Supratrochlear Spur Resection (Grooveplasty) Compared to Trochleoplasty for Treatment of Trochlear Dysplasia

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INTRODUCTION:
Recurrent patellofemoral instability is significantly debilitating to patients, with trochlear dysplasia being a common pathoanatomic feature. The addition of sulcus deepening trochleoplasty in select cases of trochlear dysplasia has been shown to be successful in preventing future instability events, but current indications and controversy remain. Resection of the supratrochlear spur, or grooveplasty, may offer an alternative to traditional trochleoplasty in select cases of severe trochlear dysplasia. The purposes of this study were to compare the 1) clinical efficacy in resolution of patellar instability, 2) patient reported outcomes, and 3) complication and reoperation rates between patients who underwent either grooveplasty or trochleoplasty as part of a combined patellofemoral stabilizing procedure.

METHODS:
A retrospective chart review was performed to identify a cohort of patients who underwent grooveplasty and a cohort who underwent trochleoplasty. These surgeries were performed in conjunction with other patellofemoral stabilization procedures. Complications, reoperations, and PROs (Tegner, Kujala, and IKDC) were collected at final follow up. All statistical analyses were two-sided and p values <0.05 were considered significant.

RESULTS:
Overall, 17 grooveplasty patients (18 knees) and 15 trochleoplasty patients (15 knees) were included. 79% of patients were female, and average follow up was 3.9 years. Mean age at first dislocation was 11.8 years overall; most patients (65%) had >10 lifetime instability events and 76% of patients had prior knee stabilizing procedure(s). Trochlear dysplasia Dejour classification was similar between cohorts. Patients who underwent grooveplasty had a higher activity level (p=0.007) and a higher degree of patellar facet chondromalacia (p=0.008) at baseline. At final follow up, no patients had recurrent symptomatic instability following grooveplasty, compared to 5 in the trochleoplasty cohort (p=0.013). There were no differences in post-operative IKDC (p=0.870), Kujala (p=0.059), or Tegner scores (p=0.052). Additionally, there were no differences in complication rates (grooveplasty 17% vs trochleoplasty 13%, p= >0.999) or reoperation rates (grooveplasty 22% vs trochleoplasty 13%, p=0.665).

DISCUSSION AND CONCLUSION:
Open resection of the supratrochlear spur, termed grooveplasty, for patients with severe trochlear dysplasia may offer an alternative strategy to treating trochlear dysplasia compared to trochleoplasty for complex cases of patellofemoral instability. Grooveplasty patients had less recurrent instability, and similar patient reported outcomes and reoperation rates compared to trochleoplasty.

Table 1. Baseline demographic comparison between grooveplasty and trochleoplasty cohorts.

	Overall cohort (n=33)	Grooveplasty (n=18)	Trochleoplasty (n=15)	P-value
Age at initial instability event mean (range)	11.8 (5-22)	11.3 (5-15)	12.3 (7-22)	0.469
Age at surgery Mean (range)	21.3 (14 -39)	21.1 (14-39)	21.5 (15-36)	0.860
Sex				
Male	7 (21.2%)	5 (27.8%)	2 (13.3%)	0.413
Female	26 (78.8%)	13 (72.2%)	13 (86.7%)	
Race				
White	28 (84.8%)	14 (77.8%)	14 (93.3%)	0.249
Black	3 (9.1%)	3 (16.7%)	0 (0.0%)	
Native/Indigenous	1 (3.0%)	0 (0.0%)	1 (6.7%)	
Other	1 (3.0%)	1 (5.6%)	0 (0.0%)	
Laterality				
Left	20 (60.6%)	10 (55.6%)	10 (66.7%)	0.722
Right	13 (39.4%)	8 (44.4%)	5 (33.3%)	
BMI	27.8 (7.4)	28.0 (5.6)	27.6 (9.3)	0.885
Tobacco Use	2 (6.1%)	2 (11.1%)	0 (0.0%)	0.489
Diabetes Mellitus	1 (3.0%)	0 (0.0%)	1 (6.7%)	0.455
Hypermobility	4 (12.1%)	0 (0.0%)	4 (26.7%)	**0.035**
Connetinal disease	5 (15.2%)	1 (5.6%)	4 (26.7%)	0.152
Occupation				
Student	24 (72.7%)	14 (77.8%)	10 (66.7%)	0.160
Laborer	6 (18.2%)	4 (22.2%)	2 (13.3%)	
Sedentary	3 (9.1%)	0 (0.0%)	3 (20.0%)	
Activity Level				
Sedentary	4 (13.8%)	0 (0.0%)	4 (28.6%)	**0.007**
Recreational	16 (55.2%)	7 (46.7%)	9 (64.3%)	
Competitive	9 (31.0%)	8 (53.3%)	1 (7.1%)	
Other/Not Reported	4	3	1	
Lifetime instability events				
< 5	6 (19.4%)	3 (16.7%)	3 (23.1%)	0.118
5-10	5 (16.1%)	5 (27.8%)	0 (0.0%)	
> 10	20 (64.5%)	10 (55.6%)	10 (76.9%)	
NA	2	0	2	
Prior knee operation(s)	25 (75.8%)	13 (72.2%)	12 (80.0%)	0.699

Categorical variables presented as percent count (%) and continuous variables as mean (range) when appropriate.

Table 2. Comparison of injury characteristics between cohorts

	Overall cohort (n=33)	Grooveplasty (n=18)	Trochleoplasty (n=15)	P-value
Trochlear Dysplasia (Dejour)				
A	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.733
B	19 (57.6%)	11 (61.1%)	8 (53.3%)	
C	0 (0.0%)	0 (0.0%)	0 (0.0%)	
D	14 (42.4%)	7 (38.9%)	7 (46.7%)	
Injury Type				
Traumatic	12 (36.4%)	7 (38.9%)	5 (33.3%)	0.293
Chronic	11 (33.3%)	4 (22.2%)	7 (46.7%)	
Habitual	10 (30.3%)	7 (38.9%)	3 (20.0%)	
Mean arc of motion	134.1 (120-150)	135.4 (120-147)	133.1 (120-150)	0.477
Degree of flexion at patellar reduction	37.0 (11.6)	38.0 (4.5)	36.5 (14.2)	0.824
Patellar grind	10 (30.3%)	5 (27.8%)	5 (33.3%)	>0.999
Lateral patellar alide ≥ 3	12 (36.4%)	4 (22.2%)	8 (53.3%)	0.083
Valgus Alignment	15 (45.5%)	9 (50.0%)	6 (40.0%)	0.446
Patella alta	15 (45.5%)	8 (44.4%)	7 (46.7%)	>0.999
Femoral Anteversion	4 (12.1%)	2 (11.1%)	2 (13.3%)	>0.999
ICRS grade				
0	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0.008**
1	2 (6.1%)	0 (0.0%)	2 (13.3%)	
2	12 (36.4%)	4 (22.2%)	8 (53.3%)	
3	5 (15.2%)	2 (11.1%)	3 (20.0%)	
4	11 (33.3%)	10 (55.6%)	1 (6.7%)	
NA	3 (9.1%)	2 (11.1%)	1 (6.7%)	
Osteochondral loose body	12 (37.5%)	10 (58.8%)	2 (13.3%)	**0.012**
Duration from initial event to surgery	9.1 (0.8-23.6)	7.9 (1.9-15.1)	10.4 (0.8-23.6)	0.315
Concomitant Procedure	31/33 (93.9%)	18/18 (100%)	13/15 (86.7%)	0.478
None	2 (6.1%)	0 (0.0%)	2 (13.3%)	-
MPFL	29 (87.9%)	17 (94.4%)	12 (80.0%)	0.308
TTO	18 (54.5%)	14 (77.8%)	4 (26.7%)	**0.005**
Femoral osteotomy	7 (21.2%)	6 (33.3%)	1 (6.7%)	0.095
Cartilage restoration	12 (36.4%)	10 (55.6%)	2 (13.3%)	**0.027**
Lateral retinacular lengthening	24 (73.7%)	12 (66.7%)	12 (80.0%)	0.458

Categorical variables presented as percent count (%) and continuous variables as mean (range) when appropriate.
ICRS = International Cartilage Research Society; MPFL = medial patellofemoral ligament; TTO = tibial tubercle osteotomy

Table 3. Outcomes

	Grooveplasty (n=18)	Trochleoplasty (n=15)	P-value
Mean Follow up (months)	50.76	42.73	0.423
Mean arc of motion	131.7°	125.5°	0.134
Patellar maltracking	1 (5.6%)	4 (26.7%)	0.165
Recurrent instability	0 (0.0%)	5 (33.3%)	**0.013**
Persistent patellofemoral pain	5 (27.8%)	2 (13.3%)	0.413
Patellofemoral arthritis Arthritis prior to procedure	8/18 (44.4%) 6 (75%)	3/15 (20.0%) 2 (66.7%)	0.266
Complications	3 (16.7%)	2 (13.3%)	>0.999
Wound infection	1 (5.6%)	0 (0.0%)	
Arthrofibrosis	2 (11.1%)	2 (13.3%)	
Reoperations	4 (22.2%)	2 (13.3%)	0.665
MUA/LOA	2 (11.1%)	2 (13.3%)	
Wound irrigation	1 (5.6%)	0 (0.0%)	
Trochlear chondroplasty	1 (5.6%)	0 (0.0%)	
Second Reoperation	2/5 (40%)	0/2 (0.0%)	0.489
Tibial osteotomy	1 (50%)	0 (0.0%)	
Meniscus allograft	1 (50%)	0 (0.0%)	
PROs, median (IQR)			
Kujala	82.0 (74.5, 91.0)	69.0 (63.5, 82.0)	0.059
Tegner	6.0 (4.0, 6.5)	4.0 (3.0, 5.0)	0.052
IKDC subjective	70.1 (58.1, 81.6)	59.2 (55.2, 82.2)	0.870

Categorical variables presented as n (%) and continuous variables as mean or median (IQR) when appropriate. MUA = manipulation under anesthesia; LOA = lysis of adhesions; IKDC = International Knee Documentation Committee