Your Patella Dislocated: Will it Happen Again? An Assessment of MRI Criteria for Recurrent Patella Dislocation After an Initial Event

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INTRODUCTION: Identifying anatomic risk factors for recurrent patella dislocations would help guide clinical decision-making and counseling for first-time dislocators. Many risk factors have been identified that increase the likelihood of patella instability, but little is known about risk stratification for recurrence of dislocation in individuals after a sentinel event. The purpose of this study is to determine if there are statistically significant differences in magnetic resonance imaging (MRI) measurements of patella instability (PI) in patients with a confirmed single dislocation versus those with multiple dislocations.

METHODS: We conducted a retrospective cohort study of patients between ages 9 and 25 at a tertiary care center (2012-2023). Patients with prior surgery in the affected knee were excluded. Our recurrent cohort included patients with multiple prior dislocations and the non-recurrent cohort included patients with only one dislocation (without recurrence). All patients with a single dislocation were contacted by phone at final follow-up to confirm their status. Demographics and several (MRI) measurements, including tibial tubercle to proximal trochlear groove (pTT-TG), Caton-Deschamps index (CDI), relative tibial external rotation (rTER), and patella tilt (PT) were collected. We also recorded the following measurements on proximal, cartilaginous surfaces to assess trochlear dysplasia: two-image lateral trochlea inclination angle (LTI), sulcus angle (SA), trochlear depth (TD). Statistical analyses included Mann-Whitney U test and independent t-test with significance set as 0.05. We conducted receiver operating characteristic curves to assess the clinical utility of these anatomical risk factors.

RESULTS: In total, 181 patients (105 females, 76 males) were included in analyses. 111 belonged to the recurrent cohort and 70 were in the non-recurrent cohort. Overall recurrence rate was 61.33% and was significantly associated with greater patella alta (CDI), PT, SA, and lower TD. LTI, pTT-TG, and rTER were not significantly different in recurrent and non-recurrent dislocators. Please see table 1. ROC curve shows that the combination of increased SA and patella alta (CDI) is associated with a 72% likelihood of recurrence (Figure 1). The area under the curves for SA, TD, and CDI individually were not clinically significant (AUC<.7).

DISCUSSION AND CONCLUSION: Patella alta (CDI), patella tilt, sulcus angle and trochlear depth, especially at proximal axial cuts, may be the most important anatomical risk factors for recurrent patella dislocation. pTT-TG, rTER and LTI were not predictive for recurrence. There is a lack of consistent literature reporting on anatomical risk factor differences between patients who experience recurrent versus single patella dislocations. Subsequent analyses should be directed towards establishing a predictive model for recurrent patella dislocation.

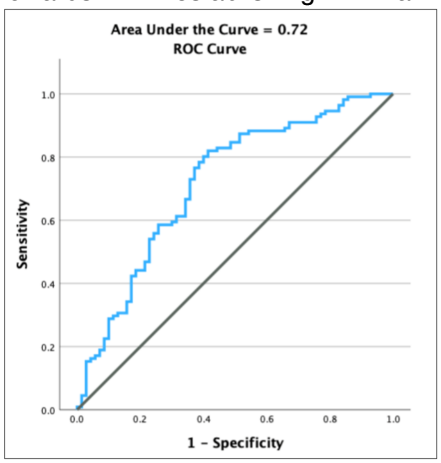

Figure 1: ROC curve depicting the AUC=0.72 for a regression model of patients with both patella alta (based on CD) and increased sulcus angle.

Table 1: Independent Samples T-tests and Mann Whitney U-tests assessing differences in sample means between recurrent and non-recurrent cohorts. Normal distributed variables were reported as mean and standard deviation. Non-normal distributed variables were reported as median and IQR.

	Not recurrent (n=70)	Recurrent (n=111)	P value
Age	14.8(±2.7)	15.3(±2.6)	0.26
pTT-TG (c)	16.5(±5.0)	17.6(±4.6)	0.12
rTER	6.1 (2.8, 8.5)	5.5(2.5, 8.3)	0.55
LTI (c)	11.5 (6.9, 17.4)	11.3 (7.6, 15.2)	0.66
Sulcus Angle (c)	156.6 (148.65, 167.9)	166.6 (160.4, 171.8)	**<0.001**
Trochlear Depth (c)	1.7 (0.9, 2.8)	1.2 (0.7, 1.7)	**<0.001**
Caton-Deschamps (CD)	1.3 (± 0.2)	1.4 ± 0.2	**0.03**
Patella tilt (PT)	17.75 (±9.5)	22.66 (±9.7)	**.001**

pTT-TG (C): proximal tibia tubercle trochlear groove cartilaginous
rTER : relative tibia external rotation
LTI (C): lateral trochlea inclination
Normal distributed variables were reported as mean and standard deviation.
Not normal distributed variables were reported as median and IQR.