

The mechanical accuracy of post-navigation conventional techniques in total knee arthroplasty

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Background & Purpose: Accurate alignment of knee implants is essential for the success of total knee replacement (TKA). Computer navigation had been introduced and become a well-recognized technique in performing total knee arthroplasty. The improvement of accuracy and component position minimizes long-term wear, risk of osteolysis and prosthesis loosening. However, conventional techniques are still familiar to most practicing surgeons with the advantage of less operative time. Some surgeons shifted back to conventional techniques after a period of computer navigation surgery. However, the comparison between the navigation surgery and conventional techniques after a period navigation guided surgery has not been reported. The current study is aimed to investigate whether an experienced orthopedic surgeon is able to obtain compatible radiological results in conventional total knee arthroplasty after a period of navigation practicing compared to the computer navigation surgery.

Methods: One hundred consecutive patients with knee osteoarthritis underwent total knee arthroplasty performed by one senior orthopedic surgeon. Initial 50 cases were performed with the navigation system (CT-free kinematic navigation system; Orthopilot, Aesculap), and subsequent 50 cases were performed with conventional manual method. Two independent investigators performed all radiological measurements to reduce observation bias. Radiographical results, coronal inclination of the femoral (optimum, 96 degrees) and tibial prostheses (optimum, 90 degrees) on standing anteroposterior radiographs, sagittal inclinations of femoral (optimum, 0 degrees) and tibial prostheses (optimum, 90 degrees) on lateral tibial radiographs, and mechanical axis angle of the lower limb on long-leg (3 feet) scanograms in the AP projection, were compared between the two groups. Outcome was defined as “ideal” when values were within 3 degrees and as “outliers” when more than 3 degrees from optimum.

Results: There were no demographic differences among the navigation and post-navigation conventional groups. Patients underwent navigation assisted surgery achieved better accuracy in the coronal plane than the conventional group. Better ideal femoral and tibial component in coronal alignment (94% vs 80%, 86%: 72%) and less outliers were recorded (6% vs 20%, 14% vs 28%). There were also better results in postoperative mechanical axis (1.9 ± 1.9 vs. 3.2 ± 2.5) in navigation group. Less outliers and better ideal mechanical angle was found in the navigation group (ideal: 88% vs 68%, outlier 12% vs 32%). There is no difference in tibial sagittal alignment and femur sagittal alignment between these two groups.

Conclusion: Although total knee arthroplasty is generally successful and despite the advances in the surgical techniques, malpositioning and malorientation are two major causes of pain following total knee arthroplasty. The current results showed that the navigation system provides a better mechanical angle and more precise in component implantation compared to the post-navigation conventional technique. It also had better alignment correction and less error. An experienced surgeon might improve their techniques in implant placing after navigation training but the accuracy and outlier are still not compatible with the navigation guided surgery. However, the real effect of navigation practicing in improvement of personal skill is still unclear and requires more research.