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**ABSTRACT TITLE:** Comparison of the Bone-Tendon-Autograft Anterior Cruciate Ligament Reconstruction: A Matched Cohort Analysis to Bone-Tendon-Bone Autograft

### **INTRODUCTION**

While multiple graft options are available for use in anterior cruciate ligament (ACL) reconstruction, bone-tendon-bone (BTB) and hamstring tendon autografts remain the most commonly used autografts. Excellent results have been achieved with BTB ACL reconstruction, however it is not without morbidity. BTB ACLR is associated with increased post-operative anterior knee pain, pain with kneeling, and has the risk of intra and post-operative patella fracture. Additionally, Graft-tunnel mismatch is problematic and often results in a bone plug recession or protrusion from the tibial tunnel, leading to inadequate osseous fixation. Given the disadvantages of the BTB, an alternative to the BTB graft is the Bone-Tendon-Autograft (BTA) based ACL reconstruction which has been developed at this institution. This technique utilizes a single bone plug from the tibial tubercle in order to mitigate the disadvantages of the BTB technique. We hypothesize that anterior cruciate ligament reconstruction with BTA autograft will provide non-inferior clinical results and failure rates when compared to BTB autograft, with a lower incidence of knee pain, patella fracture and pain with kneeling.

### **MATERIALS AND METHODS**

A consecutive series of 52 patients treated with BTA ACL reconstruction between June 2016 and April of 2018 were retrospectively identified. To differentiate this graft from a traditional BTB, we have coined the term "BTA". The middle third of the patellar tendon is used with a typical width of 10-11 mm. A standard tibial tubercle bone plug is harvested. The length of the patellar tendon and graft construct is then measured. If the tendon is >45 mm and the construct at least 70 mm, then we proceed with the BTA technique. At the inferior pole of the patella, electrocautery is used to harvest the tendon from the patella. In the comparison cohort, 50 patients from a comparison age matched cohort of patients who had undergone BTB ACL reconstruction were identified from the same time frame. Patients identified as eligible for the study were contacted and 4 online questionnaires were administered to assess functional outcomes: the Lysholm knee scoring scale, International knee documentation committee scale (IKDC), and a visual analog scale (VAS) for pain, anterior knee pain, kneeling pain, graft integrity, and knee stability. The primary outcome was ACL graft failure requiring revision surgery.

## **RESULTS**

A total of 52 patients with an average age of 27.0 +/- 6.0 years underwent a BTA ACL reconstruction and a matched cohort of 50 patients with an average age of 29.3 +/- 7.1 years underwent a BTB ACL reconstruction during a similar timeframe. At average follow-up of 2.4 years (29.3 months) after surgery, there were two re-ruptures in the BTA cohort (4.0%) compared to two re-ruptures in the BTB cohort (4.0%). In the BTA cohort, 9 (18%) patients reported anterior knee pain compared to 19 in the BTB cohort (38%) which was statistically significant ( $p=0.04$ ). A total of 11 (22%) patients report pain or pressure with kneeling in the BTA cohort. In the BTB cohort, 24 patients (48%) reported pain or pressure with kneeling which was a statistically significant difference ( $p=0.006$ ). There was no statistical difference in SANE, VAS, and Lysholm scores.

## **DISCUSSION**

Our study demonstrates that the Bone-Tendon-Autograft (BTA) anterior cruciate ligament reconstruction leads to similarly low rates of ACL graft failure requiring revision surgery, along with significantly decreased anterior knee pain and kneeling pain when compared to a Bone-Tendon-Bone (BTB) cohort. Additionally, the potential complications of graft-tunnel mismatch are eliminated with the BTA ACLR technique.