

Increased posterior tibial slope and varus are associated with a higher risk of failure following primary Anterior Cruciate Ligament reconstruction: A retrospective cohort study of 3347 patients

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INTRODUCTION:

Despite favorable clinical outcomes, the risk of revision surgery following Anterior Cruciate Ligament reconstruction (ACLR) remains high (4.1 to 13%). An increased posterior tibial slope (PTS) has been identified as an independent risk factor associated with graft re-rupture. Knee varus has also been associated with altered joint biomechanics and ACLR revision. However, the isolated effect of an increased PTS or knee varus on the risk of revision for graft failure is still ill-defined and not unanimously agreed upon. The main objective of this study was to determine if an increased PTS is independently associated with an increased risk of revision following primary ACLR. The secondary objective was to determine if knee varus is also associated with revision surgery.

METHODS:

Retrospective cohort study of all adult patients that underwent primary ACL reconstruction in three academic centers from January 1st 2010 to January 1st 2020. The main outcome was defined as revision surgery for graft re-rupture or laxity following primary ACLR. All radiological measurements were made on lateral and antero-posterior knee radiographs. The PTS was defined as the angle between a line parallel to the mid-diaphysis of the tibia and the tibial plateau on a lateral knee radiograph (measures were standardized). Coronal alignment was defined by the medial proximal tibial angle (mPTA), the joint line obliquity (JLO) and the joint line convergence angle (JLCA). Bivariate and multivariate analyses (logistic regression model) were performed.

RESULTS: The cohort included 3347 patients aged 30 ± 11 years old in average. 3118 (97%) patients received a hamstring autograft. 311 patients (9.3%) required revision surgery. The main causes for revision surgery were traumatic re-rupture (65%) and postoperative laxity (24%). Patients in the revision group had an increased PTS when compared to patients undergoing primary ACLR (10.1 ± 3.1 versus 8.7 ± 3.1 degrees, $p=0.0001$, $N=1814$). Patients in the revision group presented with a PTS > 12 more frequently than patients undergoing primary ACLR (28% vs 13%, $p=0.0001$, $N=1814$). When controlling for age, sex, smoking status, chondropathy, meniscal tear and graft type, a posterior tibial slope > 12 significantly increased the risk of revision surgery (odds ratio, 5.3 [3.1-9.2]). Patients in the revision group also presented with a mPTA < 84 degrees (varus) more frequently than patients undergoing primary ACLR (15% versus 9%, $p=0.01$, $N=1814$). There was no difference between both groups with regards to JLO and JLCA ($p \geq 0.05$).

DISCUSSION AND CONCLUSION:

An increased PTS > 12 degrees is independently associated with a higher risk of revision surgery for graft re-rupture or postoperative laxity. Varus malalignment (mPTA < 84 degrees) is also associated with revision. Future research should focus on the management of the PTS and varus in patients at high risk of failure following ACLR.