

Computer-Assisted Surgery System for Resurfacing the Patella in Total Knee Arthroplasty

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Total knee arthroplasty (TKA) is performed to alleviate pain from severe arthritis in the knee. However, 10 to 25% of patients continue to experience pain in the patellar region following TKA. Since asymmetric (tilted) patellar bone cuts have been associated with higher rates of anterior knee pain and other postoperative problems, we are developing a laboratory-based computer-assisted surgery (CAS) system to guide the surgeon to improve the accuracy of the patellar cut, with the goal of reducing postoperative anterior knee pain.

Our CAS system consists of an optoelectronic camera (Spectra, NDI, Waterloo), computer, and modified marker arrays that attach onto the patella and surgical instruments (Praxim, Grenoble, France). We are using LabView software (National Instruments, Austin, Texas) to create virtual contours of the patella and enable matching of the instrument cut plane with the system-recommended cut plane. Cut accuracy of three non-assisted and two computer-assisted methods will be tested. Our setup has been designed to mimic the intraoperative visibility and conditions of the patella. Experiments on both artificial and cadaveric patellae will be performed.

The CAS patellar resurfacing system is now complete, with both the recommended and instrument cut planes being displayed in real-time. Testing of the system on artificial patellae is about to commence. If we can demonstrate improved accuracy with minimal added time, our approach is likely to be implemented clinically.