SPONTANEOUS CORRECTION OF EXTERNAL TIBIOFEMORAL ROTATION AND TIBIAL TUBEROUSITY-TROCHLEAR GROOVE DISTANCE OCCURS AFTER MEDIAL PATELLOFEMORAL LIGAMENT RECONSTRUCTION IN FIXED OR OBLIGATORY DISLOCATORS

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Background: Tibial tubercle to trochlear groove distance (TT-TG) and external tibiofemoral rotation (TFR) through the knee joint have been identified potential contributing factors to patellar instability. In patients with a fixed or obligatory lateral patella dislocation (FOD), the normal force vector of the extensor mechanism is altered, so instead of a direct axial pull to cause extension, it exerts a lateralizing and external rotatory force on the tibia via the tibial tubercle.

Hypothesis/Purpose: The purpose of this study is to investigate postoperative changes in TT-TG and TFR after medial patellofemoral ligament reconstruction (MPFLR) in two clinical cohorts: standard traumatic patellar instability (SPI) patients and FOD patients. We hypothesized that by surgically relocating the patella in the trochlea, and re-establishing medial sided soft tissue tension, the increased medializing force vector on the patella may exert enough force to alter resting rotation of the tibia in relation to the femur in the FOD group.

Methods: A retrospective study was performed from April 2009 to February 2019. FOD and SPI patients under 18 years with available magnetic resonance imaging (MRI) of the knee before and after MPFLR were eligible. All FOD patients in the time frame were analyzed and SPI patients were randomly selected. Exclusion criteria were outside institution MRI, concomitant alignment procedures done at the time of MPFLR, and prior MPFLR or tibial tubercle osteotomy. TT-TG and TFR (using the posterior femoral and tibial condylar lines) were measured blindly on initial axial MRI. Statistical analysis using a paired sample t-test was performed with significance set at p<0.05.

Results: A total of 30 patients were included, 14 in the FOD group and 16 in the SPI group. The mean age at time of surgery was 13.9 years (range 10-17 years), 53% of the cohort was female, and the mean time from surgery to follow-up MRI was 2.0 years. Demographics by group are shown in Table 1. TT-TG and TFR were not significantly different preoperatively versus postoperatively in the SPI group (Table 2). In the FOD group, both TT-TG (17.7 vs 13.7, P=.019) and TFR (8.6 vs 3.1, P=.025) decreased significantly on postoperative MRI.

Conclusion: The postoperative decrease in TT-TG and TFR in the FOD group suggests that MPFLR in fixed or obligatory dislocators can improve the external rotation deformity through the level of the joint, and thus may help normalize the forces acting through the extensor mechanism.
Tables/ Figures

**Table 1.** Demographics of included knees.

|                  | Total (n=30) | SPI (n=16) | FOD (n=14) |
|------------------|--------------|------------|------------|
| **Age**          | 13.9 years   | 14.7 years | 13.0 years |
| **Sex**          | 53% Female   | 63% Female | 43% Female |
| **Laterality**   | 57% Right    | 56% Right  | 57% Right  |
| **Time from Surgery to Postoperative MRI** | 2.0 years | 1.8 years | 2.3 years |

**Table 2.** Preoperative and postoperative measurements of TT-TG and TFR on MRI.

|                         | Standard Patellar Instability | Fixed or Obligatory Dislocators |
|-------------------------|-------------------------------|--------------------------------|
|                         | Pre-op | Post-op | p-value | Pre-op | Post-op | p-value |
| **TT-TG**               | 15.1 ± 2.3 | 15.2 ± 4.2 | .846 | 17.7 ± 6.5 | 13.7 ± 7.4 | .019 |
| **External TFR**        | 1.9 ± 5.0 | 2.1 ± 4.6 | .896 | 8.6 ± 15.1 | 3.1 ± 13.0 | .025 |