

Surgical Care of the Lower Extremity in Rheumatoid Arthritis*

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One of the most important things for the physician to recognize in referring a patient to the orthopedic surgeon for treatment of rheumatoid arthritis is the goal of surgical correction. The primary goal in surgical treatment of diseased joints in the lower extremity is relief of pain. Some pain-free patients have such severe deformities that a surgical procedure may be undertaken in order to improve and restore function, accepting certain calculated risks; however, to improve function surgically in a pain-free joint requires complete and full understanding on the part of the patient as well as the physician.

The Hip Joint. The surgical treatment of rheumatoid disease in the lower extremity has changed drastically in the last ten years. Mold arthroplasty, which was the primary method of treating rheumatoid arthritis of the hip joint until ten years ago, unfortunately did not provide uniform relief of pain and good stability in all patients. In the hands of most surgeons doing mold arthroplasties, the rheumatoid patient got a less satisfactory result than the patient with degenerative arthritis. The major problem with cup arthroplasty in the patient with rheumatoid arthritis was postoperative stiffness and residual pain. Figure 1 illustrates the typical complication following this problem, with the cup settling into the pelvis and the femoral neck shortening under the cup.

The Austin-Moore prosthesis, which was de-

veloped for the treatment of arthritis in the hip joint, subsequently became widely used for the replacement of the femoral head following neck fractures in elderly patients. The use of this prosthesis in rheumatoid disease of the hip was rarely successful. This prosthesis was designed for stability in bone on the basis of a press-fit design. It was doomed to failure in rheumatoid disease of the hip because of inherent osteoporosis, present in most rheumatoids, which allowed the unyielding metal of the prosthesis to protrude into the soft bone of the pelvis and loosen in the soft bone of the femur where the stem of the prosthesis frequently became loose in the canal of the femur. My personal experience with femoral head replacement, using the Austin-Moore or other press-fit design prostheses in rheumatoid arthritis, has been quite disappointing.

Total hip replacement became popular in England about 15 years ago. One of the earliest prostheses used was made of two metallic components similar in design to the Ring prosthesis illustrated in figure 2. Unfortunately, the Ring and other types of press-fit design prostheses were doomed to failure in rheumatoid arthritis for the same reasons that the Austin-Moore prosthesis failed. With our patients, in whom the Ring prosthesis was inserted for rheumatoid arthritis, we had good early results. After a year and a half, however, all but a small number of these patients had painful hips.

Fortunately, polymethylmethacrylate, a bone cement, became available for treating arthritic joints. This surgical cement, used in this country for over five years, is still distributed out of Great Britain.

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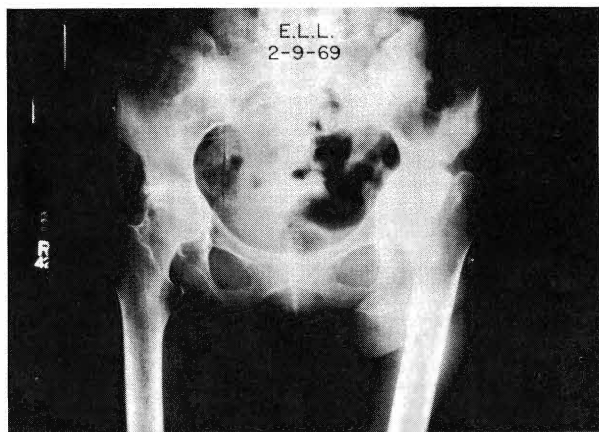


Fig. 1—Cup arthroplasty in a rheumatoid hip which failed because of shortening of femoral neck and protrusion of the cup into the pelvis.

It has allowed us variability and flexibility for inserting all types of total joint replacements utilized in the lower extremities today. This cement has many advantages in a patient with rheumatoid arthritis. In contrast to the press-fit designs, the cement backing of a total joint replacement allows a wide distribution of forces to the bone, and with few exceptions, there has been little settling of the cemented prostheses in rheumatoid arthritis. Charnley (1) certainly deserves the credit for establishing total hip replacement as a method of choice in treating diseased hip joints. Credit goes to him, not only for the design of the prosthesis which he has popu-

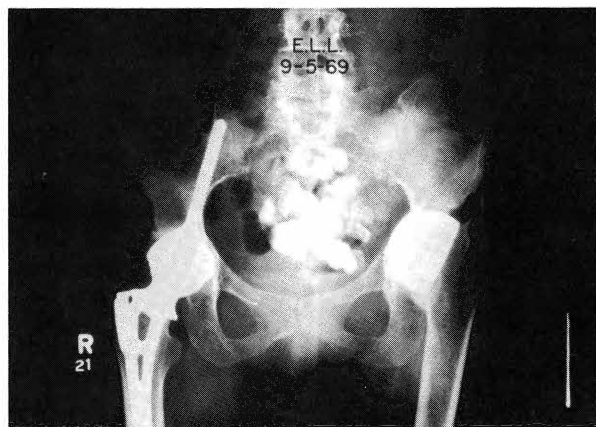


Fig. 2—Ring total hip prosthesis in right hip of rheumatoid patient. A press-fit design which failed with time in the osteoporotic rheumatoid.

The Charnley-Type Total Hip

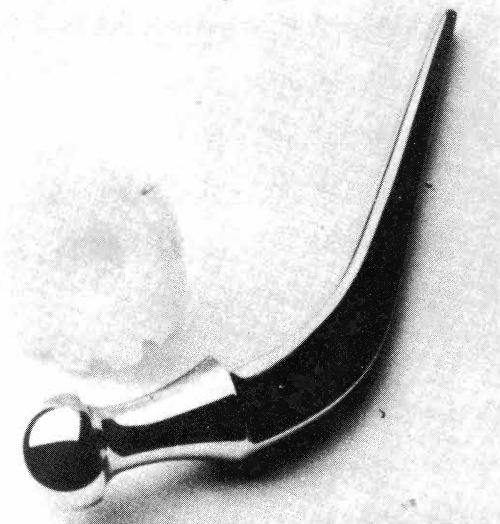


Fig. 3—The Charnley total hip with a 22 mm femoral head of stainless steel and a high density polyethylene acetabulum.

The Charnley-Müller Type Total Hip

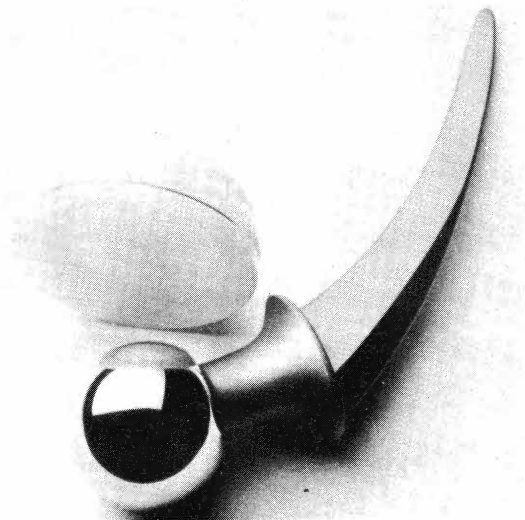


Fig. 4—The Müller total hip with a 32 mm femoral head of cobalt chrome alloy and a high density polyethylene acetabulum.

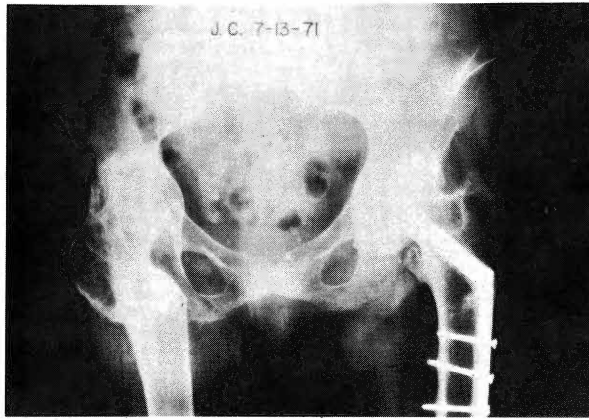


Fig. 5A—Bilateral ankylosed hips in a patient with ankylosing spondylitis. The right hip had previously had a medical displacement osteotomy while the left hip had sustained a fracture and subsequently ankylosed.

larized, but also for the fundamental work on bone cement. He did original work on the bone cement even before he began using total hip replacements as we know them today.

One prosthesis which is very popular in this country is the Müller prosthesis (2). Materials used in this prosthesis are similar to those found in the Charnley prosthesis, with a metallic femoral component and a high density polyethylene acetabular component. Charnley's prosthesis (Fig. 3) is made of stainless steel; the Müller prosthesis (Fig. 4) is made of a cobalt chrome alloy.



Fig. 5B—Postoperative results following bilateral total hip replacements.



Fig. 6A—Bilateral ankylosed cups in a 20-year-old juvenile rheumatoid.

Rheumatoid arthritis, in a series of hip replacements at the University of Virginia, has made up a relatively small proportion of those patients undergoing total hip replacement. In the first 235 replaced hips, only 35 hips were replaced for rheumatoid arthritis and eight hips for ankylosing spondylitis. In the straightforward rheumatoid arthritic patient with destruction of the hip and painful motion, the results of total hip replacement, using cemented prostheses, have been excellent to date. We have been pleased with the results in patients on whom we performed this procedure and followed for three and one-half years without any significant



Fig. 6B—Postoperative conversion to Harris replaceable-type total hips. Note ectopic bone formation.



Fig. 7A—Preoperative condition of patient with ankylosing spondylitis, fused spine and ankylosed hips (7B).

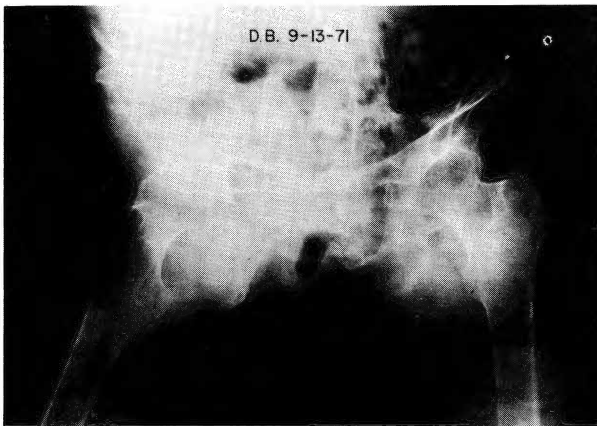


Fig. 7B.

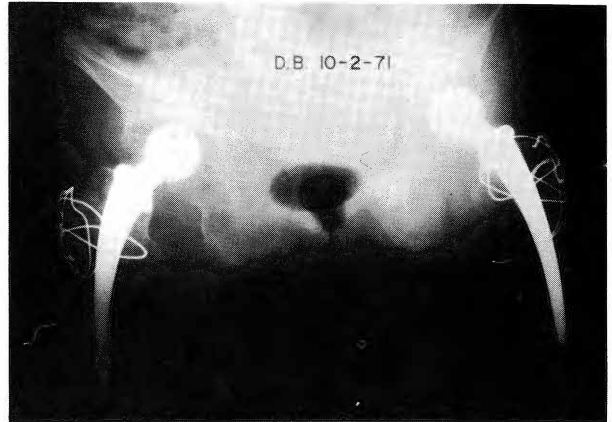


Fig. 7C—Postoperative appearance of hips following bilateral total hip replacements.

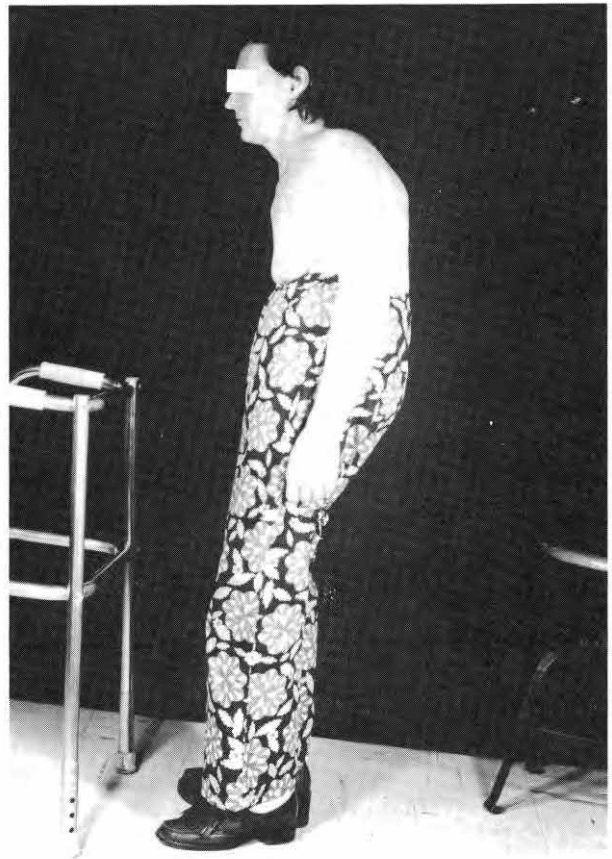


Fig. 7D—Condition of patient postoperatively following hip replacements.

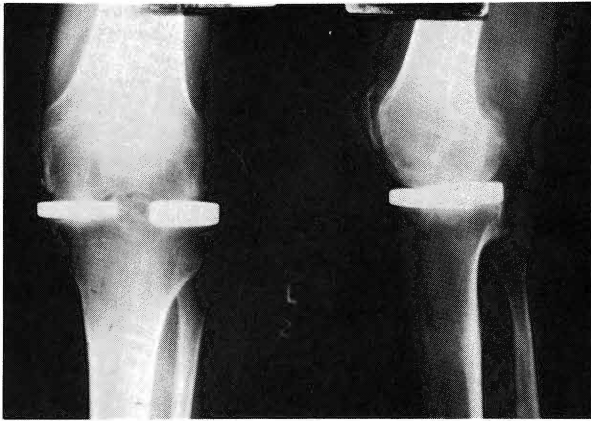


Fig. 8—McIntosh plateau prosthesis four years postoperatively with good results.



Fig. 9—McIntosh prosthesis which failed in rheumatoid two years postsurgery.

failures intrinsic to the rheumatoid process itself.

In order to show the types of problems that are suitable for management with total hip replacement, some of the more unusual cases are presented. A 76-year-old lady with ankylosing spondylitis had a fused spine, a fused right hip, and an ankylosed left hip (Fig. 5A). She had little pain but was unable to sit or drive a car. With some trepidation, we took down her fused hip and used a special type of prosthesis where she had previously had a displacement osteotomy. Following a successful result on this hip, the left hip was replaced (Fig. 5B); she is now able to drive a car, sit, and stand. She does not have normal movement in her hips but has improved markedly in function.

One of the more difficult problems we face is the management of the severe juvenile rheumatoid. A 20-year-old boy had bilateral cup arthroplasties four years prior to surgery (Fig. 6A). Both cups were ankylosed and had no motion. We converted his hips to a special type of total hip replacement designed by Dr. William Harris of Boston (3), using metallic cups which have a replaceable polyethylene liner and a metallic femoral component. This design concept is used to circumvent the problem of wear in the polyethylene. At the present time, all available information suggests wear rates of the polyethylene to be a maximum of 1 mm every five years, suggesting that with the average prosthesis in use today, we can expect a minimum of 20 years function, assuming linear wear rates are present. This particular patient developed a complication of ectopic bone formation around his hip replacements (Fig. 6B), but he is now able to walk, drive a car, and attend college regularly, walking without crutches for the first time in eight years. In addition, prior to surgery, he was unable to sit; he was only able to lie down or stand. At the present time, he can sit, stand, and lie down.

Another difficult case which was dramatically improved by total hip replacements is a 52-year-old lady with ankylosing spondylitis, a fused spine, and hip joints which were ankylosed in 90 degree flexion. She was able to ambulate only with the use of a chair for support (Fig. 7A), and her hip joints were markedly protruded (Fig. 7B). Following bilateral total hip replacement, she was able to stand and see where she was walking, as well as to sit. She did not have a normal gait because of the fused spine but was markedly improved (Fig. 7C, D).

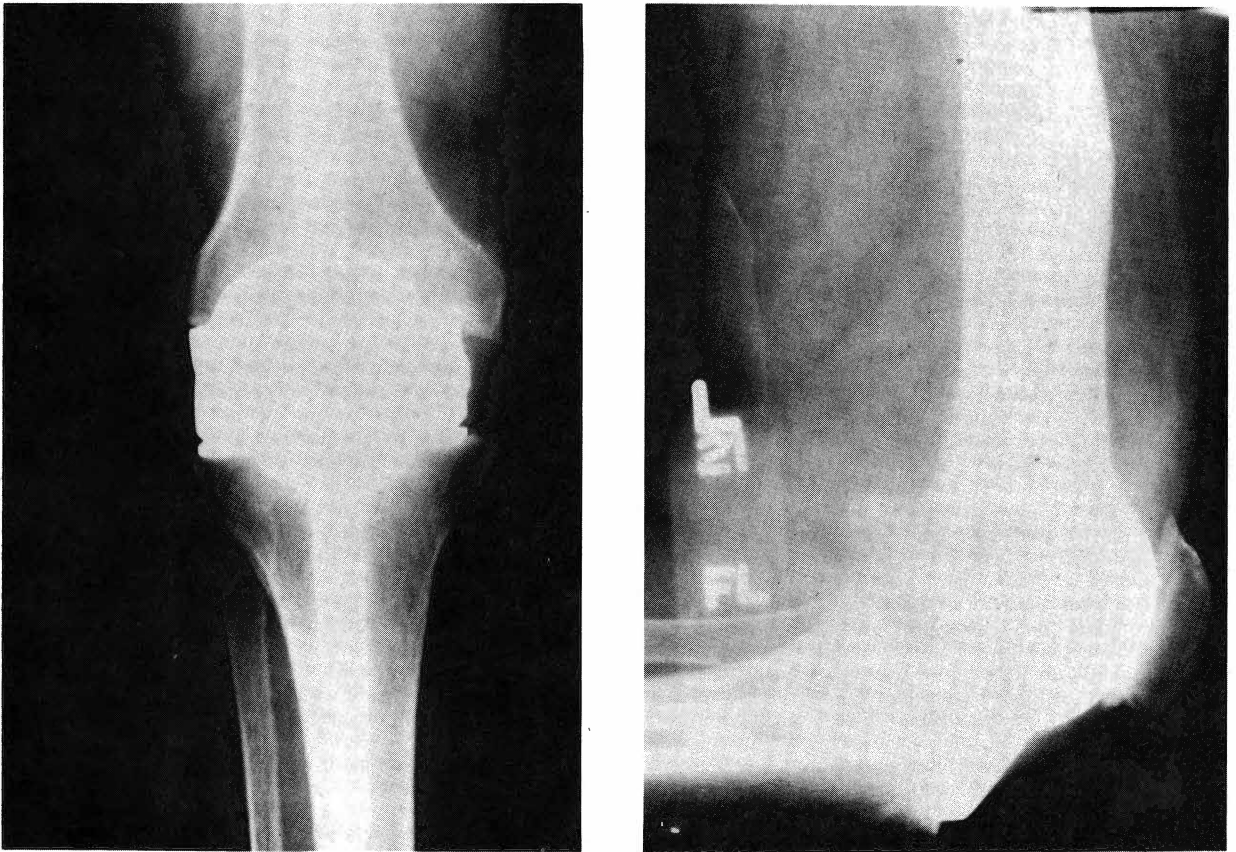


Fig. 10 A, B—Postoperative condition of knee in figure 9, converted to a Walldius hinged prosthesis.

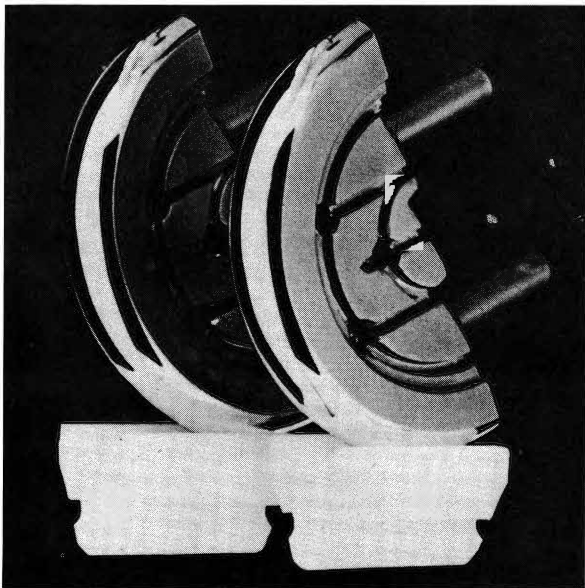


Fig. 11—Polycentric knee joint as modified from Gunston by Bryan and Peterson.

The Knee Joint. As Dr. McDowell points out, synovectomy is a useful procedure if the knee joint cartilage itself and the ligaments around the joint are not destroyed. When there is rampant synovitis, that is, when there is a single joint persistently involved with effusion and synovitis which has failed to respond to adequate medical management over a period of six months, we feel that synovectomy is the treatment of choice.

In patients with bicompartmental knee disease, where both medial and lateral tibial plateaus are involved as well as femoral condyles, arthroplasty is the only successful method of treating the destroyed articular surface. Prior to the advent of total knee replacement, tibial plateau and femoral condylar prostheses were the only surgical treatments available. In our series of patients, we favored the tibial plateau prostheses, designed by McIntosh, and found that some of these replacements did fairly well. The patient in figure 8, now four years post-surgery, is essentially pain free and has an acceptable

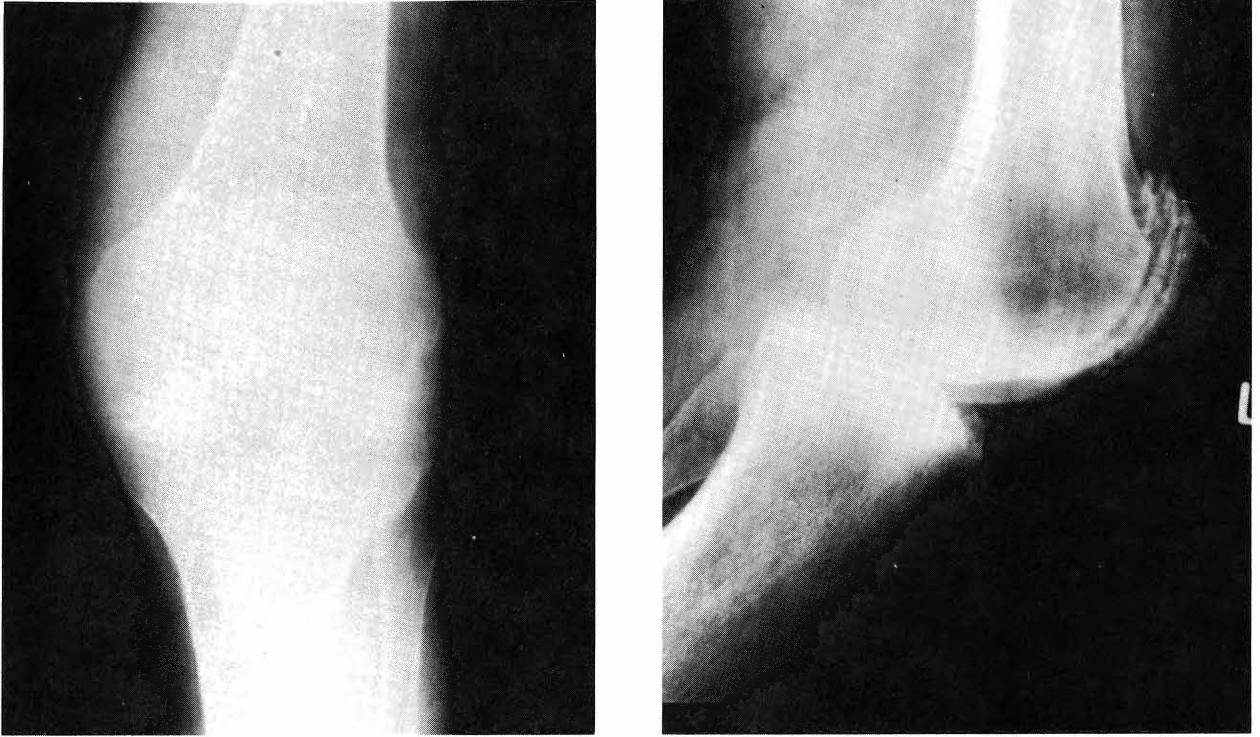


Fig. 12 A, B—AP and lateral x-ray of knee with destruction secondary to rheumatoid arthritis.

range of motion and good stability. Many of these prostheses did not do well and progressed to unstable painful knees. One such patient is a rheumatoid arthritic who lost enough bone following her McIntosh arthroplasty to have severe instability and pain, requiring major joint reconstruction (Fig. 9). We elected to treat this particular problem by use of a large hinged prosthesis designed by Walladius (4) (Fig. 10A, B). Even though this large metallic device has limited motion (90 degrees) and carries a certain incidence of loosening and infection, it has been in use longer than any other knee prosthesis on the market and gives acceptable results in the otherwise unsalvageable knee.

Criteria for Selection of Candidates for Knee Replacement. Initially, we restricted our patients for knee replacement to those over 60 years of age. As we gained experience, we began doing some younger patients in the rheumatoid arthritis group but have continued to restrict our indications in degenerative arthritis to those patients 60 years of age and older.

There are several currently popular prosthetic designs available on the market. All of these are new and little experience has been recorded with

any of these joints. My own preference for a knee prosthesis is the polycentric knee joint as designed by Gunston (5) and modified by Bryan and Peterson (6) (Fig. 11). I prefer this prosthesis because it is embedded in a biologic envelope of bone, has minimal bone cement contact, and has less reliance on cement-prosthesis contact for stability. In the knee joint where there is complete loss of joint space and patellofemoral disease (Fig. 12), we have used the polycentric arthroplasty, composed of two metallic condyles in the femur and plastic runners in the tibia (Fig. 13) with good success. This prosthesis basically allows an increase in space between the femur and tibia and improves motion as well as stability in many knee joints.

Another popular arthroplasty in the United States today is the geometric type (Fig. 14) designed by a group of orthopedic surgeons from four different hospitals (7). This two-piece prosthesis requires resection of more bone than the polycentric arthroplasty, and I have reserved this prosthesis for patients with severe osteoporosis and marked joint destruction with more than 30 degrees of varus or valgus instability. This particular knee joint (Fig. 15) had such severe osteoporosis, the surgeon's



Fig. 13 A, B—AP and lateral x-ray of knee in figure 12 following polycentric arthroplasty.

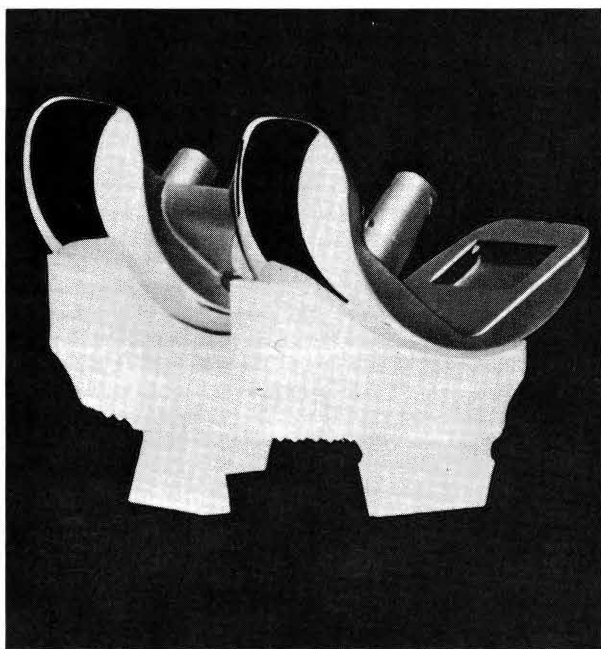


Fig. 14—Geometric knee joint.

thumb could easily be pushed through the femoral condyles. A polycentric type of arthroplasty is extremely difficult to perform in bone as soft as the bone in this particular patient, and the geometric design has allowed us to replace joints of this type providing excellent stability and good motion. The average hospital stay for knee replacements at the University of Virginia is 26 days for unilateral surgery in contrast to an average of 21 days for unilateral hip replacement.

Complications. We have had no cases of phlebitis in our total knee replacements, a fact which may be due to our prophylactic regimen. We use dextran-40 for our total knee replacements, infusing 200 ml of low molecular weight dextran prior to inflation of the tourniquet. The remaining 300 cc are infused after the tourniquet is released. The patients receive 500 cc of dextran-40 daily for three days and then every third day until discharge from the hospital. We have had two cases of hepatitis in our knee replacements—one patient, presumably

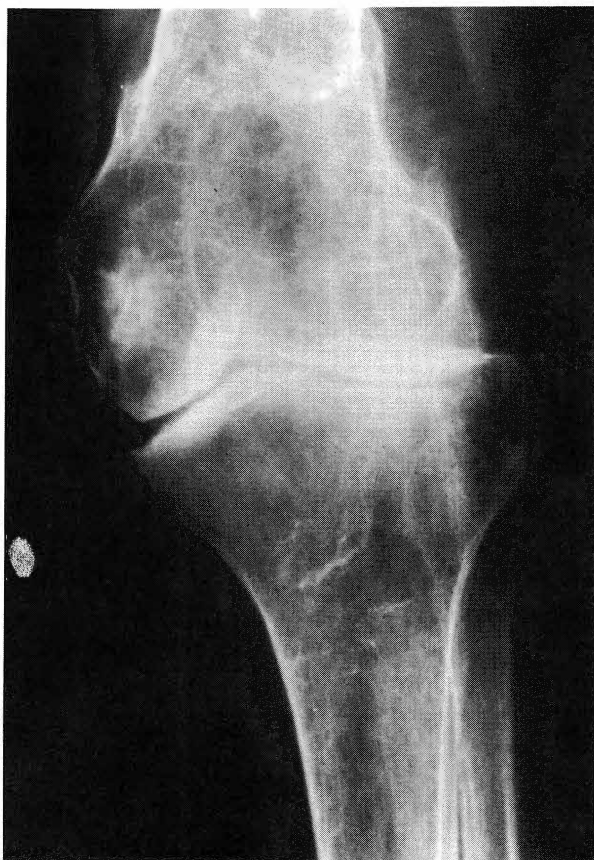


Fig. 15 A, B—Pre- and postoperative x-rays of knee with severe osteoporosis where geometric knee joint was used for arthroplasty.

from a transfusion, and the other, anesthesia-related. We have had no wound infections to date in our knee replacements, which total 35, with a minimum of six months follow-up.

Ankle and Foot. The ankle is a difficult joint to treat in rheumatoid arthritis, primarily because it is rare to have ankle disease alone without subtalar joint disease. Ankle fusion has been successful in several patients I have treated, when the ankle has been involved as an isolated joint. The goal of surgery in this particular problem must be pain relief, as function is rarely improved except as related to relief of pain.

One of the more successful surgical procedures in the lower extremity has been the treatment of forefoot disease in the rheumatoid patient. In those patients with severe hallux valgus and prominent

metatarsal heads on the plantar surface of the foot, resecting the metatarsophalangeal joints has given good pain relief in our hands. Again, function can only be improved on the basis of pain relief.

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