

Orthopaedic Observations

A Matter of Medicine...

TM Pending

Computer Navigated Total Knee Replacement

By Christopher B. Lynch, M.D.



Total Knee Replacement (TKR) continues to be one of the most successful medical interventions performed today. This procedure allows patients with painful arthritic knees to return to a more active lifestyle and achieve an improved quality and, in many cases, quantity of life. In general, ten-year knee replacement survival studies average > 90%, 15-year @ 85% and 20-year @ 75% survival. These numbers are cer-

tainly an improvement over previous survival studies reporting on the use of earlier implant designs and surgical techniques. Rates of survival continue to improve with advances in technology and techniques. Recent advances such as the incorporation of computer navigated systems promises to improve outcomes and long-term survival of currently implanted TKR's.

Initial early implant techniques incorporated "eyeballing" the essential bone cuts without the use of guides or jigs. Failures using this technique were attributed to poor attention to achieving optimal lower extremity alignment (excessive knock-knee or bow leg), and failure to balance ligaments (too loose or too tight on the inside or outside of the knee). Malalignment and instability causes abnormal stresses on the implant and the bone leading to increased risk of premature failure in TKA.

In an effort to improve outcomes by achieving better alignment, current generation surgical techniques involve the use of jigs and guides that are designed to allow more predictable and reliable bone cuts. Updated techniques have also been developed to allow for appropriate and equal balancing of the ligaments to prevent the knee being too tight or too loose. The use of these jigs and guides has certainly improved the overall alignment of total knee replacements. Alignment and ligament balancing are among the most important aspects of a surgically successful total knee replacement. Optimal alignment, unfortunately, is not a guarantee with any current technique. In fact, several recent studies have determined

that optimal alignment is not achieved in 8-25% of patients, even in the hands of the most skilled surgeons, with current cutting systems.

Computer Navigated Knee Systems are the latest tools designed to aid the surgeon in more predictably and reproducibly achieving optimal alignment and in addition, assist in achieving appropriate and necessary ligament balancing. The computer navigation system that I currently use (Ci System, DePuy) involves the use of a "computer eye" that uses infrared beams to read the position of shiny spheres attached in a specific pattern to the thigh and shin bones. The computer "eye" also reads a wand that I use to "register" the outline of the bones at the knee and generate an image of the patients' knee and entire lower extremity on the computer screen. Using this image and guides specific for the computer, appropriate cuts of both the thigh and shin bones can be made with up to a 0.5 a degree of accuracy in all planes. 0.5 degree is well within the 3 degree safe zone for alignment. The computer may also make suggestions regarding ligament balancing and sizes of implants which I may, or may not, choose to use based on my experience.

Although we joint replacement surgeons do not necessarily "need" the computer, studies from around the world have repeatedly determined that the accuracy of the computer is significantly better than the current techniques at achieving optimal alignment and avoiding outliers of the lower extremity during total knee arthroplasty. The accuracy of the computer navigation system produces optimal alignment in >95% of cases and reduces the risk of any significant outliers. Technology continues to improve and as surgeons we need to remain current. This recent advance promises to be the standard of care in the (near) future improving long-term outcomes. Eventually this technology may allow us to safely reduce incision size and minimize peri-operative soft tissue trauma potentially speeding up post-operative rehabilitation. So far, clinical results in the short term have been excellent and x-ray results have indeed proven that the computer is extremely

(Continued on the back side...)

accurate.

Approximately two years ago, I was the first surgeon in the New Haven area to utilize this technology. I had not used the computer on all my patients over the course of the last two years, but my early personal results after my first 100 selected computer navigated total knee replace-

ments have been extremely encouraging. As a result of my continued success utilizing the computer during knee replacement, currently all potential knee replacement patients are considered candidates for computer navigated knee replacement. Currently, I continue to incorporate this technique for many total knee replacements at both Milford Hospital and The Hospital of St. Raphael.

Dr. Lynch is a native of the New Haven area, born at Yale-New Haven Hospital and raised in the Spring Glen area of Hamden. A graduate of Hopkins Grammar School, he then attended Lafayette College and later graduated with "High Distinction" from Wayne State University School of Medicine in Detroit, MI. While at Wayne State, Dr. Lynch was also elected into AOA, the National Medical Honors Society. After completing his orthopaedic residency at the University of Maryland Medical Center/R.Adams Cowley Shock Trauma Center in Baltimore, Maryland, he traveled to Denver, Colorado, where he spent a year as Fellow in Adult Hip and Knee Reconstruction at Colorado Joint Replacement.

While in Colorado, under the direction of Dr. Douglas Dennis and Dr. Brian Haas, he trained as a specialist in primary and revision arthroplasty of the knee and hip. He continues to pursue related research interests which have produced various recent chapter, journal and internet publications focused on modern concepts in Total Knee and Total Hip Arthroplasty.

He and his wife have returned to the New Haven area, where he has joined The Orthopaedic Group, LLC.

Dr. Lynch performed the first computer navigated total knee arthroplasty in New Haven county at Milford Hospital.

www.togct.com