

Total Knee Arthroplasty Versus Education and Exercise: Comparing Patient Outcomes Across Knee Osteoarthritis Symptom Severity

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INTRODUCTION:

Using matched observational data, we have previously shown that total knee arthroplasty (TKA) provides superior outcomes to an education and exercise (EduEx) program in patients with knee osteoarthritis (OA). While this reflects overall findings, it is possible that superiority of TKA may be specific to patients with more severe symptoms, while EduEx may provide similar results as TKA for patients with less severe symptoms, who may or may not be eligible for surgery. In the present study, we conducted a secondary analysis of matched observational data from two Canadian prospective cohorts to determine if the treatment effect of EduEx versus TKA differs across patients with knee OA ranging from less severe to more severe symptoms.

METHODS:

This was a secondary analysis of propensity-matched data from patients with knee OA enrolled in the GLA:D Canada registry (EduEx) and LEAP-OA registry (TKA) at the Schroeder Arthritis Institute (University Health Network; Toronto, Canada). Previously, a propensity score was estimated for each patient (ranging from 0 to 1) based on a range of pre-treatment covariates. These included age, sex, body mass index, education, employment status, living alone, smoking status, medical comorbidities, anxiety/depression symptoms, bilateral knee symptoms, comorbid hip symptoms, pain medication use, opioid use, pain numeric rating scale (NRS) and the Knee injury and Osteoarthritis Outcome Score 12-item version (KOOS-12) pain, function, and quality of life subscales (all scored 0 worst to 100 best). Based on the propensity score, TKA patients were matched to an EduEx patient on a 1:1 ratio using the genetic matching method with a caliper width equal to 0.1 of the standard deviation of the logit of the propensity score.

In the current analysis, matched patients were divided into three strata based on the propensity score (<0.33 , ≥ 0.33 and <0.67 , ≥ 0.67). We postulated that higher propensity scores would indicate greater symptom severity, which was evaluated by comparing baseline characteristics across strata. Between-group differences in improvement (the treatment effect) in pain, function, and quality of life (KOOS-12 subscales) from baseline to 3- and 12-months were estimated using linear mixed models for repeated measures in each severity strata, adjusting for any unbalanced pre-treatment covariates after matching.

RESULTS:

A total of 522 patients (261 in each treatment group) were included in the matched analysis. The low propensity score strata ($n=170$) had the least medication use (77%) and best pain (mean 52.5), function (mean 56.2) and quality of life (38.2) scores. The mid propensity score strata ($n=245$) had the next lowest medication use (94%) and next best pain (mean 44.0), function (mean 46.0), and quality of life (mean 29.9) scores. The high propensity score strata ($n=107$) used the most medication (97%) and had the worst pain (mean 35.7), function (mean 33.6), and quality of life (mean 20.2) scores. We labeled these strata as low, moderate, and high symptom severity.

The analysis of treatment effects at 12-months revealed statistically significant differences in favour of TKA over EduEx across all three severity strata for pain (low severity: 21.6, 95% CI 16.3 to 26.9; moderate severity: 20.2, 95% CI 15.8 to 24.5; high severity: 29.8, 95% CI 22.2 to 37.3), function (low severity: 18.2, 95% CI 12.7 to 23.8; moderate severity: 20.2, 95% CI 15.5 to 24.9; high severity: 26.7, 95% CI 18.5 to 35.0), and quality of life (low severity: 16.3, 95% CI 10.8 to 21.9; moderate severity: 16.5, 95% CI 11.9 to 21.2; high severity: 24.4, 95% CI 16.5 to 32.3). All estimated treatment effects at 12-months were considered clinically significant.

DISCUSSION AND CONCLUSION:

From this study of well-matched EduEx and TKA knee OA patients, we report a clinically significant effect in favour of TKA over EduEx across all outcomes, regardless of knee OA symptom severity. TKA provided clinically superior outcomes of approximately the same magnitude in patients with low and moderate symptom severity, and of even greater magnitude in patients with the most severe symptoms. These findings challenge previous assumptions that only patients with severe knee OA symptoms should be prioritized for TKA and those with less severe symptoms should be prioritized for non-surgical treatments, while also balancing the impact of other important considerations such as potential harms, costs, and resource availability. As the findings are based on observational data, randomized controlled trials in groups of patients with differing knee OA symptom severity are needed to confirm these results.