

# Preservation of Prearthritic Coronal Knee Phenotype and Prearthritic Coronal Alignment Yielded Improved Kujala Scores Following Ligament-guided Medial Unicompartmental Knee Arthroplasty

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**INTRODUCTION:** There is a lack of literature evaluating outcomes of the ligament-guided approach in medial unicompartmental knee arthroplasty (UKA). An improved comprehension of the distribution of coronal plane alignment of the knee (CPAK) phenotypes and sagittal-tibial-wear patterns and their associations with patient-reported outcome measures (PROMs) and implant survivorship could provide insights into its further application in daily practice.

**METHODS:**

A registry was reviewed for patients with a minimal two-year follow-up who underwent robotic-assisted, ligament-guided, medial UKA between 2008-2016. Survivorship and postoperative PROMs were collected. CPAK phenotypes and sagittal-tibial-wear patterns were determined.

The CPAK classification was based on two independent factors and combines the validated arithmetic hip-knee-ankle angle (aHKA) and joint line obliquity (JLO) to classify phenotypes in nine possible categories. Sagittal tibial wear patterns were determined on the 30° flexed sagittal radiograph by using a validated method (Scott et al., 2020). In cases where the point of maximal tibial wear was > 55% of the entire AP diameter of the proximal tibia, excluding osteophytes, it was classified as posteromedial OA.

Survivorship, Knee Injury and Osteoarthritis Outcome Score (KOOS), Kujala and patient satisfaction were compared between phenotypes and sagittal-tibial-wear patterns.

Data were tested for a normal distribution using the Shapiro-Wilks test and compared using independent two-sample t-tests, one-way ANOVA, or Kruskal-Wallis test depending on the number of independent variables and distribution. Categorical variables were compared with Chi-square tests. Multivariable linear- and logistic regression analyses were used to adjust for confounding effects of sex, age, body-mass index (BMI) and follow-up. Survival rates were determined using Kaplan-Meier models.

**RESULTS:**

A total of 618 knees were included at a mean follow-up of 4.1 [2.0–9.6] years. Four-year conversion to TKA survival rate was 98.9% [98.4%-99.3%] and 94.3% [93.3%-95.3%] for all-cause revision (Figure 1). Sixteen medial UKA were revised to a TKA and mean time to conversion was 3.5 ± 2.5 years (Table 1).

Patients with preservation of CPAK phenotype (84.5±14.9, 81.8±15.5; p = 0.033) and restoration of prearthritic coronal alignment (84.1±14.9, 81.7±15.9, p = 0.045) had a significantly higher Kujala score (Table 2). No other significant differences in survivorship or PROMs were observed between phenotypes or sagittal-tibial-wear patterns. Additionally, no difference in survival rates was observed between preserved or altered phenotypes.

Preoperatively, seven phenotypes were observed. CPAK1 (48.1%) and CPAK2 (27.9%) were most frequently observed. Postoperatively, the same seven phenotypes were observed and distribution remained similar (Figure 2).

**DISCUSSION AND CONCLUSION:** This study demonstrated that preservation of CPAK phenotype and preservation of prearthritic coronal alignment yielded a significantly higher Kujala score. No other significant differences in PROMs or implant survivorship were observed, suggesting that robotic-assisted, ligament-guided medial UKA provides equal outcomes for all observed phenotypes and sagittal-tibial-wear patterns in medial compartment OA as long as preoperative

CPAK phenotype is preserved postoperatively.

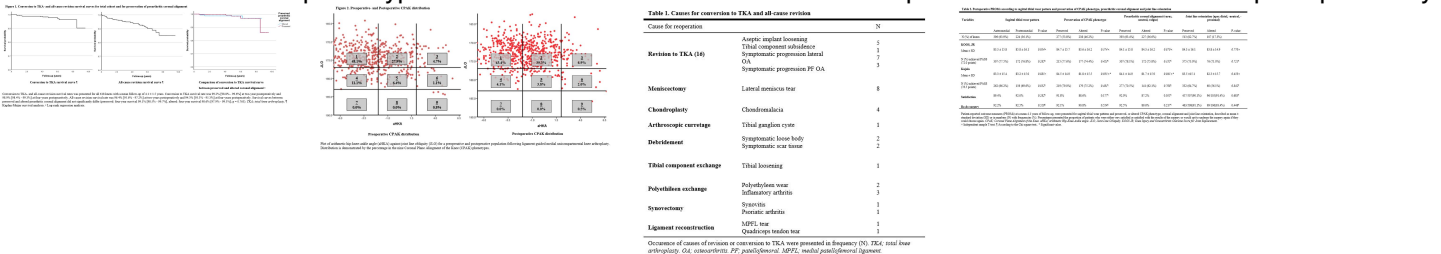


Table 1. Causes for conversion to TKA and all-cause revision	
Cause for conversion	N
Aspheric sagittal loosening	1
Tibial component subsidence	1
Symptomatic progressive lateral OA	1
Symptomatic progressive PF OA	1
Monostomy	1
Lateral meniscus tear	1
Chondrolysis	1
Chondrolysis	1
Articular cartilage	1
Symptomatic loose body	1
Symptomatic meniscus tear	1
Tibial component exchange	1
Polyethylene exchange	1
Inflammatory arthritis	1
Synovectomy	1
Potential infection	1
Ligament reconstruction	1

Conversion of causes of revision or conversion to TKA were presented in frequency (N). TKA: total knee arthroplasty; OA: osteoarthritis; PF: patellofemoral; MFL: medial femoral ligament.