## Osteochondral Fractures in Adolescent First-Time Patellar Dislocation: Three-dimensional Characterization and Association with Radiographic Features

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INTRODUCTION:

Consequences of osteochondral fractures associated with patellar dislocation can be severe for younger patients. Precise three-dimensional characterization of fracture location, size, frequency, and radiographic associations remain undefined in this population. The purpose was (1) to define the topographical characteristics of osteochondral fractures in pediatric and adolescent first-time patellar dislocaters and (2) determine relationship to radiographic and patient factors. METHODS:

A retrospective observational study was conducted between 2015-2023 of consecutive patients under 18 years of age undergoing surgical intervention for displaced osteochondral fractures in the setting of first-time patellar dislocations. Three-dimensional location and relative injury frequency was quantified with heat map analysis. Subgroup analysis of intraoperative osteochondral fracture size and location was conducted using chi-square testing and independent t-test at an alpha of 0.05.

**RESULTS:** 

anterior-posterior length were plotted using as

reference point.

The study cohort included 82 knees (80 patients), with first-time patellar dislocation and osteochondral fractures. A total of 97 osteochondral fractures were identified with the lateral femur as the most common fracture site at 55% (n = 53), compared to 43% (n = 42) patella and 2% (n = 2) lateral trochlea fractures. Patellar osteochondral fractures were significantly larger than femoral lesions (258  $\pm$  168 mm<sup>2</sup> versus 126  $\pm$  109 mm<sup>2</sup>, p <.001) and more amenable to fixation than femoral osteochondral fractures [fixation in 57.1%, n = 24 vs. 15.1% (n=8), p<0.001]. Patella and femoral osteochondral fractures were larger than 100mm<sup>2</sup> in 78.6% (n = 33) and 32.1% (n = 17) of lesions respectively. Patella mean fracture size was significantly larger in TT-TG <20mm group (p= 0.018). LFC mean osteochondral fracture size was significantly larger in open physis compared to the closed physis group (p =.027). **DISCUSSION AND CONCLUSION:** 

We found that the most common site for osteochondral fracture was the femur, although patellar osteochondral fractures are significantly larger. Factors that affect anatomic structure and ligamentous laxity, appear to contribute to patterns of osteochondral fractures.

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M75	Table 1 Patient Demographics.	Table 1 Patient Demographics.		OCF Rate		australC	OC?		F Size	
PATELLA	Total Knees	N = 82	N = 95	LFC OCF Rate n (%)	Patella OCF Rate n (%)	p- value	LFC Size Mean ± SD mm <sup>2</sup>	p- value	Patella Size Mean ± SD mm <sup>2</sup>	p- value
	Age (Years); Mean $\pm$ SD Years	$14.5\pm1.83$	Skeletal Maturity (n) - Open Physis (61) - Closed Physis (34)	38 (62.3) 15 (44.1)	23 (37.7) 19 (55.9)	0.08	142 ± 123 87 ± 51	0.027*	283 ± 191 231 ± 141	0.34
	Sex; $n(\%)$ · Male	49 (59.8)	Sex (n) - Female (37) - Male (58)	20 (54.1) 33 (57.9)	17 (45.9) 25 (43.1)	0.78	$121 \pm 104 \\ 129 \pm 114$	0.79	$213 \pm 160$ $289 \pm 171$	0.17
	• Female	33 (40.2)	TT-TG Distance (n) - >15mm (58) - <15mm (37)	30 (51.7) 23 (62.2)	28 (48.3) 14 (37.8)	0.31	120 ± 96 135 ± 127	0.63	224 ± 161 322 ± 71	0.089
↓ DISTAL	BMI (kg/m <sup>2</sup> ); Mean $\pm$ SD kg/m <sup>2</sup>	$24.8 \pm 6.4$	>20mm (17) <20mm (78) Potella Haider	8 (47.1) 45 (57.7)	9 (52.9) 33 (42.3)	0.42	105 ± 46 130 ± 117	0.31	150 ± 101 283 ± 177	0.018*
- 47.	• White non-Hispanic	66 (80.5)	- ISI>1.2 - ISI<1.2	38 (54.2) 15 (60) 30 (55.6)	32 (45.8) 10 (40) 24 (44.4)	0.62	114 ± 93 122 ± 108	0.74	231 ± 169 253 ± 187 260 ± 167	0.50
FEMUR 200 ANTERSOR	African American	13(15.8)	CDI <1.3     Lateral Inclination Angle (n)	23 (56.1)	18 (43.9)	0.55	116±95	0.12	$213 \pm 175$ 211 + 208	0.36
Jourspace	• Asian	3 (3.7)	<ul> <li>&lt;11 (24)</li> <li>&gt;11° (71)</li> <li>Sulcus Angle (n)</li> </ul>	40 (56.3)	31 (43.7)		136 ± 120		276 ± 151	
	Laterality; n (%)	47 (57 3)	<ul> <li>&gt;145° (37)</li> <li>&lt;145° (58)</li> </ul>	21 (56.8) 32 (55.2)	16 (43.2) 26 (44.8)	0.87	$128 \pm 112$ $124 \pm 120$	0.90	219 ± 132 290 ± 190	0.31
White line equivalent line and state of the	- Right	35 (42.7)	<ul> <li>&lt;3mm (65)</li> <li>&gt;3mm (30)</li> </ul>	34 (52.3) 19 (63.3)	31 (47.7) 11 (36.7)	0.31	$127 \pm 114 \\ 124 \pm 105$	0.91	$237 \pm 168$ $294 \pm 185$	0.18
POSTERIOR 00	Past Medical History; n (%)		Dysplastic (64)     Normal (31)     P-values for Pearson's chi so	35 (54.7) 18 (58.1) uare analysis co	29 (45.3) 13 (41.9)	0.75 versus LE	123 ± 114 131 ± 103 C OCF frequer	0.78 ncv within	243 ± 184 266 ± 151 OCF rate colur	0.68
00 19×	- Contralateral dislocation Injury to Surgery Time; n (%)	16 (19.5)	distinction. T-test two sided *Indicates statistical significa	o value assumin ince for p< 0.05	g equal variance	e comparir	ig mean OCF si	ze between	n radiographic j	roups.
MEDIAL KITERAL	- <1 Month	68 (82.9)								
Figure 1. Heat map of osteochondral fractures in first time patellar dislocations based on location and	- >1 Month Open Physis	14 (17.1) 54 (65.9)								
frequency. Grid representative of 1x1mm units. The white line on femur heat map indicates the most anterior portion of the lateral meniscal horn, of which LFC OCF										