Home Study Program

Minimally invasive total hip arthroplasty

This program meets criteria for CNOR and CRNFA recertification, as well as other continuing education requirements.

A minimum score of 70% on the multiple-choice examination is necessary to earn 3.7 contact hours for this independent study.

Purpose/Goal: To educate perioperative nurses about performing total hip arthroplasty procedures via a minimally invasive approach.

The article "Minimally invasive total hip arthroplasty" is the basis for this *AORN Journal* independent study. The behavioral objectives and examination for this program were prepared by Rebecca Holm, RN, MSN, CNOR, clinical editor, with consultation from Susan Bakewell, RN, MS, education program professional, Center for Perioperative Education.

Participants receive feedback on incorrect answers. Each applicant who successfully completes this study will receive a certificate of completion. The deadline for submitting this study is June 30, 2007.

Complete the examination answer sheet and learner evaluation found on pages 1261-1262 and mail with appropriate fee to

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Behavioral Objectives

After reading and studying the article on performing a total hip arthroplasty via a minimally invasive approach, nurses will be able to

1. discuss the pertinent anatomy that is affected by pathological changes that ultimately require hip replacement,
2. explain preoperative preparation for minimally invasive total hip arthroplasty (MITHA),
3. identify the critical elements of positioning the patient for a MITHA, and
4. describe the differences between single- and double-incision approaches to MITHA.

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Minimally invasive total hip arthroplasty

AORN Home Study

Sharon E. Hohler, RN

Total hip arthroplasty (THA) surgery eases pain and enhances the quality of life for many people. This is accomplished by retreading or resurfacing the acetabulum (ie, socket) and the femoral head. Arthritic hip pain is markedly improved for patients after these two worn, arthritic surfaces are replaced.

THE BACKGROUND OF THA

Since the initial total hip replacement surgeries were performed in the 1960s, emphasis has been placed on relieving arthritic pain and developing replacement parts that will last. Sir John Charnley, MD, a British orthopedist, is credited with developing the modern total hip implant. He combined a metal stem and ball with a plastic shell and held them in the place with methyl methacrylate cement.

During the past 40 years, improvements have resulted in better implant materials and improved mechanisms for holding implants in place. Lifespan for cemented and cementless THA prostheses is 80% at 20 years.[1] Development and improvement of porous acetabular and femoral stem prostheses eliminated the need for gluing the prostheses into place (Figure 1). These irregular metal components encourage bony ingrowth, allowing a patient's bone cells to intertwine with the irregular metal finish, which holds the implants securely in place. After analyzing data from second-generation cementless THA procedures, surgeons reported a 10-year implant survival rate of 96.4%.[2] Efforts continue to focus on making prostheses that will last a patient's lifetime, thus eliminating the need for revision surgery.

Minimally invasive surgery has been defined as a "procedure being performed through an incision less than 10-cm long."[3] Surgeons report that they even can perform cemented THA through a minimally invasive incision.[3] Minimally invasive procedures are creating exciting changes in the orthopedic world similar to the way laparoscopic procedures have affected general surgery.

The major disadvantage of a minimally invasive approach is the potential for poor visualization, which could lead to fractures or malpositioning of implant components. Initially, surgeons reported that the procedure was technically challenging and required longer surgical time, although a surgeon's experience minimizes these challenges. Additionally, limited scientific data exist and long-term results are unknown because the minimally invasive procedure is relatively new.[3]

Recent innovations have allowed orthopedic surgeons to decrease the

ABSTRACT

• TOTAL HIP ARTHROPLASTY PROCEDURES relieve patients' arthritic hip pain. Since the first procedure was performed in the 1960s, surgeons and implant companies have worked to improve prosthesis design, composition of implants, and the mechanisms for holding the implants in place.

• RECENTLY, SURGEONS HAVE FOCUSED on minimizing the surgical incision. Smaller incisions have resulted in smaller scars and faster recoveries.

• THIS ARTICLE PRESENTS a brief historical overview of, as well as current trends in, minimally invasive total hip arthroplasty. All aspects of care for a patient undergoing total hip arthroplasty are discussed. *AORN J* 79 (June 2004) 1244-1258.

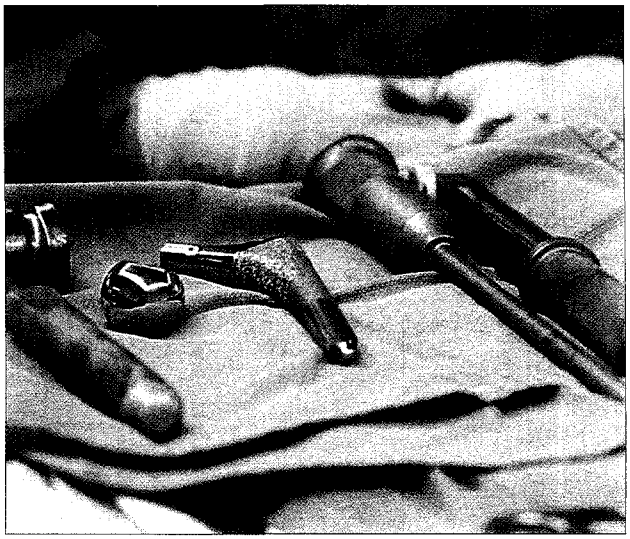

Figure 1 • Porous femoral stem and head implants for minimally invasive total hip arthroplasty.

incision size and to preserve all possible muscle and ligament strength. In a recent study, the posterior approach to performing minimally invasive total hip arthroplasty (MITHA) decreased blood loss during surgery and caused less soft tissue trauma. Patients returned home sooner, and some patients returned home as early as the evening after surgery. Additionally, patients experienced improved ambulation at six weeks and had faster rehabilitation. At two years, however, there was no difference between patients who underwent the minimally invasive approach compared to those who had a standard incision.[4] Surgeons also report that patients who undergo MITHA procedures prefer the smaller incisions and subsequent smaller scars.

Anatomy of the Hip

Three pelvic bones (ie, ilium, ischium, pubis) form the innominate bone. The innominate bone (ie, os coxae) forms a stable circular base, called the pelvis, which supports the trunk and serves as an attachment for the legs. The socket portion of the innominate bone (ie, acetabulum) forms a deep, round cavity in which the femoral head rests and articulates, forming a ball and socket joint. The proximal end of the femur consists of the femoral head and neck, upper end of the femoral shaft, and greater and lesser trochanters. The trochanters are insertion points for muscles. The capsule, muscles, and ligaments provide stability for the hip joint.[5] A total hip replacement implant consists of the

- ball that replaces the spherical head of the femur;
- stem that fits into the femur and provides stability; and
- cup, presently consisting of a porous metal shell and plastic liner that replaces the worn-out acetabulum.

Pathophysiology

Arthritis is a disease of the joints. Although most patients who undergo THA suffer from osteoarthritis, patients with both rheumatoid arthritis and osteonecrosis (ie, avascular necrosis) also may need to undergo THA. Signs that a patient's condition requires total joint replacement include that

- a series of different pain medications no longer relieve the pain;
- activity is restricted to the point that the patient has trouble getting out of a chair, going up stairs, getting off the toilet, or getting up from the floor;
- the patient cannot sleep at night because of pain; and
- the patient's pain prevents him or her from participating in activities of normal living (ie, shopping, taking a vacation).[6]

Osteoarthritis. Osteoarthritis, which is considered "wear and tear" arthritis, affects 30 million Americans,[7] making it the most common form of arthritis. Osteoarthritis develops when the smooth articular cartilage covering the ends of bones wears thin. As the cartilage wears away completely, bones rub against each other and cause pain. Nonsurgical treatment for osteoarthritis includes rest, gentle exercise, and use of nonsteroidal anti-inflammatory drugs (NSAIDs).

Rheumatoid arthritis. Rheumatoid arthritis affects 2.1 million US patients.[8]

Rheumatoid arthritis develops when an unknown trigger causes rheumatoid factor antibody (ie, an immunoglobulin M antibody [IgM]) to develop against the body's own antibody, immunoglobulin G (IgG). The body starts attacking its joints when IgG changes into an antigen. The IgM antibodies combine with IgG antigens. These antigen-antibody complexes are deposited in the synovium and stimulate immune cell release into synovial fluids. These cells release two cytokines, which leads to an inflammatory response (ie, warmth, redness, swelling, pain). As the rheumatoid process progresses, inflammatory cells in the synovial fluid grow and form a mass known as pannus, which invades and destroys soft tissue, cartilage, and bone.[8]

As rheumatoid arthritis progresses, inflammatory cells in the synovial fluid grow and form a mass known as pannus, which invades and destroys soft tissue, cartilage, and bone.

Early and aggressive treatments for rheumatoid arthritis include pharmacology, with four classifications of medications:

- biological response modifiers (BRMs);
- corticosteroids;
- disease-modifying, antirheumatic drugs (DMADs); and
- NSAIDs.

Nonpharmacological treatments involve "rest, exercise, therapeutic heating and cooling, physical and occupation therapy, and the use of assistive devices."[8 (p49)]

Osteonecrosis. Osteonecrosis occurs when the blood supply to the femoral head is diminished or destroyed. The femoral head dies and collapses, which causes pain. Osteonecrosis results from injuries, such as hip dislocation or fracture, long-term corticosteroid use, some glandular diseases, and alcoholism. Approximately 10,000 to 20,000 patients in the United States are treated for osteonecrosis each year.[9]

Preadmission Testing (PAT)

Preoperative planning enables a surgeon to optimally size and fit a prosthesis to a patient. Three objectives of this planning include

- determining leg length,
- determining the approximate size of the prosthesis needed, and
- establishing abductor muscle tension and femoral offset.

Anterior/posterior pelvis x-rays, with optional scanogram or computed tomography evaluations help the surgeon plan. The surgeon discusses the procedure, including risks and benefits and a plan for the patient's postoperative recovery, with the patient and his or her family members.

A PAT nurse meets each patient undergoing THA and assesses the patient's health status. Any problems (eg, preexisting infections, untreated diabetic ulcers) should be treated in advance. Consultations with the nurse help minimize last minute cancellations of total joint surgery. A scheduling sheet for each patient is used by the PAT nurse to communicate the patient's preexisting problems to the perioperative nurse. This communication sheet is sent to the OR and is used by the perioperative nurse to individualize the patient's plan of care. For example, if a patient has a latex allergy, this will require that latex-free supplies are used in the OR suite. Additionally, latex allergy status needs to be communicated to staff members in every area the patient will encounter before, during, and after his or her hospitalization. If the patient presents with a metal (eg, nickel) allergy, staff members ensure that a nickel-free prosthesis is used.

The PAT nurse teaches patients and their family members about hospital routines; specific preoperative routines, including preoperative shower and skin preparation; NPO status the day of surgery; and taking previously prescribed medications per anesthesia care provider preferences. The PAT nurse introduces patients to the facility pain management scale and postoperative care, including wound care, expected activity levels, and mobility restrictions.[9]

The PAT involves obtaining necessary laboratory tests and x-rays. Surgeons' standing orders vary, but routine laboratory tests include a complete blood count (CBC), blood chemistry, prothrombin time (PT)/partial thromboplastin time (PTT), and clean midstream urinalysis. Chest x-rays and an electrocardiogram (ECG) may be ordered if a patient is older than age 40 depending on

- facility and anesthesia department policy,
- whether the patient's medical condition or history warrants the need for the x-ray or ECG, and
- whether the patient's most recent x-ray or ECG is older than six months to a year.

Cervical spine x-rays in flexion and extension may be ordered for patients who have had rheumatoid arthritis five years or longer, especially if general anesthesia is planned.

Blood type and screen or crossmatch may be ordered by the surgeon. Autologous blood donation, if requested, takes place during PAT. A repeat hemoglobin and hematocrit are drawn, and results are reported upon admission.

An occupational therapist gives patients and their family members recommendations to make home environments safer and easier for patients.

- A room for sleeping on the main level should be prepared if the patient normally resides on a floor above or below ground level. This helps the patient avoid climbing stairs during the postoperative period.
- Canned and frozen foods and store supplies should be purchased in advance and stored at the patient's waist to shoulder level.
- Electrical cords should be taped down to minimize the patient's risk of falling.
- Throw rugs and other items that may clutter pathways should be removed.

Occupational therapists also address activities of daily living, such as bathtub or shower transfers, dressing, housekeeping, and meal preparation. Occupational therapists teach and reinforce behaviors that protect patients' hips from dislocating. Recommended equipment includes

- dressing sticks;
- elastic shoelaces;
- long-handled shoehorns;
- long-handled sponge brushes;
- reachers or grabbers;
- sock aids;
- three-in-one commodes that can be used in shower stalls, at bedsides, and as raised-seat commodes; and
- walker bags.

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Physical therapists teach patients how to use a walker or crutches and which movements to avoid because of dislocation risk (eg, leg crossing). A regimen of exercises is taught, including quadricep and gluteal exercises. Physical therapists have patients return demonstrate practicing the exercises and walker or crutch use.

A dietician discusses nutrition with

The circulating nurse meets the patient and verifies the proposed surgery, including site and laterality, during which he or she takes the opportunity to assess the patient's skin condition.

patients and their family members. He or she explains how a healthy, iron-rich diet during surgical recovery enhances the healing process.

The Day of Surgery

The patient arrives at the hospital approximately one to two hours before the scheduled surgery time. An admission clerk checks the patient in and gives him or her an identification bracelet and an allergy bracelet, if needed. He or she then escorts the patient to the preoperative holding area. At least two preoperative holding area personnel verbally identify the patient, obtaining his or her name, birth date, or other identifiers according to facility policy. After changing into a hospital gown, the patient lies on a cart or bed and covers his or her hair with a cap. The preoperative nurse ensures that the patient removes all jewelry, dentures, and hearing aids and places them with the patient's belongings, which usually are given to a family member for safekeeping.

The preoperative nurse initiates correct site verification activities, which include reviewing the informed consent, identification bracelet, medical record number, radiological examinations (eg, x-ray, magnetic resonance images), and availability of blood. The nurse then has the patient state his or her full name; date of birth; the planned surgical procedure; and the correct site, including laterality. When the surgeon arrives, he or she confirms the procedure and site with the patient and initials the surgical site using a permanent marker.[10]

The preoperative nurse measures the patient's vital signs and starts the IV. Any "upon admission" orders, such as repeat PT/PTT or CBC are completed at this time. The preoperative nurse verifies that the patient has been NPO for the designated timeframe and performs a preoperative nursing assessment, recording any changes obtained from the patient. The preoperative nurse also evaluates the patient's skin condition for signs of infection or compromise. The nurse answers any questions from either the patient or his or her family members. The nurse administers preoperative medications ordered by the anesthesia care provider or surgeon. Prophylactic antibiotics are administered within 30 minutes before the incision is made for best results.[11 (p289)] Family members keep the patient company until it is time for transfer to the OR. Additionally, chaplains visit each preoperative patient and offer comfort and support.

Perioperative assessment. The circulating nurse meets the patient and repeats the correct site verification activities as well as ensuring availability of the implants.[12] Site verification provides an opportunity for the circulating nurse to assess the patient's skin condition. The circulating nurse reviews the chart for pertinent information, such as the medical history and physical examination, laboratory reports, chest x-ray and ECG results, and current medications. During chart review, the nurse notes the patient's vital signs, allergies, and previous surgeries, all of which may affect the plan of care for this patient. For instance, location of metal implants affects placement of the electrosurgical unit (ESU) grounding pad.

A 1999 study reported that 57% of 3,920 patients needed a blood transfusion after THA surgery.[13] If a blood transfusion is anticipated, the nurse verifies that the type and screen or cross match has been completed.

The nurse uses information obtained from the chart review and assessment to produce an individualized care plan specific to the patient (Table 1). For example, Mrs T has a history of thrombophlebitis, which would indicate the need to check pedal pulses for arterial

TABLE 1
Nursing Care Plan for Patients Undergoing Minimally Invasive Total Hip Arthroplasty

Nursing diagnosis	Interventions	Interim outcome criteria	Outcome statement
Risk for acute and chronic pain	• Describes pain management options. • Preoperatively identifies desired level of pain control. • Identifies cultural and value components related to pain and pain control. • Implements pain guidelines. • Evaluates response to pain management interventions.	The patient demonstrates and reports adequate pain management throughout the perioperative period.	The patient's postoperative vital signs and other nonverbal symptoms remain stable, indicating adequate pain control.
Risk of anxiety related to knowledge deficit and stress of surgery	• Determines knowledge level and assesses coping mechanisms and readiness to learn. • Explains expected sequence of events. • Includes family members in perioperative teaching when appropriate. • Evaluates response to instruction. • Evaluates environment for home care and makes appropriate referrals.	The patient verbalizes understanding of the procedure and expected outcomes. The patient demonstrates decreased anxiety and increased ability to cope before induction.	The patient participates in decisions affecting the plan of care and demonstrates knowledge of emotional response to surgery and its potential side effects.
Risk for impaired gas exchange related to intraoperative positioning	• Assists with induction of anesthesia. • Ensures adequate chest expansion after positioning. • Collaborates in monitoring pulmonary and cardiovascular status.	The patient is extubated before transfer from the OR.	The patient's pulmonary function is consistent with or improved from baseline levels.

function and check for venous stasis. The nurse assesses for redness, thickening, tenderness over superficial veins, and a positive Homan's sign, which would indicate possible thrombophlebitis.[14] If these signs and symptoms are noted, the circulating nurse notifies the surgeon. In the absence of these, the nurse requests an antiembolism stocking and sequential compression device for the patient's nonsurgical leg.

The nurse assesses the patient's preoperative mental status, and identifies communication barriers, such as hearing difficulties. The patient's anxiety level and concerns about the procedure are addressed, any questions are answered, and reassurances are given by the nurse. The circulating nurse transports the

TABLE 1
Nursing Care Plan for Patients Undergoing Minimally Invasive Total Hip Arthroplasty (continued)

Nursing diagnosis	Intervention	Interim outcome criteria	Outcome statement
Risk for injury due to positioning and intraoperative manipulation of the surgical leg	• Identifies baseline tissue perfusion and neurovascular status of both lower extremities. • Assesses factors related to risk for ineffective tissue perfusion, such as immunosuppression. • Positions the patient neutrally and anatomically correct and pads pressure points. • Ensures that staff members use proper technique when handling the patient (eg, use transfer devices to prevent skin shear, prevent falls with proper restraint devices). • Evaluates for positioning injury by comparing preoperative and postoperative neurovascular status.	The patient's function and sensation is maintained or improved from baseline levels during the perioperative period. The patient's pedal pulses are present and equal bilaterally during the perioperative period.	The patient is free from signs and symptoms of injury related to positioning.
Risk of infection related to length and type of procedure and tissue manipulation during surgery	• Assesses preoperatively for susceptibility to infection (eg, chronic diseases, weight, laboratory values, skin integrity). • Implements, monitors, and maintains aseptic technique (eg, implant sterilization). • Follows facility-specific protocols and surgeon preferences regarding use of pulsatile lavage and air-exchange helmets. • Administers prescribed antibiotic therapy at appropriate times. • Initiates traffic control. • Helps minimize length of intraoperative phase by planning and anticipating care. • Prevents cross infection. • Administers wound site care and applies sterile, dry, surgical dressing after wound closure.	The patient's skin remains intact and nonreddened, wound is dry, and temperature remains normothermic throughout the perioperative period.	The patient is free from the signs and symptoms of infection.

patient to the OR when preparations are complete and all necessary personnel are ready.

OR PREPARATION

Elective total joint procedures require the highest levels of care by perioperative staff members to minimize the risk of infection. All instruments must be wrapped and sterilized, and biological indicators must read negative. Flash sterilizing instruments for elective implant cases should be avoided. Perioperative staff members and product representatives work cooperatively to plan the need for additional instrument sets; equipment; and supplies, including implants, depending on the scheduled procedure. According to Michael C. Trueblood, MD,

Perioperative staff and physicians must be vigilant of their sterile technique . . . extra equipment and people may be present in the OR, and it is imperative that staff watch for and avoid breaks in technique. If any breaks do occur, they must be corrected immediately, as an infection in a total joint is devastating.[15]

The circulating nurse and scrub person ensure that necessary instruments, sterile supplies, and positioning supplies and equipment are readily available. As with any procedure, each surgeon has his or her own preferences in supplies and equipment, so perioperative staff members should follow that surgeon's preference card when checking the case cart and gathering needed supplies. Minimally invasive instruments are required for smaller incision procedures (Figure 2). The circulating nurse consults with the anesthesia care provider and gathers additional equipment and supplies (eg, temperature-regulating blankets, additional positioning supplies) that he or she requests.

When the assigned OR is available, the circulating nurse and scrub person organize and set out all instruments, supplies (eg, large sets and packs are placed on appropriate tables), and equipment. The circulating nurse gathers needed supplies for the hood system worn by scrubbed staff members during surgery. These include the batteries, headgear, and sterile components. Staff members arrange the furniture appropriately, such as placing stainless steel OR tables on the patient's surgical side. Nonsterile equipment, such as the ESU, temperature-regulating blanket unit, and other equipment are placed on the opposite side. The nurse checks all equipment (eg, OR bed, ESU, lights, suction) for proper functioning. The OR bed should be prepared with the preferred positioning device and padded. The circulating nurse and scrub person then open the sterile supplies. The scrub person organizes the tables and Mayo trays.

Figure 2 • Innovative instruments, including lighted retractors, are used for minimally invasive total hip arthroplasty.

Anesthesia Induction

After the circulating nurse and scrub person have prepared the room, including performing the first sponge and sharp counts, the circulating nurse verifies that all needed staff members are ready and returns to the preoperative area to transport the patient to the OR. Several staff members help the patient move onto the OR bed. The circulating nurse helps the anesthesia care provider initiate ECG, pulse oximeter, and blood pressure monitoring. The anesthesia care provider performs other monitoring, such as placing an arterial line, depending on the patient's health status. The anesthesia care provider may administer general anesthesia, epidural anesthesia, or a combination of both.

Positioning

The MITHA procedure can be performed via a single or double incision. Patient positioning differs depending on which approach is used. No matter which position is used, preoperative assessment of the patient includes

. . . age, height and weight, skin condition, nutritional status, preexisting

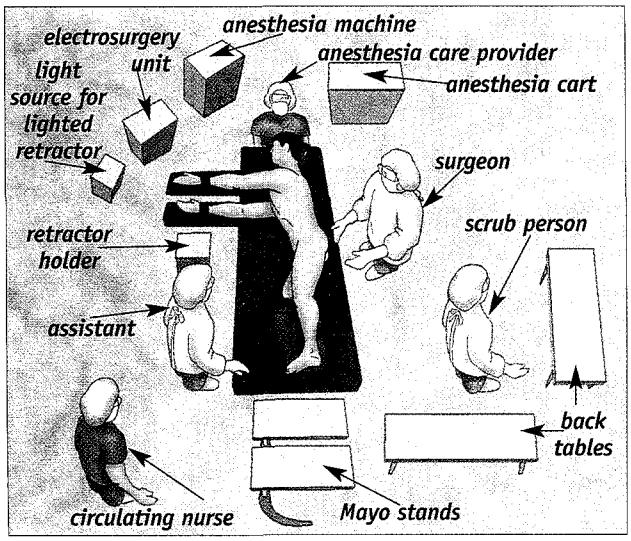

Figure 3 • Room setup for a traditional or single-incision minimally invasive total hip arthroplasty with the patient placed in the lateral position.

> *conditions which complicate the patient's risks and mobility limits. . . . The perioperative nurse should be actively involved in patient positioning. . . . evaluate that the positioning of [the] patient maintains optimal safety and function of the respiratory, circulatory, neurologic, musculoskeletal and integumentary systems . . . and then document the positioning to include the preoperative assessment, type and location of position and/or padding devices, names/titles of persons who position the patient, and postoperative outcome evaluation.*[16 (p341-346)]

For example, the circulating nurse notes that Mrs H is 82 years old, 5 ft 3 inches tall, weighs 102 lbs, and has osteoarthritis, osteoporosis, fragile skin, and poor nutritional status that is confirmed by hypoalbuminemia. A cervical neck x-ray report on Mrs H's chart shows no instability, but the circulating nurse ensures that a flexible intubating laryngoscope is readily available in case the anesthesia care provider encounters difficulty with intubation because of the patient's osteoporotic condition. The anesthesia care provider and perioperative staff members work cooperatively to position Mrs H gently, placing gel padding, which distributes pressure over larger surface areas than does foam padding, to protect bony prominences and pressure points on the patient's dependent side.[16 (p342)]

SINGLE-INCISION POSITIONING. For a single-incision procedure, the patient is placed in a secure lateral position (Figure 3). A pelvic-stabilizing device, such as a McGuire or Montreal hip holder, is used to hold the patient securely in position. The desired position is to place the patient perpendicular to the floor with no anterior/posterior or proximal/distal tilt. The anesthesia care provider places a gel roll under the patient's dependent axilla to minimize stretching or compression of the patient's brachial plexus. Gel padding is placed under the entire body, including the lateral aspect of the patient's dependent knee to protect the peroneal nerve, which is located superficially over the head of the fibula. Staff members place padding and pillows between the patient's knees, ankles, and feet before the patient's surgical leg is prepped and draped. The circulating nurse flexes the patient's lower arm on an armboard, with the dependent shoulder brought slightly forward to relieve pressure. The anesthesia care provider helps place the patient's upper arm on an elevated armboard or pillows. The circulating nurse and anesthesia care provider work cooperatively after positioning the patient and throughout the procedure to monitor the patient's radial pulses to ensure adequate circulation. Staff members use wide tape and other positioning equipment to secure the patient's position. The circulating nurse also assesses the patient's lower extremity pulses and documents their status before and after positioning and after the procedure.

DOUBLE-INCISION POSITIONING. After the patient is anesthetized, the anesthesia care provider and perioperative team members position the patient supine on a radiolucent OR bed, such as a Jackson

surgical frame. Team members also secure the patient's arm on the surgical side to an elevated arm board or ensure that it is padded, resting, and secured on the patient's chest and avoids pressure on the nerves (Figure 4). The nonsurgical arm is placed on another padded armboard. The circulating nurse and anesthesia care provider assess the patient's radial pulses to verify circulation. One or the other assesses the patient's pedal pulses and documents his or her status before and after positioning and after the procedure.

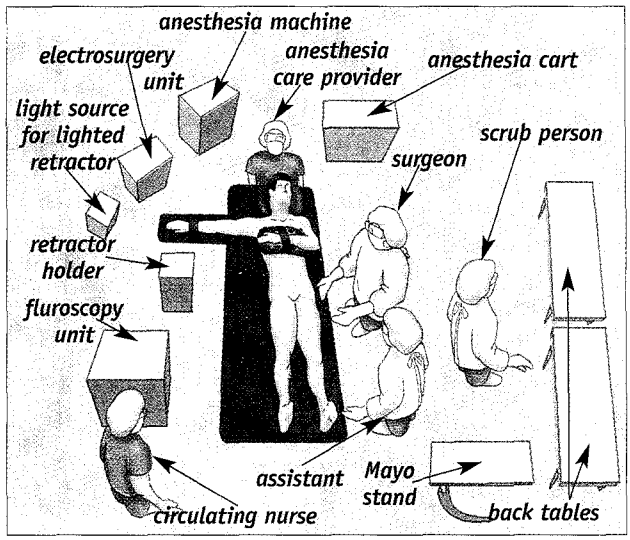

Figure 4 • Room setup for a double-incision minimally invasive total hip arthroplasty with the patient in the supine position.

Skin Preparation

The circulating nurse preps the patient's surgical limb immediately before the procedure. He or she notes and documents any moles, rashes, lesions, or other conditions at or near the surgical site. Hair at the site should not be removed unless the surgeon deems it necessary. Hair removal should be performed according to physician's orders, but recommendations include

- using the least irritating method of hair removal, such as electric or battery clippers with a disposable or disinfected head;
- performing hair removal somewhere other than the OR where the total joint procedure will be performed; and
- removing hair as close to the time of surgery as possible.

The selected antiseptic solution should have a broad range of germicidal action.[17 (p357-360)] The prepped area includes the entire hip, from above the waist to the ankle of the surgical leg, and from past midline, anterior and posterior. The surgeon and circulating nurse place an unsterile U-shaped drape before the prep to isolate the perineal area from the surgical site. After completing the prep, the circulating nurse documents the

- surgical site prepped;
- condition of the patient's skin at the surgical site;
- hair removal if performed, including method, time of removal, and area;
- type of skin prep solution used;
- names of people performing the skin prep; and
- development of any patient hypersensitivity reactions.[17 (p359)]

Time Out

A time out is taken immediately before the incision is made per institution policy. All team members participate in confirming the name of the patient, the procedure to be performed; the correct site, including laterality; and the implant to be used. The radiological examinations also are verified for correctness. The circulating nurse documents the time out to include the correct patient, site, side, agreement on procedure, position, implants.

Surgical Technique and Exposure—Single Small Incision

Innovative instrumentation has made MITHA possible. Lighted retractors allow surgeons to visualize through smaller incisions. Offset acetabular and femoral instruments and low-profile reamers fit better through the smaller incision. As much as possible, muscles are split and divided rather than cut,

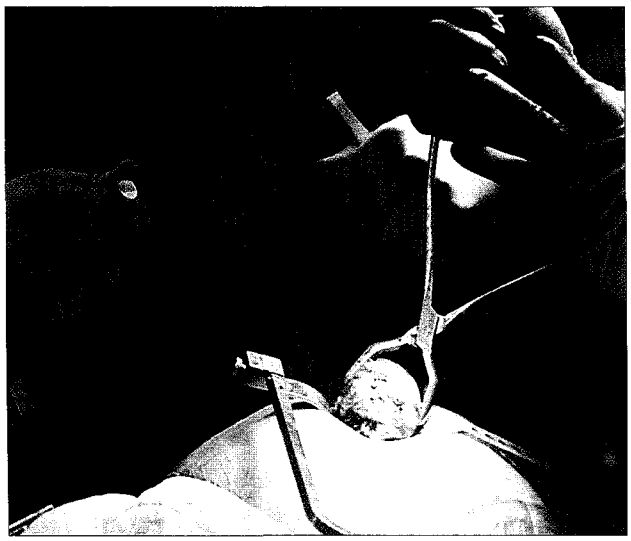

Figure 5 • The surgeon removes the patient's arthritic femoral head using a minimally invasive single-incision technique.

Figure 6 • The acetabular cup implant is inserted during a minimally invasive total hip arthroplasty procedure.

which enhances stability and healing. Placing the initial incision correctly is crucial to the smaller incision technique. The surgeon makes the incision slightly oblique, with 70% of the incision distal to the proximal pole of the greater trocanter and 30% proximal to that landmark.

After the surgeon makes the initial skin incision and ensures hemostasis, he or she incises the subcutaneous tissue. The surgeon identifies and incises the gluteus maximus muscle and fascia lata in the direction of the incision. To improve exposure, he or she bluntly splits the gluteus maximus muscle and extends the fascial incision. The surgeon and assistant protect the sciatic nerve with retractors while dividing the hip capsule, leaving all possible structures intact. The surgeon identifies landmarks and determines leg length before dislocating the hip and uses an osteotomy guide to identify the location for the femoral neck osteotomy. This also improves visibility of the joint. He or she then removes the femoral head via a femoral neck osteotomy using a large bone saw (Figure 5).

ACETABULUM. The surgeon may remove some of the acetabular capsule and any osteophytes. Skin protection is used to guard the skin edges from the acetabular reamers. Low-profile reamers fit into the small incision much better than traditional reamers. Inserting the acetabular shell implant can be accomplished with an offset-type shell inserter (Figure 6). Some surgeons impact the shell implant into the acetabulum, and other surgeons prefer to fixate the implant with screws. The surgeon then impacts the implant liner onto the cup.

FEMUR. The surgeon and assistant reposition the leg for best visualization of the femur and use an intramedullary awl and box osteotome to open the femoral canal. The surgeon then uses low-profile power reamers to help place the femoral implant. He or she uses a rasp to prepare the femoral canal for the implant. The surgeon initially starts with a 9-mm or 10-mm rasp and sequentially uses larger diameter rasps until a satisfactory fit is obtained. He or she performs a trial reduction of the femoral head on the trial stem using offset instrumentation to help apply the femoral heads. The surgeon and assistant check the patient's range of motion, hip stability, and leg length during the trial reduction. The surgeon then removes the trials and places the permanent implant stem.

The surgeon may implant the femoral head or may choose to perform a second test with the trial femoral head on the permanent implant stem. The surgeon and assistant reduce the hip and assess leg length, stability, range of motion, and abduction tension. The surgeon and assistant then close the incision, insert a drain if needed, and apply the dressing.

Surgical Technique and Exposure—Double-Incision Technique

The double-incision technique involves one incision for the acetabular component and one incision for the femoral component. The patient is positioned supine on a fracture table, and fluoroscopy is used to identify proper starting points for the incisions and ensure accurate component positioning and alignment. Since this procedure was first performed at Rush-Presbyterian-St Luke's Hospitals, Chicago, two years ago, more than 100 minimally invasive double-incision procedures have been performed. The results have been good—94% of the femoral stems in the first 70 cases were in neutral alignment, and all acetabular components were implanted at abduction angles of 35 to 55 degrees (ie, average 45 degrees). All components had bony ingrowth without migration at a follow-up period of greater than three months. Only one patient experienced a fracture, which healed. Although surgical times for the first cases were longer, the last 80 cases had surgical times ranging between 80 and 120 minutes.[18] Some surgeons used image-guided navigational systems to obtain a three-dimensional image of the hip joint.

Another study presented scenarios of 66 patients whose surgeries were performed successfully using a navigation system for the acetabular portion.[3] Use of both fluoroscopy and navigation systems helped surgeons position the acetabular and femoral components correctly through the two incisions. Disadvantages of using the navigation systems are increased cost and surgical time. Additionally, the possibilities of computer malfunction or inappropriate commands exist.[3]

Postoperative Care

After the surgical procedure is completed, the scrub person removes the surgeon's initials from the site before dressing the wound. The anesthesia care provider and circulating nurse then transport the patient to the postanesthesia care unit (PACU). The assigned PACU nurse assesses and monitors the patient, including respiratory and cardiac status, on a regular basis. Pain control is addressed, and medications are given as needed. Wound dressings are observed for bleeding.

Fluoroscopy and navigation systems can help surgeons position the acetabular and femoral components correctly.

Nurses help patients ambulate with full weight bearing within four hours after surgery, depending on the patient's bone quality and the fit of the implants. Many physicians expect their patients to go home sooner after a minimally invasive procedure. Surgeons at Rush-Presbyterian-St Luke's Hospitals report dramatic results for their patients' length of stay.

> *Eighty percent of the patients elected to go home the same day, with the remaining patients leaving the hospital the next day. The patients, not the surgeon, determined the length of stay. No patient has remained in the hospital for longer then 23 hours, and no patients were transferred to any other care facility.*[18]

Complications

Complications from MITHA can be divided into medical, mechanical, and infectious. Medical complications include cardiovascular problems, such as dysrhythmias, myocardial infarction, bleeding problems, and pulmonary emboli. Mechanical complications involve implant problems, such as breakage, loosening, and wear. Infection, a devastating complication to patients undergoing total joint replacement, requires additional surgeries, greater medical expenses, and prolonged recovery time.[5 (p897)]

Conclusion

Time will tell whether single- or double-incision MITHA will be the panacea for hip surgery. Patients benefit from having smaller incision and faster rehabilitation, and the procedure demonstrates excellent results at two years.[18] As the procedure becomes more common, patients contemplating hip surgery have begun to ask whether minimally invasive approaches are appropriate for them. ❖

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Notes

1. "Hip implants," American Academy of Orthopaedic Surgeons, *http://www.orthoinfo.aaos.org/fact/thr_report.cfm?Thread_ID=271&topcategory=Hip* (accessed 21 March 2004.)
2. M J Archibeck et al, "Second-generation cementless total hip arthroplasty," *The Journal of Bone and Joint Surgery* 85 (November 2001) 109-114.
3. W J Hozack, F Orozco, "Minimally invasive total hip arthroplasty and navigation in hip surgery," American Academy of Orthopaedic Surgeons, *http://www.medscape.com/viewarticle/451349* (accessed 21 March 2004).
4. G F Chimento et al, "Minimally invasive total hip arthroplasty: A prospective randomized study," seminar presented at American Association of Orthopedic Surgeons meeting, New Orleans, 5-9 Feb 2003. Also available at *http://www.aaos.org/wordhtml/anmt2003/sciprog/276.htm* (accessed 21 March 2004).
5. B Bowen, "Orthopedic surgery," in *Alexander's Care of the Patient in Surgery,* 12th ed, J C Rothrock, ed (St Louis: Mosby, 2003) 817-930.
6. "How do you know it's time for surgery?" Arthritis Foundation, *http://www.arthritis.org/conditions/SurgeryCenter/when_surgery.asp* (accessed 21 March 2004).
7. "Osteoarthritis of the hip," American Academy of Orthopaedic Surgeons, *http://orthoinfo.aaos.org/fact/thr_report.cfm?Thread_ID=208&topcategory=Hip* (accessed 21 March 2004).
8. J F Veronesi, "Rheumatoid arthritis," *RN* 66 (August 2003) 47.
9. C Drake, M Ace, G E Maale, "Revision total hip arthroplasty," *AORN Journal* 76 (September 2002) 415.
10. S C Beyea, "Patient identification—A crucial aspect of patient safety," *AORN Journal* 78 (September 2003) 481.
11. N R Feistritzer, "Wound healing, dressings, and drains," in *Alexander's Care of the Patient in Surgery,* 12th ed, J C Rothrock, ed (St Louis: Mosby, 2003) 289.
12. S C Beyea, "The national patient safety goals and their implications for perioperative nurses," *AORN Journal* 77 (June 2003) 1243.
13. B E Bierbaum, "An analysis of blood management in patients having a total hip or knee arthroplasty," *Journal of Bone and Joint Surgery* 81 (January 1999) 2-10.
14. H M Seidel et al, *Mosby's Guide to Physical Examination,* third ed (St Louis: Mosby, 1995) 419.
15. M C Trueblood, personal communication with the author, Cape Girardeau, Mo, 10 Oct 2003.
16. "Recommended practices for positioning the patient in the perioperative practice setting," in *Standards, Recommended Practices, and Guidelines* (Denver: AORN, Inc, 2004) 341-346.
17. "Recommended practices for skin preparation of patients," in *Standards, Recommended Practices, and Guidelines* (Denver: AORN, Inc, 2004) 357-360.
18. R A Berger, "An innovative surgical technique: Mini-incision total hip replacement," MedScape WebMD, *http:/www.medscape.com/viewarticle/458346_29* (accessed 21 March 2004).