

Computer-assisted navigation system helps experienced surgeon improve outcome in total knee arthroplasty

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Navigation-assisted total knee arthroplasty (TKA) reportedly improves component alignment. Also, experience on the knee surgery is complementary to the success of total knee arthroplasty even with the use of navigation system. Less invasive procedure in TKA is a prerequisite for a stable perioperative hemodynamic status which may contribute to fewer complications. We compared the component alignment and perioperative medical status of patients who underwent navigation-assisted and conventional TKA. We hypothesized that an experienced knee surgeon can improve outcome of total knee arthroplasty with the usage of computer-assisted navigation system. Between March 2005 and October 2007, one hundred and twenty-five consecutive patients who underwent navigation-assisted TKA for osteoarthritis, rheumatoid arthritis and traumatic osteoarthritis disorders were enrolled. One hundred and twenty-five patients were replaced with conventional TKA between February 2004 and September 2006. All patients received surgery in a single institution and performed by a single surgeon who had been performing knee arthroplasty for more than 15 years. Within the overlap period (March 2005 to September 2006), 84 patients were separated for navigation-assisted and conventional TKA according to patients' wishes. Preoperatively, age, gender, laterality, body mass index (BMI), and the medical conditions of all patients were recorded. Pre-operative anesthetic status of the patients was graded according to the American Society of Anesthesiology classification system (ASA grade). The post-operative alignment of the components and related complications were documented.

In the conventional implantation group, femoral intramedullary and tibial intramedullary alignment guides were used. With IM guidance system, we used the standard knee arthroplasty instrumentation to perform the distal femoral cut, chamber cut, and proximal tibia cut. Proper implant sizing and position was adjusted with the surgeon's experience. The femoral and tibial components were implanted with cementing. The wound was closed over a suction drain. A compression bandage was applied from the ankle to the proximal portion of the thigh. In the navigation-assisted procedures, both femur and tibia alignment cutting were measured extramedullary using a navigation system (BrainLab®, Heimstetten, Germany). These patients were evaluated for mechanical alignment, perioperative hemodynamic status, and early complications. Patient demographics were analyzed using Pearson's chi-square test, whereas the component alignment and the data of medical status were analyzed using an independent sample t-test. A *p*-value of less than 0.05 was considered to be significant.

There were no significant differences in the age, gender, laterality, BMI, causes of operation, and ASA grade between patients who underwent navigation-assisted TKA and conventional TKA. Patients with navigation-assisted TKA showed better mechanical axis, coronal and sagittal axis of the femoral component and coronal axis of the tibia components. Patients in the navigation-assisted TKA group experienced less blood loss, needed fewer transfusions, and required fewer hospitalization days and fewer early complications. There were 2 cases of delayed wound healing and 1 case of upper gastrointestinal bleeding in the navigation-assisted group. In the conventional TKA group, there were 3 cases of superficial infection, 2 cases of cerebral infarction, 2 cases of periprosthetic fracture, 2 cases of upper gastrointestinal bleeding, and 1 case each of angina pectoralis and deep infection. During the

learning period of navigation technique, the component alignments were compared between the conventional TKA group and navigation group in the overlap period. The femoral and tibial coronal alignments were closer to the ideal degree in the navigation group ($p=0.019$ and 0.007 respectively). Interestingly, the femoral component coronal alignment in conventional group TKA was also improved during the period of usage of navigation system ($p=0.008$), but not for the tibial component coronal angle ($p=0.899$). In conclusion, using navigation-assisted system by an experienced knee surgeon also contributes to the better outcome of TKA. Better alignment, less invasion and preservation of the microarchitecture of the distal femur through the avoidance of intramedullary violation contribute to the better hemodynamic status and fewer early complications.