Return to Sport After Medial Patellofemoral Ligament Reconstruction

CME

A Systematic Review and Meta-analysis

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Background: Patellar instability is frequently encountered in the athletic population. Medial patellofemoral ligament (MPFL) reconstruction is a common strategy to treat recurrent patellar dislocation and demonstrates good clinical outcomes.

Purpose/Hypothesis: The purpose was to examine return to sport after MPFL reconstruction for patellar instability. We hypothesized that patients would resume athletic activity at a high rate and that a large proportion would return to their preoperative level of performance.

Study Design: Systematic review and meta-analysis.

Methods: A systematic review of the literature was conducted using PubMed and Cochrane Library databases to identify articles reporting return to sport after MPFL reconstruction for recurrent patellar dislocation. Athletes were defined as those reporting a preoperative sport. A random-effects model was used to evaluate return to sport rates, subsequent level, and rate of instability recurrence. Meta-regression was used to compare return to sport rates in patients undergoing MPFL reconstruction without osteotomy compared with those treated with simultaneous tibial tubercle osteotomy or trochleoplasty.

Results: In total, 23 articles met inclusion criteria after full-text review. A total of 930 patients were analyzed, including 786 athletes. Women represented 61.3% of all patients. The overall mean age was 21.1 years (range, 9.5-60.0 years), with a mean follow-up time of 3.0 years (range, 0.8-8.5 years). The return to sport rate was 92.8% (95% CI, 86.4-97.6). Patients returned to or surpassed their preoperative level of activity in 71.3% (95% CI, 63.7-78.4) of cases. An osteotomy was performed on 10.5% of athletes. Return to sport did not differ significantly in patients undergoing MPFL reconstruction without osteotomy versus those receiving additional osteotomy (95.4% vs 86.9%; $P = .22$). Patients returned to sport at a mean of 6.7 months (range, 3.0-6.4 months) postoperatively. Osteotomy did not affect return time. Complications occurred at an overall rate of 8.8%. The most common complication was recurrence of instability (1.9%; 95% CI, 0.4-4.0). The Kujala score was reported by 13 studies, with pre- and postoperative combined means of 60.3 and 90.0, respectively.

Conclusion: MPFL reconstruction is an effective and reliable treatment in the setting of patellofemoral instability. Surgeons can counsel their patients that they can expect a high rate of return to sport after MPFL reconstruction surgery alone or with concomitant osteotomy.

Keywords: medial patellofemoral ligament (MPFL); tibial tubercle osteotomy; return to sport

Patellar instability is commonly encountered in the young, athletic population. The incidence of first-time patellar dislocation ranges from 2.3 to 77.4 per 100,000 person-years.[16,52,55,62] Patellar instability may result from direct trauma but is often multifactorial with varying degrees of comorbidity secondary to anatomic considerations, including degrees of trochlear dysplasia, quadriceps dysplasia, patella alta, and increased tibial tubercle–trochlear groove (TT-TG) distance.[11] Patellar dislocation frequently occurs during sporting activity, with a predominance in young athletes.[16,55] Other factors, including the role of patient sex, are variable based on individual studies; however, increased risk has been reported in women within comparable sports, particularly in the adolescent age group.[16,36]

The medial patellofemoral complex (MPFC) is the primary restraint against lateral translation of the patella and is composed of the medial patellofemoral ligament (MPFL) and medial quadriceps tendon–femoral ligament (MQTFL).[13] Rupture of the MPFC is present in more than 90% of patients undergoing surgical treatment for recurrent patellar instability.[51] Initial nonoperative management is often used for primary initial dislocations, but the recurrence rate is up to 60%[56]; the understanding is

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evolving for recurrence risk and is now guiding earlier operative intervention in high-risk patients.[22] Risk for redislocation has been significantly associated with age younger than 25 years, skeletal immaturity, Dejour dysplasia (a trochlear dysplasia classification system ranging from least severe [class A] to most severe [class D]), and TT-TG distance/patellar length ratio greater than 0.5.[22] Surgical reconstruction of the proximal medial soft tissue restraints (MPFL or MQTFL) with autograft or allograft is recommended for recurrent dislocations and demonstrates successful outcomes.[8,18,65] This procedure may be performed in isolation or with concomitant tibial tubercle osteotomy or trochleoplasty based on patient anatomy and surgeon preference.[8,33]

While the understanding of the MPFC is evolving, historically the MPFL is regarded as an essential structure for lateral patellar stability and is commonly reconstructed.[1] Because patellar dislocation often occurs during athletic or sporting participation, it is necessary to evaluate the surgical efficacy of MPFL reconstruction for returning patients to sport. The purpose of this study was to examine return to sport trends along with complications and associated findings after reconstruction of the MPFL for patellar instability, based on a systematic review and meta-analysis of the literature. We hypothesized that MPFL reconstruction would allow patients to successfully return to sport, and that a large percentage would return to their preoperative level of performance.

METHODS

Systematic Review

Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, a systematic review of the available literature was performed.[37] The literature search was conducted on May 9, 2020, using the PubMed and the Cochrane Library databases with the following search string: ("medial patellofemoral ligament" OR "MPFL" OR "medial quadriceps tendon femoral ligament" OR MQTFL OR "medial retinacular complex" OR "medial patellofemoral complex" OR "tibial tubercle osteotomy" OR anteromedialization OR Fulkerson OR "elmslie trillat" OR maquet OR trochleoplasty OR distalization) AND ("return to sport" OR SPORT OR "return to play" OR PLAY). The references of each article were also checked manually for articles that could potentially be included in the analysis.

Inclusion criteria were English-language studies, documentation of presurgical participation in sport, and postoperative return to sport after MPFL reconstruction. Exclusion criteria were basic science or nonclinical studies, review articles, expert opinions, and studies that did not report return to sport after MPFL reconstruction. The search results were reviewed by 4 authors (J.M., L.B., S.M.M., B.P.), with studies initially screened by titles, abstract, and then full text as appropriate. In a case of disagreement, the article was evaluated by 2 sports medicine fellowship–trained orthopaedic surgeons (J.L. and A.V.S.).

Quality Assessment

The modified Coleman methodology score was used to evaluate the quality of the articles involved.[7]

Data Extraction and Statistical Analysis

A standardized form for evaluation of evidence-based medicine was used to extract data from all included studies.[63] Recorded data included the design of the study, characteristics of participants (age, sex, preoperative sport, and level of play), follow-up time, type of surgical procedure, clinical results of the final follow-up (whether the patient returned to sport, postoperative level of sport, patient-reported outcomes [PROs]), and any noted complications. Athletes were defined as those who participated in sport before surgery. Because of studies reporting characteristics for all patients and not specifically for athletes, such data were aggregated and reported for all patients.

The metafor package implemented in R software Version 3.1.0 (R Foundation for Statistical Computing)[48] was used for data analysis. The primary analysis was the number of patients who returned to sport after MPFL reconstruction and the level of play upon return (same level or higher vs lower) as reported by each study. The I^2 index was used to measure the heterogeneity of the included studies. Heterogeneity is a measure of the variability in outcomes observed between studies. Thresholds were "low" for I^2 values between 25% and 49%, "moderate" for I^2 values between 50% and 74%, and "high" for I^2 values above 75%. Because the heterogeneity was moderate to high, return to sport data were combined by meta-analysis

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using a random-effects model. The raw proportions of athletes who returned to sport were stabilized using the Freeman-Tukey double arcsine transformation.[17] Weighted averages of the transformed values were calculated using random-effects DerSimonian-Laird models and then back-transformed to obtain the final proportions.[12] The rate of return to sport was reported as the mean with a 95% CI. Exploratory meta-regression was used to compare the rate of return to sport between patients who underwent an osteotomy, including tibial tubercle osteotomy and trochleoplasty, and those who did not.

Secondary criteria for analysis included functional/pain results and rate of complications. PROs and complications were reported by studies for all patients and not specifically for athletes. Therefore, these were aggregated and reported for all patients in the included studies. Additionally, the rate of recurrent instability (dislocation or subluxation) for all patients was analyzed via the same meta-analysis method as return to sport and was reported as the mean with a 95% CI.

A funnel chart was used to evaluate publication bias.[58] The precision of each study was plotted on the *y*-axis, and the estimated treatment effect was plotted on the *x*-axis. Larger studies were included at the top of the plot and smaller studies on the bottom. Symmetric distribution of point estimates around the pooled effect of treatment indicate a low level of bias using this method. A significance threshold of $\alpha \leq .05$ was used for all statistical tests.

RESULTS

Included Studies

The search yielded 847 articles after the removal of duplicates. A total of 23 articles met our inclusion criteria (Figure 1; see Appendix Table A1, available in the online version of this article).[§] Thirteen prospective and 10 retrospective studies were included, 5 of which reported comparisons of different procedures. The majority of studies consisted of level 2 evidence, although 1 level 1 study met our criteria. The mean modified Coleman score was 43.8 ± 14.3 out of a possible 90 (range, 19-76). Most studies had a risk for bias as patient selection for procedures was not random, with the exception of 1 randomized clinical trial. Only 1 study had more than 20% loss to follow-up. Fifteen studies reported on level of play upon return to sport and were eligible for subgroup analysis.

Patient Characteristics

A total of 930 patients were initially included in 23 studies, including athletes, nonathletes, and those lost to follow-up (Appendix Table A2, available online). Of the 930 total patients, 84.5% (n = 786) of the patients participated in sport before surgery and were included in the final analyses. Sex distribution for all patients was as follows: 38.7%

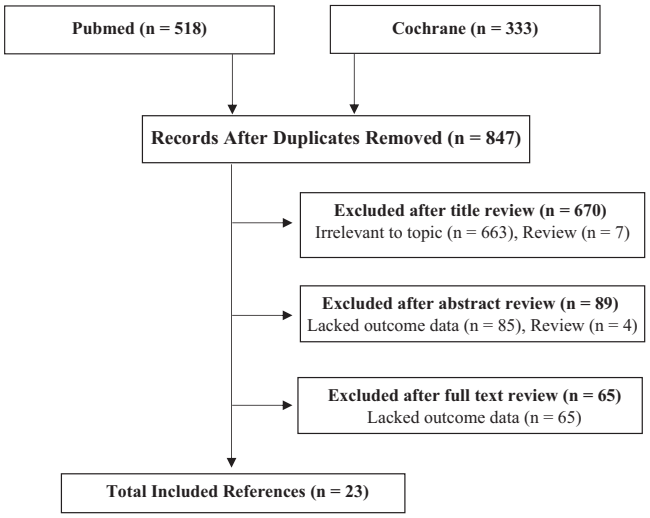

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram representing the article review process.

(n = 339) were men and 61.3% (n = 537) women. Note that certain articles only reported the sex ratio and age for the final group at follow-up, while others reported out of the initial cohort size, leading to a discrepancy compared with the initial and final pooled cohort sizes. Furthermore, sex distribution of only the athletic population was not available in isolation as the majority of studies reported the distribution among their population. The mean age was 21.1 years (range, 9.5-60.0 years). The average follow-up was 3.0 years (range, 0.8-8.5 years) postoperatively.

All studies reported the diagnosis as recurrent patellar instability. Five studies reported the number of dislocations, with a combined mean of 5.1 dislocations (range, 2-36 dislocations). All patients included in this study underwent reconstruction of the MPFL. Of the athletes analyzed with additional procedures reported, 6.7% (n = 53) had trochleoplasties, 4.6% (n = 36) had anteromedializing tibial tuberosity transfers, and 0.9% (n = 7) had distalization tibial tuberosity transfers. Further procedures included medial patellotibial ligament reconstruction (8.8%), lateral release (3.4%), and MQTFL reconstructions (1.7%). The Elmslie-Trillat procedure was also performed; however, the number of athletes who received the procedure was not specified. The indications for trochleoplasty included Dejour dysplasia types B to D[6] or the presence of a dome-shaped chondral surface of the proximal tibia.[41] Indications for anteromedialization tibial tubercle transfer included patellar J-tracking,[10,15] and indications for distalization osteotomy included patella alta.[2,15]

The level of sport before surgery was reported in 7 studies for 219 patients as follows: 83.1% (n = 182) amateur/recreational and 16.9% (n = 37) competitive/organized.

Return to Sport

The overall rate of return to sport by meta-analysis according to a random-effects model was 92.8% (95% CI,

[§]References 2, 3, 6, 10, 14, 15, 21, 23, 25, 26, 29, 33, 35, 39-41, 44, 46, 49, 57, 60, 61, 64.

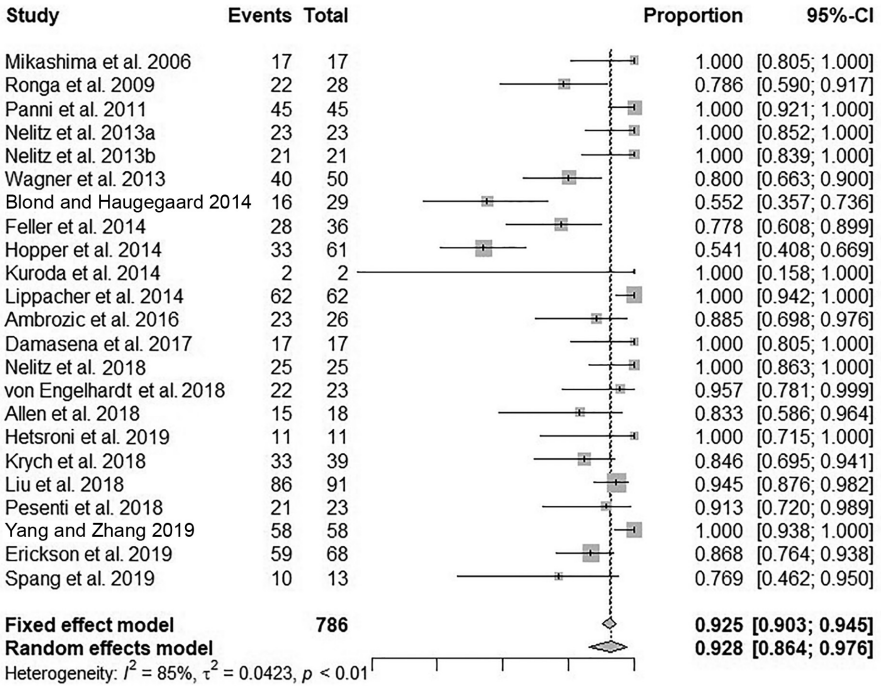

Figure 2. Forest plot chart of the combined rate of return to sport by meta-analysis with 95% CI. Events, number of athletes returned to sport; Proportion, rate of return to sport and 95% CI; Total, total number of athletes reported in the study preoperatively. According to a random-effects model, the rate of return to sport was 92.8%.

86.4-97.6). Heterogeneity was high (I^2 = 85.2%) (Figure 2). Of the 15 studies that reported a return to play time, patients returned at a mean of 6.7 months (range, 3.0-12.0 months) postoperatively. Of the 12 studies that separately reported time to return to play for those who did not undergo osteotomy, the mean time to return to sport was 6.7 months (range, 3.0-12.0 months). Only 1 study separately reported a time to return to sport in those who underwent an osteotomy, with an average time of 3.0 months.[10] The overall rate of return to sport was greater for those without an osteotomy (95.4%; 95% CI, 89.5-99.3) than for those who underwent an osteotomy (86.9%; 95% CI, 71.4-97.6) according to a random-effects model, although heterogeneity was high (I^2 = 78.4%) (Figure 3). A meta-regression comparing these groups found no significant difference in proportion returning to sport (P = .22). The overall rate of return to sport at the same or higher level of play was evaluated by 14 studies (492 patients). The combined rate according to a random-effects model was 71.3% (95% CI, 63.7-78.4), with moderate heterogeneity (I^2 = 61.7%) (Figure 4). The most common reason reported for lowering one's level of play was fear of reinjury (39.7%; n = 29), followed by objective or subjective loss in function (32.9%; n = 24) and loss of interest or lack of time (27.4%; n = 20).

Eight studies reported preinjury sports in 315 athletes. Four studies reported sports to which 164 athletes returned. The most common sport reported was soccer (17.8% preoperatively, 18.9% postoperatively) (Appendix Table A3, available online).

The funnel plot of return to sport demonstrated studies clustered symmetrically around the overall mean, suggesting a relatively low level of publication bias in studies included in our analysis (Figure 5). The Egger regression test resulted in insignificant plot asymmetry.

Patient-Reported Outcomes

The most used PRO was the Kujala score. Sixteen studies reported an average preoperative Kujala score of 60.3 (range, 30.5-80.0). Twenty studies reported postoperative Kujala scores, with a mean score of 90.0 (range, 83.0-100.0). The majority of studies that reported pre- and postoperative PROs demonstrated significant improvement. The next most common PROs were the Tegner score (7 preoperative and 10 postoperative studies) and International Knee Documentation Committee (IKDC) score (6 preoperative and 11 postoperative studies). The mean preoperative and postoperative Tegner scores were 5.0 and 5.5, respectively. The mean preoperative and postoperative IKDC scores were 54.6 and 82.7, respectively. Other less frequently used PROs included the Lysholm score, visual analog scale for pain, activity rating scale, Marx activity, Larson, and Fulkerson scores.

Complications

In total, there were 77 complications in 873 patients (8.8%) who completed the minimum follow-up as defined by each

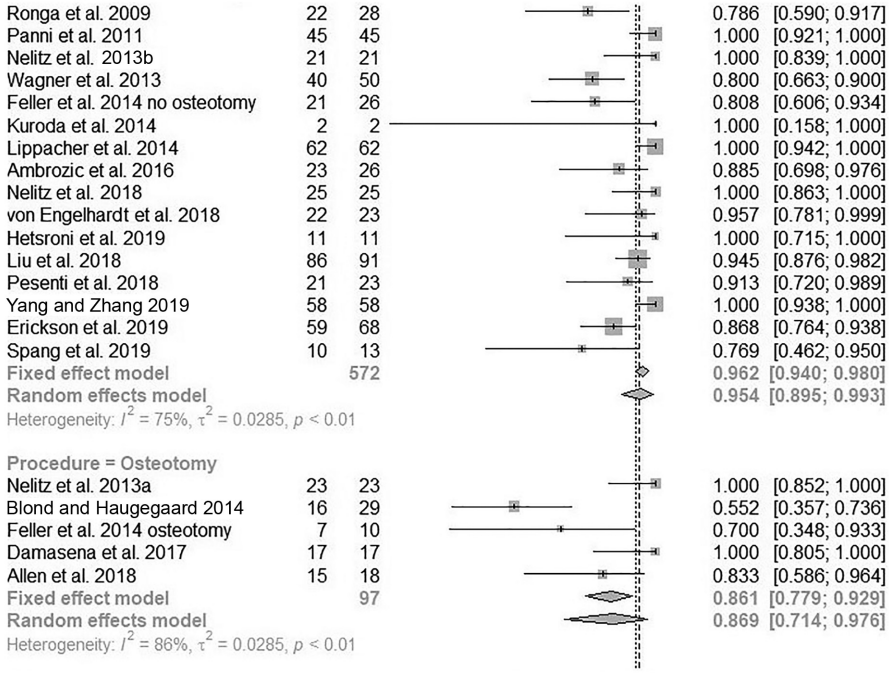

Figure 3. Forest plot chart of the combined rate of return to sport by meta-analysis with 95% CI. Events, number of athletes returned to sport; Procedure = No Osteotomy, athletes who did not undergo an osteotomy; Procedure = Osteotomy, athletes who underwent an osteotomy; Proportion, rate of return to sport and 95% CI; Total, total number of athletes reported in the study preoperatively. According to a random-effects model, the rated of return to sport were 95.4% and 86.9%, respectively. Meta-analysis demonstrated statistically similar rates of return between the groups (P = .22).

study, including athletes and nonathletes. The combined rate of recurrence of instability according to a random-effects model was 1.9% (Figure 6). Heterogeneity was moderate (I^2 = 52.9%). Other complications included fracture (1.1%; n = 10), wound complications/infections (1.0%; n = 9), persistent knee pain (1.0%; n = 9), and stiffness (0.1%; n = 5). Nine of the 10 patellar fractures were noted to be associated with the drilling of the patellar tunnel. One of the patellar fractures occurred in a patient who underwent MPFL reconstruction with tibial tubercle osteotomy. Ten patients (1.1%) underwent revision surgery for recurrence (Appendix Table A4, available online).

DISCUSSION

The primary finding of this meta-analysis demonstrates a high level of return to sport in patients undergoing MPFL reconstruction. More than 90% of patients resumed athletic activity at a mean of 6.7 months after surgery; however, a significant proportion (30%) were not able to return to their previous level of play. An important finding in our analysis was that osteotomy did not alter the rate of return to sport. Overall, these findings support MPFL reconstruction as an effective surgical treatment for athletes with recurrent patellar dislocation. These results suggest that patients can be counseled that most athletes will be able to return to sporting activity after surgery, although not all will reach their previous level of play. The most common reason for not returning to the same level of sport was fear of reinjury; however, loss of function in the operative leg was a significant reason for returning to a lower level of sport as well. Mikashima et al[35] demonstrated significantly decreased knee flexion and extension strength on the operative side that was more severe in those who reduced their level of sport. The reasons for failure to return to sport were not documented in all studies, so we are unable to elucidate exactly why some patients did not return.

The rate of return to sport after MPFL reconstruction without osteotomy in our study was comparable with those for other soft tissue reconstructions of the knee. The rates of return to sport after anterior cruciate ligament (ACL) reconstruction and meniscal allograft transplantation are 81% and 76%, respectively.[4,9] In addition, the rate of return to sport after MPFL reconstruction including osteotomy was similar to other bony procedures such as anteromedialization tibial tubercle osteotomy (83%),[34] meniscal allograft transplantation with distal femoral osteotomy (82%),[47] high tibial osteotomy (88%),[31] meniscal allograft transplantation with high tibial osteotomy (88%),[30] and Fulkerson osteotomy with lateral release (97%).[59] Liu et al[34] also reported a similar percentage of athletes returning to the same level of sport after tibial tubercle osteotomy (78%) as compared with our study after MPFL reconstruction (70%). Similar to the results reported by our study, the rate of return to the same level of sport in these procedures was also lower. While return to the same level after ACL reconstruction has been reported

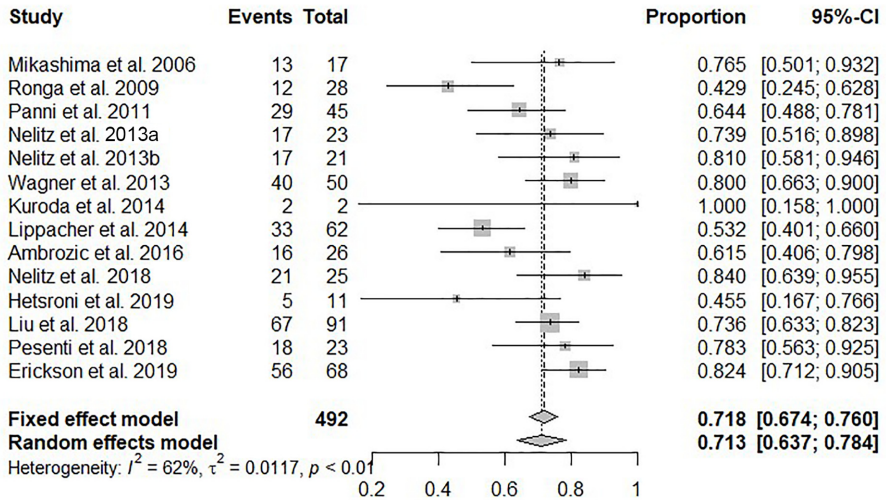

Figure 4. Forest plot chart of the combined rate of return to level of sport by meta-analysis with 95% CI. Events, number of athletes returned to the same or higher level of sport; Proportion, rate of return to the same or higher level of sport and 95% CI; Total, total number of athletes reported in the study preoperatively. According to a random-effects model, the rate of return to the same or higher level of sport was 71.3%.

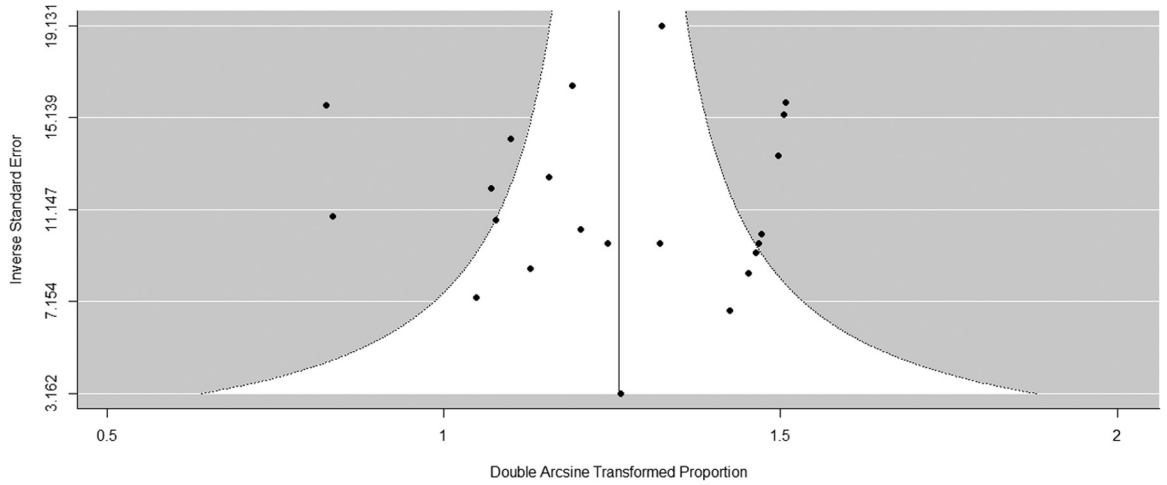

Figure 5. Funnel plot of precision versus estimated treatment effect demonstrating lack of asymmetry (P = .7441).

to be between 65% and 90%,[4,20] other studies have reported much lower rates of return to the same level of play, between 41.2% and 48.4% for meniscal allograft transplantation, posterior cruciate reconstruction, meniscal allograft transplantation with distal femoral osteotomy, high tibial osteotomy, and meniscal allograft transplantation with high tibial osteotomy.[9,30,31,34,47] We would expect a comparable rate of return to play between procedures because return to sport criteria are similar after knee operations; however, variability in patient populations (competitive vs recreational) as well as type of sport played (high impact vs low impact) likely accounts for some differences seen in return to level of sport.

MPFL reconstruction offers a high rate of return to sport, but several factors that may influence return to sport are not addressed by the reconstruction. While surgical intervention could prevent frank dislocation, it may not correct subtle anatomic abnormalities that can lead to symptomatic microinstability, as has been described in the hip.[24] In addition, MPFL reconstruction with or without an indicated osteotomy may restore the static stabilizers of the patella; however, the surgery does not directly address dynamic stability. Muscular atrophy could increase risk of patellar instability as quadriceps muscle attachments have been demonstrated to significantly affect patellofemoral tracking.[43,50,53] Reconstruction of the MPFL can lead to persistent strength deficits in the operative knee that may last more greater than 6 months.[25] Two recent systematic reviews assessed psychological factors affecting return to sport and the negative effect of fear of reinjury on return rates.[5,42] In assessing returning to sport after any injury, low fear and high motivation and confidence positively correlated with return to previous level of play.[5] A recent meta-

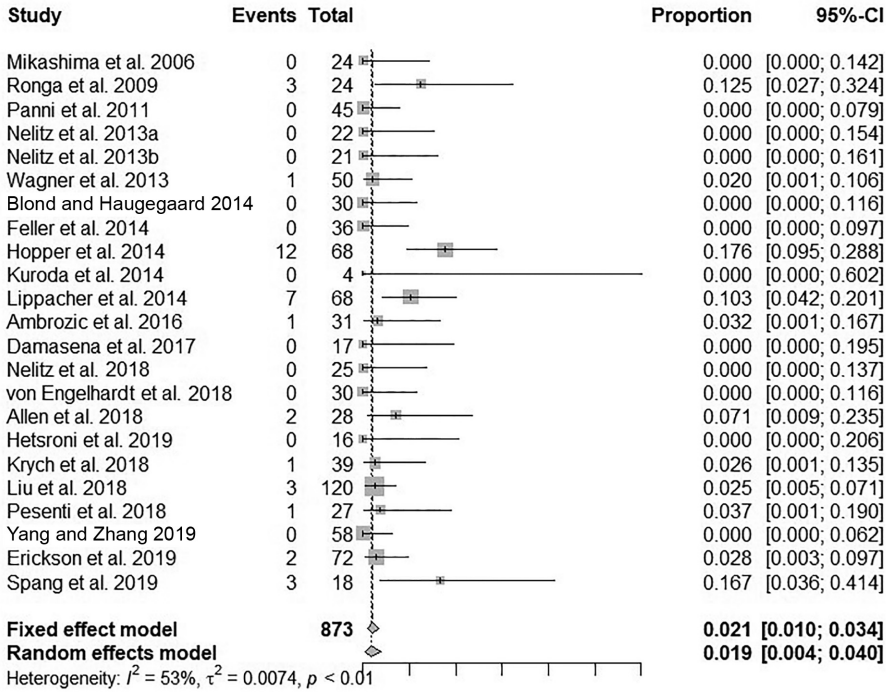

Figure 6. Forest plot chart of the recurrence of instability rate among all patients by meta-analysis with 95% CI. Event Rate, rate of recurrence of instability and 95% CI; #Instability, number of patients with recurrent instability; #Patients, total number of patients who met minimum follow-up. According to a random-effects model, the rate of recurrence of instability was 1.9%.

analysis analyzed the role of psychological factors in return to play of ACL patients and found that 64.7% of patients who did not return to sport cited a psychological factor for their inability to return.[42] The most common factors were fear of reinjury and kinesiophobia.[42] While mental readiness and kinesiophobia are well documented in the ACL reconstruction cohorts, similar apprehension likely plays a role in the return to level of play after MPFL reconstruction, as supported by the finding that the most common reason for lowering one's level of play was fear of reinjury. In addition, the functional deficits reported as reasons to lower level of sport may also be related to psychological factors. A pilot study from Shams et al[54] demonstrated continued global power deficits present in the ipsilateral hip and knee several months after return to sport. These deficits are suggested to be related to persistent kinesiophobia. To maximize return to sport, patients should be made aware of these additional challenges and address all modifiable risk factors.

An interesting finding of our study suggests that a concurrent osteotomy procedure at the time of MPFL reconstruction does not seem to affect the rate of return to play. Although an osteotomy is a more painful and involved procedure that might be expected to decrease the rate of return to play, our results suggest that successful return to sport can be achieved with either an isolated or a combined procedure. While our results do not suggest which aspects of pathoanatomy are imperative to correct, improved outcomes and a high rate of return to sport can be achieved by addressing anatomic risk factors for instability, such as increased TT-TG distance, patella alta, trochlear dysplasia, and patellar J-tracking.[2,6,10,15,25,39] Our findings suggest that patients who undergo concomitant osteotomy can expect a high return to sport rate similar to that of isolated MPFL reconstruction, provided that patellofemoral kinematics are restored and relevant psychological factors are addressed. The indications for additional bony procedures remain variable, and the degree of anatomic variation that can be tolerated without resorting to a combined procedure has yet to be fully elucidated.

Few studies reported average time to return to sport, and among them a wide range (3.0-12.0 months) was reported. A wide range (7.5-16.9 months) of time to return to play has also been reported for other knee operations, including meniscal allograft transplantation, high tibial osteotomy, meniscal allograft transplantation with high tibial osteotomy, and meniscal allograft transplantation with distal femoral varus osteotomy.[9,31,32,47] Time to return to play for ACL reconstruction has been suggested to be 9 months or longer; however, the optimal timing is still debated.[19,38] One reason for the inconsistency in time to return to play may be the wide variability in postoperative rehabilitation protocols, which was recently reviewed in the case of MPFL reconstruction.[27] Variable compliance with return to sport protocols may lead to outliers, which widens the observed range. While the available data are limited for the average time to return to sport with or without an osteotomy, a longer time to return to sport in athletes undergoing a concomitant osteotomy procedure may be necessary because of bone healing,

prolonged weightbearing restrictions, and concern for late tibia fracture.[45] One study did report a significantly longer time to return to play in those who underwent an osteotomy with their MPFL reconstruction compared with those who did not.[25] The most common sports reported in this study were football, soccer, and basketball; these are high-impact sports that may put patients at higher risk of fracture after osteotomy and would justify a longer time to return to play.[45] In the study that reported a 3.0-month time to return to play,[10] the types of sports that were played by this cohort were not reported. Additionally, this short time to return to play is not consistent with other studies that have specifically investigated osteotomy procedures. For example, Liu et al[34] reported an average time to return to play of 7.8 months after tibial tubercle osteotomy in 48 patients. It is possible that many of the athletes returning after osteotomy at 3.0 months were returning to relatively low-impact activities, thus putting them at a lower risk for late osteotomy complications. The time to return to sport may also be optimized with increased understanding of objective rehabilitation measurements and a more structured return to sport criteria, emphasizing phase-specific goals, precautions, treatment recommendations, and minimum advancement criteria to subsequent phases.

The overall complication rate was 8.8%, but less than 2% of patients required revision surgery. The most common complication was recurrent dislocation or subluxation in 1.9% of patients. The low rate may be due in part to the heterogeneity of reporting between individual study designs, along with variability in follow-up time, but these results further strengthen MPFL reconstruction as an effective treatment. Revision rates for ACL reconstruction have been reported as approximately 4%, with the majority occurring within the first 2 years after surgery, similar to the rates seen in our analysis.[28] Our results support a high rate of return to sport with a low rate of complication.

The limitations of our study, as with all systematic reviews, are primarily derived from variability in the quality of the available literature. In addition, the studies included are not time-weighted. Present-day surgical technique may differ from the technique utilized in the oldest articles included; however, studies were weighted equally with respect to when they were published. The available data were insufficient to delineate rates of return to specific sporting activities or patient characteristics affecting level of return to sport. While there was a high initial return to sport, there was no information regarding continued sporting activity over time. In addition, variable reporting of time to return to play prevented meta-analysis of this variable. The current literature primarily consists of level 2 studies of inconsistent quality, as demonstrated by modified Coleman scores. Heterogeneity was moderate to high in each individual analysis, limiting the strength of conclusions. Reconstruction techniques varied as well; however, despite using multiple techniques, all led to similar positive results. Between individual studies, there was also inconsistency with the specific data reported, as only certain studies reported variables such as frequency of dislocation and level of return to sport. The impact of publication bias was likely low. Our findings overall indicate a high return to sport rate across the majority of studies, supporting MPFL reconstruction as an effective treatment for athletes experiencing recurrent patellar instability.

CONCLUSION

MPFL reconstruction is a reliable treatment in the setting of patellofemoral instability. Underlying bony abnormalities should be properly addressed as osteotomy does not reduce the rate of return to sport; however, the degree of anatomic variation that can be tolerated with an isolated procedure has yet to be determined. Surgeons can counsel their patients that they can expect a high rate of return to sport after MPFL reconstruction surgery alone or with a concomitant osteotomy.

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