

# **Nonsurgical Management of First-Time Patellar Dislocation in the Pediatric Population: Risk of Recurrence and Functional Outcomes**

Eric Daniel Fornari<sup>1</sup>, Soroush Baghdadi, Alexandria Debasitis, Kathryn R Segal, Leila Mehraban Alvandi

<sup>1</sup>Children's Hosp Montefiore Medical Center

## **INTRODUCTION:**

Patellar instability is one of the most common injuries among active children and adolescents. There has recently been some controversy regarding the initial treatment of non-complicated first-time patellar dislocation. The purpose of this study was to 1) determine the incidence of recurrence and its risk factors among a cohort of pediatric patients treated nonsurgically for a first-time patellar dislocation, and to 2) report the functional outcomes of nonsurgical management.

## **METHODS:**

In a retrospective, single-center cohort study, patients <18 years old who presented with a first-time patellar dislocation were included. Patients who were treated surgically, as well as patients with no follow up were excluded. In addition to clinical characteristics, x-rays and MRIs were reviewed and measures of patellar height, trochlear and patellar dysplasia, and patellar lateralization were measured by two raters. All recurrent patellar instability/dislocation episodes were extracted, and statistical analysis was performed to determine the risk factors for recurrence. Next, patients who had > 1 year of follow up and had patient-reported outcome measures (PROMs) including the Lysholm score, Pedi-IKDC, and KOOS-Child available were selected to determine the changes of functional outcomes with time.

## **RESULTS:**

A total of 176 knees in 158 patients (56 male, 102 female) satisfied our inclusion criteria. The mean age at the time of first dislocation was  $14.0 \pm 2.5$  years (range, 8 – 17.9 years). The incidence of contralateral patellar instability was 11.4% (18 out of 158 patients). Patients were followed for a mean of  $16.4 \pm 17.1$  months after their first instability episode. In total, 102 knees (58%) had trochlear dysplasia. A total of 72 knees experienced recurrent patellar instability during the follow up period, translating to a recurrence rate of 40.9%. Table 1 summarizes the univariate comparisons between the recurrence and no recurrence groups. On a multivariate binary logistic regression model, trochlear dysplasia (OR: 4.53, 95%CI: 1.61 – 12.7, P=0.004), Patella alta as defined by CD index >1.3 (OR: 4.27, 95%CI: 1.76 – 10.3, P=0.001), and TT-TG > 15mm (OR: 2.49, 95%CI: 1.3 – 6.03) were significant risk factors for recurrence after nonsurgical management of a first-time patellar dislocation.

As shown in Table 2, the recurrence and no recurrence groups were similar in all PROMs at the initial visit. Compared to the initial visit, the Lysholm score, Pedi-IKDC, KOOS-Child pain, and KOOS-Child QoL improved significantly at the final follow up. Additionally, patients in the recurrence and no recurrence groups showed a similar improvement in all PROMs, except for the KOOS-Child Sports score, which was significantly higher at the time of final follow up in the no recurrence group compared to the recurrence group.

**DISCUSSION AND CONCLUSION:** We found a 41% recurrence rate in first-time patellar dislocators treated nonsurgically, with trochlear dysplasia, patella alta, and TT-TG >15 being the most important risk factors for recurrence. However, our findings also suggest that all children and adolescents will experience significant improvement in their PROMs after nonsurgical treatment of a first-time patellar dislocation. Interestingly, we found similar improvements regardless of the recurrence status, except for the KOOS-Child Sports and Play subscale, which was significantly lower in patients who had recurrence. The findings of this study suggest that despite the relatively high risk of recurrence, nonsurgical treatment of a first-time patellar dislocation is still a viable option with excellent functional outcomes. The results of this study are important in counseling patients and families regarding their long-term recurrence risk and functional outcomes, and will help in the shared decision-making process in pediatric first-time patellar dislocation.

	Recurrence (n=72)	No recurrence (n=104)	P value
History of contralateral instability	10	8	0.18
Male sex	27	35	0.59
BMI	25.5 ± 6.5	24.6 ± 6.5	0.41
Age	14.1 ± 2.5	14.0 ± 2.4	0.84
X-ray measurements			
<b>Trochlear dysplasia</b>	<b>58</b>	<b>44</b>	<b>&lt;0.001</b>
Dejour type	A:11, B:15, C:20, D:12	A:8, B:14, C:16, D:6	0.78
<b>Insall-Salvati</b>	<b>1.53 ± 0.27</b>	<b>1.39 ± 0.22</b>	<b>0.03</b>
<b>Blackburne-Peel</b>	<b>1.23 ± 0.28</b>	<b>1.08 ± 0.23</b>	<b>0.02</b>
<b>Caton-Deschamps</b>	<b>1.35 ± 0.30</b>	<b>1.24 ± 0.21</b>	<b>0.02</b>
Sulcus angle	128 ± 12.5	130 ± 10.8	0.47
Wiberg	A:13, B:23, C: 4	A:14, B:21, C: 4	0.94
Patellar tilt	14.1 ± 7.3	12.8 ± 7.1	0.47
Trochlear depth	6.5 ± 2.0	7.1 ± 1.9	0.14
MRI measurements			
<b>Insall-Salvati</b>	<b>1.52 ± 0.22</b>	<b>1.42 ± 0.14</b>	<b>0.004</b>
<b>Blackburne-Peel</b>	<b>1.18 ± 0.20</b>	<b>1.10 ± 0.16</b>	<b>0.02</b>
<b>Caton-Deschamps</b>	<b>1.42 ± 0.22</b>	<b>1.23 ± 0.15</b>	<b>&lt;0.001</b>
<b>Sulcus angle</b>	<b>153 ± 8.7</b>	<b>150 ± 10.0</b>	<b>0.04</b>
Wiberg	A:18, B: 36, C:6	A:15, B:28, C:7	0.80
Patellar tilt	17.2 ± 10.8	16.3 ± 9.1	0.63
<b>Trochlear depth</b>	<b>3.38 ± 1.42</b>	<b>4.33 ± 1.65</b>	<b>0.01</b>
<b>TT-TG</b>	<b>16.76 ± 3.76</b>	<b>13.30 ± 2.71</b>	<b>&lt;0.001</b>

**Table 1.** Univariate comparisons between the recurrence and no recurrence groups. Significant comparisons are indicated in bold. BMI: body mass index, TT-TG: tibial tubercle – trochlear groove distance.

	All knees (n=80)	Recurrence (n=57)	No recurrence (n=23)	P value
Lysholm score				
Initial visit	64.6 ± 25.6	64.3 ± 22.8	62.8 ± 32.5	0.74
Final follow-up	80.4 ± 16.6	81.4 ± 18.5	77.9 ± 10.4	0.57
P value	<b>0.008</b>	<b>0.007</b>	<b>0.03</b>	
Pedi-IKDC				
Initial visit	55.8 ± 21.3	56.8 ± 20.3	52.7 ± 24.6	0.52
Final follow-up	70.4 ± 20.8	72.6 ± 21.5	64.7 ± 18.6	0.31
P value	<b>0.002</b>	<b>0.01</b>	<b>0.04</b>	
KOOS-Child symptoms				
Initial visit	68.0 ± 22.3	70.1 ± 21.0	61.2 ± 25.6	0.21
Final follow-up	81.9 ± 14.9	82.2 ± 15.8	81.0 ± 12.1	0.84
P value	0.19	0.24	0.59	
KOOS-Child pain				
Initial visit	62.9 ± 27.2	63.7 ± 26.6	60.1 ± 30.3	0.68
Final follow-up	82.3 ± 16.4	82.4 ± 17.6	81.8 ± 12.4	0.92
P value	<b>0.009</b>	<b>0.02</b>	0.08	
KOOS-Child ADL				
Initial visit	70.7 ± 27.5	69.4 ± 27.7	74.7 ± 27.7	0.55
Final follow-up	89.9 ± 12.4	90.2 ± 13.6	88.6 ± 7.2	0.75
P value	0.48	0.54	0.57	
KOOS-Child Sports				
Initial visit	42.5 ± 33.7	43.4 ± 32.3	39.1 ± 39.7	0.70
Final follow-up	67.1 ± 26.0	63.9 ± 28.9	77.2 ± 8.1	0.04
P value	0.12	0.11	0.68	
KOOS-Child QoL				
Initial visit	39.2 ± 24.3	39.3 ± 23.7	38.8 ± 27.1	0.94
Final follow-up	57.3 ± 23.3	57.9 ± 25.6	55.3 ± 14.2	0.78
P value	<b>0.01</b>	<b>0.01</b>	0.56	

**Table 2.** Patient-reported outcome measures, compared between the recurrence and no recurrence groups horizontally, and between the initial visit and latest follow-up vertically. Significant comparisons are indicated in bold. Pedi-IKDC: Pediatric – international knee documentation committee score, KOOS-Child: Knee injury and osteoarthritis outcome score for children, ADL: activities of daily living, QoL: quality of life.