

## **Patellofemoral Pain Syndrome - Anterior Knee Pain - Patella Mal-tracking Syndrome**

Pain around the knee cap or patellofemoral joint is one of the most common musculoskeletal conditions seen in orthopaedics. The patellofemoral joint is formed by the underside of the knee cap (patella) and the lower part of the thigh (femur). Normally, when the knee bends or straightens, the knee cap glides in a groove on the thigh bone called the patellofemoral groove. This movement is controlled by the thigh (quadriceps) muscles.

The most widely accepted theory regarding the cause of patellofemoral pain suggests that the symptoms are a result of excessive patellofemoral joint stresses as a result of abnormal patella tracking. This patella mal-tracking is thought to generate excessive strain on the tissues around and supporting the knee cap (retinaculum); the underlying joint capsule; and/or the cartilage on the joint surface of the patellofemoral joint. This excessive strain is what is thought to contribute to the pain experienced by patients.

The elevated patellofemoral joint stress is believed to result from alterations in patellofemoral joint reaction forces and/or reduced contact area between the back of the knee cap and the thigh, causing irritation and degeneration of the cartilage tissues on the underside of the knee cap.

The potential causes of mal-tracking and the associated altered tissue loading are numerous. One of the most common causes reported in the literature is weakness of the Gluteus Maximus and Gluteus Medius muscles. Weakness of these muscles causes the thigh to fall inwards when under load, thus increasing the Q-angle (see note below) and so the lateral pull on the knee cap and localized increases in pressure.

Weak (or fatigued) quadriceps muscles are consistently associated with patellofemoral pain. The inability to fully contact the quadriceps means that the knee cap is not forced as deeply into the 'trochlear groove' of the thigh bone and so the contact area of the patellofemoral joint is decreased, which leads to an increase in stress on another area of the joint surface. Often an imbalance exists in one of the thigh muscles called the Vastus Medialis Oblique (VMO), if this inner thigh muscle is not working appropriately, this may lead to abnormal stresses in the patellofemoral joint and contribute to symptoms.

A tight Iliotibial Band (ITB) influences both knee cap and shin position. The lateral retinacular fibers, which attach into the lateral border of the knee cap, will both tilt and pull the knee cap laterally if it is tight. The other part of ITB attaches into outside of the upper shin, if this is tight it may rotate the shin outwards and therefore increase the Q-angle (see note below) and cause further lateral deviation of the knee cap. There are a number of other causes of patella mal-tracking including tight calf, rectus femoris, adductor longus and hamstring muscles - all of which may influence patella tracking, along with excessively flat feet.

NOTE: The Q-Angle refers to the 'quadriceps angle', which is a measurement of patellofemoral joint mechanics. The Q-Angle is measured at the intersection of two lines: one drawn from a bony point at the front of the hip to the mid-point of the knee cap and the other from the mid-point of the knee cap to the insertion point for the patella tendon,

at the upper part of the shin. Research has shown that this Q Angle can be a reasonable estimate of the muscle force vectors (direction of muscle pull) over the patellofemoral joint. Further research has suggested that there is an increase risk of PFP if the Q Angle greatly exceeds 15 degrees – which is not uncommon in females.

What are the aims of physical therapy treatment for Patellofemoral Pain Syndrome?

**The goals of therapy are really two-fold. The first is to relieve the pain, this can often be achieved using patella taping or bracing. Other modalities, including acupuncture and electrotherapeutic techniques may also prove useful, along with gentle patella joint mobilization.**

**The second (and most important) part of a comprehensive treatment plan is to improve patella tracking which usually involves stretching the tight muscles and strengthening the weak ones mentioned above. In addition, it is important to look at the joint mechanics of the hip, pelvis, low back and feet to be certain that there are no other contributing causes. The specifics of the exercises required should very much depend on the individual patient and what is found on assessment.**

**One of the most common reasons for failure when treating patellofemoral pain issues is the patient receiving a generic, rather than a tailored set of exercises. There should not be a one exercise fits all approach to patients with this problem.**

How can taping help Patellofemoral Pain Syndrome?

There are a number of reviews on the effects of patella taping (Crossley 2000 Manual Therapy, Herrington 2000 Critical Reviews in Physical and Rehabilitation Medicine). Essentially it relieves pain, improves contractile ability of the quadriceps - therefore improving function because of these two factors and it may also by changing patella position.