Partial and total knee arthroplasty have been continually refined over the past 40 years. Patients now expect fast recovery, peak performance and minimal surgical trauma. Clinical results are well documented in the literature with current generation implant systems showing comparable survivorship for both total knee arthroplasty (TKA) and unicompartmental knee arthroplasty (UKA). These procedures have become safe, predictable and, for the most part, routine. This “refinement” process has played out through incremental advancements in design, instrumenta-

**TGS® Unicompartmental Knee Arthroplasty**

Tissue Guided Surgery (TGS®) uses the patient’s unique knee motion (i.e. knee kinematics guided by the existing cruciate and collateral ligaments) to prepare the femoral condyle. After resecting the tibial plateau, a distraction platform is placed into the tibiofemoral compartment to tension the ligaments and capsule, as shown in Exhibit 1.

As the knee is extended, the Primary Femoral Cutter (PrFC) tracks along the apex of the femoral condyle, as shown in Exhibit 3 on the following page, to establish femoral component M/L position.

---

Knee kinematics, re-established by distracting the tibiofemoral compartment, guide the PrFC in preparing the Guide Surface. The PrFC is at a fixed height from the resected tibial plateau. This height correlates to the combined height of the femoral and tibial components to provide proper gap balancing throughout the range of motion.

Next, the implant support surface is prepared using sequential Secondary Femoral Cutters (SFC). Each SFC has a rail, as shown in Exhibit 4 that references the Guide Surface as the knee is extended from deep flexion. This rail maintains the cutting element at a fixed distance from the proximal Guide Surface.

The final SFC is a sweep cutter to provide a smooth finished implant support surface, as shown in Exhibit 5.

**Discussion**

The TGS UKA System combines proven implant design features with a straightforward and repeatable surgical technique to enhance implant positioning and soft tissue balancing. The materials used in the implants, along with articular compliance and bone fixation, are based on review of long standing unicompartmental implant designs with proven clinical outcomes. The TGS UKA System comprises unicompartmental femoral components that recreate the radius of the femoral condyle through an arc of 140 degrees of flexion. Unicompartmental tibial components are
FUTURETECH

designed for cement fixation. These components may be used in various combinations to create a single unicompartmental tibiofemoral replacement for either the medial or lateral side of the knee.

Traditional unicompartmental femoral components incorporate planar cuts, particularly for the posterior femoral resection. The fixation interface is loaded in shear as the knee flexes beyond 90 degrees, thereby increasing the risk of femoral component loosening. The support surface and fixation interface with the TGS®UKA femoral component is loaded in compression throughout a full arc of knee flexion, reducing the risk for implant loosening.

We believe the TGS UKA System will provide patients with a more natural feeling and functioning partial knee replacement while giving the surgeon an easier, more precise and repeatable surgical procedure. The ease of use and minimal surgical trauma provided by the TGS UKA System should fit well in outpatient surgical settings.

The TGS UKA System is manufactured by Alexandria Research Technologies, LLC (ART) and distributed through TGS® Knee Innovations, LLC. Both are privately held medical device companies.

Gerard A. Engh, M.D. is the Chairman of the Board of Directors of ART and a Board Member of TGS® Knee Innovations, LLC. Dr. Engh has been a practicing orthopaedic surgeon for over 30 years and is currently the President and Director of Knee Research at the Anderson Orthopaedic Research Institute in Alexandria, Virginia. He is the past President of The Knee Society. Dr. Engh has been involved in the development of total and unicompartmental knee replacement implants and instrumentation since 1986. Dr. Engh, along with his brother Charles A. Engh, M.D., established and continue to lead the Joint Replacement Fellowship Program at INOVA Mt. Vernon Hospital. He is on the Clinical Faculties of the University of Maryland and is a member in good standing of nine orthopaedic professional societies. Dr. Engh can be reached at jerry@andersonclinic.com.

The TGS® UKA system presented in this paper is covered under numerous patents and pending patents, to include U.S. Patent Nos. 6,482,209 and 7,115,131.