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ADVANCES IN PATELLOFEMORAL SURGERY (L REDLER, SECTION EDITOR)

Return to Play after Patellar Stabilization

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Abstract

Purpose of Review The purpose of this review is to evaluate the existing literature regarding return to play (RTP) and return to prior performance (RPP) following patellar stabilization surgery. It will also discuss suggested guidelines regarding RTP, and finally, to encourage future patellofemoral instability research to report and publish results of RTP rates using standardized RTP guidelines.

Recent Findings There is a lack of validation and universal adoption of standardized RTP guidelines. This has led to a dearth of high-quality studies on RTP and RPP after patellar stabilization. The best available studies to date would suggest high RTP rates (84%–100%), average RPP rates (33%–77%), and a highly variable timeframe for return (3–12 months).

Summary Patellofemoral instability can be a persistent and challenging problem, particularly in the young and active population for which it most often occurs. Much of the previous studies on patellofemoral instability evaluated success and failure as prevention of recurrent dislocation. However, prevention of recurrence alone may not be enough for many patients. The best available data on RTP and RPP following patellofemoral instability is based on lower quality of evidence studies, expert opinion, and published societal guidelines. Future research on this topic should include clinical validation of the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine (ISAKOS) RTP guidelines and reporting of outcomes based on these guidelines in patellofemoral instability publications.

Keywords Patella instability · Patella stabilization · Return to sport · Return to prior performance

Introduction

The reported incidence of patellar dislocation is between 5.8 and 7.0 per 100,000 person years in the general population, 29 per 100,000 in 10–17 year olds and 69 per 100,000 in military personnel undergoing rigorous training [1]. Fifty to 60% of initial first-time lateral patellar dislocations will occur secondary to a sports-related injury and will involve a compromised medial patellofemoral ligament (MPFL) and medial retinaculum at least 80% of the time [2•]. Depending on underlying patient risk factors for recurrence, non-operative or operative interventions can be effective treatment methods for patella dislocation. Despite non-operative and operative management decreasing the incidence of recurrent dislocation, at least 30%to 50% of all patients having sustained a primary patellar dislocation will continue to have symptoms of instability and/or anterior knee pain [3]. The vast majority of existing studies base success or failure on whether or not a repeat patellar dislocation event occurs. While that is essential information, return to play (RTP) and return to prior performance (RPP) are typically what is most important to the patient. A successful outcome for many patients should be interpreted as no further dislocation events, ability to return to play, and to return at their previous level of performance.

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Outcomes of Non-operative Management

Despite the widespread use of conservative management options in patellar instability, limited research focuses on outcomes

pertaining to the non-operative group alone. Currently available research focuses on predisposing factors and recurrence of instability episodes, with natural history studies demonstrating that 50%–70% of patients managed non-operatively will suffer no recurrent dislocation events [4•]. However, few studies address the outcomes of those patients without recurrent instability episodes. Atkin et al. reviewed their non-operative patients without recurrent instability episodes and found that 69% were able to return to play at 6 months after initial injury; however, 58% of those patients described limitations upon intense activity [5•]. Magnusson et al. reported that although 86.1% of patients treated non-operatively were able to return to their most important physical activity at a mean of 3.4 years after initial injury, only a striking 26.4% were able to return without limitations [4•]. Among those with limitations, 86.8% of the patients identified their initial patellar dislocation event as the cause of their ongoing limitation in their desired activity level. Moreover, contrary to popular belief, comparing those without recurrent instability to those with recurrent instability episodes, there were no statistically significant differences in Knee Injury and Osteoarthritis Outcome Score (KOOS) subscales including symptoms, pain, activities of daily living, sport and recreation function, and knee-related quality of life. Thus, even among non-operative patients without episodes of recurrent instability, significant restrictions may still exist for unproven reasons. The absence of recurrent dislocations is insufficient in evaluating conservative management protocols. Future studies should consider evaluating the outcomes of conservative treatment especially related to RTP and RPP.

Current Data on Return to Play After Surgery

Mounting evidence focuses on comparing non-operative and operative management outcomes for patellar instability. Cochrane meta-analysis concluded that some evidence favors surgical over non-surgical management, but the quality of evidence among the included studies was too low to say with certainty [6•]. Current data suggests strong objective results following patella stabilization surgery, but there is a scarcity of evidence regarding RTP or RPP protocols for medial patellofemoral ligament reconstruction (MPFL reconstruction), tibial tubercle osteotomy (TTO), trochleoplasty, or other patellar stabilization procedures.

Zaman et al. performed a systematic review in search of a validated, objective RTP protocol following MPFL reconstructive surgery [7••]. While the majority of the studies utilized time-based criteria, no consensus objective or subjective assessment was identified. Fisher et al. yielded similar conclusions regarding the lack of established rehabilitation and RTP guidelines following MPFL reconstruction [8]. RPP data was only available in 2 of 21 included studies but was reported as 77.3% in a 3- to 6-month timeframe. Poor study methodology was noted as a significant limitation to accurate evaluation [8].

Lippacher et al. demonstrated a 100% RTP in a 3- to 12-month timeframe after MPFL reconstruction but only 53% returned to pre-injury form or better [9]. The study also found that the median age of dissatisfied patients was higher than the overall median age at the time of surgery, suggesting that older patients may have poorer RPP capability. Ambrozic and Novak found that 88.5% of patients had returned to sports at an average follow-up of 6.4 years, but 30.4% of those patients returned at a lower activity than pre-injury status [10•]. Additionally, return to sport protocol or timeframe was not provided. Schneider et al. performed a systematic review that reported an 84.1% return to preinjury status following isolated MPFL reconstruction [11•]. Panni et al. found that 64% of patients were able to return to preinjury status [12]. Ahmad et al. reported 100% return to preinjury status following MPFL reconstruction [13]. Nelitz reported that 84% of skeletally immature patients were able to return to preinjury sports level following MPFL reconstruction [14•].

Return to Play After Patellar Stabilization and Concomitant Procedures

Concomitant procedures are commonly performed to address multiple concerns regarding patellar instability, but this evidence is once again limited in regard to RTP. Arshi et al., in 2016, looked at the rates of concomitant procedures performed along with MPFL reconstruction and demonstrated the most common additional procedure was lateral retinacular release (43.7%), chondroplasty (31.1%), tibial tubercle osteotomy (13.1%), removal of chondral fragments/loose bodies (10.5%), chondroplasty (9.5%), and microfracture surgery (9.5%) [15•]. In the largest study, Tjoumakaris et al. demonstrated a 97% RTP following modified Fulkerson osteotomy but did not report whether the return was to preinjury form [16]. However, the study is nonetheless useful in suggesting that osteotomy procedures may have utility in addressing concerns of recurrent patellar instability in athletes. Ntagiopoulos et al. described a series of sulcus-deepening trochleoplasty procedures with concomitant bony and/or soft tissue procedures with return to previous activity of 87%, but the level of activity was not specified [17]. Burnham et al. performed a systematic review of combined MPFL reconstruction and TTO that demonstrated excellent subjective outcomes but did not include information regarding RTP [18•]. Nelitz and Williams noted that 95% of patients undergoing concomitant trochleoplasty and MPFL reconstruction were satisfied with the surgical results and “almost all” were able to exercise at a similar level as preoperatively, but specific RTP data was not included [19•]. Thus, the information at present presents promising yet unfounded results that require more data to elucidate the

specifics in regard to RTP following concomitant procedures to address patellar instability.

Return to Play Guidelines

At this time, there have been no validated consensus guidelines, with objective criteria, to guide RTP. Until high-quality studies can be completed, RTP following patellofemoral instability is currently based on lower quality of evidence studies, expert opinion, and published societal guidelines.

Criteria for return to play after patellofemoral instability were developed during the 2013 meeting of the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine. See Table 1.

Unfortunately, there has been a lack of evidence to create validated RTP guidelines. In a 2017 systematic review, the authors reviewed 53 studies regarding RTP after MPFL surgery. Ten of the 53 studies (18.9%) included objective or subjective criteria to determine RTP. The majority of the analyzed studies used time base criteria for RTP [7••].

Much of the patellar stabilization RTP has been based off previous work and experience status post ACL reconstruction. "Despite differences between MPFL and ACL reconstruction surgeries, there are enough similarities in post-operative neuromuscular deficiencies to suggest that strategies that are found to be successful after ACL reconstruction should be considered for those who have undergone MPFL reconstruction" [20].

Ménetréy et al. developed 6 clinical criteria for return to play following patellar stabilization based on the existing literature of return to sport following ACL reconstruction. The criteria include no pain, no effusion, no patellofemoral instability, full range of motion, nearly symmetrical strength (85% to 90%), and excellent dynamic stability [21••]. To achieve these 6 criteria, post-operative rehabilitation should focus on strengthening and neuromuscular control to avoid situations of dynamic knee valgus. Increasing the Q angle at the knee puts increased strain on the MPFL and can subsequently increase the chance of patellofemoral joint subluxation/dislocation. Therefore, rehabilitation is not simply focusing on the knee and quadriceps, but a more comprehensive "core to floor" approach is recommended.

It is recommended to use criteria-based progression instead of time-based criteria for rehabilitation following RTP. In graduated rehabilitation, progression through the program requires the patient to meet specific criteria with regard to ROM, strength, endurance, neuromuscular control, clinical exam, functional tests, and subjective knee scores. This allows recovery to be tailored to each patient's needs instead of arbitrary time points.

Rehabilitation regimens commonly use a three-stage progressive program: acute, recovery, and functional phases. The acute stage following injury, or immediately after surgery, aims to restore range of motion and resolve inflammation. The recovery phase is from approximately 3 to 6 weeks, with the aim of improving lower limb muscle strength and functional stability. Finally, the functional stage of rehabilitation (from 6 weeks onwards) concentrates on returning the individual to previous levels of activity and decreasing the risk of re-injury [22•].

As strengthening and neuromuscular control improves, the athlete should begin to prepare for the sport-specific demands. Cutting maneuvers, change of direction, and running on uneven ground are the three activities perceived to be the greatest risk factors for patellar dislocation [23]. The athlete should focus on those exact maneuvers that may put them most at risk during sport. It is not until they can successfully demonstrate comfort with those maneuvers that they can safely return to sport.

Psychological Factors and Return to Play

Self-efficacy likely plays a significant role in rehabilitation and RTP. Perceived self-efficacy is defined as a judgment of one's potential ability to carry out a task, rather than a measure of whether or not one actually can or does perform the task

Table 1 International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine Criteria for RTP After Patellofemoral Instability

- Complete radiographic healing of bone if bony surgery is involved
- Full or near full range of motion
- No knee effusion
- No complaints of knee pain or knee instability
- Satisfactory core strength and endurance
- Completed neuromuscular training/proprioception
- Acceptable control with dynamic activities
- Limb Symmetry Index greater than 85% on hop tests
- Adequate performance with a physical therapist during sport-specific drills simulating the intensity and movement patterns of the given sport
- Athlete demonstrates a psychological readiness to return to sport (SANE score greater than 80 of 100)

(Source: International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine)

SANE Single Assessment Numerical Evaluation

[24]. Despite all the best surgical and physical rehabilitative efforts, the psychologic aspect of returning to play can be an obstacle. An athlete may not be able to RTP, despite passing all objective criteria, because of his or her mental state and/or expectations, further challenging the use of objective criteria to help determine RTP [25•]. Validated ACL specific self-efficacy measures exist, but currently, there are no specific self-efficacy measures pertaining to patellofemoral stability. In a review of nearly 6000 patients after ACL reconstruction, only 44% of patients were able to return to competitive sport, despite the fact that 90% of patients had normal or nearly normal function using objective outcome scores, and that 85% of patients had normal or nearly normal function on the basis of activity measures, such as the International Knee Documentation Committee subjective knee evaluation form [26]. The Inernational Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine (ISAKOS) 2013 guidelines include assessment via SANE scores to evaluate patient-reported readiness for RTP. By including the Single Assessment Numerical Evaluation (SANE) score in the ISAKOS guidelines, this acknowledges the important role of psychological readiness for RTP. However, future work would be needed to create a more specific patellofemoral instability self-efficacy survey.

Conclusion

It can be helpful for the clinician and patients to have a set of guidelines for determining RTP after patella stabilization. Guidelines can help the surgeon counsel and set realistic patient expectations during recovery. It can be useful to encourage a patient lagging behind in recovery, or to slow a patient down that may be moving too quickly. As we are able to follow patients progress through the phases of recovery, we can set out a typical expected timeframe through each phase, and most important to the patient, an estimate of when they can safely RTP. We would encourage RTP and RPP rates to be reported in future patellofemoral literature. Utilizing the most current studies, it would suggest high return to play rates (84%–100%), average RPP rate (33%–77%), and a highly variable timeframe for return (3–12 months).

Compliance with Ethical Standards

Conflict of Interest Seth L. Sherman grants from Arthrex, Inc., personal fees from Ceterix Orthopaedics, personal fees from CONMED Linvatec, personal fees from Moximed, personal fees from Neotis, personal fees from Regeneration Technologies Inc., personal fees from Vericel, grants from Zimmer, other from ACL Study Group, other from American Journal of Orthopedics, other from American Orthopaedic Society for Sports Medicine, other from Arthroscopy, other from Arthroscopy Association of North America, outside the submitted work. All other authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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