

MAKOplasty® Robotic Arm Total Hip Arthroplasty
Your Pre-operative Guide



MAKOplasty® Total Hip Arthroplasty is indicated for patients who suffer from non-inflammatory or inflammatory degenerative joint disease. It is powered by the RIO® Robotic Interactive Arm Orthopedic System, which allows surgeons to achieve a new level of precision with the newest techniques in hip replacement surgery. MAKOplasty® Hip is designed to restore patient mobility and active lifestyle.

Understanding Degenerative Joint Disease	2
Understanding Hip Arthritis	3
Total Hip Arthroplasty	4
MAKOplasty® Total Hip Arthroplasty.	6
After Surgery	9
Patient Implant Card	inside back cover

The information provided herein is not meant to substitute for the in-depth consultation you should have with your physician. Only a licensed physician can adequately diagnose and explain your underlying orthopedic condition, the natural history of the condition without intervention, the MAKOplasty® procedure, medically acceptable alternative procedures, and the potential complications and risks of any procedure and/or operation. In every case your physician must guide you on all aspects of your surgery, including pre- and post-operative care. Individual results will vary.

Understanding Degenerative Joint Disease

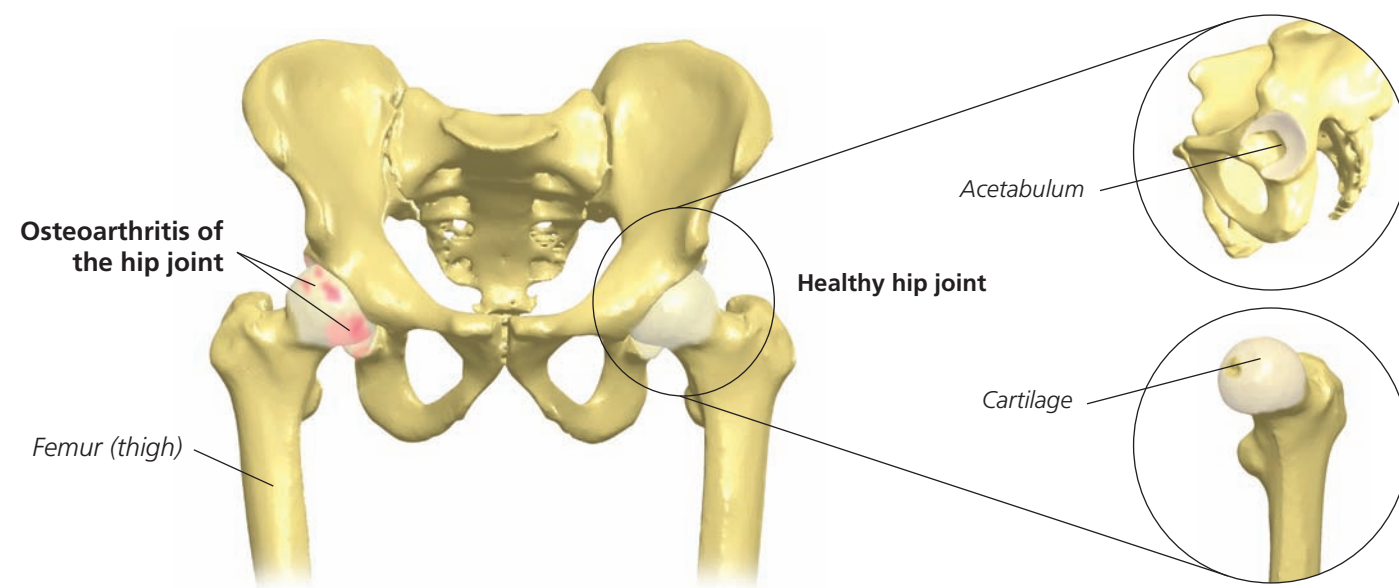
The hip is one of your body's largest weight-bearing joints. The hip is called a ball-and-socket joint because the spherical head of the thighbone (femur) moves inside the cup-shaped hollow socket (acetabulum) of the pelvis. These bones are covered by cartilage, a layer of strong tissue that cushions the bones and allows smooth, easy movement of the joint.

What is degenerative joint disease (DJD) of the hip?

There are different types of DJD that may cause hip pain. These include but are not limited to:

- Osteoarthritis (OA), also called "wear-and-tear arthritis," in which the cartilage wears down over time
- Post-traumatic arthritis, which results from a severe fracture or dislocation of the hip
- Rheumatoid arthritis (RA), an inflammatory arthritis of the joints
- Avascular necrosis (AVN), a condition where the "ball" or femoral head has lost a healthy supply of blood flow causing the bone to die and the femoral head to become misshapen
- Hip dysplasia, a developmental deformation or misalignment of the hip joint

Anterior (front) view of the pelvis



Understanding Hip Arthritis

What is hip arthritis?

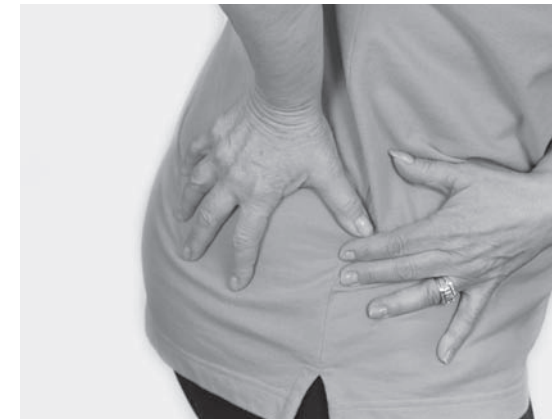
Osteoarthritis is the most common type of hip arthritis and is often called wear-and-tear arthritis or degenerative joint disease. Osteoarthritis is characterized by the breakdown and eventual loss of cartilage in the joint. As the protective cartilage wears away, bare bone is exposed and bone-on-bone contact occurs.

The main symptom of hip arthritis is pain. The pain may not only be in the hip, but it may radiate down into the front of the thigh. Pain may be present only during activities, such as walking, or it may occur all the time. Range of motion may also be affected.

What causes the pain?

Arthritis is a loss of cartilage, not a bone disease, and occurs when the cartilage, or lining, of the hip joint wears away. The cartilage serves as a cushion and allows for smooth movement of the hip.

As the cartilage wears away, small flakes of it are absorbed by the capsule—the soft tissue envelope that surrounds the hip joint. The absorption of the cartilage flakes causes inflammation and pain. When the cartilage is entirely worn away, the ball-and-socket bones touch, creating bone-on-bone contact. This contact creates mechanical pain, swelling, and stiffness for which anti-inflammatory drugs or injections only provide transient pain relief.

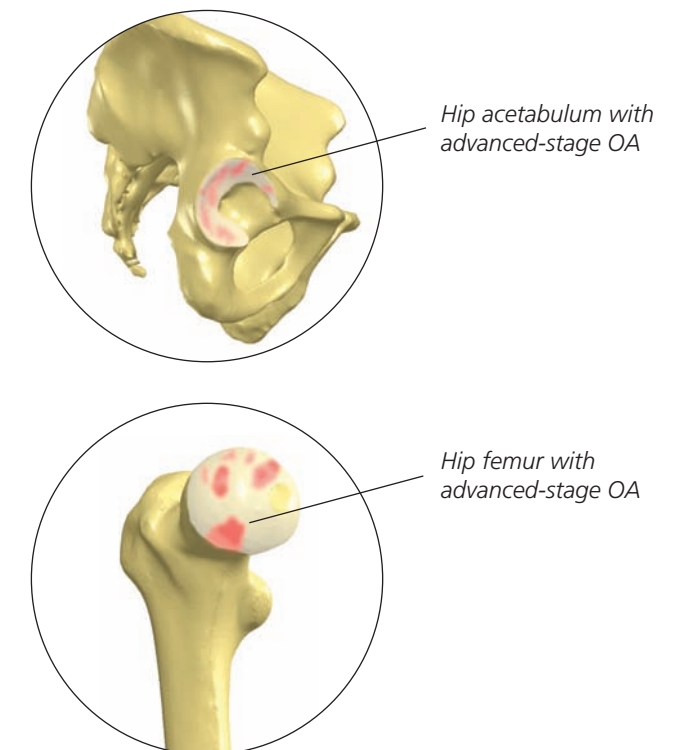


What are the symptoms?

Hip pain occurs in four places:

- Groin
- Outside the hip
- Sacroiliac joint area of the back
- Thigh to the knee (or below)

Pain from the hip is commonly mistaken for back pain, and may be treated as such until the diagnosis of hip arthritis is made. As hip arthritis progresses and pain increases, hip replacement may become a treatment option.



Total Hip Arthroplasty

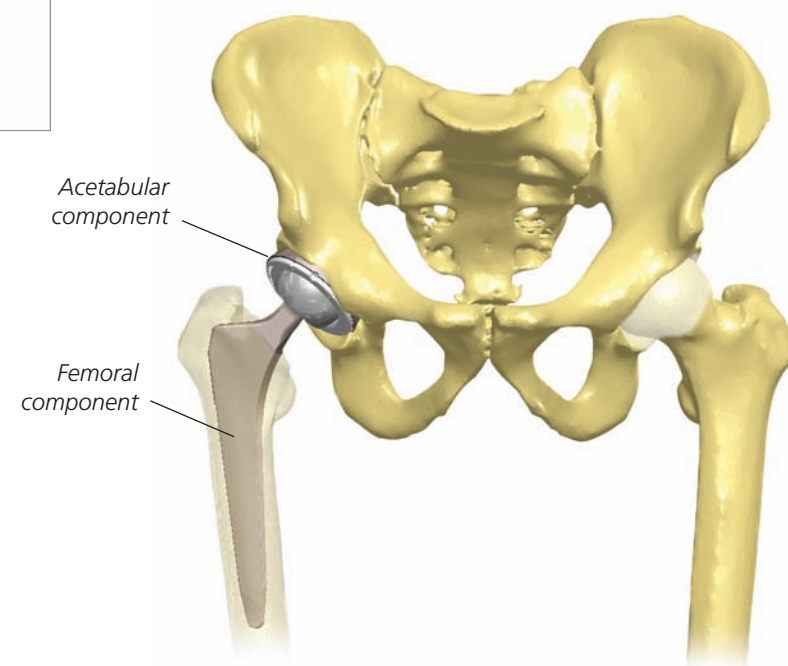
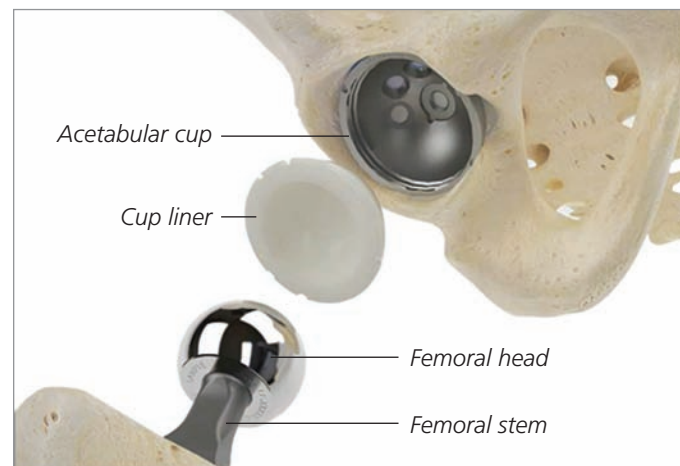
What is total hip arthroplasty?

Total hip arthroplasty, also referred to as total hip replacement, is a surgical procedure in which the hip joint is replaced by implants. The implants replace the bearing surfaces of the femur and the acetabulum.

- A metal cup with a plastic liner replaces the socket in the pelvis
- A femoral stem and head made of metal replace the femoral head

The components of a hip replacement can be seen in the illustration below. The next page shows an x-ray of these parts implanted. The metal ball and plastic form the new bearing surface (cartilage substitute), allowing the joint to move smoothly. The cup and stem are implanted in contact with the bone and have a surface that allows bone to grow into them for permanent fixation. These materials have demonstrated longevity if implanted in the correct position.

Components of a hip replacement



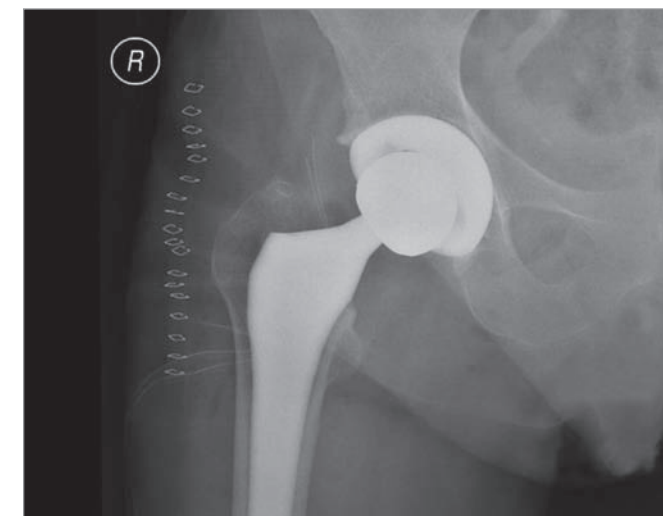
Total Hip Arthroplasty (cont'd)

Why do some hip replacements fail?

Hip replacements can fail for a number of reasons. Since implants are mechanical devices, they are subject to mechanical failure if given the right conditions. The most common reason for implant failure is loosening. Loosening is sometimes the result of infection or can be caused by the plastic debris that is generated by the bearing surface of the implants. Another reason for hip replacement failure is joint instability or dislocation.

Dislocation is the most common complication following hip replacement surgery. It most often occurs in the first year after surgery. Other issues that can surface with the hip replacement are excessive wear of the bearing surfaces, fracture of the bones holding the implants, and a difference in leg lengths. Implants that are not placed in the proper orientation can impinge or come in contact with each other, the pelvis, or the femur.

Biological failure is another reason for hip replacement failure. This includes the risk of infection, either at the surgical area or in the bloodstream. In hospitals that report their results, infection risk averages 0.5%. This failure can vary, so you should ask your doctor the risk in his/her hospital. Patients with a compromised immune system are at greater risk. Ask your doctor if you suffer from diabetes, rheumatoid arthritis, cancer, excessive alcohol or drug use, or if you are a smoker.



X-ray of implanted hip replacement components



X-ray of a dislocated hip

Credit: Zephyr/Photo Researchers

MAKOplasty® Total Hip Arthroplasty

A successful total hip replacement surgery helps a patient return to their activities of daily living, provides a reduction in pain, and improves mobility. MAKOplasty® helps the surgeon place the implants in the desired orientation, providing a good, stable biomechanical reconstruction and acceptable leg length restoration.

What are the potential benefits with MAKOplasty® robotic arm assisted hip replacement?

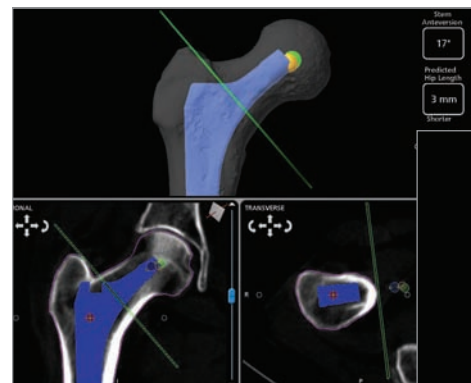
Accurate placement and alignment of implant components are a critical factor in hip replacement. MAKOplasty® Total Hip Arthroplasty (THA) is powered by the RIO® Robotic Arm Interactive Orthopedic System and provides a new level of accuracy and precision in total hip replacement.

The RIO® System software uses patient-specific anatomic information from a pre-operative CT scan to enable the accurate position of the implants so that the likelihood of implant or bony impingement is reduced as well as a possible reduction in the rate of dislocation.

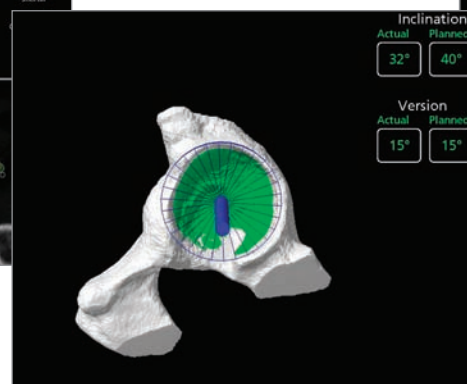
Published studies show even an experienced surgeon can be off by more than just a few degrees when judging the cup and stem positions.¹ If the judgment is off by too much for both cup and stem, the total error can lead to mechanical failure or complications like dislocation or reduced range of motion.^{2,3}

The RIO® System allows the surgeon to know and control the position of the cup and stem in addition to the final correction of leg length accomplished by the hip replacement before closing the incision.

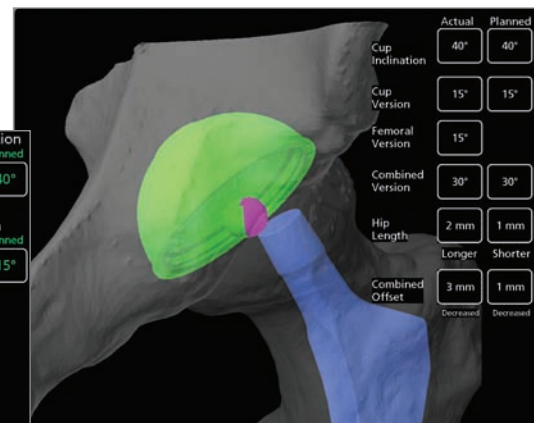
MAKOplasty® Hip procedure



Patient-specific planning for femoral stem placement



Precision reaming of the acetabular cup



Surgical results summary

1. Dorr LD, Wan Z, Malik A, Zhu J, Dastane M, Deshmane P. A comparison of surgeon estimation and computed tomographic measurement of femoral component anteversion in cementless total hip arthroplasty. *J Bone Joint Surg Am.* 2009;91:2598-2604.
 2. Jolles BM, Zangger P, Leyvraz PF. Factors predisposing to dislocation after primary total hip arthroplasty: A multivariate analysis. *J Arthroplasty.* 2002;17.3:282-288.
 3. Clohisy JC, Calvert G, Tull F, McDonald D, Maloney WJ. Reasons for revision hip surgery: A retrospective review. *Clin Orthop Relat Res.* 2004;429:188-192.

MAKOplasty® Total Hip Arthroplasty (cont'd)

How does MAKOplasty® THA work?

Before Surgery

If your surgeon determines that you are a good candidate for the MAKOplasty® procedure, he or she will schedule a CT scan of your hip one or two weeks prior to your surgery date. A surgical plan for each patient is created based on their anatomy as learned from the CT scan.

During Surgery

Inside the hip, the femur and the acetabulum are registered into the RIO® computer software by touching each bone with a probe. Three pins hold a tracker placed in the top of the pelvis; there are reflectors attached to the tracker. These reflectors, and those on the probe, collect information and pass it to the RIO® System via a high-definition camera to match the patient's CT scan to the patient's actual bony anatomy. This connects the patient's physical anatomy with the virtual bony anatomy that is on the CT scan that resides on the RIO® System.

Now the RIO® System can provide accurate numbers to the surgeon on implant position and leg length.

The operation is performed by preparing the femur first. Then the correct amount of bone below the femoral head is removed to reconstruct leg length and tension soft tissues properly. The inside of the femoral bone is prepared for the stem, and the stem's position in the bone (called anteversion) is measured by the RIO® System.



Acetabular cup system with femoral head

Your Implant

The RESTORIS® Family of Hip System Implants are used for MAKOplasty® procedures with the RIO® System. It enables a new level of precision in hip replacement, and is designed to enhance stability and to increase range of motion.



Femoral hip stem



RIO® Robotic Arm Interactive Orthopedic System

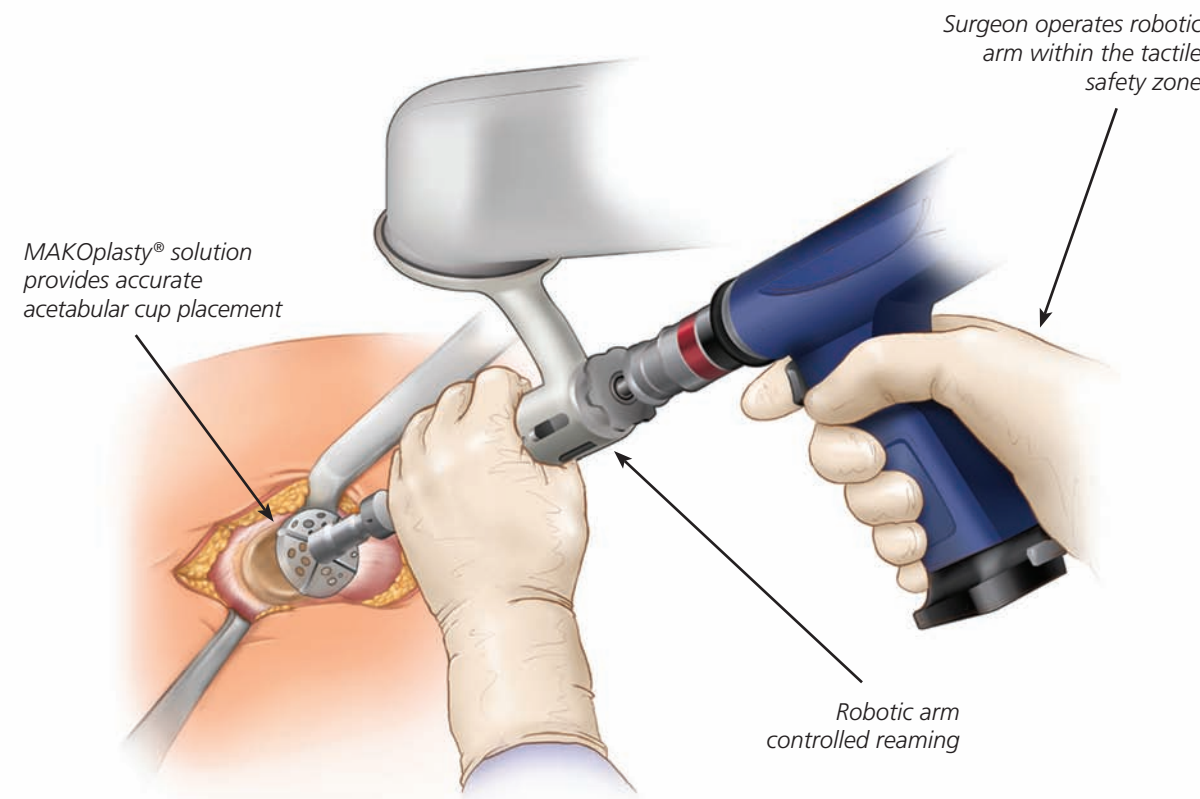
MAKOplasty® Total Hip Arthroplasty (cont'd)

What are the benefits of using the RIO® System with a total hip replacement?

The surgeon prepares the acetabular bone by using the robotic arm to guide the reaming of the bone. Reaming shapes the acetabulum for the placement of the metal cup, and the RIO® holds the reamer in the correct orientation. Without the RIO®, the surgeon can only estimate where they place the hip's center of rotation.

When bone preparation is complete, the cup is implanted using the robotic arm so cup placement is accurate in terms of depth and orientation. The plastic liner is then locked into the metal cup. The femoral stem is implanted in the femoral bone and the correct ball size (diameter and length) is attached to the stem to reconstruct leg length and soft tissue tension. The femoral ball is reduced into the cup and the RIO® provides the surgeon all the information needed to confirm the operation was completed as planned.

The position of the stem and cup must be in a specific range for proper biomechanical reconstruction. When the surgeon estimates these positions without robotic arm assistance, achieving the correct combined position can be extremely difficult.



After Surgery



Ask Your Doctor About Self Care:

- Before your surgery, arrange for assistance you may require from others after surgery
- Eat a balanced diet, take any vitamin or iron supplement your doctor recommends and be sure to drink plenty of fluids. Good nutrition may help your tissue heal and your muscles regain strength.
- Work with your physician to monitor the healing of your hip replacement. It's important to keep your physician and prescribed therapy appointments.

Physical Therapy

As early as one to two days after surgery, a physical therapist may meet with you and help you move from your hospital bed to a chair to improve your blood flow and circulation. As you recover, your therapist may also ask you to work on simple exercises to strengthen your muscles to improve the mobility of your hip. When you are more stable, your physical therapist may also help you out of bed for a short walk with a walker or crutches. As your body heals, you should be able to graduate from a walker to crutches and then a cane for support until you can put your full body weight on your hip.

Your post-surgical physical therapy program should continue shortly after your return home, and be conducted under your physician's guidance and supervision. A typical physical therapy program following hip surgery includes exercises that tighten the muscles around the hip without moving the joint in order to regain your mobility as soon as possible. Your therapist can show you appropriate ways to accommodate your daily lifestyle while you are recovering.

Your surgeon will be in charge of determining when you will be able to return to work, drive a car, or do low-impact aerobic exercises such as walking or swimming. Jogging and high-impact sports are not recommended. You should follow your surgeon's instructions and advice post-surgery.

Recovery at Home

You may want to prepare your home before you go in for surgery so it will be comfortable and safe when you return from the hospital. Think safety first by removing any hazards including floor rugs, loose phone lines or cables and clutter that can cause you to slip or fall. Organize the items you'll need on a daily basis within arm's reach to reduce unnecessary movement during the first few days following your return home.

According to the Arthritis Foundation (2009), the success of your surgery also relies on how well you follow your surgeon's post-operative instructions. Rest when you need to, but moving about frequently with your cane, crutches, or walker will gradually increase your activity level to help you heal and feel better.

- Practice walking every day, first around your home and later outside
- You should be able to resume most light activities within six to eight weeks with your physician's approval
- It is important to follow the exercise program developed by your physical therapist diligently. This will help your muscles regain mobility and strength, allowing you to walk normally again.

Patient Name: _____
 Date of Implant: _____
 Site of Implant: Left Hip
 (check all that apply) Right Hip
 Surgeon Name: _____
 Hospital: _____
 Address: _____
 Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____
 Date of Implant: _____
 Site of Implant: Left Hip
 (check all that apply) Right Hip
 Surgeon Name: _____
 Hospital: _____
 Address: _____
 Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____
 Date of Implant: _____
 Site of Implant: Left Hip
 (check all that apply) Right Hip
 Surgeon Name: _____
 Hospital: _____
 Address: _____
 Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____
 Date of Implant: _____
 Site of Implant: Left Hip
 (check all that apply) Right Hip
 Surgeon Name: _____
 Hospital: _____
 Address: _____
 Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



For more patient information, please call **877.411.MAKO** or visit
www.makoplasty.com.



Restoring Quality of Life Through Innovation®



Restoring Quality of Life Through Innovation®

2555 Davie Road | Fort Lauderdale, FL 33317 | 866.647.6256 | www.makosurgical.com

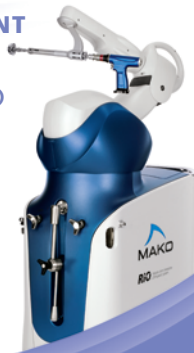
© MAKO Surgical Corp. 204502 r00 06/11

IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



IMPLANT CARD FOR PATIENT

MAKOplasty®

Robotic Arm
Total Hip Arthroplasty

For more information, please call
877.411.MAKO or visit
www.makoplasty.com.



Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11

Patient Name: _____

Date of Implant: _____

Site of Implant: Left Hip
(check all that apply) Right Hip

Surgeon Name: _____

Hospital: _____

Address: _____

Phone Number: _____

© MAKO Surgical Corp. 204503 r00 06/11