Predictors of Radiographic Osteoarthritis 2-3 Years after ACL Reconstruction: Data from MOON Onsite Nested Cohort

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Objectives: Multiple studies have shown patients are susceptible to post-traumatic osteoarthritis (PTOA) after anterior cruciate ligament (ACL) injury even with ACL reconstruction (ACLR). Prospective studies using multivariate analysis to identify risk factors for PTOA are lacking. This study aims to identify baseline predictors of radiographic PT OA after ACLR at an early time point and hypothesizes that meniscal injury and cartilage lesions will be associated with worse radiographic OA using the Osteoarthritis Research Society International (OARSI) atlas criteria.

Methods: 421 patients who underwent ACLR returned onsite for standardized posteroanterior metatarsophalangeal radiographs a minimum of 2 years after surgery. At baseline, demographics, graft type, meniscal status/treatment, and cartilage status were collected. OARSI atlas criteria were used to grade all knee radiographs. Multivariable ordinal regression models identified baseline predictors of radiographic OARSI grades at follow-up.

Results: The mean age was 19.8 years with 51.3% females. Higher age (odds ratio (OR) 1.06) and BMI (OR 1.05) were statistically significantly associated with higher OARSI grade in the medial compartment. Patients with a meniscal repair and a partial meniscectomy had statistically significantly higher OARSI grades in the medial compartment (meniscal repair OR 1.92 and meniscectomy OR 2.11) and in the lateral compartment (meniscal repair OR 1.96 and meniscectomy OR 2.97). Graft type, cartilage lesion, sex, and Marx activity scales had no significant association with OARSI grade.

Conclusion: Older patients with a higher BMI who have an ACL tear with concurrent meniscal tear requiring partial meniscectomy or meniscal repair should be advised of their increased risk of developing radiographic OA. Alternatively, patients with an ACL tear with an articular cartilage lesion can be reassured that they are not at increased risk of developing radiographic knee OA at 2-3 years following ACLR.

Predictor	Outcome					
	Lateral Compartment		Medial Compartment		Total Knee Score	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Sex						
Female	-	-	-	-	-	-
Male	1.29 (0.89,1.87)	0.182	1.23 (0.86,1.76)	0.259	1.26 (0.87,1.83)	0.221
Age	0.98 (0.94,1.02)	0.293	1.06 (1.02,1.10)	**0.006**	1.02 (0.98,1.06)	0.435
BMI	1.02 (0.97,1.07)	0.488	1.05 (1.00,1.10)	0.048	1.04 (0.99,1.09)	0.111
Marx Activity Rating Scale	0.99 (0.95,1.04)	0.742	1.02 (0.98,1.07)	0.377	1.01 (0.96,1.06)	0.787
Graft		0.637[a]		0.887[a]		0.820[a]
BPTB autograft	-	-	-	-	-	-
Hamstring autograft	1.15 (0.79,1.66)	0.458	0.93 (0.64,1.35)	0.717	1.08 (0.74,1.58)	0.678
Allograft	1.33 (0.61,2.90)	0.476	1.11 (0.51,2.41)	0.791	1.25 (0.56,2.80)	0.589
Lateral Cartilage Status						
Grade 1	-	-			-	-
Grade 2-4	0.85 (0.50,1.45)	0.559			1.47 (0.85,2.55)	0.171
Lateral Meniscus		<0.001[a]				0.002[a]
No tear	-	-			-	-
Meniscal repair	1.96 (1.00,3.83)	0.049			1.32 (0.66,2.66)	0.430
Partial meniscectomy	2.97 (1.95,4.54)	<0.001			2.21 (1.46,3.34)	<0.001
Untreated tear	1.10 (0.68,1.79)	0.690			1.05 (0.64,1.72)	0.844
Medial Cartilage Status						
Grade 1			-	-	-	-
Grade 2-4			1.56 (0.81,2.98)	0.181	1.01 (0.52,1.96)	0.985
Medial Meniscus				0.006[a]		0.020[a]
No tear			-	-	-	-
Meniscal repair			1.92 (1.23,3.01)	**0.004**	1.83 (1.17,2.87)	**0.008**
Partial meniscectomy			2.11 (1.13,3.93)	**0.019**	1.72 (0.91,3.24)	0.094
Untreated tear			0.91 (0.50,1.68)	0.773	0.85 (0.47,1.53)	0.582

[a] p-values from a likelihood ratio test are shown for factors with >2 levels
Bold indicates the value is statistically significant with p<0.05
BPTB – Bone patellar tendon bone
OR – Odds ratio
CI – Confidence interval