Chronic anterior knee pain in athletes: Common causes

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Abstract

Anterior knee pain is a very common clinical presentation. In this article, the classification of anterior knee pain syndromes according to the anatomy of the knee extensor mechanism is described. The clinical diagnosis, special investigations, and principles of management of the more common causes of anterior knee pain are discussed.

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Introduction

The knee extensor mechanism consists of the quadriceps muscle and its attachments, the patella and the patellar tendon and its tibial attachment. Knee extensor mechanism disorders giving rise to anterior knee pain, are probably the most common injuries that affect people engaged in activities requiring repetitive knee extension and flexion movement (e.g. distance runners, aerobic dancing, ballet dancing, military training). These disorders can involve any of the anatomical structures that constitute the knee extensor mechanism (quadriceps muscle, quadriceps tendon, patella, patella tendon and tibial tuberosity) and can therefore give rise to a variety of clinical syndromes. Historically, those syndromes involving structures around the patella have often been lumped together and incorrectly labelled as "chondromalacia patellae".

The different conditions involving the knee extensor mechanism can also be classified according to anatomical site, aetiological factors, radiological findings, clinical presentation, macroscopic pathology and histology. This has led to considerable confusion in the literature regarding these conditions. The aim of this article is to provide some insight into the possible causes of anterior knee pain arising from injury to the knee extensor mechanism. Specifically the aim is to provide the clinician with an anatomical classification of the possible causes of anterior knee pain, and then briefly discuss principles of diagnosis and management of some of the more common conditions.

Anatomical classification of causes of chronic anterior knee pain

Although there are many methods of classifying clinical syndromes of disorders of the knee extensor mechanism, perhaps the most logical one is to consider the conditions that affect each anatomical structure (Table 1).

The clinical diagnosis, special investigations and principles of management of the more common causes of anterior knee pain will be discussed briefly.

Common causes of anterior knee pain

Patellofemoral pain

Patellofemoral pain (PFP) syndrome is by far the most common cause of chronic anterior knee pain. It represents a number of conditions that may or may not result from malalignment of the patellar tracking mechanism. There are studies indicating that there is not necessarily a correlation between anterior knee pain and patellar maltracking, but that there is a positive correlation between patellar dislocation and maltracking.

Clinical diagnosis

The typical presentation of PFP is that of a young athlete with chronic anterior knee pain, and no history of an acute injury. Typically there is a history of increased or unaccustomed activity where there was repetitive knee flexion and extension. Pain is aggravated by prolonged flexion and relieved by extension. Swelling, locking and feelings of instability are not present. Clinical examination typically reveals peri-patellar tenderness (usually the inferior pole in runners, and the medial or lateral border in cyclists), abnormal patellar tracking, poor vastus medialis muscle bulk, and biomechanical abnormalities (increased quadriceps angle, genu valgus, pes planus and increased subtalar joint pronation).

Special investigations

Usually none are required but plain

Table I: Classification of knee extensor syndromes by anatomical structure
Common syndromes

Anatomical structure:	**Clinical syndrome:**
Patella	- Patellofemoral pain - Patellofemoral arthritis
Patellar tendon	- Patella tendinopathy
Tibia	- Osgood-Schlatter syndrome
Less common syndromes	
Anatomical structure:	**Clinical syndrome:**
Quadriceps muscle	- Chronic muscle strains
Quadriceps tendon	- Quadriceps tendinopathy
Patella	- Patellar stress fracture - Plica syndromes - Pre patellar bursitis - Sinding-Larsen-Johansson syndrome
Retinaculum	- Retinaculitis (medial or lateral)
Fat pad	- Fat pad impingement

film X-rays (lateral and skyline view) can assist in the diagnosis of bony abnormalities of the patella.

Principles of management
The treatment is non-surgical and consists of quadriceps muscle stretches, rehabilitation of the vastus medialis muscle function, and correction of biomechanical abnormalities. Patellar taping may be used to facilitate rehabilitation. Avoid activities resulting in high patellofemoral loads, e.g. squatting, step running and uncontrolled knee extension exercises. Bracing has been used with limited success. Operative procedures to correct malalignment are described and may be considered in severe cases not responding to non-operative treatment.

Patellofemoral arthritis

Patellofemoral osteoarthritis is a common cause of anterior knee pain in older adults. There may be a past history of acute trauma.

Clinical diagnosis
Typically, patients will present with gradual onset anterior knee pain and stiffness with decreased range of pain-free movement. Clinical examination will reveal peri-patellar tenderness, crepitus, and in some instances decreased range of motion. Decreased range of motion is more suggestive of tibo-femoral degeneration. Most of these patients will be pain-free on level walking but complain of discomfort when climbing steps and getting up from a sitting position.

Special investigations
The diagnosis is confirmed on plain film X-rays.

Principles of management
The principles of treatment are to reduce the load by avoiding flexion-extension type of exercise and steps where possible, correct biomechanical abnormalities such as abnormal pronation with orthoses (if present), provide pain relief, alter sports activity, and consider glucosamine and chondroitin supplementation. Surgery in the form of a patellectomy is seldom indicated. Tibial tubercle osteotomy, lateral release, knee replacement, patellar resurfacing, and patello-femoral replacement can be considered.

Patellar tendinopathy

Patellar tendinopathy is a common cause of chronic anterior knee pain in older athletes. In recent years the proposed pathophysiology and treatment of this condition has been revised. This condition is no longer regarded as an inflammatory condition, but rather repetitive injury to the ground substance of the connective tissue as the result of an overuse injury.

Clinical diagnosis
Athletes with patellar tendinopathy typically present with gradual onset and progressive pain during sports activity (usually running or jumping). There may be associated swelling. On examination, there is usually tenderness over the tendon, and pain on resisted quadriceps contraction.

Special investigations
The most useful investigations to delineate the extent of the pathology are soft tissue diagnostic ultrasound, and MRI.

Principles of management
The principles of treatment are first to avoid uncontrolled loading, to modify sports activity to maintain flexibility and to commence with a graded eccentric training programme. Surgical treatment is reserved for those that do not respond to this after at least 4-6 months.

Tibial apophyseal injury (Osgood-Schlatter's syndrome)

Tibial apophyseal injury or Osgood-Schlatter's syndrome is a traction injury of the growth plate over the tibial tubercle. It occurs in adolescent athletes who engage in running and jumping sports activity, and is also considered basically to be an overuse injury.

Clinical diagnosis
These young athletes typically present with anterior knee pain, and swelling over the tibial tubercle (if symptoms have been present for some time). There is pain with repetitive knee extension and flexion and on examination, there is tenderness over the tibial tubercle. Swelling may be present. Resisted knee extension is painful.

Special investigations
Usually none are required, but plain film X-rays may be useful to exclude other causes of bony swelling or an avulsion.

Principles of management
The principles of treatment are to reduce sports activity and maintain flexibility and once pain has decreased, to start with a progressive resistance training rehabilitation programme. Return to sports is gradual and dependent on symptoms.

See CPD Questionnaire, page 30

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