Chapter 23  Hip Disarticulation

Daria Brooks Terrell

BACKGROUND
- Hip disarticulation is an amputation of the lower extremity through the hip joint capsule. Although most tumors of the lower extremities are amenable to limb-sparing techniques, some tumors of the femur and thigh are so extensive that hip disarticulation is needed for adequate tumor resection.
- With advances in prosthetic design, patients can ambulate with a prosthesis despite the larger energy expenditure needed to ambulate after a hip disarticulation compared to more distal amputations. Even without prosthetic use, many patients are very successful in ambulating and carrying out daily activities.
- Performing a hip disarticulation may be more preferable in some cases instead of leaving a patient with a very short above-knee amputation stump site, which can make prosthesis fitting difficult.

ANATOMY
- The hip joint region is supplied by several major arteries. Familiarity with these structures can minimize intraoperative bleeding if they can be identified and ligated as needed. These arteries include the profunda artery, the medial and lateral circumflex arteries, and the obturator and superior and inferior gluteal arteries.
- The tensor fascia lata, gluteus maximus, and iliotibial band form an outer muscular envelope around the hip, and at least one of these structures usually needs to be split to gain access to the hip.
- The femoral triangle must be identified to access the main neurovascular structures encountered in this procedure. The femoral triangle is bordered superiorly by the inguinal ligament, laterally by the sartorius muscle, and medially by the adductor longus muscle.
- Hip disarticulation involves amputation through the hip joint capsule. This strong fibrous layer covers the anterior hip to the intertrochanteric line but leaves most of the femoral neck exposed posteriorly.
- Tumors can often extend to the ischiorectal fossa; this should be determined preoperatively by examining computed tomography (CT) and magnetic resonance imaging (MRI) scans. The ischiorectal fossa is an area bounded medially by the sphincter ani externus and anal fascia, laterally by the tuberosity of the ischium and obturator fascia, anteriorly by the fascia covering the transverse perinei superficialis, and posteriorly by the gluteus maximus and sacrotuberous ligament. Assessment for tumor extension to this area is particularly important in planning the flaps that will be used.

INDICATIONS
- Proximal tumors not extending above the midthigh
- Femoral diaphyseal tumors with proximal intramedullary extension
- Soft tissue sarcomas of the thigh with extension to the femur or neurovascular structures
- Unresectable local recurrences, particularly after radiation therapy has been used
- Pathological fractures that are not responsive to induction chemotherapy and immobilization
- Palliation of extensive tumors

IMAGING AND OTHER STAGING STUDIES
Computed Tomography and Magnetic Resonance Imaging
- CT is useful in showing the effect of the tumor on the structural integrity of the bone. It may also show extension into the soft tissues, especially in the ischiorectal fossa, hip joint, and groin. MRI shows the intraosseous spread of the tumor within the marrow and therefore is helpful in determining the level of amputation and the appropriateness of the hip disarticulation.

Bone Scan
- A bone scan is helpful in evaluating the bony involvement of the femur, pelvis, and acetabulum. Acetabular involvement is a contraindication to doing a hip disarticulation.

Angiography and Other Studies
- Angiography can help identify the external iliac, common femoral, and profundus arteries when preparing for surgery.
- A biopsy is warranted before most amputations. However, given the potential functional limitations and prosthetic needs of a hip disarticulation, a biopsy is definitely recommended before performing a hip disarticulation.

SURGICAL MANAGEMENT
- Lymph node involvement should be assessed before proceeding with a hip disarticulation. Lymph node involvement is a relative contraindication to performing a hip disarticulation unless the procedure is done for palliation.
- Hip disarticulations are often required after poor chemotherapeutic response or tumor aggressiveness. These situations increase the likelihood for close surgical margins, which can lead to local recurrences.
- All radiographic studies must be reviewed to ensure that there is no suggestion of tumor proximal to the lesser tuberosity. This would increase the risk of having positive or close margins.
- The development of the flaps is critical for optimal wound closure and healing. It is not uncommon to make flaps of unusual shape in performing a hip disarticulation for tumor of the middle or distal femur or thigh. Previous scars, radiated...
fields, and the presence of a tumor mass all determine the best skin to be used. If possible, fasciocutaneous flaps should be constructed to promote wound healing.

- Optimizing the patient’s overall health and nutritional status preoperatively is essential in promoting wound healing and decreasing perioperative complications.

Preoperative Planning

- Manipulation of more proximal venous structures can increase the likelihood of the development of deep venous thrombi. Often these more proximal thrombi can embolize and lead to fatal pulmonary emboli. In patients with a prior history of deep venous thrombosis or pulmonary emboli, the surgeon should consider placing a venous filter before surgery to minimize the risk of pulmonary emboli.

- An amputation is a life-altering event; both physical and emotional issues need to be addressed. Many patients find psychological counseling helpful, so the surgeon should ensure that these services are available in the perioperative period.
- Having patients meet with a prosthetist and a functional amputee can help manage expectations and provide answers about daily activities and function.

Positioning

- Since a hip disarticulation involves both anterior and posterior dissections, a semilateral or lateral position is often best.

Approach

- The major portions of the hip disarticulation are done through an anterior approach to the hip and groin. This facilitates exposure of the femoral triangle and muscle origins.
- Recently, Lackman et al. published their technique using the lateral approach for hip disarticulations. This has the advantage of familiarity and provides access to both anterior and posterior structures.

INCISION AND INITIAL EXPOSURE

- Bony landmarks to be identified include the pubic tubercle, anterior superior iliac spine, anterior inferior iliac spine, ischial tuberosity, and greater trochanter (TECH FIG 1A).
- The anterior incision starts 1 cm medial to the anterior superior iliac spine and continues distally to the pubic tubercle and over to the pubic bone to 2 cm distal to the ischial tuberosity and gluteal crease.
- If the buttock flap is extremely thick, the anterior portion of the incision should be moved laterally.
- The posterior incision starts about 2 cm anterior to the greater trochanter and extends to the back of the leg distal to the gluteal crease.
- The distance the incision is beyond the gluteal crease is directly proportional to the anteroposterior diameter of the patient’s pelvis.
TECHNIQUES

The sartorius muscle is located as it arises from the anterior superior iliac spine. It is dissected free from the surrounding fascia and then transected from its origin on the spine by electrocautery. The femoral sheath and fibroareolar tissue posterior to the femoral vessels are also incised by electrocautery. This dissection exposes the hip joint capsule (TECH FIG 2A).

With the hip slightly flexed, a finger can be placed in a mediolateral direction under the iliopsoas to isolate the muscle, which can then be freed from its origin at the lesser trochanter (TECH FIG 2B). If an attempt is made to pass the finger beneath the muscle from lateral to medial, the very intimate attachments between the iliopsoas muscle and the rectus femoris muscle prevent this from being easily done. By sharp and blunt dissection the entire iliopsoas muscle is dissected until its insertion on the lesser trochanter is clearly defined. Several vessels of prominent size pass from the anterior surface of this muscle, and care should be taken to secure these vessels before their division. The iliopsoas muscle is severed at the level of its insertion onto the lesser trochanter.

Next, the adductor muscles are released from the pelvis in a lateral to medial process. To preserve the obturator externus muscle on the pelvis, the surgeon locates its prominent tendon arising from the lesser trochanter. Locating this tendon identifies the plane between the pectineus muscle and the obturator externus; a difference in the direction of the muscle fibers of these two muscles is also apparent. A finger is passed beneath the pectineus muscle, and it is released at the level of its origin from the pubis by electrocautery (TECH FIG 2C). Beneath the pectineus muscle numerous branches of the obturator artery, vein, and nerve can now be visualized.

The gracilis, adductor longus, adductor brevis, and adductor magnus are transected at their origins on the symphysis pubis. The obturator vessels and nerves usually bifurcate around the adductor brevis muscle. Branches of the obturator artery must be identified and secured during the dissection to prevent accidental rupture and retraction of the proximal ends up into the pelvis (TECH FIG 2D).

The extremity is hyperabducted to localize the ischial tuberosity and the retracted cut ends of the adductor muscles. The circumflex femoral vessels should be visible and should be avoided. The semimembranosus, semitendinosus, and long head of the biceps are transected from their origin on the ischial tuberosity while preserving the quadratus femoris and sciatic nerve (TECH FIG 2E).

DIVISION OF ANTERIOR HIP AND GROIN MUSCLES AND ISCHIAL TUBEROSITY RELEASE

Skin, subcutaneous fat, and fascia of Scarpa are incised to expose the aponeurosis of the external oblique.

Saphenous vein branches are clamped, divided, and ligated.

A moderate-sized artery, the superficial epigastric, and multiple branches of the external pudendal vessels are secured.

The spermatic cord in men or the round ligament in women is identified, and care is taken to avoid injuring these structures.

An incision made just below the inguinal ligament into the fossa ovalis exposes the femoral vein, artery, and nerve (TECH FIG 1B).

Individual silk ties are placed around the femoral vessels; first the artery and then the vein are tied in continuity. Right-angle clamps are placed between the ties, and the vessels are severed. The proximal ends of the vessels are further secured by a silk suture ligature placed proximal to the right-angle clamps. The femoral nerve is placed on gentle traction and ligated where it exits from beneath the inguinal ligament. When the femoral nerve is severed, it retracts beneath the external oblique aponeurosis, so that if a neuroma forms it will not be in a weight-bearing portion of the stump (TECH FIG 1C).

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**Part 4  ONCOLOGY • Section III  SPINE AND PELVIS**

**TECH FIG 2  • (continued)**

C. Transection of pectineus muscle at its origin.  
D. Transection of gracilis, adductor longus, brevis, and magnus muscles from their origin; division of obturator vessels and nerve.  
E. Release of the flexor muscles from the ischial tuberosity. (Courtesy of Martin M. Malawer.)

**HIP JOINT CAPSULE INCISION AND DIVISION OF POSTERIOR MUSCLES**

- All the anterior and posterior muscle groups have been divided. The joint capsule overlying the head of the femur is incised, and the ligamentum teres is transected by electrocautery (TECH FIG 3A).
- The patient’s torso is tilted from posterolateral to anterolateral. The incision is completed posteriorly through gluteal fascia (TECH FIG 3B). The tensor fascia lata and gluteus maximus muscles are divided in the depths of the skin incision. These are the only muscles not divided at either their origin or insertion in the procedure. Directly beneath these muscles is the rectus femoris muscle, which is transected at its origin on the anterior inferior iliac spine by electrocautery (TECH FIG 3C). The common tendon comprising contributions from the gluteus medius, gluteus minimus, piriformis, superior gemellus, obturator internus, inferior gemellus, and quadratus femoris muscles, is exposed after the division of the gluteus maximus. All these muscles are divided close to their insertions on the greater trochanter (TECH FIG 3D).

**TECH FIG 3  • A.** Incision of the anterior portion of the hip joint capsule.  
**B.** Completion of the skin incision. (continued)
TECH FIG 3 • (continued) C. Division of tensor fascia lata, gluteus maximus, and rectus femoris muscles. D. Transection of the muscles inserting into the greater trochanter. (Courtesy of Martin M. Malawer.)

RELEASE OF SPECIMEN AND CLOSURE

- Transection of the hip joint capsule is completed by incising the posterior portion of the capsule. The sciatic nerve is dissected free of surrounding muscle, transected, and allowed to retract beneath the piriformis muscle (TECH FIG 4A).
- The obturator externus and gluteus medius are sutured together over the acetabulum and joint capsule to help provide soft tissue coverage of the bony prominence (TECH FIG 4B).
- The gluteal fascia is elevated and secured to the inguinal ligament and the pubic ramus. Multiple stitches are placed bisecting the fascial edge that gather the gluteal fascia as it is secured to the inguinal ligament. Sutures are individually placed and then tied. Before closure of this posterior myocutaneous flap, suction catheters are placed beneath the gluteal fascia. The skin is closed with interrupted sutures. Again, care is taken to make sure that there is equal distribution of the excess tissue of the posterior flap. Not infrequently, additional suction catheters must be used to obliterate space within the subcutaneous tissue when the buttock flap is thick (TECH FIG 4C). Patency of the suction catheters must be maintained until drainage is diminished. Ambulation may proceed if the patient's hemodynamic status permits on the first postoperative day.

TECH FIG 4 • A. Release of specimen. B. Approximation of obturator externus and gluteus medius over the joint capsule. (continued)
POSTOPERATIVE CARE

- A compressive dressing should be maintained for 3 to 5 days to minimize swelling. After this time the wound should be inspected and redressed.
- Drains should remain until the total daily output is minimal.
- Prosthesis fitting can begin when the wound swelling has decreased and the wound is completely healed. Usually this takes at least 4 to 6 weeks after surgery.

OUTCOMES

- The 5-year survival of patients after hip disarticulation done as the primary treatment is 32%. When done for local recurrence, the 5-year survival is 25%.
- Hip disarticulation has been shown to be very effective as a means of palliation for extensive tumors without other treatment options. It thus improves the quality of life of these patients.
- Prosthetic use in this population is usually lower than that seen in groups with more distal amputations. Use ranges from 5% to 60% of amputees. Problems with artificial limb use and reasons for the lack of limb use have included limb weight and inconvenience with toileting. Despite this, all patients should be offered an artificial limb.
- Many patients with hip disarticulations are very functional, and one study found that most were even able to drive whether or not they used a prosthesis.

COMPLICATIONS

- The local recurrence rate is 2% to 12% and is usually higher in patients whose amputation was done for local recurrences or if there were close margins.
- Wound healing problems can arise from seroma or hematoma development. The use of drains can help decrease the risk of seromas and hematomas.

REFERENCES