MPFL Reconstruction With Grammont is Safe and Effective in Pediatric Patients With Patellar Instability and Increased TT-TG Distance: A Comparison Study

Anthony Dure, Evan Sheppard, Syed Imraan Ahmed, Md Sohel Rana, Emily Liyun Niu

INTRODUCTION: Patellar instability in pediatric patients is commonly treated with medial patellofemoral ligament reconstruction (MPFLR) alone or combined with additional procedures. MPFLR alone does not directly address other underlying anatomic risk factors for patellar instability, such as elevated tibial tubercle trochlear grove (TT-TG) distance. In adults, patients with increased TT-TG distances can undergo a tibial tubercle transfer, which medializes the patellar tendon insertion. In skeletally immature patients, an osteotomy of the tibial tubercle could potentially cause a growth arrest and deformity. The Grammont procedure was originally described to treat habitual patellar dislocation. It involves elevating the patellar tendon from the tibial tuberosity while leaving it attached distally to a periosteal sleeve and transferring the tendon and periosteum more medially on the tibia. This technique has not been studied in acute and recurrent traumatic patellar instability, nor has it been compared as an adjunct procedure to MPFLR. We conducted a retrospective review of patients who had Grammont with MPFLR and compared them to patients who had MPFLR alone to assess the outcomes and complication rates and quantify the changes in anatomic measures such as TT-TG distance on postoperative MRI.

METHODS: Retrospective review of all patients treated surgically for patellar instability from 2010-2023 at a level one pediatric trauma center was performed. Inclusion criteria were patients under 19 years of age treated for patellar instability with MPFLR with or without Grammont. Patients were excluded from the study if they had a trochleoplasty, congenital or fixed dislocations, or less than 3 months of postoperative follow-up. Eighty-one patients were included in the analysis. 45 patients underwent MPFLR alone, and 36 patients underwent MPFLR plus (+) Grammont procedure. Demographics and clinical and imaging characteristics were compared between the groups. The primary outcome studied was the rate of recurrent instability. Additionally, we compared the rate of grade II and III complications between groups using the adapted Clavien-Dindo classification system for orthopaedic surgery. Postoperative MRI was used to evaluate the amount of correction achieved in the TT-TG distance, articular overlap, and patellar tilt in MPFLR alone vs MPFLR + Grammont.

RESULTS: Patients in the MPFLR + Grammont group were significantly younger at the time of surgery (median age 13.4 vs. 15.3 years, p=0.010) and more frequently female (80.6% vs. 57.8%, p=0.029). The mean preoperative TT-TG was higher in the MPFLR + Grammont group (18.8 vs. 16.3 mm, p=0.002). The rate of preoperative patella alta was also higher in the MPFLR + Grammont group but failed to reach significance (82.9% vs. 63.6%, p=0.073). The post-operative recurrent instability rate was lower in the MPFLR + Grammont group (5.6% vs. 17.8%) but did not reach statistical significance (p=0.097). In patients who had postoperative MRI (n=17), correction achieved in TT-TG distance was 10.4 mm in the MPFLR + Grammont group (n=6) compared to 4.5 mm in the MPFLR group (n=11). Twenty-six (32.1%) patients had grade II/III complications, with no significant differences in complication rate between surgical groups (Table 2). Revision surgery for recurrent patellar instability was performed in 4 patients in the MPFLR group (8.9%) and 2 patients in the MPFLR + Grammont group (5.6%). One patient in the MPFL + Grammont group had a growth arrest of the tibial tubercle, resulting in a recurvatum deformity that did not require further intervention. Another patient in the same group could not return to sports due to extensor mechanism weakness. This weakness was attributed to significant patella alta, which was present before surgery but had worsened postoperatively. This patient eventually required patella tendon repair and reconstruction to address the distal patella insertion site 28 months after the initial procedure.

DISCUSSION AND CONCLUSION: In this series, combined MPFLR with Grammont procedure was used more frequently in younger and female patients with more significant anatomic risk factors for patellar instability, including greater preoperative TT-TG distance and rates of patella alta. We found lower rates of recurrent instability and greater TT-TG correction than MPFLR alone, although neither reached statistical significance. We found similar complication rates between the two groups. The Grammont procedure appears to be a safe and effective adjunct to MPFL reconstruction for patellar instability in skeletally immature patients with increased TT-TG distance.

Table 1: The demographics and clinical characteristics between MPFL vs. MPFL + Grammont group

Characteristics	Overall (N=81)	MPFL (N=45)	MPFL + Grammont (N=36)	P value
Age at surgery (years), Median [range]	14.3 [8.2, 18.3]	15.3 [9.7, 18.3]	13.4 [8.2, 17.6]	**0.010**
Female, n (%)	55 (67.9)	26 (57.8)	29 (80.6)	**0.029**
BMI, median [range]	22.5 [16.2, 41.6]	22.5 [16.4, 41.6]	22.4 [16.2, 40.6]	0.909
Operative side, n (%)				0.309
Left	49 (60.5)	25 (55.6)	24 (66.7)	
Right	32 (39.5)	20 (44.4)	12 (33.3)	
Preoperative Pain, n (%)	37 (45.7)	18 (40.0)	19 (52.8)	0.251
Time from initial instability to surgery (months), median [range]	26.6 [0.5, 122.2]	27.1 [0.5, 115.4]	26.1 [2.0, 122.2]	0.718
First time dislocator, n (%)	22 (27.2)	14 (31.1)	8 (22.2)	0.371
Preop Canton-Dechamps, mean [range]	1.3 [0.1, 2.1]	1.3 [0.1, 2.1]	1.3 [0.7, 1.9]	0.207
Preop Canton-Dechamps class, n (%)				0.073
Normal	18 (22.2)	12 (36.4)	6 (17.1)	
Patella Alta	50 (73.5)	21 (63.6)	29 (82.9)	
Preop TT-TG, mean [range]	17.5 [9.8, 27.6]	16.3 [9.8, 27.6]	18.8 [12.8, 27.0]	**0.002**
Time from surgery to final follow-up (months), median [range]	11.9 [3.2, 64.5]	10.9 [3.2, 64.5]	14.4 [3.4, 62.3]	0.151
Time to return to activity (months), median [range]	7.3 [2.8, 26.9]	7.3 [2.8, 17.9]	7.2 [2.8, 26.9]	0.930

* P values were obtained from the unpaired t-test or Mann-Whitney-U test for continuous variables and the Chi-square test for categorical variables

Table 2: Postoperative complications

Characteristics	Overall (N=81)	MPFL (N=45)	MPFL + Grammont (N=36)	P value
Complications (any), n (%)	30 (37.0)	15 (33.3)	15 (41.7)	0.440
Complications (grade II and higher), n (%)	26 (32.1)	14 (31.1)	12 (33.3)	0.831
Recurrent instability, n (%)	10 (12.3)	8 (17.8)	2 (5.6)	0.097
Postop Extension deficit, n (%)	2 (2.5)	2 (4.4)	0 (0.0)	0.200
Postop Flexion deficit, n (%)	10 (12.3)	5 (11.1)	5 (13.9)	0.706
Growth arrest, n (%)	1 (1.2)	0 (0)	1 (2.8)	0.261
Deformity, n (%)	5 (6.2)	1 (2.2)	4 (8.3)	0.099
Infection, n (%)	1 (1.2)	1 (2.2)	0 (0.0)	0.368
Pain, n (%)	10 (12.3)	4 (8.9)	6 (16.7)	0.290
Return to OR, n (%)	10 (12.3)	5 (11.1)	5 (13.9)	0.705

* P values were obtained from the unpaired t-test or Mann-Whitney-U test for continuous variables and the Chi-square test for categorical variables