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Arthritis of the Knee and Treatment

Total knee replacement (TKR) has been performed since 1974. It began with rather strict indications for patients over 60-65 years of age, and instrumentation was indeed poor. Only experienced surgeons had results consistent with any series.

Since 1982 instrumentation has continued to improve and now is very accurate in implantation of knee devices. Age and weight limitations have become much more liberal and now well over 300,000 knee implants a year are performed in the United States. Arthritis of the knee has always been a part of our aging process, but increased activity, injury, and obesity have certainly added to the growing popularity of this operation.

Arthritis:

Degenerative arthritis is a chemical breakdown of the surface or articular cartilage of weight bearing joints. It is associated with aging, trauma, and increased activity or weight.



Figure 1. Normal knee



Figure 2. Arthritic knee

The most common type of arthritis is, of course, osteo or degenerative. Rheumatoid arthritis is second and has a more inflammatory background with involvement not only of the surface of the joint but of the muscles, ligaments, and tendons. Bone is generally less dense in rheumatoid arthritis.

Trauma and other immune conditions can also hasten the “aging process” of the knee leading to treatment and even surgery.

Conservative Treatment

Before reaching the end-stage arthritic changes of the knee, there are many forms of treatment that can keep individuals more painfree and active.

Early after a patient is made aware that arthritis is the cause of symptoms decreasing excess body weight is extremely important. Exercise is also of significance in that it enhances the strength of the muscles, tendons, and ligaments that support the joints, and in fact improves the durability of the joint surface itself. Running, jumping, and impact type sports are not included in the exercise program. Cycling, limited walking on a treadmill or flat surface, swimming, and elliptical type of machinery are recommended.

Medications:

Anti-inflammatories, particularly non-steroidal (NSAIDS), can give intermittent relief. Over-the-counter Advil, Aleve, and ibuprofen are examples. In later stages of arthritis the pharmaceuticals which are taken on daily basis are recommended. This, of course, depends upon an individual's ability to tolerate anti-inflammatory medication. The obvious complaints are gastrointestinal and fluid retention.

Injections:

Cortisone injections can be effective in moderately severe cases of arthritis. I personally believe they should be spaced 2-3 months or more apart. Excessive use of injections anywhere in the body can cause ill effects not only locally but to other organ systems.

The steroids pills such as a Medrol Dosepak given over a 6 day period can be used on a monthly or longer basis. Diabetics and those with congestive heart failure are generally contraindications to this drug.

Hyalgan or Synvisc injections (hyaluronic acid):

These have been used for 11 years now throughout the country. Initially there was considerable marketing hype about the positive advantages of these injectable medications. The chemical involved is similar to the cartilage and fluid of the joint and do assist in eliminating inflammation and thusly pain. These injections do not improve the arthritis of the articular surface or "cushion" of the joint. Most studies have shown a 20-25% improvement with the 3 injection regimen, but many experienced knee surgeons throughout the country have discontinued their use due to a lack of effective control of arthritis.

Arthroscopic Surgery of the Arthritic Joint:

Arthroscopic surgery has been performed in this country since 1974. Surgical procedures through the scope started in 1976. While it has been a tremendous success in removing major cartilage tears, loose bodies, and occasional repairs of small arthritic or traumatic defects in the surface of the joint, it has little advantage in a patient with arthritis over the age of 45-50. Unless a cartilage tear is major, a bucket handle tear, or a large flap tear, which causes an actual derangement of the joint, over 75% of minor cartilage tears in the presence of arthritis should be left alone. Exercise and conservative treatment are far less interventional. After 25 years of observing results of arthroscopic "debridements" of joints I have found that the arthritis frequently becomes more symptomatic and disabling.

Removing large cartilage tears, loose bodies, and large flap tears of the actual surface of the joint are indications for arthroscopy, but once arthritis has developed to more advanced stages, it is actually contraindicated.

Physical Therapy:

While physical therapy is extremely important after the surgical replacement of the joint, its main indication before an operation is educating a patient as to exercise program. Attending

physical therapy for weeks or months will have no beneficial effect that cannot be obtained by working in a gym or with certain exercise programs at home.

Total Knee Replacement

Surgical Indications:

Pain, instability, and progressive deformity are the common complaints leading to surgical replacement of the knee. If daily activity, including work, is limited by disabling pain there may be no other decision to make regardless of age. Individuals in their 30's and 40's are electing to have replacement surgery in order to keep up their necessary life activities. There are excellent alternatives with non-cemented implants now that can offer potential long term durability, even in more active patients.

Diagnosis:

Many patients can be simply examined and end-stage arthritic change is obvious by manual manipulation of the knee or watching their gait. Weight bearing x-ray will reveal complete or nearly complete loss of cartilage surface between the bones. The more advanced cases will have bowing or knocked-knee deformities and if too advanced, will require more than the traditional replacement.

Laboratory testing is of no diagnostic significance other than in rheumatoid disease. The x-rays changes will show more osteoporosis or thinning of the bone and lack of spur formation.

Surgical Risks:

These are outlined in the blue book attached to this guideline for surgery. Infection, of course, is the most serious non-life threatening complication. A host of risk factors including diabetes, obesity, general poor health, chronic steroid use, and staph carriers head the list.

We use intravenous antibiotics before and after surgery and flush out the joint with at least 3-4 liters of antibiotics solution during the case. Meticulous surgery, lower operating time, and the expertise and experience of the surgeon are perhaps the most important aspect of avoiding complications.

Blood clots are an inevitable problem with many patients whether it be knee, hip, or abdominal surgery. Once again, rapid surgery with decreased tourniquet time and meticulous care of the tissues are extremely important. Depending on the risks factors in a patient, short term injectable anticoagulants followed by aspirin for 5-6 weeks may be used or Coumadin for 10-30 days.

Elevation of the leg at or above heart level immediately after the surgery (in the recovery room) have the distinct advantage of using gravity to prevent swelling and clogging of the vessels. I promote this in my patients for the first 2-3 weeks, and particularly throughout the hospitalization and the next seven days. Stockings during the day are helpful but not as important as the age old process of gravity.

Many studies have shown that long term aspirin, 325 mg, once or twice daily for 5-6 weeks after surgery is quite effective in low risk individuals. Lovenox and injectable followed by aspirin or Coumadin followed by aspirin is also quite effective. I would be remiss in failing to mention that excessive bleeding times with Coumadin can increase swelling and tissue

bleeding to the extent that infection rate is increased. Thusly, I tend to keep the pro time with Coumadin at 1.4 to 1.8 during the first 7-14 days after surgery.

Surgery:

This has been to some extent explained in the blue book. My incision is curved around the inner side of the knee cap or patella. Generally it is 4" in normal size individuals. With increasing obesity and musculature this may be extended to 5-6". I prefer in some patients, particularly those with knock-knees, to avoid any muscle incision and use the sub or mid vastus approach which not only preserves the inner muscle to the knee cap, but aids in postoperative tracking of the knee cap.

With the conventional incision I prefer to incise only partly into the quadriceps mechanism and this affords a rapid recovery.

Intermedullary rods or other alignment systems are used only 9-10 mm of surface of the femur and the tibia are removed and these can be done very accurately with the present instrumentation. Balancing the ligaments and the alignment of the knee is extremely important and correlates once again with the experience and expertise of the surgeon. Fixation to the bone is generally by cement or methyl methacrylate, which is not a glue but a bonding for tight fixation to the femur, tibia, and patella (knee cap). These knees in my experience are averaging 15-25 years.

In the younger age groups, under 60, I am increasingly using more of the uncemented implants, which have new and improved bone ingrowth surfaces. These have the potential of a lifelong adherence to the patient, as we expect with the hip implants, and the only failure that may occur many years down the road will be of the plastic or polyethylene bearing surface between the 2 upper/lower implants. This plastic interface can easily be changed with a 10-15 minute operation and an overnight stay.

Computer or Navigation Assist in Total Knee Replacement:

At least 8 years ago some researchers and surgeons around the country began to devise a computerized method of aligning the hip, knee, and ankle axis for knee replacement. It was felt that this could better assist surgeons in making the initial removal of bone to better balance the knee and its multiple ligaments and muscles and tendons. It was also estimated that the navigation computer or "brain" would improve final results and decrease the chances of "outliers" where there was not a perfect alignment between the hip, knee, and the ankle.

To this date no one has shown any evidence that there is an improvement in results of surgery. In fact, three centers around in the country in a double blind study have noted there were more complications in the computer group and more re-operations in those performed with the assist of the navigation brain. In fact, another study demonstrated that the best results balancing the knee and obtaining improved function are associated with surgeons having the most expertise and higher volume of knee replacements. This is a logical explanation for good outcome in many types of surgical procedures.

This is not to say that the computer or navigation equipment is not useful in some cases. I indeed have used it on a few occasions. Where there is significant abnormality of the anatomy of a patient or retained rods or metal within the marrow canal of the bones, the computer may certainly be of value.

Mini or Limited Incision Knee Surgery:

As previously mentioned, the length of the scar varies with the size and obesity of the patient. Minimal or shorter wounds can be performed safely in a number of individuals. There are complications with some very small wounds and particularly those where the approach is from the side of the knee. These involve skin damage, stretched or torn ligaments, torn tendon attachments, and malpositioning and alignment of the implants. Cosmetics aside, these are not associated with good outcomes.

The smallest incision possible for a particular patient, along with minimal or no muscle involvement in the incision, lends to a better recovery and less painful postoperative course. Once again, the expertise and experience of the surgeon is all important.

In conclusion, a great result trumps small incisions every time. There has been no proof in the literature thus far by many centers that the functional outcome is superior with smaller incisions and muscle involvement.

Partial Knee or Uni Knee Replacement:

This is not a new procedure. It was performed back in the 1970's both in Europe and the United States. I performed the first partial knee replacement in 1976. The partial or hemi knee replacement was more common in the 70's and 80's due to the relative lack of consistency in results with the total joint implant. Instrumentation was in the early stages then and has vastly improved.

The partial knee has gone through many renditions through the last 30 years. It has been called different names but with fairly similar appearance on x-ray. The latest marketing has been done with the Oxford hemi knee and this is an improvement in instrumentation, but for the most part similar in function to a hemi knee performed in the 1980's. This involved a plastic bearing which moved in a track with metal above and below. The Oxford knee has a plastic bearing which moves at will over a metal baseplate.

The partial knee can be done through a smaller incision, it is less painful postoperatively, and requires less physical therapy. Function returns much more quickly. This all sounds great to a patient, but one must also read the fine print.

The partial knee is only indicated in a small percentage of individuals. High activity, large or overweight, and poor bone density are some of the limitations to the durability of this small implant. If there is significant patella disease or arthritis in the remainder of the joint the results are certainly less than adequate. Patients must accept the fact that revision may be necessary in 2, 5, or 10 years. Labor type jobs, tennis, and other strenuous activities may compromise an early good result. There is a small area of implant fixation on the bone with significant amount of pounds per square inch at the bone implant connection. Younger patients with limited arthritis in the knee and healthy body weight and bone density may be candidates for this procedure, but must be aware of the need for revision surgery at some point in the future.

Postoperative Management

After surgery patients may be treated for pain with IV narcotics in the form of a PCA pump or intramuscular injections. Nerve blocks may be performed by anesthesia before or after the operation itself. Injection of long acting analgesics and pain medication into the soft tissues around the operative site are also helpful.

After 24 hours I prefer to discontinue any IV and intramuscular narcotics. Muscle relaxants and oral pain medication is generally superior and allows the patient more freedom to increased activity without dropping the blood pressure. Ice and high elevation above the heart are helpful adjuncts to pain control.

Patients may be in the hospital between 2 and 4 days depending upon physical ability and age. Therapy is generally started the following morning from surgery, and most patients should be independent by day 2 or 3.

The more quickly range of motion can be obtained, the less chance of scarring down or the development of capsulitis. The patients may mobilize their own knee, or the CPM (Continuous passive motion) machine and hands on therapy will help assist in the 90-100° motion that is desirable by day 4 or 5. The CPM machines are not a necessary treatment device, but do help with elevation of the leg and relaxation of the patient to accepting mobility in their knee. Many people do quite well without the machine, and it has become somewhat of a social treatment device.

Weight bearing can be instituted immediately, although a walker or a crutch is generally used until muscular strength is sufficient to carry a patient to independent gait. The uncemented knees may require 2 weeks of assisted weight bearing as compared to those with cement. Further study is being done to determine if any change in the postop management of uncemented knees is mandatory.

Post Discharge Management

The majority of my patients return home with family assist. They will have home health and physical therapy and possibly a CPM machine for 5-7 days. At that time they will be seen in the office where half of the staples are removed and outpatient therapy started.

Some patients may require further rehab in a nursing home facility. I generally have some preferences as to a more optimum facility. If it is necessary, 5-10 days are generally recommended, but it is well established that this does not enhance the total recovery of many patients. If there is absolutely no one at home to assist or a patient is more disabled from a musculoskeletal basis, then there is no other choice.

Some patients may proceed directly from the hospital to an outpatient therapy center. Younger more independent patients will choose this post discharge protocol.

Knee replacement will cause varying degrees of swelling for 3-6 months. Most patients should have 115-130° in the first 4-6 weeks. Motion can continue out to 4-6 months.

Elevation of the operative leg at or above heart level the first 10-14 days is extremely important. Icing several times a day after discharge is also advisable. A new machine which involves very cool temperatures and compression, namely the Game Ready device, has recently become a significant assist in reduction of pain and swelling and improvement in motion. This device is covered by many insurance companies, although not Medicare. Some patients choose to pay for it, as it can be used for 2-3 weeks following surgery. The Game Ready device has been used in professional sports for injuries and post surgery for a number of years.

Activity level and expectations in patients vary according to the preoperative capability. Low physical stress jobs may only require a 3 week return, where as higher stress requirements need 6-8 weeks or more. Golf may be started at 2 months, but tennis should be restricted for 3-4 months or longer depending upon physical strength. Regardless of how well or how slowly a patient proceeds at 6-8 weeks, their knee will improve over the next 4-6 months.

Range of motion of the knee after surgery depends upon preoperative deformity and contractures. Most patients in my practice have 120-130° or more at 4-6 months. I have seen many increase their motion after one year. The new high flexion implants that require not only a slightly different prosthesis but surgical technique have certainly increased the eventual range of motion. However, 110-115° is very acceptable and makes most daily activities possible with minimum stress.

Total knees have limited longevity, however by average in the practice has been 15-24 years. Most problems with knees have been associated with failure of the plastic bearing between the 2 metal parts covering the bone. This is treatable with a new plastic bearing and no further surgical intervention if the main components are still well fixed to the bone.

There is a condition called osteolysis or poly (plastic) wear phenomenon where bone is weakened by excessive particle disease. This is one of several reasons that even the best functioning knee replacement should be watched every 2 years with an x-ray and examine by a physician. If plastic disease can be avoided with a new bearing it is a small price to pay for avoiding a complete revision of the entire implant.

Total knees can loosen in time. Excessive weight, excessive activity, and the ravages of birthdays causing decreased density of the bone can decrease the life expectancy of any implant. Thusly, I am becoming a stronger proponent of the newer cementless knees in younger, heavier, and more active patients. I started using uncemented knee implants in the early 1980's, and many of these are still functioning. The design of the joint was changed in the early 90's, and cement became the gold standard for longevity. Now with improvement in texture of the metals for bone ingrowth, cementless implantation is making a come back.

Conclusion

While the total knee implant has not reached the pinnacle of the hip replacement, which may be a permanent fixture in most people, we are certainly making strides with the knee implants to improve function and longevity and successful outcomes.

The patient must be aware that a good result without complication is far better than too small a scar or too small an implant or excessive technology. The surgeon is still the captain of the ship, and vast experience with this operation gives more reproducible excellent results.