CASE REVIEW

Treatment of Patello-Femoral Pain Syndrome in a Track Athlete

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Key Points

- A rehabilitation program concentrating on hip, knee, and foot strengthening was successful in managing patello-femoral pain syndrome.
- Strengthening of the intrinsic foot muscles significantly decreased navicular drop in both feet.
- Arch taping was successful in decreasing knee pain during normal ambulation.

Patello-femoral pain syndrome (PFPS) has been identified as the most common injury sustained by runners.[1] The cause of the condition has not been conclusively determined and has even been suggested to be due to psychological rather than physical factors.[2] A classification system has been introduced to assist clinicians in diagnosing potential causes of PFPS.[3] This system requires examination of the entire lower extremity for muscle weakness or lack of flexibility. Recent literature suggests that abnormal loads on the patello-femoral joint may be created by proximal and distal abnormalities.[4]

A strength deficiency in hip abduction, external rotation, and extension has been documented in females with PFPS.[5] Although hip abduction strength has been shown to be significantly lower in individuals with PFPS compared to healthy controls, differences have not been found in hip or knee motion during stair climbing[6] and walking.[7] An analysis of runners with PFPS demonstrated a significant inverse association between hip abduction strength and amount of hip adduction motion following a run.[8] Proximal strengthening of abdominal, hip abductor, and hip external rotator muscles has been been shown to result in a significant improvement in PFPS symptoms.[9]

Distal lower extremity abnormalities should be considered during a clinical examination of a patient with PFPS. Female patients[10] and soldiers[11] with PFPS have not been found to exhibit excessive foot pronation, but excessive navicular drop has been identified as a risk factor for PFPS among military cadets.[12] Excessive pronation can alter biomechanical function throughout the lower extremity kinetic chain.[13] To the extent that abnormal foot pronation exacerbates PFPS, strengthening of the musculature that provides dynamic support for the medial longitudinal arch may be beneficial,[14] as well as the use of semi-rigid orthotics.[15]

Medial longitudinal arch height can be assessed by measurements of the navicular tuberosity in sitting and standing positions. Navicular drop is defined as the distance the navicular tuberosity displaces downwardly as the body weight is imposed upon the subtalar joint.[16] We assessed navicular drop with method used by Headlee et al,[14] who

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reported strong intratester reliability (ICC = .95) and a standard error of measurement of 0.73mm. Other research has demonstrated high intratester reliability (ICC = .87–.95) and intertester reliability (ICC = .76–.93) reliability for navicular drop measurement.[16]

Inferior displacement of the navicular bone under load may result from muscle weakness, ligament laxity, or a combination of the two. Lacking clear evidence about the cause of PFPS, a theoretical framework is needed for development of a treatment plan.[3] This case report provides support for treatment that includes strengthening of proximal and distal musculature.

Case Review

A 23-year-old male Division III college track athlete who competed in 55-m, 100-m, and 200-m events reported development of stiffness and pain in his left knee during training over 4- to 5-week period. The athlete reported pain that was affecting his performance to the team physician, who referred him to the athletic training staff for rehabilitation. During the initial evaluation, the patient related having been diagnosed with patellar tendinitis of his left knee by a physician approximately one year earlier. He stated that the condition had resolved quickly and did not recur. He complained about swelling after activities, but no swelling was evident at the time. Palpation elicited pain over the medial patellar facet, medial femoral condyle, and vastus medialis obliquus muscle. The patient reported a pain level of 8 on a 10-point scale during active motion of the involved knee. Pes planus was clearly evident in a standing position. Orthotics had been provided 3 years earlier by a chiropractor. Navicular drop of 11 mm was measured for the right foot and 13 mm was measured for the left foot. A value greater than 10 mm is considered excessive.[13] There was approximately 15° less flexion range in the left knee and slight weakness of the knee flexors (4 + out of 5 for manual muscle testing) was evident. Weakness also was evident in the left hip abductors (4 + out of 5). Lateral patellar tilt, patella alta, and a shallow trochlear groove were identified as possible predisposing factors for PFPS. Medio-lateral patellar motion was interpreted to be normal and consistent with that of the the contralateral extremity. The patellar apprehension sign was negative. Observation of standing lower extremity alignment did not reveal evidence of hip anteversion, genu valgus, or tibial torsion. Excessive pronation of both feet was clearly evident during gait, especially during the mid-stance phase.

Treatment

The team physician advised the patient to discontinue all training activities and to focus on strengthening for correction of lower extremity misalignment. McConnell taping also was recommended to address the lateral tilt of the patella. Over a 6-week period, the patient refrained from participation in any running activity, and he completed a total of 11 rehabilitation sessions that were supervised by the athletic training staff. Because the patients' knee pain significantly decreased after the first week of treatment, McConnell taping was not administered during the rehabilitation process.

Treatment primarily consisted of lower extremity strengthening exercises (Table 1). During the first week of the rehabilitation program, a low-Dye arch taping technique was applied to both feet for support of the medial longitudinal arch throughout the day. At the end of the first week, he reported a decrease in pain from 8/10 to approximately 5/10 during ambulation. After 2 weeks of therapy, his pain rating decreased to 3/10 during ambulation. After the sixth treatment session (end of week 3), the patient only experienced discomfort when new exercises were initiated or exercise intensity was significantly increased. Jogging on a mini-trampoline was initiated during the second week with no adverse effects.

Foot Exercises

Muscle endurance was developed by having the patient pick up marbles with his toes and placing them into a container one at a time. The activity was continued until the muscles fatigued, and he could no longer continue performing the task. After the third session, the patient performed towel toe-curls with a resistance of 2 pounds until unable to continue. This exercise requires activation of the intrinsic muscles of the foot, including the flexor hallucis brevis, flexor digitorum brevis, quadratus plantae, lumbricals, and interossei, which are believed to control foot pronation.[14] After the 11 treatments, navicular drop decreased from 11 mm