Functional Rehabilitation of Lateral Patellar Instability

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Patellar Instability can be a difficult problem for clinicians to manage. Treatment for lateral patellar instability may involve conservative care or corrective surgery. Among patients treated conservatively, it has been reported that the frequency of patellar-instability episodes decrease as the patient gets older.¹

Whether the athlete is managed conservatively or surgically, treatment for patellar instability typically involves a progression from an acute phase to a sports-specific phase. Throughout the rehabilitation process, reducing the lateral displacement force vector on the patellofemoral joint is key to protecting and promoting healing of the medial stabilizing structures of the patella that are often damaged. Pain and inflammation should also be controlled. As swelling resolves and the athlete’s range of motion and strength improve, rehabilitation progresses from the acute phase to a functional phase. The functional phase consists of activities such as stair climbing and gait training. Individuals who do not participate in sports may be satisfied once they achieve full function with daily activities. Athletes, however, should be progressed beyond the functional phase to the sports-specific and return-to-sport phases. This article discusses how clinicians treating athletes with patellar instability can address biomechanical and anatomical factors during the functional activity and return-to-sport stages of rehabilitation to promote healing of damaged structures.

Biomechanics of Patellar Instability

Biomechanical factors contributing to patellar instability may be intrinsic or extrinsic. Intrinsic factors are those related to the anatomy of the patella, such as laxity of the medial patella-stabilizing ligaments or a shallow femoral trochlea. Extrinsic factors are those that are not part of the knee anatomy but contribute to lateral patellar displacement.

Intrinsic Factors

Knowledge of the anatomy of the patellofemoral joint is essential for the clinician to understand its biomechanics. The medial stabilizing ligaments of the patella, including the medial patellofemoral ligament (MPFL) and the medial patellomeniscal ligament (MPML), often undergo plastic deformation as chronic instability develops. The MPFL originates from the adductor tubercle and attaches to the superomedial portion of the patella and the undersurface of the quadriceps. The MPML originates from the inferomedial portion of the patella and the undersurface of the quadriceps tendons and indirectly attaches to the tibia through attachment to the coronary ligament anterior to the medial collateral ligament.² More than 50% of the restraint to excessive inferolateral patellar displacement is attributed to the MPFL, with the greatest restraint provided in knee flexion when the MPFL is most taut.³⁻⁵ In flexion, the medial femoral condyle also acts as a cam to accentuate elongation of the MPFL.⁶ In contrast, the MPML contributes up to 25% of the restraint to lateral patellar displacement, with its greatest restraining effect provided in extension.²⁻⁶

If the medial patellar ligaments are injured, therapeuetic exercises should impose minimal stress on them. For example, avoiding high resistance in the 30–0° range of knee extension protects the MPML. Avoiding deep squats and other exercises involving
extreme knee flexion theoretically protects the MPFL. An understanding of the biomechanics of the patellofemoral joint should guide selection of therapeutic activities that will minimize stress on the anatomic structures that normally resist lateral displacement of the patella.

**Extrinsic Factors**

Extrinsic factors that contribute to lateral patellar instability include lower extremity malalignment, weakness, and inflexibility. Biomechanical factors that contribute to creation of a lateral force vector acting on the patella include subtalar pronation, genu valgus, internal femoral rotation, and hip adduction (Figure 1). Demands imposed by sports activities can accentuate the effects of biomechanical malalignments that contribute to patellar instability (Figure 2). For example, basic positions of dance, such as the plié and passé, increase the lateral force vector on the patellofemoral joint as the dancer attempts to achieve a turned-out position (Figure 3). Dancers with pronated feet, hip weakness, or other impairments commonly suffer patellofemoral instability. Rehabilitation focused on extrinsic factors may adversely affect healing of intrinsic structures.

**Advanced Rehabilitation Phases**

**Functional-Activity Phase**

The functional-activity stage of the rehabilitation program emphasizes restoration of general mobility, that is, normal gait and stair climbing, while protecting the patellofemoral joint from lateral displacement. Biomechanical deviations can be analyzed during closed kinetic chain activities involving single-leg stance, such as a lateral step-up or a single-leg squat, to identify extrinsic factors that stress the patellofemoral joint. Excessive subtalar pronation is an example of an extrinsic biomechanical deviation that a clinician might observe with these closed kinetic chain activities. Patients with excessive subtalar pronation often present excessive genu valgus. Weakness in the lower extremity and trunk can also contribute to these biomechanical deviations.

A multifaceted approach to management of the condition is needed to address factors contributing to lateral patellar instability occurring during functional activities. Passive restraints can be used to influence intrinsic and extrinsic factors. An orthotic with a medial heel wedge can be used to reduce foot pronation and rear-foot valgus. The orthotic can, thereby, indirectly correct more proximal deviations along the kinetic chain.