Minimally-Invasive, Computer-Assisted Total Knee Replacement

Total Knee Replacement is fundamentally a major reconstructive procedure. The term "minimally invasive" refers to doing total knee replacement surgery in a way that hopefully allows the patient to recover more easily and more quickly. The most important goals of total knee replacement are to properly align the leg, to properly align and fix the implants to the bone, to improve limitations of motion, and to balance the surrounding ligaments. So long as these goals can be met, the next step is to achieve these goals in a way that facilitates recovery.

The length of the skin incision, while the most visible, is not an important aspect of minimally invasive total knee replacement. Exactly what is done to the capsule surrounding the knee joint and the quadriceps tendon just above the knee cap affects recovery more than any other issue. The skin incisions are much smaller than before, but what is done underneath is the real factor.

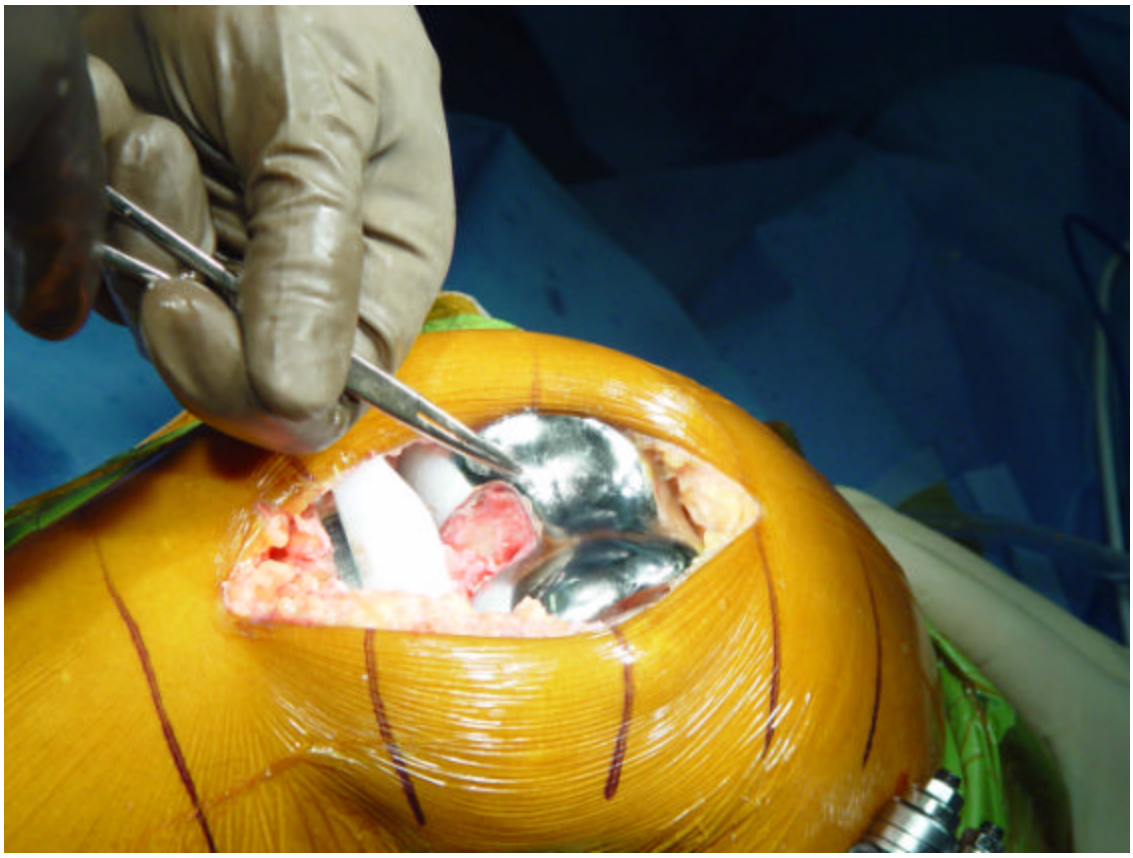
Traditionally when replacing a knee, the knee cap would be flipped over and the knee fully bent to bring the ends of the femur and tibia into view. This requires a longer incision in the knee joint capsule and quadriceps tendon above the knee cap. With more attention to the subtleties of leg position, the optimal placement of surgical instruments, and improving the design and reducing the size of surgical instruments, all of the goals of total knee replacement can be achieved without making the incision up so high and without flipping the knee cap over.

The use of computer-assistance during surgery has great advantages because many of the traditional, space occupying instruments that are used with traditional surgery are completely eliminated. Instead, a narrow digitizing probe can be slid into critical areas to measure important factors such as joint surface position and rotation. The combination of minimally-invasive techniques with computer-assisted techniques is far more powerful than either one alone.

Computer-assisted, minimally-invasive total knee replacement is certainly more technically demanding than conventional knee replacement. It takes some time for the surgeon to become familiar with these techniques. When the surgery becomes routine, it takes about 10 minutes longer to add the computer-assisted aspects to the surgery but some of that time is often recovered by having things come out just right on the first "trialing" of the new knee because subsequent reshaving of the bone surfaces to adjust component alignment or component size is less common. Performing the knee replacement using minimally-invasive techniques is also more demanding and can be more time consuming. This is especially true for larger knees since the actually knee replacement components are bigger and take up more space.

It is a fair question to ask if making knee replacement surgery more complex and tricky is really worth it. At this point, after having performed more than 100 computer-assisted total knee replacements I'm convinced that it's definitely worth

it. The minimally-invasive techniques allow the patients to gain motion more rapidly and with less pain. Knee replacement surgery requires a lot of therapy and effort on the patient's part, but it's generally less painful and difficult than it used to be and I think that it's worth the extra effort in most situations.



Appearance of the knee after the real components have been inserted, just before closure of the incision.