

5 year follow-up: 100 conventional non-navigated versus 100 computer-assisted navigated total knee arthroplasties – a prospective randomized trial

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Introduction: The aim of introducing computer-assisted navigation systems for total knee arthroplasty (TKA) was to improve implantation accuracy and ligament balancing of TKA. However beside many contradictory publications after short term there is no mid-term data published comparing computer-assisted surgery with the conventional TKA technique.

Materials & Methods: In a prospective randomized study with a minimum follow-up of 5 years we enrolled 200 patients (200 TKA), 100 TKA performed with the conventional technique (Group A), 100 TKA performed with a computer-assisted navigation system (Group B). We wanted to show if there is a positive effect of the navigation system towards TKA survival, radiological component alignment and clinical outcome. Radiological investigations with a follow-up rate of 86.2% in Group A versus 80.2% in Group B were performed by standard X-rays including long leg weight-bearing X-ray measuring the mechanical axis of the limb, medial proximal tibial angle (MPTA), tibial slope, patella alpha angle and lateral distal femoral angle (LDFA). For clinical investigations we determined range of motion (ROM), stability in full extension and 30 ° flexion, anterior drawer test, subjective feeling of instability, anterior knee pain, effusion, Insall Knee Score, Hospital of Special Surgery Knee Score (HSS) and Western Ontario Mac Master University Index Score (WOMAC). The follow-up rate for clinical investigation was 85.7% in Group A versus 79.8% in Group B.

Results: We found no significant difference in TKA survival rate or aseptic loosening (Group A 95.4% versus Group B 98.9% 5-year survival rate, $p = 0.368$). The mechanical axis of the limb with a mean deviation of $2.44^\circ \pm 2.2^\circ$ in conventional group versus $1.67^\circ \pm 1.6^\circ$ in navigated group was significant different ($p = 0.015$). 81% of Group A versus 90% of Group B were within 3 ° varus/valgus deformity of the mechanical axis of the limb ($p = 0.157$). The accuracy of tibial slope was higher with navigated procedure ($p = 0.001$). More patients of Group B (95% versus 79% in Group A) were within a deviation of 4 ° - 10 ° tibial slope ($p = 0.007$). The mean deviation of 90 ° LDFA was higher ($p = 0.034$) in conventional group compared with the computer-assisted technique (1.89° versus 1.36° in Group B). Mean deviation of 90 ° MPTA, mean MPTA, mean LDFA and the patella alpha angle were similar in both study groups ($p \geq 0.253$). There was no significant difference in evaluation of ROM, ligament balancing, rate of anterior knee pain or feeling of instability ($p \geq 0.058$). Insall Knee Score total (181 Group A/191 Group B) and HSS Knee Score total (91 Group A/93 Group B) were higher with the navigated procedure ($p \leq 0.026$). Analysis of WOMAC total and HSS grades showed equal results in both groups ($p \geq 0.070$).

Conclusion: With the computer-assisted navigated system the accuracy of the mechanical axis of the limb in frontal plane and the accuracy of the tibial component in the sagittal plane was higher compared to the conventional surgical technique. However, TKA survival rates and clinical outcome parameters were similar in both study groups 5 years after implantation.