Understanding Anterior Knee Pain: Patellofemoral Pain Syndrome

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ABSTRACT

Patellofemoral pain syndrome (PFPS) is 1 of the most common causes of anterior knee pain and should be included in the differential diagnosis for anterior knee pain in every patient. PFPS is characterized as an overuse injury. The exact mechanism of injury is still under investigation, but it is believed to stem from maltracking of the patella. PFPS commonly presents in adults who complain of anterior knee pain with activity. This pain can lead to significant disability. When treated appropriately, disability and chronicity can be avoided or reduced.

Keywords: anterior knee pain, chondromalacia patella, knee pain, runner's knee, patellofemoral pain syndrome

Knee pain is 1 of the most common reasons that a patient presents to the primary care setting.[1,2] Of patients who present with knee pain, the most common location for that knee pain is in the anterior portion of the knee.[3,4] When clinicians are considering the differential for knee pain, they should always consider patellofemoral pain syndrome (PFPS) in their differential diagnosis.

PFPS is the most common cause of knee pain seen in the outpatient setting.[5] PFPS is characterized and categorized as an overuse injury. Although it is not a tendinopathy as most overuse injuries are, PFPS results from the repetitive motion of knee flexion. This overuse of the knee combined with several other factors can lead to irritation of the articular surface of the patella. This irritation leads to pain with bending the knee. PFPS, if left untreated, can lead to degeneration and long-lasting pain and disability. Eventually, permanent damage to the articular surface of the patella known as chondromalacia patella (CP) may develop.[6]

PFPS is seen commonly in active adults who participate in activities such as running, basketball, and racket sports.[7] Although it is 1 of the most commonly observed causes of knee pain in the outpatient setting, it is frequently misdiagnosed and improperly treated. Some of this may stem from the general lack of consistent terminology. Over the years, PFPS has been called jumper's knee, runner's knee, patellofemoral syndrome, CP, and idiopathic anterior knee pain.[8]

Another cause of misdiagnosis and improper treatment is that the cause is often multifactorial and can be confusing.[3,4] The purpose of this article is to clarify some of the confusion regarding PFPS and CP and to provide information on the current literature regarding the pathophysiology, diagnosis, and treatment of PFPS.

THEORIES OF PATHOPHYSIOLOGY

Debate as to the origin or cause of PFPS still occurs. Currently, several theories are thought to contribute to the development of PFPS. We will review the most widely accepted of these theories here.

Maltracking of the Patella

Most experts agree the mechanism of injury in PFPS is maltracking of the patella.[3] In the normal knee, the patella should smoothly glide in between the 2 condyles of the femur in the trochlear groove. In individuals with PFPS, it has been observed that the patella does not track through the trochlear groove but instead takes an aberrant pathway during knee flexion.[4] This pathway is usually over the lateral condyle of the femur. Abnormal tracking of the patella leads to increased pressure and grinding on the

underside of the patella. Over time, it is thought that the increased friction and pressure can lead to softening and more severe damage of the cartilage on the underside of the patella, thus creating the more chronic and permanent condition called CP.[6]

Muscle Weakness and Muscle Tension

As stated previously, the theorized maltracking of the patella is usually in a lateral direction over the lateral condyle. The maltracking is almost never observed over the medial condyle because of the increased prominence. The cause of this maltracking remains elusive. There have been several theories regarding the cause of the maltracking. Most of these theories focus on muscle tension imbalance and muscle weakness.[4,8]

Although many studies support that muscle weakness and/or muscle tension contribute to maltracking of the patella, there is little consensus on a single muscle group that is to blame. In reality, proper patellar tracking is a very dynamic motion that is influenced by several muscle groups including the quadriceps and gluteal muscles.[4,8] As such, it is likely that maltracking of the patella can be caused by tightness or weakness in these muscle groups.[9] Because of the complexity of this, it has been difficult to pin down a single cause of patellar maltracking.

Quadriceps Dysfunction

Several studies report that the quadriceps muscles play an important role in patellar tracking.[10] Tightness in the vastus lateralis can lead to increased lateral pull on the patella and maltracking.[10] Weakness in the vastus medialis can also lead to maltracking of the patella.

Hip Rotation and Abduction Dysfunction

The literature also identifies external hip rotator and hip abductor weakness as a cause of maltracking of the patella.[9] It is hypothesized that weakness in the gluteal muscles leads to improper kinesiology that influences the patellar tracking.

Inactivity and Increased Intensity of Physical Activity

Imbalances in muscle strength and flexibility are seen in individuals who have been sedentary and have some degree of muscle atrophy because of inactivity. It is also seen in active individuals who have recently increased intensity of activity or have been involved in excessive activity.[3]

The result of maltracking of the patella leads to inflammation and irritation of the underside of the patella. The underside of the patella does not contain nociceptive nerve fibers so it is not the cause of the pain initially. It is hypothesized that the increased friction resulting from maltracking causes surrounding tissue inflammation and irritation leading to anterior knee pain.

CLINICAL PRESENTATION

History

The defining characteristics of PFPS include knee pain, typically in an anterior distribution without radiation, as well as pain with flexion of the knee with walking, running, or jumping.[2] In more advanced stages of PFPS, the patient may have pain after sitting with the knee in the flexed position for an extended period of time.[2] Typically, this is seen in those individuals who are very active or those who have recently intensified their physical activity too quickly.[3] The pain associated with PFPS can lead to avoidance of the aggravating activities. The patient may also complain of knee swelling.[3]

Physical Examination

Physical examination of the patient with anterior knee pain should be comprehensive. The diagnosis of PFPS is one of exclusion. Other knee conditions that should be ruled out before a diagnosis of PFPS include meniscal tear, ACL and PCL tears, and other ligamentous damage. Knee evaluation should include inspection of the knee and surrounding tissues, palpation of the knee joint margins and patella, and active and passive range of motion of the knee. Special tests including tests to evaluate the ACL, PCL, and meniscus should be included in the examination.

There are several physical assessment modalities that are commonly used in the assessment of anterior knee pain and can be helpful in the identification of PFPS. It is important to note that many of these tests have not yet been rigorously tested.[11] Although evidence is still lacking, some evidence suggests that using multiple tests to evaluate PFPS is effective in making a clinical diagnosis. Some of the more common tests used in the assessment of PFPS will be reviewed here.