TT-TG Measurements Obtained In Weight Bearing and Non-Weight Bearing States are Different

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Summary:
The same knees with patellar instability were imaged with CT in weight bearing and non weight bearing states and the measured TT-TG distances were different.

Data:
Background There are multiple aspects of lower extremity alignment that can contribute to patellar instability. Physicians regularly consider TT-TG distance when planning treatment for patients with patellar instability. TT-TG has been classically measured on non-weight bearing magnetic resonance imaging (MRI) or computed topography (CT) scans, but more recently clinicians have been obtaining these measurements on weight bearing CT scans. Literature has not previously compared TT-TG measurements obtained in weight bearing and non-weight bearing positions. This study compares TT-TG measurements performed in weight-bearing vs. non-weight bearing positions of the same knees. Materials and Methods The images of patients with patellar instability who obtained weight bearing and non-weight bearing CT scans between the dates of January 1st, 2014 and December 31st, 2021 were measured for TT-TG distance. A paired sample t test for means was utilized to compare the measurements. Results Thirty knees had both a weight bearing and non-weight bearing TT-TG length CT scan performed that could be used to measure TT-TG distance. The weight bearing group, with an average of 15.2 mm, was significantly greater than the non-weight bearing group, averaging 10.2 mm (p < .0001). Additionally, the variance in measurements for knees under the weight bearing positions (37.6 mm) was more than twice as large as the variance for measurements obtained in the non-weight bearing position (16.5 mm). Conclusion TT-TG distance is routinely used while diagnosing and planning treatment of patients with patellar instability. In this study, TT-TG distance ranged from 4.0 to 29.0mm with a mean 15.1 (SD: 4.4). CDI ranged from 0.7 to 1.7l with a mean 1.1 (SD: 0.2). Only 14% had no trochlear dysplasia and 45% had Dejour D dysplasia. 54/199 (27%) had a J-sign on the affected side. The re-dislocation rate at 12 months was 1% and this increased to 2% at 2 years. The mean preoperative Norwalk Patellar Instability score was 42.6 (SD: 23.6). This improved to 17.7 (SD: 23.9) at 1 year (p < .005) and was similar at 2 years (21.7, SD:28.0) at 2 years

The mean preoperative Marx activity score was 7.7 (SD: 6.4) and did not change significantly at 1 year (mean: 6.9, SD: 5.6) or at 2 years (mean:7.2, SD: 5.7). The mean preoperative KOOS QOL score was 30.3 (SD:21.2). This improved to 66.6 (SD:24.1) at 1 year (p < .0001) and was unchanged at 2 years: 69.4 (SD:23.1).

Discussion The re-dislocation rate and PROMs indicated satisfactory outcomes in this patient cohort. However, the project has highlighted the practical difficulties of addressing the question of how far the indications for isolated MPFL reconstruction can be extended as patients undergoing any bony procedure were automatically excluded and the thresholds for an additional procedures were at the individual surgeon's discretion. In addition, the re-dislocation rate was low, thereby precluding a useful comparison between recurrent dislocators and patients who had no further instability episodes. Nonetheless, the fact that patients with a CDI of up to 1.7, a TT-TG of up to 29mm, or Dejour D trochlear dysplasia were included, does suggest that an increase in the previously reported thresholds for when to add a bony procedure to an MPFL reconstruction can result in successful outcomes in some patients.

Data:
Background In treating recurrent patellar instability, one of the questions of interest is how far the indications for an isolated MPFL reconstruction can be extended. This ISAKOS-sponsored multi-center study followed the outcomes of patients undergoing isolated MPFL reconstruction using higher thresholds than widely accepted for additional surgery for patella alta and tibial tubercle trochlear groove (TT-TG) distance. Methods 199 patients from 5 countries (USA, Australia, Finland, Japan and Chile) were enrolled. All underwent an isolated MPFL reconstruction. The decision to perform additional stabilization surgery such as a tibial tubercle osteotomy was left to the discretion of the individual surgeon, but patients having additional surgery were not included. The guiding principle was a TT-TG distance up to 24 mm on MRI and a Caton-Deschamps index (CDI) up to 1.4 were not considered to be an indication for a tibial tubercle osteotomy. Rates of further patellar dislocation and PROMs (Norwich Patellar Instability, Marx Activity and KOOS QOL scores) were recorded preoperatively and at 1 and 2 years. Results 66% patients were female, 62% had a non-contact injury originally, and 42% had a positive family history of patellar instability. The mean age at surgery was 21 (SD: 6.7). TT-TG distance ranged from 4.0 to 29.0mm with a mean 15.1 (SD: 4.4). CDI ranged from 0.7 to 1.7l with a mean 1.1 (SD: 0.2). Only 14% had no trochlear dysplasia and 45% had Dejour D dysplasia. 54/199 (27%) had a J-sign on the affected side. The re-dislocation rate at 12 months was 1% and this increased to 2% at 2 years. The mean preoperative Norwalk Patellar Instability score was 42.6 (SD: 23.6). This improved to 17.7 (SD: 23.9) at 1 year (p < .005) and was similar at 2 years (21.7, SD:28.0) at 2 years

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Summary: Surgeons should be aware of this phenomenon and aim for a uniform C-arm position for every MPFL reconstruction.

Data: Background: Medial patellofemoral ligament (MPFL) reconstruction is an established procedure in the treatment of patellar instability. However, femoral tunnel misplacement is responsible for 38.2% of cases in revision surgery. Different methods are published for the identification of the femoral MPFL insertion site. In clinical practice, the Schottle technique, using C-arm can be considered the gold standard. Purpose: The purpose of the study was to evaluate the influence of the C-arm position on the radiographic femoral MPFL positioning. Study Design: Descriptive laboratory study. Methods: Ten cadaveric knees were dissected, the femoral MPFL insertion site was identified and marked using 10 mm eyelets. According to possible clinical scenarios, true lateral radiographs in two different C-arm positions (MLS: 5cm from the receptor with X-ray beam from medial to lateral; LM25: 25cm from the receptor with X-ray beam from lateral to medial) were taken. At each radiograph, the eyelet position was recorded as the distance (proximal-distal and anterior-posterior) from the optimal radiographic insertion point according to Schottle et al. Differences were calculated using the Wilcoxon signed-rank test (2-related sample), and a p-value of less than 0.05 was considered significant. Results: The anatomical femoral MPFL insertion in the MLS-position was located a mean of 2.3 ± 2.4 mm (range, 0.2-5.8) proximally and 4.1 ±/+ 6.0 mm (range, 6.2-13.6) anteriorly to the Schottle point. This resulted in an absolute distance of 7.2 ± 3.0 mm (range, 3.6-13.6). In the LM25-position it was located a mean of 0.6 ±/− 1.8 mm (range, -3.2-5.6) distally, and 2.7 ±/+ 5.7 mm (range, -8.4-9.8) anteriorly, which resulted in an absolute distance of 5.5 ±/+ 3.1 mm (range, 1-9.8). The mean distance of the eyelet in both positions – MLS compared to LM25 - was 3.0 ±/+ 2.3 mm (range, 0.7-3) proximally and 1.4 ±/+ 2.3 mm (range, -2.7-4.8) anteriorly with an absolute distance was 4.1 ±/+ 2.1 mm (range, 2.4-8.8) in the MLS-position. Wilcoxon signed-rank test (2-related sample) showed a significant difference between the two C-arm setups in the x-axis (proximal-distal). No significant differences could be determined when comparing the distance in the y-axis (anterior-posterior) or the absolute distance between Schottle point and the anatomic attachment of the MPFL. Conclusion: Intraoperative C-arm position in MPFL reconstruction, does affect femoral anterior-posterior tunnel positioning. Surgeons should be aware of this phenomenon and aim for a uniform C-arm position for every MPFL reconstruction.

Category: Knee - Patellofemoral

Post-Operative Apprehension and J-Sign Predict Poorer Outcomes After Isolated Medial Patellofemoral Ligament Reconstruction for Patellar Instability

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Summary: In this prospective study for patients undergoing isolated MPFL reconstruction for recurrent patellofemoral instability, patients with post-operative J-signs showed worse PROMs in 2-years, a higher percentage of patients who had pre-operative knee hyperextension and post-operative apprehension did not RTS and patients who had post-operative apprehension did not experience recurrent instability.

Data: Objectives: A multicenter prospective trial is currently underway to identify which subset of patients with recurrent patellofemoral instability would benefit from a concomitant bony realignment procedure in addition to a medial patellofemoral ligament (MPFL) reconstruction. The aim of this study is to investigate if post-operative apprehension is measure of sub-optimal outcomes to determine if this may be an additional indicator of patients who may need bony realignment in addition to an isolated soft tissue procedure. Post-operative J-sign, a clinical exam finding that may indicate patellar maltracking was also investigated. Recurrent instability, return to sport (RTS), and patient reported outcome measures (PROMs) were used as outcomes for this study. Methods: Patients with recurrent patellar instability were prospectively enrolled in an institutional registry beginning March 2014. All patients underwent primary, unilateral, isolated MPFL reconstruction regardless of their bony anatomy. Radiographic measurements including TT-TG, Caton-Deschamps Index (CDI), Patellar Trochlear Index (PTI), Trochlear Depth Index (TDI), Patellar Tendon to Lateral Trochlear Ridge (PT-LTR) and Tibial Tuberole to Lateral Trochlear Ridge (TT-LTR) were obtained at baseline. Recurrent instability, patient outcomes including PROMs, and return to sport (RTS) were obtained annually. Presence of post-operative apprehension, post-operative J-sign, and knee hyper-extension were also collected. Independent samples t-tests and chi-square analyses were used to compare continuous and discrete variables, respectively, between groups. Results: 138 patients (72% female; mean age 20.1 ± 6.1 years) underwent isolated MPFL reconstruction between March 2014 and December 2019. Mean Beighton Score was 5.3 ± 3.0 and knee hyperextension was 5.4 deg ± 2.8 deg. Eighty-nine patients (65%) had pre-operative knee hyper-extension. At 2-year follow up, six patients (5%) reported an episode of recurrent instability, nine patients (8%) reported post-operative apprehension, and 44 patients had a post-operative J-sign (37%). No patients with post-operative apprehension reported recurrent instability. By 2-year follow-up, 89% of patients were able to return to sport (RTS). 50% of patients who had pre-operative knee hyper-extension and post-operative apprehension did not RTS (p=0.034). While not statistically significant, a higher percentage of patients who had recurrent instability or apprehension did not RTS (40%) compared to those who did not (11%). Patients with post-operative J-signs had significantly worse IKDC (P=0.022), KOOS-PS (P=0.011), and Kujala (P=0.035) at 2-years. For patients with recurrent instability or post-operative apprehension, Kujala was statistically significantly lower at 1-year compared to those without (84.9 vs. 91.7, P=0.019). At 2-year follow-up the difference was still maintained between the two groups (83.6 vs. 91.6). Conclusion: Patients with post-operative J-signs showed worse PROMs at 2-years post-operatively. A higher percentage of patients who had pre-operative knee hyperextension and post-operative apprehension did not RTS. Patients who had post-operative apprehension did not report a recurrent instability event at most recent follow up. These findings support the need to further investigate if post-operative J-sign and apprehension may be important markers of sub-optimal outcomes after isolated MPFL reconstruction for recurrent instability, which in turn, may help identify patients that may benefit from concomitant bony realignment procedures at the time of their index procedure.

Category: Knee - Patellofemoral

Body Mass Index Does Not Affect Outcomes Following Medial Patellofemoral Ligament Reconstruction: A Retrospective Analysis of 161 Knees

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Summary: Class 1 obesity does not affect radiographic, clinical, or patient-reported outcomes following MPFL-reconstruction.

Data: Introduction: Dislocations of the kneecap may cause significant pain and disability, with recurrent dislocations often requiring surgical reconstruction. Medial patellofemoral ligament reconstruction (MPFL-R) has been developed to achieve stability in such knees. Body mass index (BMI) is a known risk factor for a variety of conditions, yet there exists a lack of data regarding the influence of BMI on radiographic, clinical, and patient-reported outcomes (PROs) following MPFL-R. The purpose of this study was to evaluate the outcomes from obese and non-obese patients undergoing MPFL-R without tibial tubercle osteotomy (TTO). We hypothesized that patients with a BMI ≥ 30 would exhibit worsened outcomes across all variables. Methods: A billing query identified all patients from one