Delta angle is a more important risk factor than isolated medial or lateral posterior tibial slopes for ACL re-ruptures: a regression analysis of 1174 patients

Siddarth Raj¹, Atif Ayuob¹, Jonathan Jessup¹, Henry Kelvin Christopher Searle¹, Imran Ahmed¹, Feisal Ali Shah², Peter JM Thompson¹, Andrew John Metcalfe¹, Nick Smith¹

¹Department of Trauma & Orthopaedics, ²University Hospitals Coventry & Warwickshire NHS Trust

INTRODUCTION:

An increased posterior tibial slope (PTS) has been identified as a risk factor for primary anterior cruciate ligament (ACL) rupture and ACL reconstruction (ACLR) failure. The aim of this study was to assess the relationship between ACLR failure and: the medial posterior tibial slope (MPTS); the lateral posterior tibial slope (LPTS); and the delta angle (difference between LPTS and MPTS).

METHODS:

All patients who underwent ACLR between 01/01/2007 and 31/12/2018 at our institution with baseline orthogonal knee radiographs were eligible for inclusion. Patients with previous slope- or varus/valgus-correction osteotomy/osteotomies, multi-ligament injuries and intra-articular knee fractures were excluded. Two independent authors measured MPTS and LPTS using an established method, and inter-user agreement was calculated for validation. Baseline demographic data were extracted from electronic patient records. Multiple logistic regression models were used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) to determine the correlation between the exposures of interest and ACLR failure.

RESULTS:

Overall, 1,405 patients were included with 1,207 primary ACLRs (269 female, 938 male; mean age 28.61) and 198 revision ACLRs (40 female, 158 male; mean age 25.45). In the primary ACLR group, the mean MPTS was 5.26°, LPTS 9.27° and delta 3.03°. In the revision ACLR group, the mean MPTS was 3.63°, LPTS 9.72° and delta 6.14°. Logistic regression analysis revealed the delta angle was associated with ACLR failure (OR 1.75, 95% CI 1.58-1.95; p<0.001). Lower MPTS (OR 0.59, 95% CI 0.53-0.65; p<0.001) and higher LPTS (OR 1.81, 95% CI 1.61-2.06; p<0.001) were also independent predictors of ACLR failure.

DISCUSSION AND CONCLUSION:

Unlike previous studies, this study identified low MPTS and high LPTS as factors associated with ACLR failure. A high delta angle, which may create an internal rotation force, appears to be the driving force associated with ACLR failure.