimally invasive technique applicable to all primary hip patients and can be reproduced safely. Careful surgical technique avoids complications and allows accurate and reproducible component positioning and limb-length restoration and does not increase the rate of hip dislocation. The use of this surgical technique even eliminates dislocation precautions. The fact that Dr. Matta's published series does not include any recurrent dislocators or need for revision for dislocation is significant. We feel that cadaver courses are necessary to properly teach this technique to surgeons unfamiliar with the Smith-Petersen approach.

As one begins a new technique, whether it is the originating surgeon or those subsequently learning the technique, there may be an increase in complications or an observance of new ones. Although we consider the observed complications to date to be acceptable and rarely a long-term problem, we do not consider the rates to be fixed. We also feel that reporting them and discussing them will lead to a long-term decrease in their incidence and a shortened learning curve for new surgeons. The response and enthusiasm of patients regarding their results has pushed us to continue our use of this technique and to work to address the technical details.

REFERENCES


