



Comparison of Outcome and Survival After Unicompartmental Knee Arthroplasty Between Navigation and Conventional Techniques With an Average 9-Year Follow-Up



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ABSTRACT

Background: Unicompartmental knee arthroplasty(UKA) has become a treatment of choice for many patients with isolated unicompartmental arthritis due to its specific advantages over total knee arthroplasty, but few studies have compared conventional and navigational UKA with similar instrumentation on mid- to long-term results. We investigated whether the use of imageless navigation can improve implant positioning and clinical outcomes of UKA at a long-term follow-up compared to the conventional technique.

Methods: We prospectively studied clinical and radiological results in 68 patients with an average age of 64.0 years (range, 50 to 81 years) who received UKA between January 2003 and December 2005 using the conventional or navigational technique. Clinical evaluations were performed preoperatively and the last follow-up included knee range of motion, Hospital for Special Surgery (HSS) scores, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores and Visual Analogue Scale (VAS) pain score. For radiologic evaluation, the mechanical alignment of the lower limb was measured using mechanical femoro-tibial angle (mFTA) and Kennedy protocol.

Results: After an average 9-year follow-up (range, 7.4 to 10.8 years), the navigation group showed better coronal alignments of the components, fewer radiological outliers and better clinical scores, but similar estimated 10-year prosthesis survival rates.

Conclusion: This study indicates that the use of navigation significantly contributes to the desired mechanical axis and improved component placement as compared to the conventional technique.

Level of Evidence: Prospective comparative study, Level III.

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Unicompartmental knee arthroplasty (UKA) has excellent 10-year survival rates of approximately 95% [1–6]. It has become a treatment of choice for many patients with isolated unicompartmental arthritis due to its specific advantages over total knee arthroplasty [4,7–10] especially after introduction of minimally invasive techniques [7,11].

Precise positioning of implants and accurate restoration of the mechanical axis are essential for long-term survival [2,12–15]. Failure to achieve this may cause early polyethylene wear [1,5], progression of arthritis in other compartment [2,5,14–16], and implant loosening [17]. All are responsible for increased revision rates [18]. This risk may be particularly

higher in minimally invasive techniques where identification of anatomical landmarks may be limited [19–21]. Moreover, many UKA systems offer limited and potentially inaccurate instrumentation that relies on a substantial amount of surgical judgment for prosthetic placement that increases error in the placement.

Computer-based navigation systems have produced definite improvements in component positioning and mechanical alignment in UKA [22–29]. However, only a few studies have compared the short- to intermediate-term clinical results [26,27,30]. Although in several studies a higher proportion of patients with navigated UKA tended to have better clinical scores, no statistically significant difference in survivorship was evident [26,27]. Another study reported that navigation had a longer operation time and did not lead to better positioning of the prosthesis than the conventional method [30].

Few reports have compared conventional and navigational UKA with similar instrumentation on mid- to long-term results. The purpose of this study was to compare the radiologic and clinical results and survival rate between conventional and navigational UKAs after an average follow-up of 9 years. We hypothesized that using navigation during

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Table 1
Indications for Medial UKA.

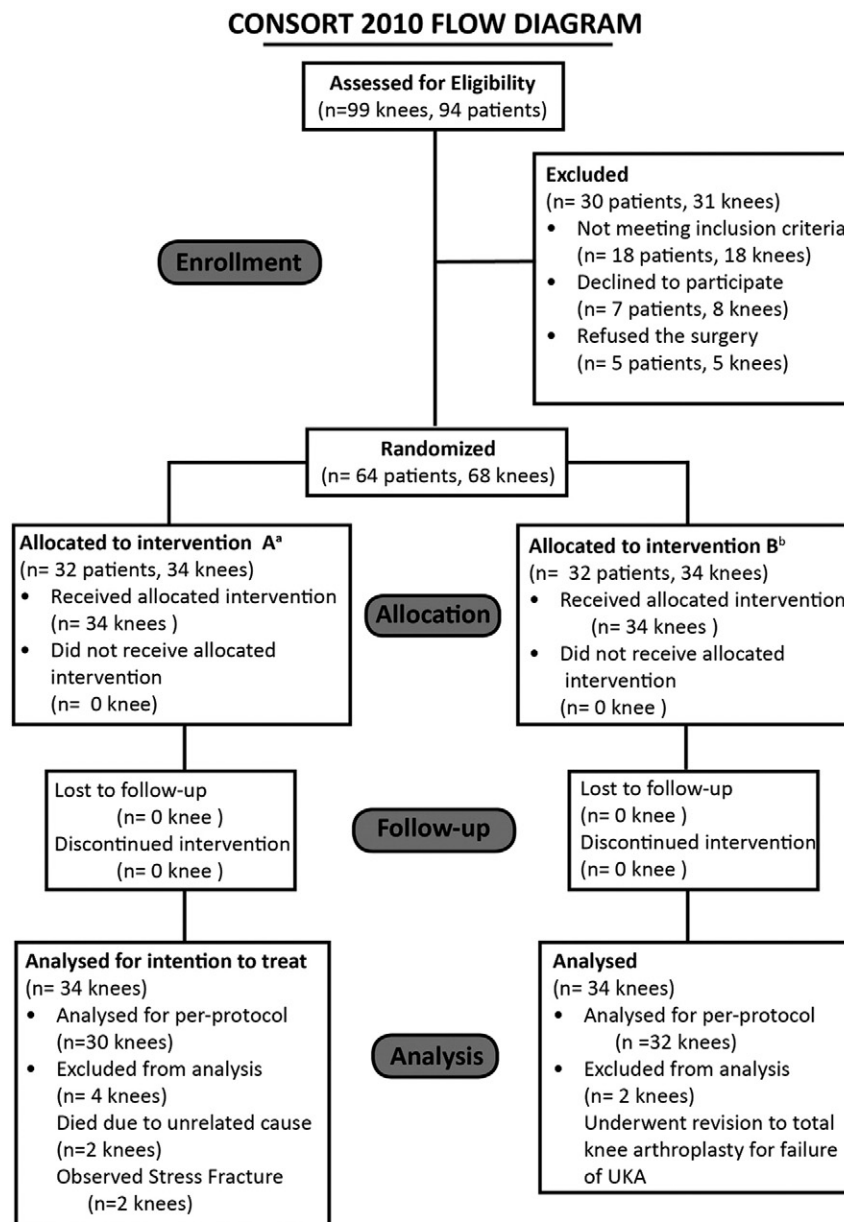
Symptoms requiring arthroplasty attributable to isolated medial compartment arthritis
Stable knee joint with intact cruciates and collateral ligaments
Less than 15° correctable varus malalignment, readily correctable passively
Less than 15° fixed flexion deformity
Range of motion >90°
Minimal involvement of other tibiofemoral and patellofemoral compartment (Ahlbeck grade 1) without any localized symptoms

UKA would result in better limb alignment and implant positioning, as well as improved clinical outcomes, as compared to conventional UKA. We also hypothesized that this will lead to improved overall survival of the navigational UKA.

Materials and Methods

Patients

Between January 2003 and December 2005, we examined patients with predominant medial compartment pain clinically attributed to arthritis and isolated medial compartment arthritis managed by medial unicompartamental arthroplasty. Patients were asked to participate in this institutional study that compared the results of navigational vs conventional UKA. Our institutional review board approved the study design, and informed consent was obtained from all patients. A total of 68 consecutive patients were enrolled in the study. Strict inclusion criteria were required for selection of the patients for surgery (Table 1). Exclusion criteria were presence of moderate to severe osteoarthritis in the lateral or patellofemoral compartments (Ahlbeck grade 2–4) with localizing symptoms, anterior cruciate ligament injury/deficiency, and previous



a: Navigation-assisted Minimally Invasive Unicompartamental Knee Arthroplasty (NAV-UKA)
b: Conventional Minimally Invasive Unicompartamental Knee Arthroplasty (MIS-UKA)

Fig. 1. CONSORT diagram.

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