Original Article

Adding Lateral Retinacular Release to Medial Patellofemoral Ligament Reconstruction Fails to Demonstrate Clinical Benefit Compared With Isolated Medial Patellofemoral Ligament Reconstruction

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Purpose: To compare functional outcomes and failure rates between medial patellofemoral ligament (MPFL) reconstructions with and without lateral retinacular release (LRR) at minimum 1-year follow up. **Methods:** A retrospective review identified consecutive patients from 2013 to 2019 at a single center who met all of the following inclusion criteria: at least 1 confirmed patellar dislocation, patellar tilt (evidenced by tight retinaculum on operative examination or patellar tilt on radiographs), underwent either MPFL reconstruction alone or combined with LRR, had available preoperative documentation and imaging, and were at least 1 year out of surgery. Patients were excluded if they had previous surgery to the ipsilateral limb or had any concomitant procedure performed. Demographics and preoperative imaging were evaluated. Failure rates and functional outcome scores were obtained including Kujala, Patient-Reported Outcomes Measurement Information System, International Knee Documentation Committee, Single Assessment Numeric Evaluation, and Knee injury and Osteoarthritis Outcome Scores. Clinical failure was defined as revision MPFL reconstruction on the affected knee or at least 1 instance of postoperative patellar dislocation. **Results:** A total of 18 patients underwent isolated MPFL reconstruction (mean follow-up = 29.3 ± 8.3 months, range = 15.1-42.8 months), and 31 underwent MPFL reconstruction combined with LRR (mean follow up = 36.0 ± 11.3 months, range = 14.0-51.9 months). At final follow-up, there were no statistical differences between the isolated MPFL and MPFL combined with LRR cohorts for any of the functional outcome scores ($P > .05$ for all). At the time of final follow-up, no patients who underwent isolated MPFL and 19.3% (n = 6) or patients undergoing MPFL combined with LRR experienced clinical failure ($P = .073$), as defined by subsequent patellar dislocation or revision MPFL reconstruction. Of these, 2 patients underwent revision MPFL reconstructions with distal tubercle transfer for borderline abnormal TT:TG (i.e., >15 mm). **Conclusions:** MPFL reconstruction surgery combined with LRR failed to demonstrate significantly different functional outcome scores and failure rates compared with isolated MPFL reconstruction at minimum 1-year follow up. In addition, there were no differences in rates of achieving MCID between both groups **Level of Evidence:** Level III, retrospective cohort study.

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Stability of the patellofemoral joint depends on several anatomical structures, including the medial patellofemoral ligament (MPFL), which is the primary soft-tissue restraint resisting lateral translation of the patella.[1] Due to its role in resisting lateral displacement of the patella and its high tear rate during index patellar dislocation,[2] reconstruction of the MPFL has become a common treatment modality for recurrent patellar instability in patients with normal patellar height and normal tibial tubercle–trochlear groove (TT-TG) distance.[3-5] However, the decision to add versus not to add a lateral retinacular release (LRR) to MPFL reconstruction is a topic of debate.

Few studies have evaluated the effect of LRR in combination with MPFL reconstruction. In one randomized control trial, Malatray et al.[6] compared outcomes after isolated MPFL reconstructions to MPFL combined with LRR in patients with chronic patellar instability. Those authors found no statistical differences in International Knee Documentation Committee (IKDC) score averages, postoperative patellar tilt, or complications between the 2 treatments. Although postoperative patellar tilt was measured in their study, the presence or absence of preoperative patellar tilt is a variable that may possibly influence postoperative functional outcomes in patients undergoing MPFL reconstruction, regardless of whether an adjunctive LRR is performed.

Ultimately, criteria for performing a LRR as an adjunct to MPFL reconstruction in patients with chronic patellar instability remain heterogenous, and outcomes, including failure rates, remain poorly understood. The purpose of this study was to compare functional outcomes and failure rates between MPFL reconstructions with and without LRR at minimum 1-year follow up. We hypothesized that adding a LRR to MPFL reconstruction would not confer clinical benefit, as measured by patient-reported outcomes (PROs) and failure rates.

Methods

After we received institutional review board approval, a retrospective review was performed to identify all patients with lateral patellar instability who underwent either an isolated MPFL reconstruction or MPFL reconstruction with LRR between 2013 and 2019 at a single center. Patients who underwent either MPFL reconstruction alone or with LRR, had available preoperative documentation and imaging, and were at least 1 year out of surgery met inclusion criteria for the study. Those who had previous surgery to the ipsilateral limb or underwent concomitant procedure at the time of surgery were excluded from the study.

Collection of Pre- and Postoperative Variables

Demographic variables and preoperative imaging were analyzed including the medical history, clinical data, preoperative plain radiographs, magnetic resonance imaging scans, and operative reports. PRO scores collected included Kujala, Patient-Reported Outcomes Measurement Information System (PROMIS), IKDC, Single Assessment Numeric Evaluation (SANE), and Knee injury and Osteoarthritis Outcome Scores (KOOS). Preoperative magnetic resonance imaging scans were used to measure the TT-TG distance.

Surgical Technique

Patients underwent MPFL reconstruction if they had a history of recurring medial patellar instability, which includes multiple patellar subluxations or dislocations. Patients underwent concomitant LRR in the presence of excessive lateral patellar tilt or excessive lateral tightness. Both were evaluated radiographically as well as intraoperatively. Contraindications for isolated MPFL reconstruction or MPFL reconstruction, as well as LRR, without additional concomitant procedures include patella alta, trochlear dysplasia, and enlarged TT-TG distance.[7-10] All surgical procedures were performed by 1 of 4 fellowship-trained orthopaedic surgeons (including B.R.W.) at our institution. Preoperative examination included assessment of dynamic patellar tracking bilaterally, as well as quadrants of translation and endpoint with medial and lateral translation. At the time of the procedure, diagnostic arthroscopy was first performed to evaluate for associated intra-articular pathology. If indicated, a titrated lateral retinacular release was performed to restore patellar recentering and normalized medial translation (i.e., 2 quadrants of medial translation) and patellar tilt. While viewing through the medial portal with a 30° arthroscope, a LRR is performed with a hooked electrocautery probe approximately 1 cm lateral to the patellar attachment. If used, the tourniquet is deflated, and hemostasis is obtained with radiofrequency wand after debridement of redundant synovium.

MPFL reconstructions were performed using hamstring allograft or autograft. As previously described, by use of intraoperative fluoroscopy, the femoral insertion of the MPFL was identified and a small incision was made at the Schöttle point, 1 mm anterior to a line extending from the posterior cortex and 2.5 mm distal to the posterior origin of the medial femoral condyle.[11] Once the position was confirmed on a lateral fluoroscopic image, a unicortical bone socket was created using a 2.4-mm guidewire and 6.5-mm reamer for graft placement. The graft was then implanted into this socket and secured. A small vertical incision was made along the superior aspect of the medial border of the patella. The graft was then shuttled medially toward the patella, traveling between layers 2 and 3 of the medial retinaculum, using looped suture to facilitate passage. Two suture anchors, either 4.75-mm PEEK (polyether ether ketone) SwiveLock (Arthrex, Naples, FL), 2.4-mm BioComposite SutureTak (Arthrex), or 2.9-mm Osteoraptor (Smith & Nephew, Andover, MA) suture anchors, were placed at the midpoint and superomedial aspect of the patella for graft fixation. The tails were tensioned individually at 30° of flexion and side-to-side suturing of the MPFL was performed followed by imbrication of the soft tissue. Stability was determined by a firm endpoint and 2 quadrants of translation.

Postoperative Rehabilitation

Every patient underwent a standardized rehabilitation program starting on postoperative day 1. Patients

Table 1. Demographic Information for Isolated MPFL and MPFL Combined With LRR Cohorts

	Isolated MPFL (n = 18)	MPFL Combined With LRR (n = 31)	*P* Value
Age, y, mean ± SD	23.2 ± 12.6	21.4 ± 9.7	.857
Female, n (%)	11 (61%)	23 (74%)	.357
BMI, mean ± SD	29.0 ± 9.9	26.7 ± 9.8	.912
TT-TG distance (mm), mean ± SD (range)	14.1 ± 3.1 (8-20)	15.6 ± 3.6 (12-26)	.271
Follow-up, mo, mean ± SD	29.3 ± 8.3	36.0 ± 11.3	.033

BMI, body mass index; LRR, lateral retinacular release; MPFL, medial patellofemoral ligament; SD, standard deviation; TT-TG, tibial tubercle−trochlear groove.

were discharged with full weight-bearing status as tolerated. A long-leg, hinged knee brace locked in extension for the first 2 weeks with passive range of motion beginning with 0-30°, followed by incremental degrees of locking and passive range of motion until week 6 when the brace was discontinued.

Data Collection

PROs were collected via telephone by trained researchers with contact at a minimum of 1 year after the operation. Clinical outcomes were evaluated by postoperative recurrent instability, revision surgery, infection, and scores including the Kujala, PROMIS, IKDC, SANE, and KOOS. Clinical failure was defined as revision MPFL reconstruction or at least 1 instance of postoperative patellar dislocation. Postoperative dislocation events were identified based on clinical documentation. Complications were defined as reoperation on the affected knee for reasons other than persistent instability.

Statistical Analysis

All statistical analysis was performed using SPSS software (version 27; IBM, Armonk, NY). Descriptive statistics were calculated. Student *t*-tests and paired *t*-tests were used to compare continuous data where appropriate between patients with or without LRR, and Fisher exact tests were used to compare categorical data. Statistical significance was defined as $P < .05$. Minimally clinically important difference (MCID) for IKDC function scores was calculated based on the distribution method described by Norman et al.[12] The equation was half the standard deviation for the preoperative scores. The MCID for ICKC function scores was calculated to be 1.54 for the isolated MPFL reconstruction and 1.71 for the MPFL reconstruction combined with LRR.

Results

During the inclusion period, 115 patients were eligible for the study, and 49 patients completed questionnaires. In total, 18 patients underwent isolated MPFL reconstruction with a mean follow-up of 29.3 months and standard deviation of 8.3 months, ranging from 15.1 months to 42.8 months. In addition, 31 patients underwent MPFL reconstruction with LRR with a mean follow-up of 36.0 months and standard deviation of 11.3 months, ranging from 14.0 months to 51.9 months. Demographics for the patients identified in both cohorts are outlined in Table 1. There was no statistically significant difference when we compared demographics and TT-TG distance between both groups (all $P > .05$).

Comparison of Functional Outcomes

As shown in Table 2, there were no significant differences in preoperative or postoperative IKDC function scores between the 2 cohorts. Both cohorts exhibited significant improvements in IKDC function scores, but there was not a significant difference in the magnitudes of improvement ($P = .271$). In total, 61.1% (11 of 18) of the subjects who underwent isolated MPFL met or exceeded the MCID, and 64.5% (20 of 31) of the subjects who underwent MPFL combined with LRR met or exceeded the MCID ($P = 1.000$).

As shown in Table 3, there were no significant differences between the isolated MPFL and MPFL

Table 2. Comparison of Preoperative Versus Postoperative IKDC Function Scores for Isolated MPFL and MPFL Combined With LRR Cohorts

	Isolated MPFL (n = 18)	MPFL Combined With LRR (n = 31)	*P* Value
Preoperative, mean ± SD	5.13 ± 3.08	5.42 ± 3.42	.773
Postoperative, mean ± SD	7.69 ± 2.02	7.55 ± 2.12	.828
Improvement, mean ± SD (*P* value)	2.56 ± 4.02 ($P = .025$)	2.12 ± 4.15 ($P = .006$)	.837
Achieved minimal clinically important difference, n (%)	11 (61.1%)	20 (64.5%)	1.000

IKDC, International Knee Documentation Committee; LRR, lateral retinacular release; MPFL, medial patellofemoral ligament; SD, standard deviation.

Table 3. Patient-Reported Outcomes of Isolated MPFL and MPFL Combined With LRR Cohorts

	Isolated MPFL (n = 18)	MPFL Combined With LRR (n = 31)	*P* Value
Kujala, mean ± SD	78.8 ± 15.8	78.4 ± 15.0	.931
PROMIS, mean ± SD	75.6 ± 10.9	74.0 ± 9.8	.607
IKDC, mean ± SD	63.0 ± 12.4	58.3 ± 9.6	.332
SANE, mean ± SD	72.8 ± 22.8	71.6 ± 16.6	.845
KOOS, mean ± SD			
Symptoms	76.0 ± 15.6	76.5 ± 14.6	.912
Pain	79.3 ± 16.6	75.1 ± 21.4	.888
ADL	86.1 ± 18.0	88.0 ± 12.0	.690
Sport	59.1 ± 21.4	71.1 ± 24.8	.149
QOL	56.3 ± 23.6	57.1 ± 20.1	.904

ADL, activities of daily living; IKDC, International Knee Documentation Committee; KOOS, Knee injury and Osteoarthritis Outcome Scores; LRR, lateral retinacular release; MPFL, medial patellofemoral ligament; PROMIS, Patient-Reported Outcomes Measurement Information System; QOL, quality of life; SANE, Single Assessment Numeric Evaluation; SD, standard deviation.

combined with LRR cohorts for any of the PROs, which included Kujala, PROMIS, IKDC, SANE, and KOOS.

Failure Rates

At the time of final follow-up, patients who underwent isolated MPFL and 19.3% (n = 6) of patients undergoing MPFL combined with LRR experienced clinical failure ($P = .073$), as defined by subsequent patellar dislocation or revision MPFL reconstruction. Of these, 2 patients underwent revision MPFL reconstructions with distal tubercle transfer for borderline abnormal TT:TG (i.e., >15 mm).

Complication Rates

At the time of final follow-up, 11.1% (n = 2) of patients who underwent isolated MPFL and 3.2% (n = 1) of patients undergoing MPFL combined with LRR experienced complications ($P = .546$), as defined by reoperation on the affected knee for reasons other than persistent instability. In the isolated MPFL cohort, one patient had persistent knee pain treated with arthroscopic debridement of the MPFL reconstruction, and another underwent arthroscopic lysis of adhesions with LRR for postoperative fibrosis. One patient in the MPFL combined with LRR cohort underwent subsequent open irrigation and debridement due to surgical site infection by methicillin-susceptible Staphylococcus aureus.

Discussion

The present study demonstrated similar PROs and failure rates at 1-year follow up between patients undergoing MPFL reconstruction with LRR and MPFL reconstruction alone for recurrent patellar instability and patellar tilt. Given the lack of demonstrated clinical benefit conferred by adding a LRR to MPFL reconstruction in this patient population, surgeons should be cautioned against performing LRR as adjunct to MPFL reconstruction. Our finding that LRR did not provide additional clinical benefit to patients with patellar instability and patellar tilt undergoing MPFL reconstruction adds to complex body of knowledge regarding the treatment algorithm for patellar instability.

Previous studies have compared outcome scores between patients undergoing MPFL reconstruction to patients undergoing both MPFL and LRR for patellar instability. In a systematic review evaluating 2,131 knees, Migliorini et al. observed greater postoperative Kujala, Lysholm, Tegner, and IKDC score averages for patients undergoing MPFL reconstruction combined with LRR than for patients undergoing isolated MPFL reconstruction. Although the results from the current study did not demonstrate similar results, there are a few details that may explain the differences. For one, all patients in the present study had concomitant patellar tilt, whereas Migliorini et al. did not specify patellar tilt as an inclusion or exclusion criterion. The incidence of patellar tilt, a common indication for LRR, in their study population is unknown and may have influenced their results.[13-15] Of note, although Migliorini et al. found greater scores in the MPFL combined with LRR cohort for all PROs evaluated, they determined that those differences were not clinically relevant and concluded that there is no evidence of adding LRR to improve MPFL reconstruction. In the present study, it is the authors' opinion that LRR should be cautioned against unless further clinic benefit is substantiated.

The failure and revision rates for MPFL reconstruction and MPFL reconstruction plus concomitant LRR has been reported in the literature as well. In a meta-analysis, Jackson et al.[16] evaluated failure rates 1,521 knees with instability who underwent isolated MPFL reconstruction. The authors demonstrated that failure rates ranged from 0% to 10.7% of cases, compared with the present study, which found an 0% failure rate for isolated MPFL reconstruction. Relatively low failure rates were reported in another systematic review by Stupay et al.,[17] who observed a failure rate of approximately 6% among 1,048 knees undergoing isolated MPFL reconstruction. With regards to MPFL

reconstruction with concomitant LRR and TTO, Su et al.[18] reported similar failure rates (5.6%) to the current study. The authors reported that study age and trochlear dysplasia were associated with greater rates of failure.

Although LRR has demonstrated benefit in certain settings such as in isolated, pathologic lateral retinacular tightness,[13-15] the procedure is not without downsides or risk. The lateral retinaculum (LR) reduces the force required to laterally displace the patella between 0 and 20° of flexion, and it contributes an estimated 10% of the restraining force against lateral translation, secondary to its posteriorizing vector upon the patella.[19,20] The findings of Gallagher et al.[21] provide further evidence for the contribution of the LR in patellar stability. Their cadaveric study demonstrated that LRR significantly decreased pressure across the patellofemoral joint in knees with overtensioned, reconstructed MPFL ligaments. Releasing the LR might not only fail to provide clinical benefit—as demonstrated by the present study—but even reduce lateral stabilization of the patella. This was confirmed by the finite element model analysis performed by Kheir et al.[22] that demonstrated adding LRR to MPFL reconstruction results in decreased patellofemoral contact pressure, contact area, and increased lateral patellar displacement with increased knee flexion. Based on the growing evidence in the literature, LRR adjunct should be cautioned against in the patellar instability treatment algorithm unless clinical benefit is substantiated.

Limitations

There are a number of limitations in this study that should be considered. First, the study follow-up time is relatively short. However, it is often important for athletes to know when they can expect improvements immediately following surgery, so a short follow-up may provide this information. Second, the low response rate to questionnaires from eligible patients potentially introduces nonresponse bias. In addition, the small study group may have led to the study being underpowered, and an a priori power analysis was not performed. Third, the retrospective nature of the study limited our ability to implement standardized time points for follow-up, resulting in a longer follow-up time for the MPFL combined with LRR cohort than the isolated MPFL cohort. Lastly, the use of 4 different surgeons is potential confounder.

Conclusions

MPFL reconstruction surgery combined with LRR failed to demonstrate significantly different functional outcome scores and failure rates compared with isolated MPFL reconstruction at minimum 1-year follow-up. In addition, there were no differences in rates of achieving MCID between both groups.

Disclosure

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: B.R.W. reports fellow grant support from Arthrex and Smith & Nephew, outside the submitted work; consulting fees from DePuy Mitek/Johnson & JohnsonJohnson & Johnson and Sparta Biosciences, consultant for Arthrex, and design team for FH Ortho, outside the submitted work; speakers bureau for Vericel and speakers fees from Arthrex, outside the submitted work; associate editor for Arthroscopy, board of directors for AANA, Membership Experience Task Force for ASES, and Research Committee for AOSSM, outside the submitted work; and stock options for Vivorte and stock in Spara Biosciences and Kaliber AI, outside the submitted work. All other authors (T.L.W., E.M.M., E.C.B., D.E.R.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

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