

Surgical Approaches to Total Hip Arthroplasty

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Surgical exposure of the hip for trauma, infection, or reconstruction can be adequately accomplished through a variety of surgical approaches. This article describes in detail five classic approaches to the hip: Smith-Petersen (anterior), Watson-Jones (anterolateral), Hardinge (direct lateral), transtrochanteric, and posterolateral. In addition, recently described mini-incision posterior and anterior approaches are outlined. (Journal of the Southern Orthopaedic Association 12(2):90–94, 2003)

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Anterior Approach (Smith-Petersen)

The anterior approach to total hip arthroplasty (THA), described by Smith-Petersen, utilizes the internervous plane that is present between the sartorius (femoral nerve) and tensor fascia latae (superior gluteal nerve) superficially and also between the rectus femoris (femoral nerve) and gluteus medius (superior gluteal nerve) more deeply (1). The plane between these muscles allows for good access to the hip joint, although femoral exposure is not as good as in other approaches.

The patient is first placed supine on the operating table, and a folded towel is put under the operative hemipelvis. This allows the pelvis to be brought forward for easier access. Next a skin incision is made from the middle of the iliac crest and curved to the anterior superior iliac spine. The incision is then curved distally and laterally to finish below the level of the lesser trochanter. The lateral femoral cutaneous nerve must be considered in this approach to preserve lateral thigh sensation. It exits about 1 cm medial and below the anterior superior iliac, and it passes over the sartorius. The tensor fascia latae and gluteus medius muscles are then detached from the iliac crest and elevated subperiosteally from the lateral wing of the ilium.

Dissection is then continued through the deep fascia to visualize the position of the tensor fascia latae laterally

and the rectus femoris and sartorius muscles medially. In this space, the ascending branch of the lateral femoral circumflex artery may be encountered and should be ligated for hemostasis. The interval between the rectus femoris and tensor fascia latae is then opened. The anterior capsule can then be visualized by placing a cobra retractor over the anterior acetabular rim. Next, the capsule is incised transversely, and the femoral head is visualized. The head is dislocated, and an oscillating saw is used to transect the femoral head. The head is then removed with a corkscrew and hip skid. After removal of the head, a complete capsulotomy is performed, and visualization of the acetabulum is maximized by placing Homan retractors anteromedially and posterolaterally.

Anterolateral Approach (Watson-Jones)

The anterolateral approach was first described by Watson-Jones and provides good exposure to the hip without trochanteric osteotomy (2). The approach utilizes the intermuscular plane between the tensor fascia latae and the gluteus medius.

The patient is placed supine on a table with a moveable (kidney rest) segment to allow the buttock skin to hang freely. The incision is started 2.5 cm posterior and distal to the anterior superior iliac spine. It is then curved distally and posteriorly to the greater trochanter and extended 5 cm distal to the greater trochanter along the shaft of the femur (Fig. 1). The interval between the tensor fascia latae and gluteus medius is then identified and divided midway between the anterior spine and greater trochanter. Dissection is continued proximally to locate and protect the inferior branch of the superior gluteal nerve innervating the tensor fasciae latae. The vastus lateralis and vastus ridge are then identified, and electrocautery is used to reflect the muscle proximally 1–2 cm from its origin. Blunt dissection is then continued to expose the capsule. A retractor

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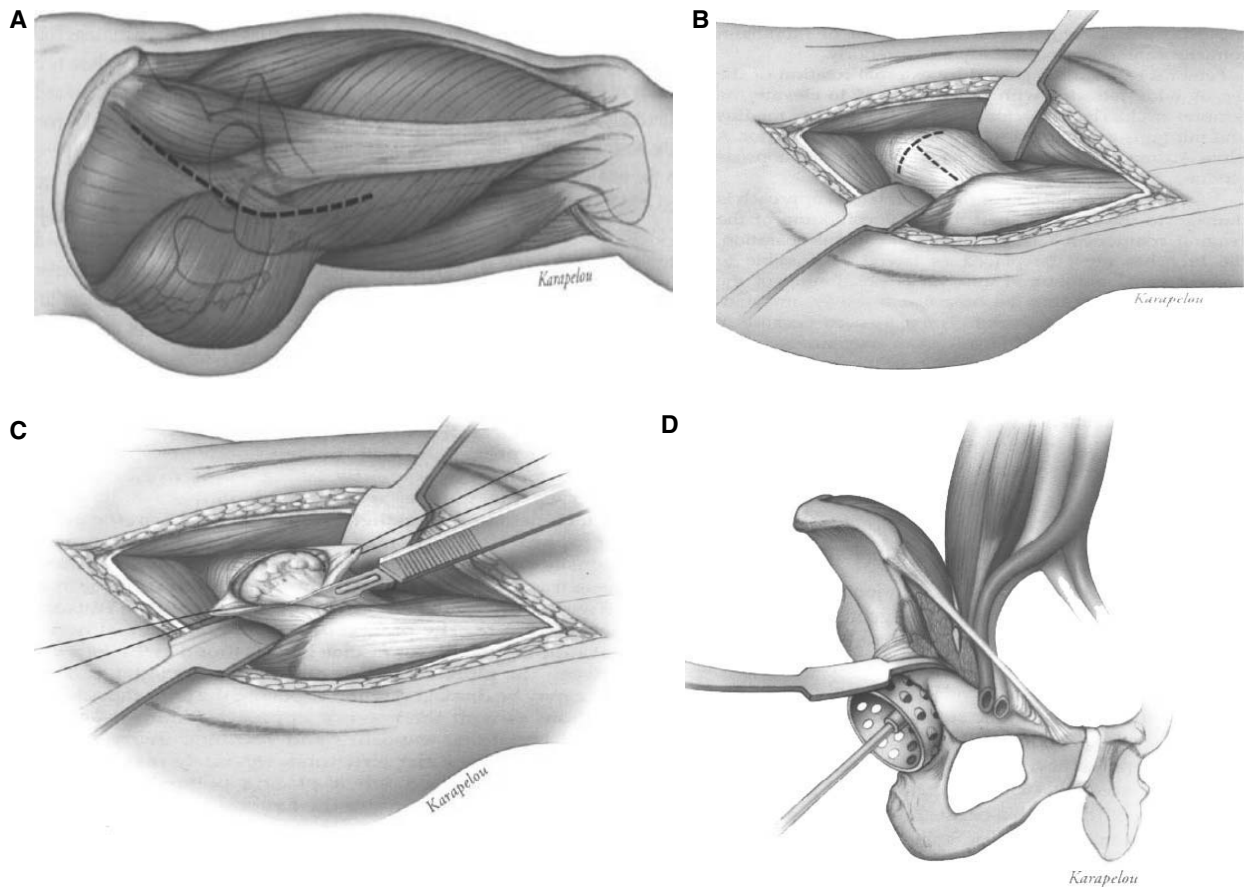


FIGURE 1 Anterolateral approach to the hip. **A**, Skin incision for anterolateral approach. **B**, The anatomic plane is exposed by retracting the gluteus medius posteriorly and the tensor fascia latae anteriorly. **C**, The hip joint is exposed anteriorly by a T-shaped incision that is later repaired. Alternatively, a complete capsulectomy may be performed. **D**, Acetabular preparation is augmented by careful retractor placement anteriorly to avoid neurovascular structures.

is placed over the anterior wall of the acetabulum, and the capsule is incised longitudinally across the anterior superior femoral neck. The femoral head can then be dislocated by external rotation, traction, and adduction of the limb. A femoral neck osteotomy is performed using an oscillating saw. Retractors are placed anteriorly, posteriorly, and inferiorly to optimize visualization of the acetabulum. Exposure is then optimized by using a wide retractor to elevate the femoral neck, and a small retractor is used to protect the gluteus medius and minimus. A blunt Aufranc retractor can then be hooked under the iliopsoas tendon.

Direct Lateral or Transgluteal Approach (Hardinge)

This approach bisects the periosteum covering the greater trochanter, therefore allowing for preservation of the tendinous insertion of the gluteus medius and minimus proximally and vastus lateralis distally (3). This provides better access to the femur for reaming than in the anterior or anterolateral approaches. It also avoids the need for a

trochanteric osteotomy while still providing good access to the joint.

The patient is placed in the supine position, allowing the gluteal fat to hang freely. An incision is then made midline along the femoral shaft starting 5 cm proximal to the greater trochanter and ending 5–6 cm below it. The tensor fascia latae is then exposed and incised the entire length of the previous incision. The gluteus maximus is now exposed and divided along its aponeurosis. Next the sciatic nerve should be protected by placement of a Charnley retractor. The greater trochanter can now be visualized. The anterior one-third of the gluteus medius and vastus lateralis insertions on the greater trochanter are split longitudinally and sharply separated from the greater trochanter. The underlying gluteus minimus tendon can then be exposed and detached from the anterior greater trochanter. An anterior flap is then made using the anterior portion of the gluteus medius, the underlying gluteus minimus, and the anterior portion of the vastus lateralis. The dissection should not extend more than 5 cm proximal

to the greater trochanter to avoid injury of the superior gluteal nerve. The capsule is now exposed and a T-shaped capsulotomy is performed. The femoral neck can then be osteotomized and removed. Exposure is then optimized by placing retractors circumferentially.

There are several structures that are vulnerable to retractor placement anteriorly. These include the femoral nerve, artery, and vein. The lateral femoral circumflex artery may also be injured during vastus lateralis mobilization.

Lateral Transtrochanteric Approach

Charnley first popularized the lateral transtrochanteric approach in 1962 with the introduction of low-friction arthroplasty (4). This technique allows for good visualization of the anterior and posterior hip and a full view of the acetabulum.

The patient is positioned in a lateral position, and the incision is the same as in the direct lateral approach. The tensor fascia latae is divided 2–3 cm distal to the greater trochanter and is curved proximally to parallel the gluteus maximus. The gluteus medius and vastus lateralis can then be visualized. The anterior capsule is then exposed and stretched by external rotation of the femur. The anterior capsule is divided with electrocautery to expose the vastus ridge (Fig. 3).

Next the trochanteric osteotomy is performed by passing a cholecystectomy clamp posteriorly from the anterosuperior exposed surface of the femoral neck. The capsule is then pierced, and the cut is made with a Gigli saw after it is assured that it is located deep to the posterosuperior surface of the trochanter. The osteotomy site then exits through the vastus ridge. This technique can be modified by using an oscillating saw. This cut starts at the vastus ridge and is angled 45° to end at the superior margin of the femoral neck. The external rotators and remaining capsule can then be detached as needed. The detached trochanter can then be dislocated by adduction. Later repair can be done by a variety of techniques including wire knots and the Dall-Miles cable grip system.

Some disadvantages to this approach include trochanteric nonunion, which has been reported to range from 5% to 32%, and trochanteric migration, which if greater than 3 cm has been shown to correlate with poor abductor power (4). Other complications include trochanteric bursitis, ectopic bone formation, and broken wires. Another disadvantage is delayed weightbearing postoperatively, which is usually 6 weeks.

Posterolateral Approach

The posterolateral approach is the most commonly used approach because it is technically simpler than other

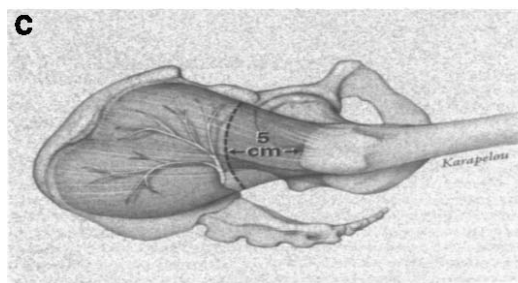
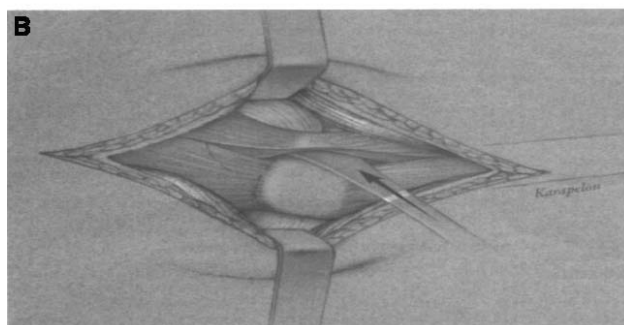
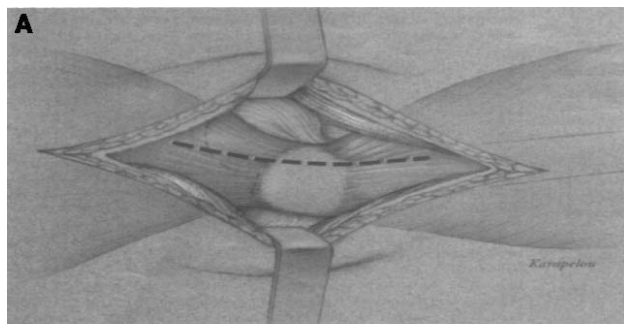


FIGURE 2 Direct lateral approach to the hip. **A**, The anterior one-third of the gluteus medius and vastus lateralis is split longitudinally. **B**, Deep dissection with elevation of the gluteus medius and vastus sharply from the anterior femoral surface. **C**, The location of the superior gluteal nerve and the safe zone for surgical dissection (shaded).

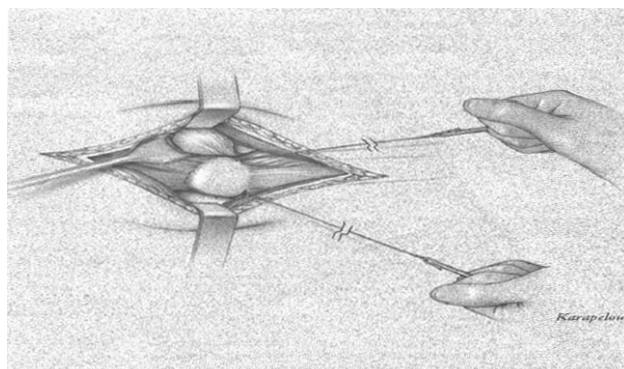


FIGURE 3 The anterior exposure of the interval between the tensor fascia latae and gluteus medius and inferior vastus ridge provide reference for osteotomy of the greater trochanter.

approaches and also because it does not interfere with the abductor mechanism of the hip. A disadvantage to this approach is the higher rate of dislocation, reported to be as high as 9.5% (5, 6). The patient is placed in the lateral position, and the pelvis is secured in a neutral position. After skin preparation and draping, the trochanter is outlined superiorly, inferiorly, anteriorly, and posteriorly. The incision is then made longitudinally with one-third being over the trochanter, one-third below it, and then a curved portion above the trochanter in the direction of the fibers of the gluteus maximus. The tensor fascia latae and gluteal fascia are incised in line with the skin incision. The gluteus maximus is then bluntly divided, and the gluteal sling is divided on its superior half with electrocautery. The posterior border of the gluteus medius is retracted using a 90° angled thin Homan retractor. An Aufranc retractor is then used superficial to the external rotators to lie under the femoral neck. The piriformis, gemelli, and obturator externus tendons are identified and tagged with nonabsorbable braided sutures, and their insertion is released. These muscles are then placed posteriorly to form a protective sling around the sciatic nerve.

The gluteus minimus is divided from the capsule with a periosteal elevator, and a thin bent Homan retractor is placed to protect the abductor muscles. A trapezoidal posterior capsule flap is then created by incising the capsule along the longitudinal posterior border of the trochanter. A superior incision is then made along the normal course of the piriformis tendon from the greater trochanter to the acetabular labrum. An inferior incision is made along the superior border of the quadratus femoris making sure to avoid the sciatic nerve. The corners of the capsular flap are then tagged with sutures and retracted with the short external rotators. The femoral head is then dislocated with traction and internal rotation of the leg. After dislocation, the quadratus femoris is identified and electrocautery is used to divide the muscle 2–3 mm from its insertion on the femur, leaving some tissue for later repair. Some branches of the medial femoral circumflex artery will be encountered, and these should be ligated. An Aufranc retractor is then placed on the inferior border of the lesser trochanter. The femoral neck is then osteotomized, and the exposure is complete after retractors are placed anteriorly and posteriorly. Care should be taken during anterior acetabular retractor placement to avoid injury of the femoral nerve.

Minimally Invasive Approaches

Posterior Mini-incision THA

A new mini-incision approach has been proposed by Wright et al. (7). The main benefit of this approach is cosmesis. Other anticipated benefits were decreased blood

loss, decreased operative time, and decreased hospital length. In their preliminary reports, the only significant benefit that was seen was improved cosmesis; otherwise the standard and mini-incision approaches produced equivalent results.

The patient is placed in the standard lateral decubitus position with the pelvis locked perpendicular to the table. The incision is made longitudinally over the greater trochanter while the hip is flexed 30°. The incision should be two-thirds distal and one-third proximal to the tip of the trochanter. Dissection is then performed in the plane between the fascia and subcutaneous fat to allow for mobilization of the skin. This allows for the incision to be a movable window. Next the fascia latae and gluteus maximus fascia are divided in line with the skin incision, and this division is extended 3 cm proximal and distal past the limits of the skin incision. The gluteus maximus muscle fibers are spread proximally as is done in the posterolateral approach. The proximal 1 cm of gluteus maximus tendon insertion is released by electrocautery. The femur is then flexed and internally rotated to reveal the short external rotators and the posterior capsule. An angled Homan retractor is placed deep to the abductor tendons to isolate the proximal femoral neck, and an Aufranc retractor is placed proximally to quadratus femoris to isolate the distal femoral neck. The piriformis and obturator internus tendons are tagged (for later repair) and released from their insertions on the greater trochanter. A posterior capsulotomy is done, and the edges are tagged with stay sutures for improved exposure and later repair. Superior and inferior capsules and the quadratus femoris are released to aid in posterior dislocation of the femoral head. Retractors can then be used to help expose the femoral neck for osteotomy. For acetabular exposure, a C-shaped Homan retractor is used on the anterior wall, a wide-angle Homan is driven into the ischium, and an Aufranc retractor is placed into the obturator foramen. Work can then be done on the acetabulum. The proximal femur is then exposed into the incision by using two retractors, one narrow femoral neck retractor to lever on the anterior neck and an Aufranc retractor to lever on the inferior neck. After the acetabular and femoral components have been inserted, the wound can be closed by repairing the capsule and short external rotators with sutures through two drill holes in the posterior aspect of the greater trochanter.

Anterior Mini-incision THA

The anterior mini-incision approach has been proposed by Dr. Raj Sinha. In this approach, an 8-cm skin incision, located 40% proximal and 60% distal to the tip of the greater trochanter, is made. Sharp dissection proceeds to

the fascia latae, which is incised in line with the skin incision. The fibers of the gluteus medius are identified, and the muscle is split one-third from its anterior edge down to the high point on the lateral aspect of the trochanter. The gluteus minimus and capsule are incised longitudinally and dissected off the anterior femur. Dissection proceeds distally to the vastus origin and no further. A blunt Hohmann retractor is used to dissect the capsule posteriorly and anteromedially off the femoral neck. Dislocation can be accomplished at this point, and the THA proceeds as usual with the standard retractors. Care should be taken to protect the proximal skin edge, particularly when the femur is being broached. Short-term follow-up data indicated no difference in complications rates between mini- and standard-incision THA.

References

1. Smith-Petersen, M. N. Approach to and exposure of the hip joint for mold arthroplasty. *J. Bone Joint Surg.* 31-A:40–46, 1949.
2. Watson-Jones, R. Fractures of the neck of the femur. *Br J. Surg.* 23:787–808, 1936.
3. Hardinge, K. The direct lateral approach to the hip. *J. Bone Joint Surg.* 64-B:17–19, 1982.
4. Charnley, J. *Low Friction Arthroplasty of the Hip. Theory and Practice.* New York, Springer-Verlag, 1979.
5. Robinson, R., Robinson, H., Salvati, E. A. Comparison of the transtrochanteric and posterior surgical approaches for total hip replacement. *Clin. Orthop.* 147:143–147, 1980.
6. Vicar, A. J., Coleman, C. R. A comparison of the anterolateral, transtrochanteric, and posterior surgical approaches in primary total hip arthroplasty. *Clin. Orthop.* 188:152–159, 1984.
7. Wright, J. M., Crockett, H. C., Sculco, T. P. Mini-incision for total hip arthroplasty. *Orthopedics (Special Edition)* 7(2), 2001.