



Increased Failure Risk of Revision Anterior Cruciate Ligament Reconstruction with Unaddressed Posterior Tibial Slope

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Disclosures

- David Flanigan, MD is a consultant for and receives research support from Vericel, Zimmer, and Smith & Nephew; is a consultant for ConMed-MTF and DePuy Mitek; and receives research support from MTF, Histogenics, Aesculap, Cartiheal, Anika Therapeutics, and Moximed
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Introduction

- Increased posterior tibial slope (PTS) is a common finding among patients who undergo multiple ACLR¹
- Increased PTS is associated with increased risk of graft rupture after revision ACLR²
- Patients who undergo multiple ACLR were associated with statistically significantly higher PTS than patients with single ACL graft failure³

Purpose

- To assess whether there are differences in cause of failure between primary and multiple revision ACLR
- We hypothesized that patients who failed a revision ACLR would have a higher incidence of excessive PTS and a lower incidence of technical error

Materials and Methods

- Retrospective chart review identified 383 revision ACLR patients between 2009 and 2024
 - 306 met inclusion criteria
- Lateral knee radiographs to assess femoral and tibial tunnel placement and PTS. Excessive PTS was considered as a slope of $\geq 12^{\circ}$ ⁴⁻⁶



PR-ACLR Group	MR-ACLR Group
<ul style="list-style-type: none">• Patients who underwent primary revision ACLR	<ul style="list-style-type: none">• Patients who underwent multiple revision ACLR



<div>TABLE 1</div> <div>Baseline Characteristics</div>				
	All (n = 306)	PR-ACLR Group (n = 245)	MR-ACLR Group (n = 61)	p-value*
Male gender (N (%))	187 (61%)	154 (63%)	33 (54%)	0.207
Age (years; mean ± SD)	26.3 ± 9.5	25.7 ± 9.5	28.5 ± 9.5	0.040
BMI (kg/m²; mean ± SD)	27.5 ± 6.3	27.2 ± 6.1	28.6 ± 7.0	0.149
Delay (months; mean ± SD)	7.58 ± 16	6.53 ± 15	11.8 ± 21	0.073
<u>Activity at the time of injury:</u>				
Sports (N (%))	147 (48%)	120 (49%)	120 (49%)	0.509
Recreational (N (%))	38 (12%)	38 (12%)	5 (8%)	0.264
ADLs (N (%))	40 (13%)	27 (11%)	13 (21%)	0.033
Other (N (%))	81 (26%)	65 (27%)	16 (26%)	0.962
* For continuous variables, independent t-test is performed, while for nominal variables Chi-square tests or Fishers’s exact tests were used.				

<div>TABLE 2</div> <div>Posterior Tibial Slope and Graft Present at Failure</div>				
	All (n = 306)	PR-ACLR Group (n = 245)	MR-ACLR Group (n = 61)	p-value*
Elevated PTS (≥12°)	135 (44%)	94 (38%)	41 (67%)	<0.001
PTS (degrees; mean ± SD)	11.0 ± 2.8°	10.7 ± 2.8°	12.2 ± 2.6	<0.001
Autograft (N (%))	185 (60%)	161 (66%)	24 (39%)	<0.001
Allograft (N (%))	70 (23%)	41 (17%)	29 (48%)	<0.001
Hybrid (N (%))	16 (5%)	11 (4%)	5 (8%)	0.245
Unknown (N (%))	35 (11%)	32 (13%)	3 (5%)	0.074
* For continuous variables, independent t-test is performed, while for nominal variables Chi-square tests or Fishers’s exact tests were used. PTS indicated posterior tibial slope.				

<div>TABLE 3</div> <div>Contributing Factors to ACL Graft Failure</div>				
	All (n = 306)	PR-ACLR Group (n = 245)	MR-ACLR Group (n = 61)	p-value*
Technical Error*	184 (60%)	166 (68%)	18 (30%)	<0.001
Femoral Tunnel	167 (55%)	151 (62%)	16 (26%)	<0.001
Tibial Tunnel	85 (28%)	79 (32%)	6 (10%)	<0.001
Missed Pathology	2 (1%)	2 (1%)	0 (0%)	1.0
Repeat Trauma	250 (82%)	200 (82%)	50 (82%)	1.0
Biologic Failure	10 (3%)	5 (2%)	5 (8%)	0.03
* For continuous variables, independent t-test is performed, while for nominal variables Chi-square tests or Fishers’s exact tests were used. Patients may have more than one technical error.				

Discussion and Conclusions

- Patients undergoing multiple revisions had a higher incidence of excessive posterior tibial slope.
- Higher incidence of excessive PTS with risk of revision failure is consistent with prior literature.¹⁻³
- An elevated PTS may create a cycle of increased strain on the ACL, leading to recurrent ACL injuries, and should be addressed surgically.
- Patients undergoing primary revision were more likely to have technical errors contributing to failure.

Limitations

- Selection bias and potential bias in data collection may have affected the results.
- Some patients in the MR-ACLR group underwent a two-stage revision ACLR.
 - We chose to include these patients in our study to limit the risk for selection bias.
- The descriptive nature of this study means that many factors were left to the discretion of the surgeon and research team.
 - Posterior tibial slope, mechanism of failure, etc.

Future Directions

- Larger sample size to:
 1. Control for potential confounding variables
 2. Confirm the association between increased failure risk of revision ACLR and excessive PTS

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