

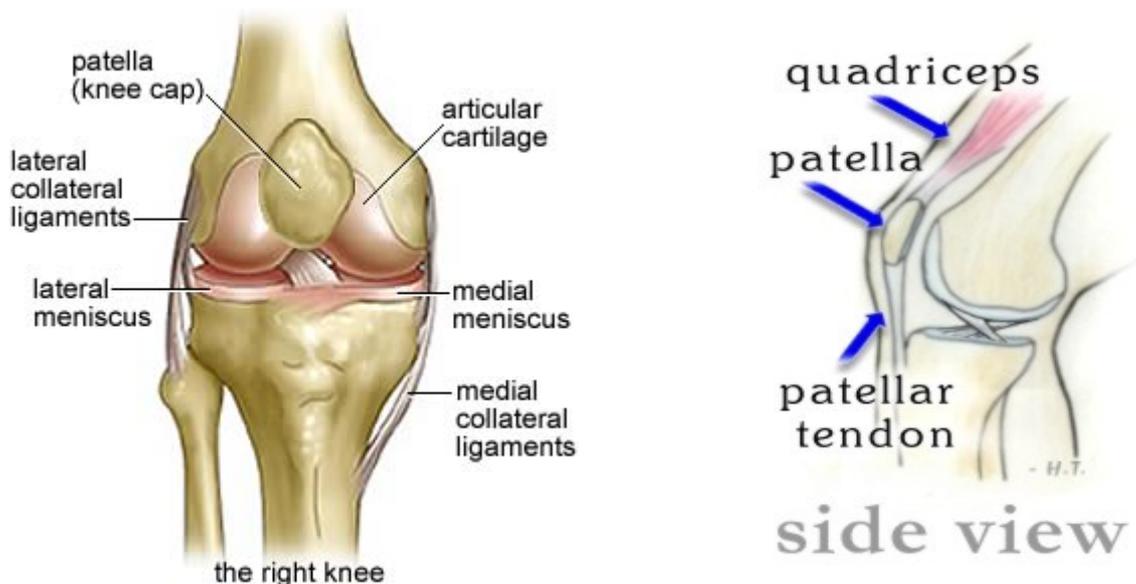
Anterior knee pain (patellofemoral dysfunction)

What is it?

Anterior knee pain is an umbrella term which encompasses a wide range of related but significantly different conditions resulting in pain around or behind the knee cap.

25% of the population will be affected at some time and it is the most common overuse syndrome affecting sports people – although you do not have to be sporty to be affected. It is also a leading cause of chronic knee pain in adolescents.

Basic anatomy



The knee cap (patella) is a triangular bone which sits on top of the thigh bone (femur). Both the back of the kneecap and the end of the thigh bone (femoral condyle) on which the kneecap sits are covered with cartilage (shiny surface). This cartilage helps to reduce friction, promote smooth movement and acts as a shock absorber.

The back of the kneecap is divided by a vertical ridge which corresponds with a groove in the end of the thigh bone. Although these ridges are matched to a certain extent, they are not totally matched.

The kneecap is held in place partly by its bony make up and partly by the soft tissues around the knee, especially the thigh muscles (quadriceps) that encircle the kneecap and form the patella tendon.

The role of the kneecap is to increase the lever arm of the thigh muscles to allow them to work more efficiently, to reduce friction of the patella tendon on the bones beneath and to protect the femoral condyles from direct pressure and wear and tear, e.g. when kneeling.

Why does knee pain happen?

The kneecap and thigh bone work closely together when the knee is bent and straightened. If due to any, or a combination, of the factors stated below, this fails to occur, then pain may result. When the knee bends and straightens the kneecap follows an 'S' shaped path with the kneecap gliding up and down on the femoral condyle. As the angle of knee bend (flexion) increases, the back of the kneecap is exposed to varying stresses in different areas of the kneecap. These forces may not be spread evenly over the area but may build up in certain areas of the kneecap not designed to tolerate these pressures. This is especially so when the muscles of the thigh are working incorrectly and are 'imbalanced' (out of sync with each other). This 'imbalance' can lead to further limitation of the joint between the kneecap and the thigh bone and a swollen knee may be the result, which often makes the problem worse.

Common symptoms

1. Pain beneath and/or around the kneecap especially on climbing up and down stairs, kneeling and squatting.
2. Clicking and grating in the knee.
3. Giving way of the knee.
4. 'Cinema goers' knee (pain after maintaining a sitting position for a period of time).
5. Swelling.
6. Tight feeling in the calves and thighs.

All the above symptoms may interfere with sports and cycling and climbing stairs may become a problem. The above symptoms may be brought on by repeated activity of a repetitive nature, e.g. running, cycling, climbing and step aerobics.

Factors influencing the condition

1. Skeletal factors e.g.
 - size and shape of knee
 - leg length
 - bony changes in thigh (femur)
 - and lower leg (tibia) bones.
2. Joint factors e.g.
 - tightened soft tissues on the outside of the knee.

3. Muscle factors e.g.
 - poor thigh muscle control and power
 - tight hip, thigh and calf muscles
 - abnormalities in the soft tissues around the knee
 - disturbed muscular control around the knee
4. Biomechanical factors
 - deformities or limited movements at the spine, hips, knees, ankles and feet.
5. Trauma
 - direct or indirect blow to the knee.
6. Overuse, e.g. cyclists and runners.
7. Unaccustomed activity.
8. Maintenance of a static position for long periods, e.g. sitting.
9. Arthritis (osteoarthritis and rheumatoid arthritis) and other inflammatory conditions.
10. Softening of the shiny surface (cartilage) e.g. chondromalacia patellae.

Self-help/management

1. Maintain joint stability/mobility – non weight-bearing exercises will help to build up the muscles around the knee so that stress is reduced around the joint and will maintain joint ranges of movement. Progress to weight bearing exercises as pain allows.
2. Do continue to exercise up to the limit of pain but DO NOT push through the pain.
3. Avoid repetitive activities until pain has subsided.
4. Avoid walking up and down hills.
5. Avoid high heels which can worsen the problem by pushing kneecaps back onto the thigh bones.
6. Avoid kneeling and squatting.
7. Avoid standing for long periods of time with the knees locked back.
8. Avoid breaststroke swimming.
9. If the knee swells – rest it and use ice to settle.

Possible treatments

1. Physiotherapy
 - a) Strengthening exercises and re-education of muscle activity in the correct sequence.
 - b) Stretches for tight muscles.
 - c) Control of swelling.

- d) Pain relief.
- e) Taping techniques as necessary.
- f) Joint mobilization techniques to restore full range of movement at the joint.
- g) Re-introduction to sport and previous aggravating factors in a pain free state.
- h) Treatment of spine, hips, ankles and feet as necessary.
- i) Provision of temporary or referral for permanent orthotics.
- j) Referral to pain clinic if severe and/or unremitting pain.

2. Aids

Walking stick or crutches may sometimes help to aid walking when the knee is initially painful and/or swollen.

3. Orthotics

Insoles may sometimes help if foot position is a contributing factor in producing knee pain.

4. Drugs

- Painkillers
- Anti-inflammatory drugs.

5. Surgery

Surgery is important for investigation and management of related problems and is used for this rather than for treatment of the pain itself.

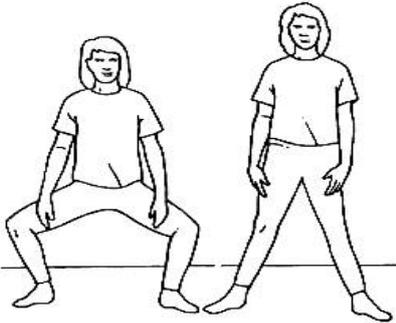
The type of surgery which occasionally may be undertaken includes:

- a) Arthroscopy – as an investigative means with correction of any abnormality within the knee as necessary. Also used to exclude any other cause.
- b) Lateral retinacular release of the soft tissues – to decrease the forces on the outside of the knee to allow the kneecap to track better.
- c) Elmslie-Trilliat procedure – antero/medial advancement of the tibial tuberosity (small bony bump on the lower leg just below the knee) to help decompress the patello-femoral joint.
- d) Realignment surgery of the patello-femoral joint.

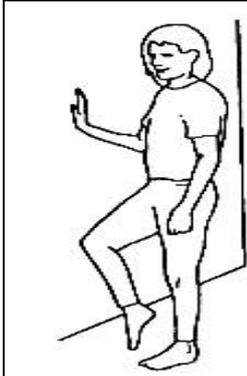
Please ask your knee specialist about these types of surgery and what they entail.

Exercises

Activities which improve the quadriceps muscles without friction on the patella are the key to relieving and then preventing the recurrence of these conditions. The muscle on the inside of your thigh just above the knee is the vastus medialis muscle and it plays a very important role in holding the kneecap in the right position and protecting it. You may also require to be taught strengthening exercises to aid your “core stability” and hip strength and control as these areas work together with your knee to aid control.

	<p>1. Lying on your back or sitting with your back supported and your legs out straight in front of you.</p> <ul style="list-style-type: none"> – Pull your feet up towards you and turn your foot out to the side slightly. – Push your knee down firmly so that your thigh muscles tighten. – Hold for 10 seconds. – Repeat 10 times.
	<p>2. Lying on your back or sitting with your back supported and your legs out straight in front of you.</p> <ul style="list-style-type: none"> – Pull your feet up towards you and turn your foot out to the side slightly. – Push your knee down firmly so that your thigh muscles tighten. – Keeping your knee straight, lift your leg up to just clear the bed. – Hold for 10 seconds and lower slowly. – Repeat 10 times.
	<p>3. Place feet either side of a telephone directory or hips width apart, with feet facing forwards.</p> <ul style="list-style-type: none"> – Bend knees slightly keeping knees over the big toe. – Tighten bottom and stomach muscles. – Turn knees out over 2nd/3rd toes keeping feet still. <p>Hold for 10 seconds. Repeat 10 times.</p>

	<p>4. Stand in a lunge position with the affected leg forwards and both feet facing forwards. Try to keep your back knee straight. Transfer your weight over your front foot, in line with your great toe.</p> <ul style="list-style-type: none"> – Tighten bottom and stomach muscles. – Turn knee out over 2nd/3rd toes keeping feet still. – Hold for 10 seconds. – Repeat 10 times.
	<p>5. Stand in front of a small step or the bottom step of the stairs.</p> <ul style="list-style-type: none"> – Tighten bottom and stomach muscles. – Step up with your affected leg leading, keeping your knee over 2nd/3rd toes. – You may need to hold onto a rail or support initially. – This exercise can be made harder by increasing the height of the step or by doing the exercise more slowly. – Repeat 10 times.
	<p>6. Stand sideways on a step with your affected leg and your other foot hanging over the edge of the step.</p> <ul style="list-style-type: none"> – Slowly bend your affected knee allowing your other heel to brush the floor. – Try to keep the knee of your affected leg over your 2nd/3rd toes. – This exercise can be made harder by increasing the height of the step or by doing the exercise more slowly. – Repeat 10 times.
	<p>7. Stand on your affected leg on a step facing down.</p> <ul style="list-style-type: none"> – Slowly lower yourself down by bending your knee to 30 degrees. – Try to keep the knee of your affected leg over your 2nd/3rd toes. – This can be made more difficult by bending your knee more so that the heel of your unaffected leg touches the ground and/or by increasing the height of the step and doing the exercise more slowly.



8. Stand on your affected leg with your knee slightly bent and turned over your 2nd/3rd toes.
- Try to balance in this position.
 - Hold for 10 seconds.
 - Repeat 10 times.
 - To make this exercise more difficult, close one eye or both eyes.

Once the above exercises are able to be completed with ease, you should then practice jumping, hopping, running and cycling maintaining your affected knee over your 2nd/3rd toes. The use of a mirror to view what is happening at your knee may be beneficial.

Once you are pain free, you should not stop doing your exercises but should gradually decrease the frequency that you are doing them. Should you experience a flare up of your symptoms then you should restart your exercises again as able.

Exercise pictures © Physio Tools Ltd.

Further Information

Visit the Trust website at www.royalberkshire.nhs.uk

Physiotherapy Outpatient Department
Physiotherapy East
Royal Berkshire NHS Foundation Trust
London Road
Reading, RG1 5AN
T: 0118 322 7811
F: 0118 322 7815
T: 0118 322 5111 (switchboard)

This document can be made available in other languages and formats upon request.

Debbie Burden, Orthopaedic Physiotherapy Specialist
Reviewed: November 2016
Review due: November 2018