

Orthopaedic and Sports Injuries Services "OASIS"
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ANTERIOR KNEE PAIN

Anterior knee pain refers to pain at or adjacent to the patella (kneecap). It is one of the most common presenting problems seen in a sports medicine practice. The causes are varied and may relate to age, acute trauma, repetitive strain or biomechanical disadvantages. Patients present with a cluster of symptoms including pain behind the patella with ascending and descending steps and hills, pain with prolonged bent-knee sitting, pain to squat and pain with running and jumping activities. In general terms, anterior knee pain can be successfully treated in the majority of cases. Vital to successful treatment however is accurate diagnosis, a careful explanation to the patient, and patient compliance with a rehabilitation regime.

Anatomy

The extensor mechanism refers to a continuous structure extending from the front of the pelvis the front of the upper tibia (shin bone). It begins as a tendon arising from the front of the pelvis and extending downwards to blend with the quadriceps muscle group. The quadriceps is the most powerful muscle group in the body. At the lower end of the quadriceps group, another tendon forms which provides attachment of the distal quadriceps to the front of the proximal tibia. The patella sits completely within this distal quadriceps tendon and as such is known as a sesamoid bone.

The quadriceps is not a single muscle but contains several muscles including the rectus femoris, vastus lateralis, vastus intermedius and vastus medialis obliquus (VMO). The rectus femoris crosses both the hip and the knee, whereas the other muscles cross only the knee. The relevance of this is that the rectus femoris acts as both a knee extensor *and* a hip flexor, while the other quadriceps muscles act solely as knee extensors.

The large vastus lateralis is active throughout the full range of knee extension but the smaller VMO muscle is active mainly in the last 30° of extension.

The patella itself articulates with the distal femur (thigh bone) within the knee. The articulation between the patella and the distal femur is known as the patellofemoral joint. The articular surface of the patellar is shaped like the keel of a boat. This allows it to glide in the femoral groove, or 'knuckle' of the distal femur. Imprecise movements between the patella and the femur cause many cases of anterior knee pain. This problem is referred to as patellofemoral dysfunction or patellofemoral maltracking.

The portion of the distal tendon, between the patella and the tibia, is known as the patellar tendon. The patellar tendon can become inflamed or degenerative, a condition known as patellar

ANTERIOR KNEE PAIN

tendinosis or 'jumpers knee'. It is very common in sports such as volleyball and basketball. Posterior to the patellar tendon, within the knee is a collection of fatty tissue known as the infrapatellar fat pad.

Age

The predominant causes of anterior knee pain vary according to age of the patient.

Between the ages of 8 and 15 years anterior knee pain often relates to apophysitis or inflammation at the site where tendon attaches to a growth plate. These growth plates are present at the front of the proximal tibia (Osgood-Schlatter's disease) and at the lower pole of the patella (Sinding-Larsen-Johansson syndrome). This age group is also affected by osteochondritis dissecans (OCD). In this condition, a combination of compromised blood supply and repetitive microtrauma leads to break down of a small area of bone within the knee. Often there is fragmentation of the affected bone and the overlying cartilage. The patient will usually present with painful clicking, swelling and sometimes locking of the knee.

Between the years of 15 and 30, acute trauma is more likely to contribute to anterior knee pain. Contact sports provide an environment where patellar instability may develop. There may be underlying ligamentous laxity in some cases of patellar instability, but direct trauma alone can cause the patella to sublux or dislocate. A blow to the front of the patella can result in damage to the articular cartilage on the back of the patella, or even a patellar fracture. Hyperextension of the knee in sport may cause the infrapatellar fat pad to become pinched between the patella and the distal femur. The fat pad then becomes swollen and irritable, resulting in further impingement.

Beyond the age of 40 years, degenerative processes within the knee may cause anterior knee pain. Osteoarthritis of the knee with breakdown of articular cartilage causes painful grating in the patellofemoral joint. The muscles controlling patellar movement are often wasted and not functioning appropriately.

Biomechanical issues

Many different biomechanical factors can have a bearing on the function of the patellofemoral joint. Genu valgum ('knock knees') indicates an angle on the knees such that the knees are closer together than the feet, when the individual is standing at rest. Excessive internal rotation of the femurs may contribute to genu valgum. This condition is known to be associated with anterior knee pain. Pronated (flat) feet can cause or exacerbate genu valgum.

ANTERIOR KNEE PAIN

Tight muscles in the lower limbs can increase the pressure acting on the patellofemoral joint during weight bearing activity. Tightness of the quadriceps, hamstrings, calf muscles and iliotibial band can adversely affect patellofemoral function.

Muscles act as motor units to move the joints but also as shock absorbers during impact activities. Weakness of the quadriceps, hip abductors and hip external rotators can increase the potential for patellofemoral pain.

The patella itself can vary in term of its position relative to the knee. A very high sitting patella is more likely to be unstable and cause pain. The femoral groove at the end of the femur may have a very redundant lateral femoral condyle, allowing the patella to travel laterally to an excessive degree.

Repetition strain

Anterior knee pain can be caused by repeated forceful loading of the patellofemoral joint, particularly where the individual has had little preparation for such activity. A sudden increase in training load in running or jumping sports is certainly known to place the individual at risk for anterior knee pain. Taking a school group walking in the mountains, for example, when some of the children are not fit to undertake such activities, can result in very florid cases of patellofemoral dysfunction. Even well-trained children are susceptible to patellofemoral overload. Often a promising all-round athlete will be playing several sports at once, such that they are engaging in high impact activities for 7 or 8 sessions per week. Parents need to monitor the activity levels of their children and make sure they stay within reasonable limits.

"Moving house" is a classic domestic activity where an unfit individual will suddenly undertake repetitive walking up & down steps, carrying heavy loads, with predictable consequences.

Unusual causes

The above factors are implicated in the far majority of cases of anterior knee pain. It is important to remember however that there are other less common but more serious diagnoses that need to be taken into account. Paediatric tumours are known to occur around the knee joint and can mimic conditions such as Osgood-Schlatter's disease. Similarly, anterior knee pain can in fact be due to pathology within the hip joint such as a slipped growth plate or a disturbance of blood supply to the hip joint (Perthes disease).

ANTERIOR KNEE PAIN

It is important that all cases of anterior knee pain that do not resolve quickly with conservative measures are assessed by a suitably qualified clinician to ensure that an important diagnosis is not missed.

Treatment

Treatment of anterior knee pain varies according to the exact diagnosis and the underlying causes. It is beyond the scope of this article to go through all of these in detail. Some commonly employed treatments include:

- Stretching exercises for the hamstrings, quadriceps, calf muscles and iliotibial band
- Strengthening exercises for the quadriceps (especially the VMO), hip abductor and hip external rotator muscles
- Patellar taping techniques
- Patellar tendon counterforce brace
- Orthotics for the longitudinal arch of the feet
- Anti-inflammatory medication
- Patellar mobilisation
- Corticosteroid injections
- Surgery (minority of cases)

Summary

Anterior knee pain is a common problem presenting to sports medicine clinics. The far majority of cases are due to relatively benign causes and respond well to conservative measures. Accurate diagnosis will guide treatment processes. Serious pathology is implicated in some cases and thorough assessment is important so that such cases are not misdiagnosed.

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