

Minimally Invasive Total Hip Replacement

Dana C. Mears, MD, PhD
Greater Pittsburgh
Orthopaedic Associates
5280 Centre Avenue
Pittsburgh, PA 15206

Seventeen years ago, a new method for a total hip replacement was introduced clinically, which displayed a marked shortening of the hospital stay and acceleration in the overall recovery period. The patented method was developed by Dr. Mears in collaboration with Zimmer, a leading manufacturer of orthopaedic implants. Currently, the technique is being used in selective medical centers around the U.S. and abroad. Standard cementless implants of a well-accepted and clinically tested design are employed. At the University of Pittsburgh Medical Center- Presbyterian-Shadyside Hospital (UPMC-SSH), a specialized minimally invasive total hip replacement program has been assembled, which includes the operative procedure as well as the pre and post-operative care. A separate clinical unit was created, which employs innovative techniques for anesthesia and pain management along with a specialized and intensive protocol for physical therapy. The initiation of therapy within a few hours after the surgery enables most patients to be discharged to their homes within a day after the surgery and potentially on the day of surgery.



Introduction

A total hip replacement is performed to manage severe degenerative arthritis of the hip and occasionally other problems. The procedure includes a replacement of the femoral head and the insertion of a cup into the anatomical hip socket of the pelvis. The Two-incision Approach uses one 2-4" incision in front of the hip to remove the arthritic femoral head (ball-part) and to prepare the socket for the insertion of the cup. A second 1.5-2.0" incision, high on the outside of the hip, is used to prepare the marrow cavity of the upper femur (thighbone) for the insertion of the prosthesis (femoral stem or pin) that anchors the replacement femoral head (ball). The lengths of the incisions may vary depending upon the thickness of the tissues. The surgical incisions progress down to the hip joint between the neighboring muscles, thereby to minimize muscular damage. Intra- operative x-rays are taken to provide guidance that supplements the direct visual observations, thereby to ensure an accurate placement of the implants. Specialized retractors are used to

separate the tissues and provide an exposure of the hip. At the time of the surgical procedure, conventional total hip implants are assembled from multiple components. By assembling the implants in situ, the minimally invasive technique permits the use of far smaller incisions than is possible for a conventional procedure. A so-called cell saver is used to cleanse and return any blood that drains into the incision during the procedure. Whereas a standard procedure employs a large incision through the hip capsule, thereby to lessen the stability of the hip and create a predisposition for a post-operative dislocation, the MIS technique employs two small capsular incisions and thereby preserves the stability of the hip.



While the size of your incision approximates that of a car key it varies with your body build.

After an MIS procedure, a patient is encouraged to move the hip without any limitations, thereby to encourage the optimal mobility. With the rapid restoration of activity within a few hours after the surgery, the risk of a deep venous thrombosis (DVT/PE) is minimized. Likewise, the risk of a post-operative wound infection is diminished by the marked decrease in the extent of the surgical procedure.

The Selection of Patients

Most patients who have degenerative arthritis, rheumatoid arthritis, avascular necrosis or post-traumatic arthritis with incapacitating pain are suitable candidates for an MIS total hip replacement.



A patient with a minor deformity of the hip, possibly from congenital dysplasia or a prior fracture of the hip or pelvis is a candidate for the procedure. Uncommon contraindications for the procedure include a major bone deformity, some types of retained hardware and selective other complex situations. Currently, most health insurance companies have restrictions on bodily size with a maximum body mass index (BMI) of 40. The companies have some additional restrictions pertaining to the use of recreational drugs, regular medicinal opioid medications, smoking and severe renal (kidney) disease. With respect to the quality of the clinical outcome, a major factor is your degree of physical

activity and physical fitness prior to the surgical procedure. An individual with a highly sedentary lifestyle possesses a much GREATER difficulty to achieve an excellent recovery after the total hip replacement.

Expectations after a Minimally Invasive Total Hip Replacement.

Upon completion of the initial recovery period, the total hip replacement generally provides a markedly superior performance in comparison to the previous function of the severely arthritic hip. The arthritic pain is eliminated, while the hip displays stable flexion from a fully straightened position to a bend well beyond a right angle (90°). The amount of flexion is variable, although it is generally sufficient to sit in a standard chair and to climb or descend a flight of stairs. If a hip is quite stiff prior to surgery and for an extended period, then the likelihood for excellent hip motion after surgery is decreased. Most patients can walk without walking aids, climb and descend stairs unaided and swim, play golf, bike, or take walks. Most patients, however, are aware that the hip possesses some minor shortcomings that a perfectly normal hip would not possess. After prolonged walking on hard surfaces, the hip may ache temporarily. With respect to the quality of the clinical outcome, a major factor is your degree of physical activity and physical fitness prior to the surgical procedure. An individual with a highly sedentary lifestyle possesses a much GREATER difficulty to achieve an excellent recovery after the total hip replacement.

Scheduling of the Procedure and Pre-operative Planning

If you reside in Western Pennsylvania or a neighboring state, initially an office evaluation provides the opportunity to undertake a physical examination, a review of appropriate radiographs (x-rays) and to discuss the anticipated surgery. After an evaluation by Dr Mears, you will meet with Michelle Phillips to arrange for a date of the surgery. Alternatively, if you prefer to return to your home for discussions with your family, friends or employer, you can call Michelle to arrange for the date of your surgery. After the surgery is scheduled, if questions arise that pertain to pre-operative arrangements, you can call Michelle to discuss the issues. If you live further away from Pittsburgh, x-rays of the hip, or a corresponding CD, can be mailed to our office, along with a brief history of the problem. Subsequently, a preliminary discussion by a phone call or by e-mail can be undertaken. Either an office visit may follow or you may elect to schedule surgery and to visit our office for the clinical examination on the day before the surgical procedure. In the latter instance, this format has to be consistent with the protocol that is approved by your health insurance company.

A standard pre-operative medical screening evaluation is necessary, which includes: a history and physical examination, blood and urine tests, an electrocardiogram and a chest x-ray. Your PCP may supervise these tests or they can be undertaken at UPMC Presbyterian-Shadyside Hospital. If a test displays the presence of certain abnormalities or changes from the results of previous tests, such as an electrocardiogram, further testing may be necessary before medical clearance to undergo the procedure is

granted. If you have had previous assessments by a cardiologist, pulmonologist, kidney or diabetes specialist, you will need to have an updated evaluation to determine whether additional testing is appropriate. The specialist will write a report for a review by the anesthesiologist at Shadyside Hospital, immediately prior to your surgery.

The Potential for Blood Transfusion

During the surgical procedure, typically a small amount of bleeding occurs. Routinely during surgery, a so-called cell saver is used to return the blood that is shed into your circulation. If a larger quantity of blood loss occurs, you may receive a transfusion. While uncommon, this situation usually occurs when an individual takes a regular blood thinner (anticoagulant), including: Coumadin, Xarelto, Eliquis and Plavix. Currently, with the rarity of transfusion, a pre-operative arrangement for the use of your own blood (autotransfusion) or that of a directed donor has ceased to be undertaken.

Activities on the Day of Surgery

On the day of surgery, you will report to UPMC Presbyterian- Shadyside Hospital for a preliminary assessment by the anesthesiologist.



The anesthesiologist will discuss the anesthetic protocol with you.

He/she will discuss the anesthesia and the treatment options to minimize post-operative pain. Our goals include keeping you as comfortable as possible while still enabling you to begin physical therapy soon after surgery. While we will use narcotics when needed to treat your pain we will also give you a combination of non-narcotic analgesics to reduce that need as much as possible. An important part of this “multimodal analgesia” is the use of a peripheral nerve block. This nerve block is a shot that is administered pre-operatively by our acute pain service and is intended to partially numb the surgical site. For hip surgery the nerve block is called a lumbar plexus block. The lumbar plexus is a group of nerves that provide most of the sensation of the hip. This procedure consists of an injection in the lower back to the side of the spine and immediately above the buttock. The nerves are identified either by the use of an ultrasound imaging device or by the use of a nerve stimulator which generates a small electric current that stimulates the femoral nerve causing a contraction of

the thigh. When the proper nerve is identified a dilute solution of a local anesthetic, ropivacaine, is injected.

At this time, our Physician's Assistant, Liz Hollins, will review the itinerary of activities for the day, including the objectives that you have to achieve prior to a discharge to your home.



Most patients choose to have a nerve block to minimize post-operative pain.

For the surgical procedure, most patients benefit from the use of a mini-dose spinal anesthetic with supplementary intravenous sedation. The sedation ensures a lack of awareness of the procedure. At the end of the procedure, a fully awakened state is rapidly restored.



You will receive some sedation to keep you comfortable during surgery.

Potential Complications with Nerve Blocks

1. Systemic toxicity. If the local anesthetic is injected as a large quantity into a vein, it can go to the heart and brain to provoke a stoppage of the heart (cardiac arrest) and/or a seizure. To avoid these complications, the local anesthetic is injected as a small amount at a time and after verifying by aspiration that no blood returns to the syringe.
2. Injury to a nerve. The medication can produce persistent numbness and muscle paralysis. These complications are rare. In most such cases the nerve function recovers within weeks or months. Infection or a hematoma (bleeding around a nerve) is a rare complication of a nerve block procedure.

Surgery

After the pre-operative evaluation and preparation, you are transported to the operating room for the surgical procedure. A spinal anesthetic is performed, typically while you are in a sitting position.



Most patients elect to have a spinal anesthesia.

Then you are repositioned on your back and given a sedative to rest comfortably during the hip procedure. An x-ray based guidance technique (fluoroscopy) is used throughout the procedure. The imaging permits an identification of the proper site for the incisions. It documents the appropriate sites for preparing the acetabulum (socket of the pelvis) and the femur (hip/thigh bone). The fluoroscopic navigation directs the proper alignment and fixation of the implants. The surgery is performed by the use of a principal anterior incision of 2-4” and a shorter second incision of 1.5-2.0”. The lengths of the incisions depend upon your bodily size. The incisions extend between muscles to reach the hip joint to minimize the cutting of muscles. While the acetabular implant (cup) is standardized for all of the procedures, the selection of the stem is based upon the degree of osteopenia of the femur. The cementless implants possess surface coatings akin to “Brillo pads” to encourage your bone to grow into the small interstices (holes) in the porous coatings. Each incision is closed with sutures that are below the surface of the skin and that dissolve spontaneously. The dressing consists of a waterproof coating, akin to a coat of paint. Normally, no dressings are applied to the incisions. While the surgery lasts about one hour, you are in the operating room for 1.5-2.0 hours, including the spinal anesthesia and preparation to be transported to the Recovery Room.

Post-operative Activities

At the completion of the surgery, you are transported to the Recovery Room for a minimum period of two hours. Dr. Mears

will go to the Family Waiting Room to discuss the procedure with available family members or friends. The family members and significant others are urged to be in the Family Waiting Room for this discussion. If a room on 2 Pavilion (2 PAV) is not available when you are alert and comfortable, the physical therapist will start your therapy in the Recovery Room. The therapy includes transfers to a standing and sitting position. Initially, walking is completed with the use of a walker. For a transfer to 2 PAV, the spinal anesthesia and nerve block have to dwindle to a degree whereby you can place all of your weight on the operative leg so that it supports you.



After a period in the Recovery Room, you are transferred to 2PAV.

Activities on 2 PAV

Typically, you undergo two or three therapy sessions on the day of the procedure. The objectives of the sessions include the ability to transfer from the bed to a chair, or bathroom, to walk with a walker, crutches or cane and to undertake bending and strengthening exercises for the hip and leg. As you advance to a second or third therapy session, you will walk progressively longer distances and practice climbing stairs.

You are encouraged to put all of your weight on the operative leg and to fully bend the hip. The therapists provide devices to help with activities of daily living, such as the application of socks.



Initially, you will be asked to walk with a walker. You walk progressively longer distances and practice climbing stairs.

Criteria for Discharge to your Home

To be safely discharged to your home, you have to be independent for transfers from the bed and for walking with a suitable walking aid. You have to be eating, drinking, voiding on your own and have satisfactory control of pain. Our PAC, Liz Hollins, will meet with you to confirm your completion of these objectives and discuss your appropriate activities after the return to your home. After surgery, nausea and vomiting is a problem that may be attributable to the anesthesia and to various pain medications. So-called “antiemetic” medications are administered to prevent or eliminate the problem. Prior to the hip surgery, if a male patient possesses a past history of prior urinary retention, benign

prostatic hypertrophy (BPH), a prior prostatectomy, or treatment for prostatic cancer, he is advised to undergo an evaluation by a urologist. Various treatments may be considered to lessen the risk of urinary retention after the hip procedure.

Prior to the admission to the hospital arrangements should have been established whereby a family member or friend is able to collect you at the hospital whenever your discharge plans are completed for transport to your home or other appropriate site for your initial convalescence. Likewise, before your admission to the hospital, arrangements should be firmly established that a family member or friend would be able to assist you at home for at least a week after the surgical procedure. While the individual does not have to be present for all hours of the day, he/she should be present at night in case you should fall or have some type of medical problem. The individual should be able to assist with shopping for groceries and other provisions along with washing clothes or other activities. You will be unable to drive after a right hip replacement for **THREE WEEKS** and after a left hip replacement for at least **ONE WEEK**. Suitable alternative arrangements need to be made in advance of the surgery.

Post-operative Medications and Therapy

Several types of medications are given before, during and after the surgery to minimize the risk for a complication. An antibiotic is administered to lessen the risk for a wound infection. An anti-emetic is given to minimize the risk for post-operative nausea.

Usually, aspirin as one 81 mg tablet is given twice daily for a four-week period to minimize the risk of a post-operative blood clot (i.e. DVT/PE). If a patient possesses an exceptional risk for a blood clot or if he/she regularly takes a blood thinner (anti-coagulant) such as Coumadin, Xarelto, Eliquis or Plavix, an alternative medication other than aspirin may be given. For a control of pain, both oxycodone and Tylenol are used. If you have an allergy to oxycodone, a suitable alternative medication is used. Prior to your discharge from the hospital, a concierge service, “Meds to Beds”, is available to bring your medications for use at home to your room. The service provides a seven-day supply of pain medications. The service ensures that if you were to arrive at your home after the local drug store is closed, you would have the appropriate medications.

At home, you are encouraged to undertake daily walks indoors or outdoors. After you walk for a certain distance, you will begin to feel discomfort in your hip. Your body tells you when to stop the activity. It is important to “listen” to it! As the days progress after the surgery, you will be able to undertake progressively more activities. If you are discharged to your home on a walker or two crutches, you can progress to a cane whenever you feel able to do so.

At home, you may prefer to walk with 2 crutches or with just one crutch or a cane.

Likewise, you can eliminate the cane whenever you are able to walk without it. At discharge, the therapists will provide you with a picture booklet of exercises to be done at home on a daily basis. You are encouraged to move the hip as much as possible so that you achieve the optimal flexibility.

Generally, home physical therapy is discouraged. Most home therapists are not familiar with the altered protocol for the accelerated recovery plan. The home therapist may encourage you to revert to a standard post-operative therapy program for a conventional total hip replacement, thereby to retard your recovery. One month after the surgical procedure, you will have an evaluation with Dr Mears to assess your progress and to review x-rays of your hip replacement. At that time, you may begin to progressively return to your normal schedule of activities.





Within few days, you will be able to resume regular physical activities.

You will receive a prescription to start a one-month period of outpatient therapy. The objectives of the therapy are to improve your activity level and to undertake strengthening exercises for your hip muscles. Most health insurance companies have decreased the amount of physical therapy that they will fund. The therapy is far more productive if it starts one month after the surgery when you have partly recovered. Afterwards, you are encouraged to join a local health club for a year. The strengthening program should include aerobic machines, such as a stationary bicycle, treadmill or elliptical machine. Swimming is a suitable alternative. The use of a regular weight-training regime, such as the use of weight machines, is strongly recommended. This prolonged strengthening regime is necessary to optimally restore the chronically weakened hip muscles that atrophy during the progression of the arthritis.

Resumption of Driving

For a safe resumption of driving, it is critical that you be effectively in control of the vehicle. Otherwise, in the event of an accident, you may not have coverage provided by your insurance carrier. As a reasonable guideline, for a procedure on the right hip, the resumption of driving is deferred for **THREE WEEKS** after the surgical procedure. After an uncomplicated post-operative recovery from a left hip, driving can be resumed one week after surgery, provided that you can enter and sit in the vehicle without difficulty.

Return to Work

The time for a return to a regular job depends upon several factors, including the degree of physical activities that are necessary to perform the position. Another critical factor is whether you are permitted to start on a part-time basis and progressively return to a full-time capacity. Another major factor is the presence or absence of other medical problems, including another major arthritic joint. Still another factor is travel to the job and your capability to drive or to have alternative travel arrangements. If you are a sedentary worker in an office, a part-time return to the job within a week may be feasible. A full-time performance may be reasonable within two to four weeks. If the job involves heavy labor, a more prolonged deferral is anticipated. If the position involves walking and climbing stairs along with carrying objects of up to twenty-five pounds, a deferral of about two months after the surgery is likely. If the position involves strenuous activities including the

climbing of ladders, working in awkward positions and carrying heavy loads, a deferral of at least two to three months is likely.

How to Address a Post-operative Problem

After any surgical procedure, some type of medical problem may arise. While most of the issues are minor, a suitable plan to address the situation is needed. Within a few days after a return to your home, you may elect to undertake extensive activities so that your operative hip becomes painful and the pain fails to resolve rapidly. If you “overdo activities”, this painful situation may follow. At this stage, the appropriate recourse is to markedly reduce your activity level and to take one of the pain pills that was prescribed when you left the hospital. If you are concerned about the severity of the pain, then call the office to explain the situation. During weekdays from 8am to 4 pm, you can talk to Michelle Phillips to discuss the problem. If necessary on a weekend or evening, you can discuss the issue with the physician on call for GPOA. Unlike Michelle, that individual will not be knowledgeable about your surgery. If possible, a discussion with Michelle is preferable. Other problems that may be addressed by Michelle include: drainage or discoloration of an incision, calf pain, numbness of the thigh or a difficulty with your exercises.

When you depart from 2 PAV, you are provided with post-operative instructions. The document lists a phone number for the ward as a potential way to contact a nurse who would be familiar with your post-operative recovery and able to advise you. Usually, you are unable to discuss

your concerns with a nurse who can provide useful information. A call to Michelle is more likely to resolve the concern.

Certain issues, such as an abnormally high or low blood pressure, are best addressed by your family physician (PCP). If your medications for diabetes mellitus are failing to optimize your blood glucose level, your PCP should be alerted. Rarely, a true medical emergency arises, such as severe chest pain or shortness of breath. Likewise, a fall that culminates in severe hip or leg pain and an inability to walk merits a prompt assessment in an emergency room. Historically, an assessment in an ER was widely undertaken to undergo an evaluation for widely diverse post-operative problems. Overall, apart from a serious medical emergency, this site is inappropriate for an evaluation of a minor issue. The medical staff at the ER is unfamiliar with your surgical procedure. Health insurance companies are concerned about this costly means to undertake an evaluation. Recent changes in insurance policies dictate that your insurance company will review such an evaluation. If the assessment concludes that the assessment in the ER was unnecessary, you will be financially liable for the cost of the ER visit.

Potential Complications

To some degree, all of the complications that have been reported for a conventional total hip replacement pertain to a minimally invasive one. This limited review is of insufficient length to discuss all of the complications that have been reported after a total hip

replacement, including many exceptionally uncommon ones.

Nevertheless, the most common potential problems are assessed. A wound infection is uncommon, probably in view of the decreased surgical dissection needed for an MIS procedure. Likewise, a dislocation of the hip replacement after an MIS procedure is equally uncommon. The excellent stability of an MIS hip replacement correlates with the preservation of the stabilizing soft tissues around the operative hip, namely the hip capsule and hip muscles. Seventeen years ago in the initial reports of clinical results after MIS hip replacement, the risk of a fracture of the proximal or upper femur was about three-fold greater than that for a regular hip replacement. With progressive modification in the technique, this problem has been greatly diminished, probably to a lesser likelihood than for a standard procedure. While general and spinal anesthetics are quite safe, no surgical procedure is wholly safe and free from the risk of a potential complication, some of which are rare events. The risk for an injury to a major blood vessel is a remote possibility.

After an MIS hip replacement, about 25% of the patients experience the presence of a numb patch on the anterior thigh. When the surgeon separates the edges of the incision to view the hip joint, his retraction of the nerve creates the problem. In most patients, the numbness resolves spontaneously during the subsequent three-month period. In a similar way, about one percent of patients experience a temporary injury to the femoral nerve, which permits flexion of the hip. Generally, this uncommon problem resolves during a three-month period.

After an MIS hip replacement, an injury to the sciatic nerve to provoke a “foot drop”, potentially with numbness of the foot, is an unlikely possibility. For a patient who has lumbosacral spinal stenosis, and thereby a considerable risk of a sciatic nerve palsy after a standard hip replacement, an MIS procedure minimizes that risk. Likewise, after an MIS procedure, the risk for an injury to the gluteal nerves is minimized.

Whenever a man-made device is utilized in the body, the potential for a premature “wearing out”, breakage or loosening arises, a problem shared with the use of all other manmade devices, such as a car, television or a computer. Where a patient is of a younger chronological age, and thereby possesses a longer life expectancy, this consideration becomes a greater concern. If such a problem does arise, a surgical revision may be needed to address the situation. After a total hip replacement in a young adult, eventually some type of surgical repair or revision procedure is highly likely to be necessary. Certain activities such as jogging, combative sports and falls from a height, immeasurably increase the likelihood for a premature failure. For this reason, after a hip replacement, these activities are discouraged in a life-long way.

Special Circumstances

If a patient has a prolonged exposure to potent, pain-killing medications (codeine, opioids) or recreational drugs and occasionally other agents prior to a total hip replacement, the response of the body to various therapeutic agents that control postoperative pain can be markedly altered. This factor may apply even if the patient had a prolonged abstinent period between exposure to the drugs and the time of the surgical period. In this event, the post-operative pain may be difficult to control, and the relief of pre-operative arthritic pain may not be nearly as complete. The essential postoperative therapeutic exercises may be accompanied by considerable pain so that the activities cannot be as effectively performed. The ultimate clinical outcome may be markedly compromised and inferior to the normal outcome. If such a situation could apply to you, a preoperative discussion with Dr. Mears is strongly recommended.

Prior to a total hip replacement, a patient's family members or friends may recognize features of a mild dementia in the patient. Dr. Mears and his team should be made aware of this situation. After the surgical procedure, in the presence of a strange hospital environment, the exposure to anesthetic agents and other medications, the behavioral changes are likely to become much more marked, including confusion and mood changes. In turn, the patient's ability to perform the therapy may be impaired so that the ultimate clinical outcome is heavily compromised. If these possible problems are recognized prior to the surgery, some preventive

measures may be undertaken. After the surgery, with the assistance of the Social Services Department, our therapists can recommend that you be transferred to a skilled nursing center or an in-patient rehabilitation facility for additional intensive therapy. This situation is most likely to arise for patients more than 80 years of age, or in the presence of multiple medical problems, including multiple arthritic and impaired joints or dementia. Special arrangements may be organized to optimize the environment for the early convalescent period.

For additional information about the procedure, or to arrange for an appointment, call or email Michelle Phillips (tel. 412-661-5500 or michellephillips@gpoa.com)