Anterior and Lateral Knee Injuries

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Contributors

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Overview[1]

Differential diagnosis of non-traumatic anterior and lateral knee pain is challenging due to the complex anatomy of the knee and its central role in the kinetic chain. Causes for pain and other symptoms may be training errors or overload, functional disbalance or weakness of the muscles in the back, the hips or the thigh. In addition, impairments of adjacent joints, anatomical abnormalities, and growth-related issues in adolescents can all contribute to developing knee pain. The most common pathologies for anterior knee pain are patella-femoral pain syndrome and patellar tendinopathy (which will be covered in another resource). Here we will focus on infra-patellar fat pad impingement (also known as Hoffa's disease) and apophysitis of the tibial tuberosity (Osgood-Schlatter syndrome).will also learn about lateral knee pain, the most common cause being the iliotibial band friction syndrome (ITBFS). However, in children and adolescents, pain at or close to the knee that cannot be clearly attributed to a tendon, ligament, muscle or an acute injury, is always suspicious of a bony tumour, which needs to be excluded by further clinical and radiographic diagnostics.

Anatomy

A detailed knowledge of the anatomical structures in this region is paramount for successful diagnosis and treatment. The knee joint is a hinge type synovial joint, formed by 2 articulations- tibiofemoral and patellofemoral. The tibiofemoral articulation is between the medial and lateral condyles of the femur and the tibial condyles and is where most of the weight passes through the knee joint. The patellofemoral articulation is between the anterior distal aspect of the femur and the patella. There are many ligaments and tendons surrounding the knee joint. The patella ligament is a continuation of the quadriceps femoris tendon, and it attaches to the tibial tuberosity. There are collateral and cruciate ligaments (not covered in this resource).

The infrapatellar fat pad is a mass of adipose tissue that sits just below the patellar. It has a rich supply of nerves so can be very painful if impingement occurs.

The iliotibial band is a thick band of facia running on the lateral aspect of the thigh that inserts just below the knee. It can become inflamed from repetitive friction between the band and the lateral epicondyle of the femur, resulting in lateral knee pain.

Aetiology[2-8]

Training errors, overload, muscular weakness of the proximal and distal muscles and biomechanical abnormalities are all risk factors for developing anterior and lateral knee pain. Anterior knee pain contributes substantially to the 20-40% of family practice consultations that relate to musculoskeletal pain.

Fat pad impingement can be acute in onset, which can be brought on by trauma (direct blow to the knee). Or it can be chronic in nature, often due to repeated or uncontrolled hyperextension of the knee or exacerbated by weak quadriceps.

Osgood-Schlatter syndrome is seen in adolescents, with boys (usually aged 13-15y) affected more commonly then girls (usually aged 10-12y). It is associated with High level of activities involving running, jumping or cycling during a growth spurt.

Non-traumatic lateral knee pain due to overuse is particularly common among distance runners and cyclists, the most common cause being ITBFS, which has a 1.6%-12% prevalence in runners and 15-24% prevalence in cyclists.

Clinical Features

The differential diagnosis of knee-related pain is led by a comprehensive clinical examination. The clinical features of the 3 pathologies focused on in this resource are given in the following table:

Pathology	Localization of pain	Pain	Exacerbating/ Relieving feautres	Other clinical signs
Anterior knee[9,10]				
Fat pad impingement	Localized tenderness beneath the inferior pole of the patella	Acute: very painful Chronic: dull and permanent	Exacerbation by extension and prolonged standing	Localised swelling beneath the inferior pole of the patella
Osgood-Schlatter lesion	Anterior aspect of the tibial tuberosity	Dull at rest. Sharp during acute aggravation	Intensity- and duration-related aggravation of pain during exercise	Associated tightness of the quadriceps muscle. Excessive subtalar pronation may predispose.
Lateral knee[6,8,11,12,13,14]				
ITBFS	At or close to the insertion of the ITB at the lateral tibial tuberosity	Dull, burning	Pain aggravation by exercise, especially during long session and during **downhill** running	Pain during exercise may be associated with a snapping sensation. Swelling to the lateral knee joint line.

Investigations

MRI or Ultrasound may be helpful if the clinical examination is inconclusive. If a severe bone pathology is suspected (fracture of the patella or the fibular head; bony tumour) an X-ray may confirm the diagnosis. If Osgood-Schlatter is suspected and there is more pain and swelling than would usually be expected, an x-ray should be considered to exclude a bony tumour.

Management Options

ITBFS[14,20,21,22,23,24,25,26,27,28]: Local symptoms may be addressed with cryotherapy (cooling), topical NSAIDs and physical therapy. For initial pain relief short courses of oral NSAIDs may be helpful. Injections with corticosteroids should be avoided due to inconsistent treatment effects and the risk of weakening the tendons/ligaments. Treatment should always include a stop of the activity causing the pain and involve strengthening of each segment along the kinetic chain (lower back, gluteal muscles, tensor fascia lata, tibio-fibular rotation and foot alignment). Soft tissue massage (foam role, focal ischaemic pressure with the elbow) and dry needling of trigger points along the ITB and of trigger points in the gluteal area is an option to reduce ITB tension, but the evidence is not strong.

Anterior knee pain[15,16,17,18,19]: According to underlying condition (Table 2)

Pathology	Acute management	Return-to-Sport	Prevention
Fat pad impingement	- rest - topical or short course oral NSAIDs - fat pad unloading tape (V-tape below the fat pad with the point of the 'V' at the tibial tubercle coming wide to the medial and lateral joint lines	- when pain free at rest without pain killers - gradually increasing training load, preceded and accompanied by specific exercises to improve motor control and strength of local, proximal and distal muscles	- avoid repetitive and uncontrolled hyperextension of the knee by continuing the supportive exercises
Osgood-Schlatter	- the condition is self-limiting - reduction of activity to a level where there is only little or no pain	- gradual increase of training load (first volume and then intensity) according to pain symptoms - exercises to strengthen and improve motor control of quadriceps muscle as well as abductors, adductors, internal and external rotators of the hip - regular stretching of the quadriceps muscle	- regulation of exercise as pain allows until growth speed has markedly decelerated - if existing subtalar pronation present, correction should be sought (e.g. shoe insoles, but this should be accompanied by regular exercises to improve the strength and motor control of the foot and ankle)

Return-to-Sport and Prevention

Anterior knee pain[15,16,17,18,19]: According to underlying condition (Given in Table 2)

ITBFS[14,20,21,22,23,24,25,26,27,28]: In cases of extensive inflammation visible on MRI/Ultrasound the pain-causing exercise should be stopped for at least one week and until the athlete is pain-free without any pain relief. Afterwards, a gradual return-to-sport should be accompanied by regular strengthening exercises of the hip abductors and external rotators. These strengthening exercises and correction of potential biomechanical disbalances along the kinetic chain should accompany the training to prevent a re-occurrence of ITBFS. In case of continued recurrence of symptoms, an operative lateral retinacular release of the ITB at the lateral femoral epicondyle may be considered.

Case Study 1: The runner with lateral knee pain

Young female athlete, 16 years old runner. Training load during the last 6 months doubled from 3 times a week to 6 times per week. No regular strength training and stretching. Right-sided lateral knee pain around the insertion of the iliotibial tract (at the lateral tibial tuberosity) radiating to the distal portion of the lateral thigh. At rest and with walking she experiences low level of pain, pain gets worse when exercising, especially when running downhill. She had no clinical signs of local inflammation other than tenderness.

Conservative treatment for suspected iliotibial band friction syndrome (ITBFS) was started. She was advised to rest for one week, apply local cooling, and do regular exercises to strengthen hip-abductors and external rotators on both legs, plus stretching of the hip adductors. Once able to swim pain free she took up swimming long term.

Case Study 2: The long-jumper with anterior knee pain

Young male long-jumper, 13 years old. 3 weeks history of gradually increasing pain during training sessions, especially sprinting and jumping, at the tibial insertion of the patella tendon of the right knee (his jumping leg). The pain is improved by resting. He has had a growth spirt over the last few months.

On examination he had slight swelling and tenderness at the tibial tuberosity. The diagnosis of Osgood Schlatter was made. He was advised to rest for one week, with subsequent activity modification during the following 12 weeks until growth velocity decreased. Initiation of regular quadriceps and hamstring strengthening exercises were advised, and full return-to-sports occurred after 5 months.

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