

Donor Site Morbidity Following Anterior Cruciate Ligament Reconstruction Using Quadriceps Tendon Versus Bone-Patellar Tendon-Bone Autograft: Results at 2-Year Follow-up

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INTRODUCTION: Bone-patellar tendon-bone (BTB) autograft has historically been regarded as the gold standard graft for anterior cruciate ligament reconstruction (ACLR). However, despite widespread utilization of BTB autografts, multiple complications following BTB harvest have been reported, including anterior knee pain, difficulty kneeling, patellar tendon rupture, patella fracture, tendon contracture, numbness, and weakness. The quadriceps tendon (QT) autograft has been proposed as an alternative graft in young, high demand patients to achieve comparable clinical outcomes while avoiding complications associated with BTB autograft. Recently, a novel 10-question donor site morbidity instrument was developed by Hacken et al that was used to evaluate donor site morbidity (DSM) following ACL reconstruction with BTB autograft. However, to date, the instrument has not been used to evaluate donor site morbidity following QT autograft harvest and comparatively little data have been reported regarding QT donor site morbidity. Therefore, a retrospective comparative evaluation of donor site morbidity following ACL reconstruction with QT versus BTB autograft was performed to evaluate differences between graft types.

METHODS: All patients who underwent ACLR with QT autograft between January 2018 and February 2020 were identified in a single institution registry and matched to a control group of patients who underwent BTB autograft ACLR on the basis of age and sex. Patients with a history of revision ACLR, additional concomitant ligament surgery, cartilage surgery, and knee osteotomy were excluded. Donor site morbidity was assessed using a 10-question donor site morbidity instrument and scores were compared to traditional patient reported outcome measures including the IKDC scores, Marx Activity Rating Scale, and SANE scores. The DSM instrument consists of questions that assess symptom severity and patient dissatisfaction. Each question has four possible answer choices and is scored from 0-10. Cumulative DSM scores were divided into four categories: excellent (> 93.3 points), good (80.0-93.2 points), fair (50.0-79.9 points), and poor (≤ 49.9 points). Post-operative complications including quadriceps tendon rupture, patella fractures, and ACL graft failure were assessed via registry query and chart review. Multivariate analysis was conducted to investigate factors associated with donor site morbidity scores.

RESULTS: Thirty-two QT patients (15 men, 17 women) with a mean age of 23.0 years (range 13-45) were compared to 61 BTB patients (32 men, 29 women) with a mean age of 22.2 (range 13-45) who responded at a minimum 24-months after surgery. Composite DSM scores were rated good or excellent in 26 of 31 QT patients (81%) versus 44 of 61 BTB patients (72%) ($P=0.45$). Statistically significant differences were noted between graft types with respect to presence of numbness, with 37 of 61 BTB patients (61%) versus 10 of 32 QT patients (31%) reporting mild, moderate, or completely diminished sensation to light touch ($P=0.02$). Differences were also noted in kneeling pain, with 30 of 61 BTB patients (49%) versus 6 of 32 QT patients (19%) reporting either mild pain with kneeling or inability to knee on hard surfaces ($P=0.01$). Finally, differences were reported in patient-reported presence of quadriceps wasting and atrophy, with 20 of 32 QT patients (38%) reporting slight, moderate, or severe atrophy versus 15 of 61 BTB patients (25%) ($P=0.01$). However, no statistically significant differences were noted between graft types in pain at donor site, size of numbness, difficulty with stairs, difficulty with prolonged sitting, anterior knee pain, weakness in the knee, or incision cosmetic appearance ($P>0.05$). Multivariate analysis was conducted to investigate factors associated with donor site morbidity scores. Results demonstrated that graft type, sex, body mass index (BMI), operative age, and meniscus integrity were not significantly associated with DSM scores ($P>0.05$). Correlations between traditional patient reported outcome measures and donor site morbidity scoring were analyzed using Pearson ranked and showed statistically significant correlation between the DSM score and IKDC ($P<0.01$), Marx ($P=0.04$), and SANE ($P<0.01$). There were no instances of quad tendon rupture, patella fracture, or ACL graft failure in either group.

DISCUSSION AND CONCLUSION: Donor site morbidity following ACLR with QT and BTB autograft demonstrated good to excellent results in the majority of patients. Significantly more BTB patients experienced numbness at the graft harvest site and pain with kneeling compared to QT autograft patients. However, more patients reported persistent quadriceps atrophy following QT autograft harvest compared to BTB autograft. IKDC, Marx, and SANE scores correlated with DSM scores, suggesting that these instruments may be impacted somewhat by DSM following ACL reconstruction.