

## **A small hamstring graft diameter is a risk factor for failure in ACL reconstructions even when combined with anterolateral extra-articular procedures**

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**INTRODUCTION:** Small graft diameter is a known risk factor for failure in isolated anterior cruciate ligament (ACL) reconstructions using hamstring tendons. However, recent studies suggest that smaller intra-articular grafts, when combined with extra-articular augmentation, may have similar failure rates compared to larger grafts used in isolated reconstructions. This study aims to evaluate whether a small hamstring graft diameter predicts failure or the need for revision in ACL reconstructions combined with anterolateral augmentation.

**METHODS:** Patients who underwent primary ACL reconstruction with a hamstring graft combined with either anterolateral ligament (ALL) reconstruction or lateral extra-articular tenodesis (LET) were retrospectively analyzed. Patients who underwent treatment for meniscal injuries were included. Those who had additional ligament reconstructions beyond the ACL and anterolateral augmentation, procedures for chondral lesion repair, or corrective osteotomies were excluded from the analysis. Demographic, preoperative, intraoperative, and postoperative data were collected, including the presence of knee hyperextension, time from injury to surgery, pre- and postoperative KT-1000 and pivot shift results, graft diameter, meniscal tear and its treatment, postoperative IKDC and Lysholm scores, and the occurrence of graft failure or contralateral ACL tear. Failures were analyzed in relation to each variable using bivariate logistic regressions to quantify the association between these factors and graft rupture. A ROC curve was created to determine the graft diameter cutoff point that best discriminates reconstruction failure.

### **RESULTS:**

A total of 711 patients were included in the analysis, comprising 502 males (70.6%) and 209 females (29.4%), with a mean age of  $29.6 \pm 7.8$  years and a mean follow-up of  $39.1 \pm 11.2$  months. Of these, 687 patients (96.6%) underwent ALL reconstruction and 24 (3.4%) underwent LET. Failure occurred in 32 patients (4.5%). Regarding the intra-articular graft diameter, 35 patients (4.9%) had a 6 mm graft, 150 (21.1%) had 7 mm, 324 (45.6%) had 8 mm, 183 (25.7%) had 9 mm, and 19 patients (2.7%) had a 10 mm graft diameter. In total, 185 cases (26%) had grafts < 8 mm, and 526 cases (74%) had grafts  $\geq$  8 mm. In the bivariate logistic regression model, intra-articular graft diameter was the only pre- or intraoperative variable significantly associated with failure. Failure rates varied significantly by graft size: 8.6% for 6 mm, 10% for 7 mm, 1.9% for 8 mm, 3.8% for 9 mm, and 5.3% for 10 mm grafts ( $p = 0.012$ ). The overall failure rate was significantly higher for grafts <8 mm compared to those  $\geq$ 8 mm (9.7% vs. 2.7%,  $p < 0.001$ ). Patients with grafts  $\geq$ 8 mm had a 75% lower risk of failure than those with smaller grafts. Receiver operating characteristic (ROC) curve analysis identified an optimal cutoff value of 7.5 mm for predicting graft failure—corresponding to  $\geq$ 8 mm—with an area under the curve (AUC) of 0.624, sensitivity of 56.2%, and specificity of 75.4%.

### **DISCUSSION AND CONCLUSION:**

Despite the protective effect of extra-articular augmentation in reducing the risk of ACL reconstruction failure, the intra-articular diameter of the hamstring graft remains a strong predictor of success, even when combined with a lateral extra-articular procedure.