Patient and Operative Risk factors for Subsequent Total Knee Arthroplasty Following Primary Anterior Cruciate Ligament Reconstruction: A Cohort Study of 52,222 Patients

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INTRODUCTION:

Total knee arthroplasty (TKA) in patients who have undergone anterior cruciate ligament reconstruction (ACLR) has been associated with high risk of infection, arthrofibrosis, and longer operative time due in-part to difficulty with exposure and retained hardware. Patients who undergo ACLR are at a higher risk of undergoing total knee arthroplasty (TKA) and are at risk earlier than those from a general population. As the ACLR patients become older and as ACLR surgery becomes more prevalent in the older athlete, the rates of TKA after ACL will only increase. We aim to determine the incidence of TKA following ACLR by patient age at the time of ACLR and graft selection, as well as evaluate the risk factors for TKA after ACLR.

METHODS: Data from a US healthcare system's ACLR registry was used to conduct a cohort study. Primary ACLR patients were identified (2005-2022). Patient factors considered included age, body mass index (BMI), gender, race/ethnicity, smoking status, ASA classification, activity at the time of injury, and medical comorbidities. Time from injury to ACLR, concomitant meniscal or chondral injuries, multi-ligament injury, graft type, and drilling technique were procedure factors evaluated. Postoperative factors included revision surgery, ipsilateral reoperation, and contralateral operation during follow-up. The outcome of interest was a subsequent TKA. Patients were followed until the outcome of interest unless censored for membership disenrollment, death, or December 31, 2022 (the study end date). Multivariable Cox proportional hazards regression was used to determine factors associated with TKA following ACLR using $p<0.05$ as the threshold for statistical significance.

RESULTS: The study sample included 52,222 primary ACLR. The mean age was 28.6 years, and more patients were male (60.2%). When considering age at the time of ACLR, the 15-year cumulative incidence of TKA after ACLR was 0.07% for those aged <30 years, 1.17% for those aged 30-39 years, 3.96% for those aged 40-49 years, 8.05% for those aged 50-59 years, and 22.53% for those aged ≥60 years (**Figure 1**). When considering graft used at ACLR, the 15-year cumulative incidence of TKA after ACLR was 3.15% for allograft, 0.36% for BPTB autograft, and 0.69% for hamstring autograft; it was 0.55% at 10-years follow-up for hybrid grafts (using an allograft and hamstring autograft) and 0.27% at 4-years for quadriceps tendon autograft (**Figure 2**).

Risk factors for TKA included increasing age compared to those <40 years (40-49 years: hazard ratio [HR]=7.85, 95% confidence interval [CI]=4.65-13.24; 50-59 years: HR=17.51, 95% CI=10.47-29.28; ≥60 years: HR=50.41, 95% CI=25.52-99.60), female gender (HR=1.48, 95% CI=1.10-1.97), a history of other neurological disorders at the time of ACLR (HR=5.98, 95% CI=2.56-13.98), chondral injuries reported during the ACLR (HR=1.61, 95% CI=1.17-2.23), and allograft selection (HR=2.24, 95% CI=1.19-4.20). Ipsilateral reoperation (HR=2.46, 95% CI=1.80-3.35) and contralateral surgery (HR=2.55, 95% CI=1.80-3.61) during follow-up were both risk factors for TKA.

DISCUSSION AND CONCLUSION:

The 15-year cumulative risk of TKA in patients who were ≥60-years old when undergoing their ACLR was 23%. Patients who underwent ACLR with allograft had a 2-times higher risk of undergoing a TKA. Age, female gender, concomitant chondral injury, and ipsilateral reoperation or contralateral surgery during follow-up were risk factors for TKA in patients who have undergone prior ACLR.

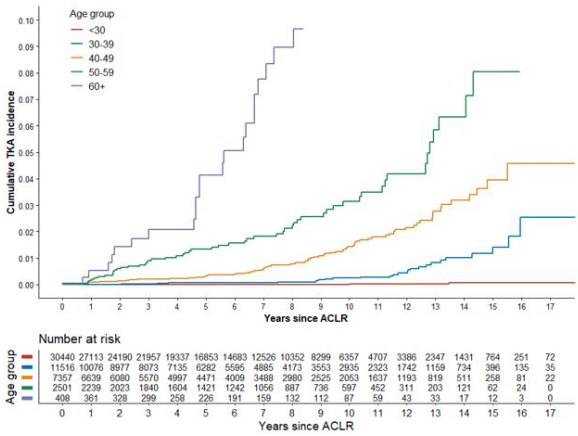

Figure 1.

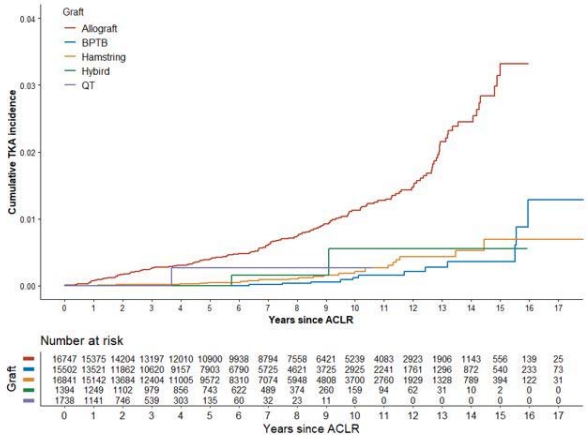

Figure 2.