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Decreased Posterior Tibial Slope Does Not Impact Postoperative Posterior Knee Laxity after Double-Bundle Posterior Cruciate Ligament Reconstruction

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Summary:
This study found that a decreased posterior tibial slope was not associated with increased PCLR graft laxity. This implies that PCL stability can reliably be achieved in patients following DB PCLR despite having a less than average amount of posterior tibial slope (< 6°) preoperatively.

Abstract:

Background

Recent clinical studies have identified sagittal plane posterior tibial slope as a risk factor for increased postoperative laxity after single-bundle (SB) posterior cruciate ligament reconstruction (PCLR). However, the effect of tibial slope and its role in graft laxity following double-bundle (DB) PCLR has not been investigated clinically.

Purpose/Hypothesis: The purpose of this study was to retrospectively compare the degree of posterior tibial slope and its impact on posterior tibial translation (PTT) after DB PCLR. It was hypothesized that preoperative tibial slope would not be associated with graft laxity following DB PCLR.

Methods

Patients who underwent primary DB PCLR without ACL injury between 2010 and 2017 by a single surgeon were retrospectively analyzed. Measurements of posterior tibial slope were performed using the lateral radiograph and PTT was measured using kneeling PCL stress radiographs, preoperatively and at a minimum of 1-year postoperatively. Linear regression was used to assess the relationship between native posterior tibial slope and postoperative graft laxity, determined by PCL stress radiographs.

Results

One hundred three patients with PCL tears and subsequent DB PCL reconstructions were included. Ninety (87.4%) patients reported a contact mechanism at time of injury, while 13 (12.6%) patients reported a noncontact injury mechanism. Sixty-four (62.1%) patients had combined extra-articular ligament injuries that were concurrently reconstructed with the PCL tear, while isolated PCL tears were identified in 39 (37.9%) patients. Forty-nine (47.6%) patients had an acute (< 6 weeks) injury, 54 (52.4%) patients had a chronic (> 6 weeks) injury at time of imaging and evaluation. Four (4%) patients demonstrated failed PCLRs, as defined by SSD in PTT = 8 mm on PCL stress

radiographs. The mean posterior tibial slope for all PCL injured patients was 5.9°+/- 2.2°. There was a significant reduction in the amount of mean SSD in PTT between preoperative (10.6 +/- 2.7 mm) and postoperative (1.5 +/- 2.6) PCL stress radiographs following DB PCLR (95% CI [8.4, 9.8], $p < 0.001$). Linear regression analysis revealed no significant correlation between preoperative posterior tibial slope and the amount of SSD in PTT on postoperative stress radiographs obtained at a mean 18.5 months postoperatively ($R = -0.115$, $p = 0.249$). Similarly, when adjusting for combined ligamentous injury, injury chronicity, mechanism of injury, BMI, and age at surgery via multiple linear regression, preoperative tibial slope was not a significant independent predictor of postoperative SSD in PTT (beta = -0.079, 95% CI [-0.308, 0.150], $p = 0.496$). Combined injury (beta = -1.01, 95% CI [-2.00, -0.01], $p = 0.047$) was a significant independent predictor of decreased postoperative SSD in PTT on posterior stress radiographs.

Conclusion

Graft laxity, determined by PTT in posterior kneeling stress radiographs, was not influenced by decreased posterior tibial slope in patients following DB PCLRs. With further blinded-comparison studies required to corroborate these findings, the current recommendation for DB PCLR is reinforced by the lack of a decreased degree of tibial slope's impact on graft laxity compared to its negative effect on SB PCLRs.