

Ministry of Defence

Synopsis of Causation

Anterior Knee Pain

Author: Dr Tony Fisher, Medical Author, Medical Text, Edinburgh
Validator: Mr Jignesh Patel, University College Hospital, London

September 2008

Disclaimer

This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

The Ministry of Defence accepts full responsibility for the contents of this synopsis, and for any claims for loss, damage or injury arising from the use of this synopsis by the Ministry of Defence.

1. Definition

- 1.1 **Anterior knee pain** is an ill-defined term used to describe a common presenting complaint which has a number of possible origins. It includes a significant proportion of patients in whom no cause can be found. It occurs most commonly in adolescents and young adults and is generally used to indicate the symptom of **pain or discomfort (from whatever cause) which is experienced in the anterior aspect of the knee**. Uniform definition and classification have yet to be achieved.

2. Clinical Features

- 2.1 The nature, location, quality and severity of anterior knee pain all depend largely on the nature of the underlying condition. Although the joint is extremely well adapted for its function and the loads applied to it, even small changes in shape or alignment may have important functional implications¹, and anterior knee pain is the most common knee problem seen by general practitioners².
- 2.2 Although generally experienced at the front of the knee, pain is frequently poorly localised. It is often aggravated by activity, especially walking and running, and subsides on cessation of movement. However in a proportion of cases the symptom is provoked by inactivity; for example prolonged sitting with the knee flexed.

3. Aetiology

- 3.1 The anterior part of the knee consists mainly of structures associated with the patellofemoral joint, which includes a variety of tissues such as cartilage, subchondral bone, synovial plicae, infrapatellar fat pad, retinacula, capsule, and tendons. Each of these structures, alone or in combination, can be a source of anterior knee pain.
- 3.2 The symptom may be due to over-use or trauma. There are also a number of poorly categorised miscellaneous causes and occasionally it is due to previous surgical trauma. A few developmental conditions may be responsible for the symptom. In a significant proportion of cases, no cause can be found.

3.3 Over-use

A number of knee conditions causing anterior knee pain are related to over-use.

- 3.3.1 **Patellar tendinitis (Jumper's knee)** This condition is not confined to individuals who engage in this particular activity, although it is more common in athletes involved in basketball, volleyball or other jumping sports which place very large biomechanical forces on the knee. It is caused by chronic overloading of the patellar tendon at the tendon-bone interface at the lower pole of the patella. Conservative management usually leads to resolution, although the individual may have to abandon the activities which caused it.
- 3.3.2 **Juvenile traction osteochondritis (Osgood-Schlatter's disease) and Sinding-Larsen-Johansson disease** These conditions occur in juvenile knees; most commonly in boys of age 12-14 years. The first is due to repeated microavulsion injuries at the tibial insertion of the patellar tendon whereas in the latter a similar process affects the patellar origin of the tendon. Both conditions are benign and usually resolve with conservative treatment, although occasionally a small ossicle may persist and require removal.
- 3.3.3 **Painful bipartite patella** Bipartite patella is a common developmental condition which is regarded as a variant of normal ossification. Occasionally however, perhaps in response to over-use, it may be the source of pain and tenderness, and rarely, an avulsion fracture.
- 3.3.4 **Stress fracture of the patella** This condition is most usually seen in athletes or sportsmen, and is caused by overloading of the patella.

3.4 Trauma

In some cases of anterior knee pain there is a history of a single traumatic episode, or of repeated minor trauma.

- 3.4.1 **"Bone bruising"** The patello-femoral joint is particularly vulnerable to injury when the knee is flexed. Damage may occur when the individual falls forward on to the flexed knee, or sustains a direct blow, e.g. from a vehicle dashboard. Usually symptoms resolve in due course but occasionally the pain may persist, despite the apparent absence of significant intra-articular damage. The reason for the recalcitrant

nature of the pain in certain individuals is unknown³.

- 3.4.2 **Osteochondritis dissecans** This is an occasional cause of anterior knee pain which may occur in younger individuals, typified by degeneration and re-calcification of the articular cartilage and delamination and sequestration of the underlying bone. Although many authorities have proposed repetitive microtrauma as the underlying cause this has not been confirmed and the cause is as yet imperfectly understood.

3.5 Idiopathic anterior knee pain

In many instances the cause of anterior knee pain cannot be established with certainty^{4,5} despite careful investigation. Some authorities would include cases of “patello-femoral pain syndrome” within this group. Usually the patient is young and physically active, and over-use may be at least partly responsible. Indeed, some believe that most cases of so-called idiopathic anterior knee pain are in fact caused by over-use or repetitive trauma when there is a predisposing anatomical malalignment. However similar symptoms do occur in individuals who are inactive and/or overweight. Idiopathic anterior knee pain is more common in females.

3.6 Miscellaneous conditions v

- 3.6.1 **Chondromalacia patellae** This is a condition of unknown origin which is characterised by an abnormality of the articular cartilage. It is described in a separate Synopsis.
- 3.6.2 **Maltracking of the patella** During flexion and extension of the knee the patella follows a series of complex changes of position which include a medial tilt and a few degrees of rotation⁶. In the final 20° or so of extension, abnormal tilting of the patella may occur, with or without subluxation, causing pain and crepitus. The resulting abnormal distribution of load may adversely affect the nutrition of the cartilage. The cause of this maltracking is multifactorial, but quadriceps muscle imbalance and osseous deformity are often responsible. If extreme it may cause recurrent dislocation of the patella.
- 3.6.3 **Excessive lateral pressure syndrome** In this condition there is no maltracking or subluxation but a tight retinaculum causes abnormal lateral tilting of the patella, with softening or fissuring of its articular cartilage. The patient complains of activity-related anterior knee pain exacerbated by prolonged knee flexion (sitting or squatting) or stair-climbing. The cause of the condition is unknown.
- 3.6.4 **Reflex sympathetic dystrophy** In this condition the individual complains of severe intractable knee pain of long duration, usually following trauma or surgical operation, and disproportionate to the original injury. It is accompanied by autonomic dysfunction, dermal trophic changes, muscle wasting and osteoporosis. This condition is poorly understood and if prolonged may result in severe disability.
- 3.6.5 **Psychogenic anterior knee pain** In a small number of patients with anterior knee pain the condition appears to be of psychogenic origin. The reason for the association is unknown.
- 3.6.6 **Plicae** These are normal structures consisting of folds of synovial lining. They are variable in size and location and may rarely cause anterior knee pain if unusually sited or if fibrosed.

- 3.6.7 **Hoffer's syndrome** In this condition the infrapatellar fat pad is unusually large and areas of fibrosis and inflammation may suggest that it has been subject to pressure or to pinching, so giving rise to pain⁷.
- 3.6.8 **Bursae** These normal structures may become the seat of infection or become inflamed due to chronic pressure or repeated trauma.
- 3.6.9 **Osteoarthritis of the knee** This common condition may occur as a primary degenerative disorder or secondary to previous bony injury to the joint surfaces. It is discussed in a separate Synopsis.
- 3.6.10 **Ossification of the patellar tendon** This condition may be related to previous injury. It is uncommon but disabling and causes pain and stiffness.

3.7 Surgical/traumatic causes

- 3.7.1 **Hauser procedure** This surgical procedure for recurrent patellar dislocation involves transplantation of the tibial tubercle. This relocation of the patellar tendon may cause disturbance of normal tracking and excessive pressure on the patella with ensuing late-onset osteoarthritis.
- 3.7.2 **Infrapatellar contracture syndrome** Injury or surgery may cause this condition, which is typically the result of prolonged postoperative immobilisation or infection. The soft tissue contractures may lead to limitation of patellar mobility or patellar entrapment with adaptive shortening of the patellar tendon. It may be treated by surgery specifically aimed at the division of adhesions and excision of excess fibrous tissue.
- 3.7.3 **Neuromas** Post-traumatic neuromas may complicate surgical or traumatic scars of the knee, as in any other site⁸.

3.8 Developmental disorders

- 3.8.1 Developmental abnormalities of the patella and underlying condylar surfaces may lead to maltracking of the patella, premature degenerative change and a tendency to dislocation. Such conditions as the Stickler syndrome (arthro-ophthalmoplegia) and Down's or Marfan's syndromes may cause such abnormalities.

4 Prognosis

- 4.1 It is impossible to generalise regarding the prognosis of anterior knee pain as the outcome largely depends upon the nature of the underlying condition. However some authorities believe that in many patients idiopathic anterior knee pain which commences in childhood is likely to persist into adulthood and may presage such conditions as rheumatoid arthritis and ankylosing spondylitis⁹.
- 4.2 In general, anterior knee pain due to over-use syndromes resolves with cessation of the activity responsible.

5 Summary

- 5.1 Anterior knee pain is a common symptom, whose origins may be over-use, trauma (accidental or surgical), or developmental; it can also result from a number of miscellaneous disorders, but in a significant proportion of cases the cause is unknown.
- 5.2 The prognosis rests on the origin of the pain; many, particularly those due to over-use, tend to resolve spontaneously.

6 Related synopses

Osteoarthritis of the Knee

Chondromalacia Patellae

Internal Derangement of the Knee

Knee - Ligament Injury

7 Glossary

adhesions	Scarring which causes adjacent structures to adhere to each other.
autonomic dysfunction	Malfunctioning of that part of the nervous system which regulates key functions including the activity of the muscles in the walls of blood vessels, the gut, heart etc.
avulsion	Pulling off.
bursa	A fibrous sac that contains a small quantity of joint fluid. Bursae are found between tendon and bone, skin and bone and muscles. They function to facilitate movement.
crepitus	A sensation of grating, indicating a roughened joint surface.
dermal trophic changes	Changes in the skin occurring due to impairment of the nerve supply to the area.
fibrosis	The formation of fibrous scar tissue.
microavulsion injury	A term indicating that, at the microscopic level, tissue connecting one structure to another has been partially torn from its attachment.
microtrauma	Damage at a microscopic level.
neuroma	A painful benign tumour arising from nervous tissue, often occurring in a scar.
ossicle	A small bone.
tendinitis	Inflammation of tendons and of tendon muscle attachments.
tibial tubercle	The bony promontory at the front of the tibia to which the patellar tendon is attached.

8 References

-
- ¹ Bellemens J. Biomechanics of anterior knee pain. *Knee* 2003;10:123-6.
 - ² Taunton JE, Wilkinson M, Esdaile JM. Diagnosis and management of anterior knee pain. *Can Med Assoc J* 2001;164(11):1595-601.
 - ³ Price AJ, Jones J, Allum R. Chronic traumatic anterior knee pain. *Injury, Int J Care Injured* 2000;31:373-8.
 - ⁴ Hull JB, Hobbs C, Sidebottom S. Anterior knee pain syndrome. A review of current concepts and controversies. *J R Army Medical Corps* 1999;145(2):89-94.
 - ⁵ Shea KG, Pfeiffer R, Curtin M. Idiopathic anterior knee pain in adolescents. *Orthop Clin North Am* 2003;34(3):377-83, vi.
 - ⁶ Reider B, Marshall JL, Ring B. Patellar tracking. *Clin Orthop* 1981;157:143-8.
 - ⁷ Theut PC, Fulkerson JP. Anterior knee pain and patellar subluxation in the adult. In: DeLee JC, Drez D editors. *Orthopaedic Sports Medicine: Principles and Practice*. Philadelphia: W.B. Saunders Company; 2003. p. 1792-1808.
 - ⁸ Jackson AM. Anterior knee pain. *J Bone Joint Surg Br* 2001;83(7):937-48.
 - ⁹ Stathopulu E, Baildam E. Anterior knee pain: a long term follow-up. *Rheumatology* 2003;42(2):380-2.