



AML Total Hip Replacement



DR. Haverbush's Experience, Perspective and Recommendation

Introduction

Total hip replacement was first performed in Europe in the early 1960s. The procedure was pioneered by Dr. John Charnley, a very famous British orthopaedic surgeon. Charnley and other European orthopaedic surgeons popularized the procedure throughout the 1960s. Eventually, total hip replacement arrived in the United States in the early 1970s, but at the time it was only permitted by the Food and Drug Administration to be done in a few selected centers around the country. I had the very good fortune to be at the Cleveland Clinic at that time, which was one of the selected centers for total hip replacement in the United States.

Total hip replacement was restricted in the early years because of the use of methyl-methacrylate, or acrylic bone cement as it is commonly called, which is used to anchor the components to the bone. Methyl methacrylate is still used to this day in joint replacement in certain patients in whom it is indicated. We have become very familiar over the years with its properties and what patients could benefit from its use.

I would like to personalize my presentation by making sure that you understand that the following is based on my experience and knowledge with the procedure of total hip replacement or total hip arthroplasty, which is a term sometimes applied to the procedure. The two terms, total hip replacement and total hip arthroplasty, can be used interchangeably.



When pain and stiffness in the hip joint becomes severe, a patient will usually go to the family doctor for evaluation. Frequently, an anti-inflammatory medication of some type and possibly physical therapy exercises are prescribed as the initial treatments for arthritis of the hip joint. In many cases, these measures can be successful for a period of time. If the disease progresses - and it usually does - referral to an orthopaedic surgeon skilled in total joint replacement is usually arranged by the primary care physician.



When a hip patient comes to our office, a history of the hip problem is taken as well as a complete medical history. A thorough physical examination and x-rays of the affected hip, the knee, and possibly the hip on the opposite side are taken. This combination of thorough history, examination, and appropriate x-rays give enough information for me to properly advise the patient of the best course of treatment.

Osteoarthritis

The most common cause of hip disease is osteoarthritis, commonly known as wear-and-tear arthritis. It usually occurs with no previous history of injury to the hip joint. The hip appears to simply wear out. Obviously, this explanation is very simplistic and why this happens in the majority of cases is still uncertain. Perhaps genetic research will eventually unlock the mystery of why certain persons develop osteoarthritis of major joints and other persons, no matter how long they live, will never develop arthritis.

Indication for surgery

Whether a total hip replacement is indicated in a particular case can only be decided by the patient and the surgeon on an individual basis. This is a very important bridge to cross from conservative treatment to surgery, and both the surgeon and the patient must be very certain that this is the right direction to take.

If the patient and I feel that the symptoms are so severe and function is declining even with conservative treatment, the decision for surgery is usually made. When the decision has been made, I discuss recommendations for the proper type of hip replacement for that particular patient. A hip replacement includes a new socket, as well as a ball and a stem which form the lower half of the hip joint.





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While most patients who undergo hip replacement surgery are age 55 or older, I always evaluate patients individually and my recommendations for surgery are based on the extent of the person's pain, disability, and general health status and not solely on age. At one end of the spectrum, patients are living longer with higher quality of life expectations. It is not uncommon to do a total hip procedure now for a patient in their 90s.

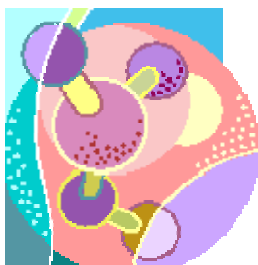
The other end of the spectrum is the younger patient with degenerative arthritis of the hip that has developed from trauma or congenital dysplasia. These patients experience pain and disability, diminishing their activity level and quality of life in their 30s and 40s. Intervention with hip replacement is occurring in these patients at an earlier age than in the past.

The vast majority of individuals who undergo hip replacement surgery have a dramatic lessening of pain and a major improvement in their ability to perform activities of daily living. It is acknowledged by joint replacement surgeons as well as patients that the total hip replacement procedure has been one of the most successful orthopaedic procedures in the history of our specialty. As a group, these are typically our most grateful patients, and the success of the procedure is as high as or higher than any orthopaedic procedure. Indeed, the contribution of Sir John Charnley, the British orthopedic surgeon who pioneered the procedure, has resulted in the alleviation of severe hip pain in hundreds of thousands, if not millions of patients throughout the world over the last 35 years.



However, it would be incorrect to think that a replacement hip is ever as good as a normal functioning hip. The patient must follow directions and take responsibility for care of the hip for the prosthetic joint to do a good job for them for as long as they will need it. Following surgery, patients are advised to avoid certain activities for the rest of their life including jogging, high impact sports or carrying heavy objects. I cannot give a specific amount of weight that can be lifted because it would vary greatly with the size of the patient and their physical capacity.

Total hip replacement continues to evolve



overweight status.

Even in a procedure as old and well established as total hip replacement, changes in technology and technique are bringing important advances to the field. In the beginning, all total hip replacement parts were cemented into the bone with methyl methacrylate. This seemed to work well for many years, but eventually it was noted that some prostheses began to loosen and change over a period of years. It was felt at that time that the bone cement was the problem. It was thought that the cement might be breaking down, possibly due to the patient's activities or their



This ushered in a whole new generation of orthopaedic prostheses which were developed by the orthopaedic manufacturers, including DePuy Orthopaedics, Inc. which is the company that I have exclusively used for many years. Prostheses were developed that had a porous coated surface in which the bone of the patient's socket in the pelvis and the bone of the femur would grow into the porous coated covered implant. Prostheses inserted in this way bypass the use of methyl methacrylate (bone cement) and rely on the patient's ingrowth of bone into the components to hold them. In my joint replacement practice at least 95% of new hips are being inserted without bone cement.



Over time, joint replacement surgeons began to be aware that even without bone cement; the prosthesis would sometimes loosen and fail to be held securely in the bone. After years of intensive study and scrutiny, it became apparent that the polyethylene liner of the socket could, in some cases, undergo wear change. The extremely tiny polyethylene particles, actually microscopic in most cases, were causing serious changes in the joint itself and at the bone-porous coated surface. The use of acrylic cement is still indicated in many patients whose bone, for a variety of reasons, may not be able to grow into the prosthesis. This has led to many improvements in the polyethylene plastic material that is used for the lining surface of the socket.

AML Total Hip System



I have used many types of hip replacement prostheses over the years but settled on the AML total hip replacement system many years ago. It is, in my opinion, the best and most durable hip replacement system that I can offer my patients. It has been outstandingly successful for more than 20 years of use. 95% of patients are still doing well after 20 years.

The AML prosthesis has a porous coating which allows for ingrowth of bone over virtually the entire length of the prosthesis. This insures very adequate ingrowth of bone into the stem to hold it securely. The prospect of the prosthetic stem loosening has been practically non-existent over many years in my practice. The patient's pelvic socket is reshaped and prepared to accept a porous coated metal shell which then is compacted into the bone. Traditionally, the liner of the metal socket has been polyethylene and the articular hip ball has been made of metal.

This combination of components has been extremely successful in my practice over many years. The AML prosthetic system as described has been very successful in the vast majority of patients. But, as I said, things continue to evolve.

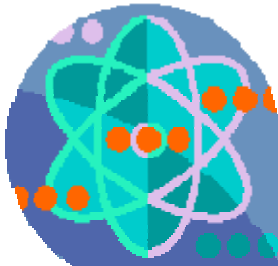


New components



In a search for more durable and long-lasting components, DePuy Orthopaedics, Inc. and other orthopaedic manufacturers have been doing extensive research and development over many years to formulate even better components. Thus far, the porous-coated femoral stem which I described has remained virtually unchanged because of its outstanding success. However, changes have occurred in the area of the articular hip ball and the polyethylene socket liner. We now have components available which have a larger size articular hip ball which is thought to give more stability to the hip joint and has less tendency to dislocate.

One type of DePuy total hip has an extremely highly polished metal ball and metal socket liner. The polyethylene in this type of hip has been eliminated in favor of two extremely polished metal surfaces. This is referred to in the industry as "hard on hard bearing surfaces" and these types of DePuy total hips are felt to give the greatest range of motion of the hip and the potential for the least amount of wear.



If a polyethylene liner is used instead of a metal-on-metal surface, DePuy has introduced a new manufacturing process, referred to as "marathon polyethylene" which has many advantages over the former type of polyethylene. In fact, in hip simulator wear testing this new marathon polyethylene has been shown to have an 86% reduction in wear. This has been possible by exposing the polyethylene to radiation thereby cross linking the molecules together making it much more wear resistant.

Another extremely interesting innovation has been ceramic components which include a ceramic articular hip ball and a ceramic socket. Thus, there would be ceramic material on both sides of the hip joint - not metal on metal or metal and polyethylene. While ceramic is known to be somewhat brittle, its wear properties are much less than the polyethylene.

It is beyond the scope of this discussion to go into all of the various details of ceramic, metal and polyethylene implants. It is sufficient to say that we carefully consider which implant would be best based on the circumstances that exist for the particular patient.

Small incision surgery (minimally invasive, less invasive surgery)



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The most recent evolution of hip replacement surgery has brought us to the threshold of another milestone in joint replacements. Whether you refer to the procedures as small incision, minimally invasive, or less invasive, they all have one principle in mind. That is, to perform the hip replacement surgery through much smaller incisions than previously were used. The reason for this is clear in that smaller incisions will allow surgery to be done with less damage to surrounding tissues, primarily the muscles. This allows for faster recovery in most cases and less pain for the patient.

It would be entirely incorrect to think of small incision surgery as only a cosmetic benefit to the patient. That might be a benefit, but it is certainly a very superficial one and frankly one that most of my patients do not place great emphasis upon. They want me to do the best surgery that can be done for them by placing the best prosthesis available that will last them the rest of their life.

Basically there are two ways to do small incision total hip replacement surgery. One is with two-incisions and the other involves only one-incision that is considerably smaller than the one-incision technique of years past. I personally prefer the one-incision technique for my patients. It is simply a personal preference and the approach that I am most comfortable with.

Small incision total hip replacement has been possible by the development of many new orthopedic instruments that make the joint replacement much easier to perform through a smaller incision.



The benefits of less invasive hip replacement surgery are:

- Less pain from the incision(s)
- Less cosmetic skin incision
- Less muscle damage
- Less blood loss
- Faster rehabilitation, in most cases
- Shorter hospital stay
- Patients able to bear weight on the operated leg sooner
- Walking aids usually used for a shorter period of time

Small incision surgery has been used widely for a relatively short period of time compared with traditional total hip surgery which dates back to the mid 1960s when it was developed in England and popularized in Europe as we have noted earlier in the article. These newer techniques in hip replacement seem to be safe, effective and able to streamline the recovery process. However, the long term benefits of these less invasive techniques have not yet been documented fully to know whether they represent an improvement over traditional total hip replacement surgery.

The benefits are certainly obvious initially, but after two or three months all of the



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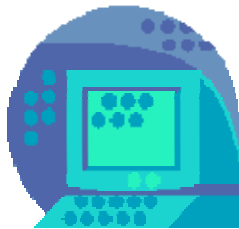
patients seem to be doing about the same, no matter what type of procedure they have had. Small incision surgery cannot be done on everyone. It is very difficult to perform on larger patients, and this precludes many from having the procedure because of their size.

Also, because the procedure is much more difficult technically, we may be implanting a prosthesis through smaller incisions that will not anchor to the bone as well as with more traditional surgery, and therefore the prosthesis may loosen and become painful in a year or two. In the early-going, however, this would not be obvious. We have a very short-term follow-up on the newer, small incision procedures.



Many surgeons are concerned that a rapid rehabilitation of patients, such as letting them walk with a cane or one crutch almost immediately, will not allow for time for the bone to grow into the prosthetic cup and stem. If this does not happen, loosening of the prosthesis is the result and will cause pain and necessity for further surgery to repair what did not heal.

On the horizon

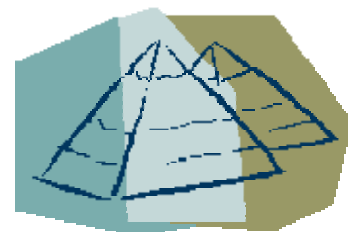


Even more revolutionary developments in the field of total hip replacement surgery seem to be on the way. These would involve the use of computer-based navigation systems in the operating room telling the surgeon exactly where to make the cuts in the bone, thus allowing for very accurate placement of the components of the prosthesis.

It has been known for decades that the accurate placement of the components in the patient's body leads to the longest possible life of the prosthesis, no matter what type of prosthesis is used. How the components are placed in the body is crucial and a principle that has never changed. The computer-assisted navigation systems improve the surgeon's ability to accurately and reproducibly place the components.

Total hip replacement pyramid for success

We enthusiastically agree with DePuy Orthopaedics, Inc.'s concept of successful total hip replacement as a pyramid. The foundation of the pyramid is fixation first. This means the immediate and long term fixation of the acetabulum or socket shell to the bone of the patient. This must be achieved in the socket as well as the femur.



Next in the pyramid is the interchange of various components that can be used which is termed "advanced modularity." There is an interchange of components between metal, polyethylene and ceramic to meet the particular patient's needs that is truly amazing. Restoring the biomechanics of the patient's hip joint to



meet their particular anatomy is crucial to providing a well-functioning, durable and long-lasting hip prosthesis.

The peak of the pyramid is to reduce wear of the components, whether they be metal, ceramic or polyethylene. Without this wear reduction, no total hip replacement prosthesis could be expected to last for the rest of the patient's life.

Conclusion

Average hospital stays following hip replacement surgery have diminished significantly over the years. It must be remembered, however, that our patient population covers a very great range of ages and body types and co-morbidities. We have not yet achieved outpatient surgery for total hip replacement in our institution, even though we are aware that this is occasionally done in other places. It is debatable whether this is even safe or appropriate for patients, even though it might be technically possible.

Newer techniques in control of patient pain postoperatively as well as anesthesia techniques have enabled earlier patient discharge. Also, preoperative planning and involvement of the physical therapist and the hospital discharge planner have assisted earlier hospital discharge. I personally feel that a hospital stay of two or three days is perfectly acceptable; however, some patients will need to be in the hospital longer, and many will still go to the rehab unit after a few days in their regular hospital bed.

Blood replacement is still required in some patients after hip replacement surgery. A very small number of patients can develop infection under the skin or even deep infection in the wound after hip replacement surgery. This can be a very serious complication and very difficult to treat, even with antibiotics.

Total hip replacement is a very complicated subject with many aspects which cannot be dealt with in detail here. Whether the individual patient is even a candidate for total hip replacement and, if so, what the best choice of components would be is something that I can only decide on an individual basis. If a patient is interested, I try to tell them what type of components I will be using, but my experience is that most patients leave this decision up to me.

Total hip replacement has been an amazing, shining star in the firmament of orthopaedic surgery. I feel fortunate to have been trained in hip and knee replacement surgery at the Cleveland Clinic Foundation in Cleveland, Ohio, which was one of the original institutions allowed to perform total joint replacement in the United States. I have continued to learn and to evolve over the years to where my Orthopaedic Surgery specialty is today. I have been very satisfied with the AML Total Hip prosthetic system created by DePuy Orthopaedics, Inc. It is my prosthesis of choice in my patients with hip arthritis.

I hope this discussion has been a learning experience for you and possibly your family and I would be happy to answer questions that were not made clear.



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Dr. Haverbush



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