

Posterior cruciate ligament (PCL): reconstruction and rehabilitation

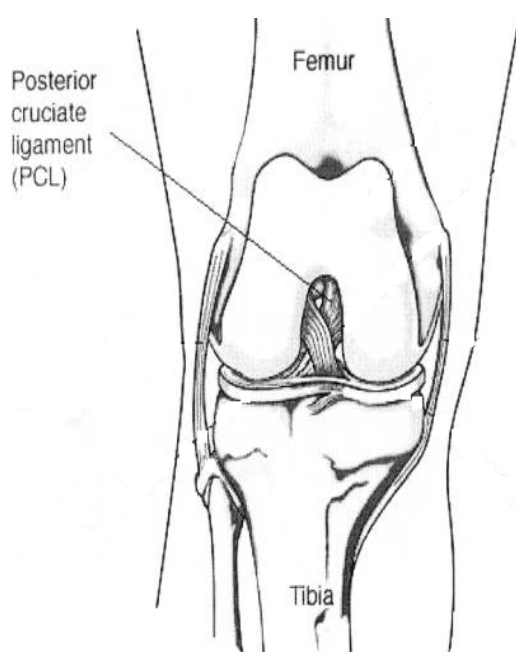
Posterior cruciate ligament reconstruction is an operation to replace your torn posterior cruciate ligament (PCL) and restore stability to your knee joint. This leaflet outlines what happens during and after surgery, outlines the risks and benefits, and gives advice and exercises to help you recover if you decide to go ahead with the operation.

What does the PCL do?

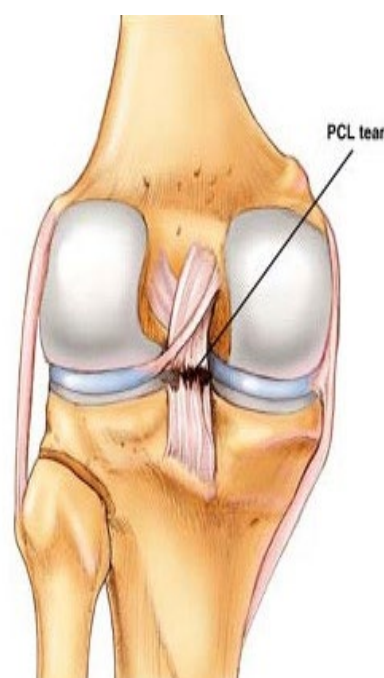
The PCL is the largest ligament in the knee and stops the shin bone from moving too far backwards, relative to your thigh bone.

It is commonly injured by a significant blow to the front of the knee/upper shin. Most athletic PCL injuries occur during a fall onto the flexed (bent) knee. Hyperextension ('over straightening') and hyperflexion ('bending too far') of the knee can also cause a PCL injury and the PCL is often involved when there is injury to multiple ligaments in a knee dislocation.

Not everyone who has a PCL injury will require surgery as most isolated tears (no other ligaments involved) can heal just with the early application of an appropriate splint/brace. If the ligament does not heal or there are other ligaments involved, some people can notice a 'looseness' and an occasional feeling of giving way. This requires a reconstruction (replacement) operation.



Posterior (back) view



Anterior (front) view

Reasons for not operating

To undertake this major reconstruction, you must have appropriate symptoms of instability. This is not an operation for pain. An operation is not recommended if there is any active infection in or around the knee or when there is a lot of other disease, such as arthritis, within the joint.

Reconstructing the PCL is not going to cure arthritis or necessarily make it feel more comfortable, unless there is a very pronounced instability component to the problem.

Due to the fact that isolated tears can heal, an initial period of bracing (at least 6 weeks) is usually recommended before proceeding to surgery. A period of 'pre-operative rehabilitation' may also be recommended, which can help to restore a full range of movement and some muscle strength and confidence.

Alternatives to surgery

- If we do not recommend reconstructive surgery, stability of the knee can be significantly improved with intensive physiotherapy exercises – not just for strengthening the muscles (quadriceps especially) but equally importantly for improving balance and ability to 'hold on to your knee'. Some people seem to gain more benefit from physiotherapy than others.
- Bracing is also a way of stabilising the knee without surgery and there are purpose-made PCL braces which protect the joint and can be very valuable during certain sports. However, the braces are rather cumbersome to wear day to day, and in some contact sports the braces are banned for obvious reasons. But in sports such as tennis and squash and for skiing and snowboarding, they can be particularly useful if these are the occasions that the knee tends to give out. Wearing a brace does not appear to weaken the knee.
- The use of slim Neoprene sleeves appears to improve patients balancing skills very slightly and some people use them but their benefit is very difficult to actually measure.

Success rates of surgery

PCL reconstruction is done far less commonly (20 times less) than anterior cruciate ligament (ACL) reconstruction. The rehabilitation protocols are very different from ACL reconstruction and the outcomes are less good. 90% (9 out of every 10) of ACL reconstruction patients have a 'successful' reconstruction, whereas only about 60-70% (6 or 7 out of 10) of patients will feel similarly satisfied after PCL reconstruction. The surgical and rehabilitation techniques continue to improve but it is certainly not an operation for the 'occasional' surgeon.

Instability symptoms should be reduced and a patient's ability to get back to more vigorous activities enhanced. However, the 'posterior sag' (when the lower leg drops back), which is often present pre-operatively sometimes recurs to a lesser extent due to 'stretching' of the graft. It is therefore common that although there will be an improvement, it may not feel quite as good as it was before the injury. 10% (1 in 10) of people fail to get significant benefit from the operation for a variety of reasons. Sometimes, this is due to a complication such as infection or other problem that leads to stiffening of the knee, although this is extremely unusual.

A few patients have a nicely 'stabilised' knee but lose confidence despite lengthy rehabilitation. They sometimes do not actually feel as if they have been benefited and have not got back to levels of activity they might have wished.

Not everyone with a stable knee gets back to the level of sport they did before and indeed a lot of patients find the injury followed by a reconstruction puts them off going back to the original sport that they injured the joint in.

More specific complications are outlined overleaf.

The operation

The operation takes approximately 1½ hours and is done with the aid of the arthroscope (keyhole surgery). The most commonly used graft is made up of two of your own hamstring tendons – either taken from the same leg. A 1½ inch incision (cut) is made over the upper inner part of the shin and the hamstring tendons are collected and folded over to form a four strand graft. This is then passed through the knee and fixed with a variety of screws, pins and/or staples to provide a secure fix, matching the original position of the ruptured ligament. Sometimes – especially if you have had previous ligament surgery – it may be felt better to use a dead donor tendon (allograft). This will not therefore require additional surgery and scarring to obtain it.

The keyhole camera (arthroscope) is used to check the rest of the joint for signs of wear and tear and attend to any cartilage trouble either with repairing (stitching) or removing a torn fragment.

The wounds are normally closed with stitches and the leg bandaged with simple dressings, wool and crepe bandage. A splint – locked in extension (straight) – is fitted at the end of the procedure which helps to protect the graft in the early weeks of recovery.

After the operation

In the first day or two after surgery the knee will be sore and you will require some form of regular painkiller, which will be provided. Pain varies and some people find the procedure more troublesome than others, but during this time you will be encouraged to get mobile with the physiotherapists and start your rehab programme.

You will only be able allowed to ‘touch’ weight bear on your leg but will be mobilised as soon as you are safe and usually discharged from hospital the day after the operation. If performed early in the morning, you may be discharged the same day, i.e. as a day case procedure. Further physiotherapy and post-operative issues are dealt with below.

Side effects

We define a side effect as an inevitable consequence of the operation but not necessarily of any benefit to you – the obvious example being the scar. Other common side effects that occur after knee ligament surgery are:

Sensory disturbance around the scar on the inner side of the knee, which can be permanent. A slight numbness typically in a ‘D’ shaped area which may stretch for several inches below the scar on the inner side of the leg. It does not lead to any long-term weakness or progressive damage but can be a permanent feature.

It is normal for the knee to be slightly stiff for several weeks afterwards, to be swollen and uncomfortable and kneecap clicking and crunching is not an uncommon complaint for weeks if not months after the procedure before the muscle tone has recovered fully.

Proprioception. Despite functional stability the operated knee may not 'feel right' for a long time. Regular balance exercises and wearing a tubigrip occasionally may help this.

Complications

Fortunately, serious complications are rare. Infection can occur (less than 1%, less than 1 in every 100) and although this potentially could damage the result of the procedure, we have had very few incidents of this occurring. What is a little more common is superficial infection in the wound where it becomes pink, inflamed and sore and would normally respond to antibiotics either prescribed by the hospital or your GP. This complication tends to occur in the first two weeks after the operation and is unusual (less than 5%, less than 5 in every 100) but normally fully responds to treatment.

Deep Vein Thrombosis ('clot in the leg')

This is a recognised complication and one we actively try and avoid. Blood thinning agents are not actually recommended routinely but we do use compression stockings and recommend early active mobilisation following your operation. The most important issues are to tell us beforehand if you are on any medication, such as the contraceptive pill, or even more importantly, if you have ever had a clot before – which puts you at particular risk.

Even with all the treatment available, clots cannot be absolutely guaranteed not to occur. The usual symptom is a painful, swollen calf within a few days to a few weeks after your operation. It is a potentially fatal condition because the clot, if left untreated, can move into the lungs. We have never had a case of fatal embolus (clot in the lung) but we have had cases of thrombosis which have required patients to come back for assessment, diagnosis and treatment with blood thinning medication. In these rare cases, the result of the operation has not been affected, but of course recovery has been slower and rehabilitation has been delayed by several weeks.

If you do get a painful, swollen calf in the weeks following your surgery please contact us as an emergency or attend the Emergency Department (A&E), rather than wait for the next outpatient appointment.

Pain

Persistent pain can occur after any knee operation. Most post-operative pain settles down in 48 hours and then an ache continues for a few weeks after exertion. Some people seem to struggle with pain for a little longer for reasons which are not always associated with infection or other obvious cause and there are very rare abnormal pain responses (regional pain syndrome) which can cause this and these have their own specific treatments. If pain becomes a problem, please let us know, as in the vast majority of cases, the pain is manageable with simple medication alone.

Early graft failure

The graft is at its weakest in the few weeks after your surgery – just as you are beginning to gain your confidence on the leg – and there have been cases with accidents occurring in the first few weeks where the new graft has ruptured. This is very unusual and probably in most

cases unavoidable in the circumstances, but it is important to take the advice that we are giving you regarding gradual progression and follow the advice of the physiotherapists.

Very rare and extreme risks

All surgery is potentially fatal although the incidence of a serious rare anaesthetic complication leading to death is probably 1 in $\geq 10,000$ and we have never had a fatality in our unit in 15 years of knee ligament surgery. However, it is beyond the scope of this document to identify all the most extreme (less than 1 in 1000) risks that you might be prone to. We will be very happy to discuss any worries about specific concerns and also about any family history or your own personal history of problems in the past, which are much more relevant.

Outpatient physiotherapy

This usually starts **within the first 1-2 weeks** following surgery and should be arranged before discharge. This is the basic programme of exercise but will differ according to the individual and the complexity of the injury. You will be given exercises to do for the initial period between discharge and physiotherapy starting.

Typical progress / targets:

Weeks 0-2

Goals

- Protect fixation and mobilise surrounding soft tissues.
- Diminish swelling / inflammation.
- Maintain PCL splint in full extension (no hyperextension).
- All exercises to be completed in the splint.
- Splint / brace to be worn for sleep.
- Regain active quadriceps (especially inside part – vastus medialis oblique).
- Restore knee cap movement.
- Touch weight bearing (with splint **on**).

Week 2

Clinic appointment for change of splint to dynamic MEDI PCL brace (with restricted range of movement, **0-60 degrees only**).

Week 2-6

Goals

- Prevent scar adhesions.
- Prevent symptoms of anterior knee pain.
- Improve strength, power and endurance.
- Be able to perform straight leg raise with no lag (knee bend). (May require electrical stimulation.)

- Pillow to be placed under knee when resting to support lower leg. PCL brace should be left on for 6 weeks and only removed for washing.
- **Passive** knee bending (0-60°) is allowed with the brace on. You should help to bend your knee with either your hands or a towel hooked around your foot and keep your foot in contact with the bed. Do not actively bend your knee without assistance.
- Increase to full weight bearing (as swelling, quads strength and confidence allows).
- Restore balance reactions and control.

Week 6

Knee Injury Clinic appointment (x-ray on arrival).

Week 6-12

Goals

- Continue to wear MEDI PCL brace (full range of movement).
- Wean from / remove brace at 12 weeks post operatively.
- Normal gait pattern. Wean from crutches if no quads lag, full knee straightening and knee bend 90-100°.
- Eliminate any joint swelling which occurs.
- Prevent any graft site or scar adhesions.
- Full pain free hyperextension and flexion to 100 degrees.
- Improve balance reactions and control.
- Enhance muscular power and endurance.
- Weights above the knee may be used to progress exercises as strength permits (be guided by your physiotherapist).
- Static bike – no resistance. Saddle needs to be set high so knee not fully straight as push down. Place instep on pedal to decrease hamstring action.
- Return to driving when 'safe' to do so.

Week 12

Knee Injury Clinic appointment (check appropriate progress).

Weeks 12-16

Goals

- Wean from / remove brace at 12 weeks post operatively.
- Normal gait pattern with full knee straightening.
- Aim for full knee flexion.
- Start walking on the treadmill and progress to light jogging.
- No anterior knee pain.
- Start open chain hamstring strengthening (i.e. without foot being fixed).

- Strengthening exercises can be progressed by placing a weight on the tibial tubercle (bony bump at front of knee) and gradually moving these towards your ankle as strength and control allows (be guided by your physiotherapist).
- Progress muscular strength, power and endurance of hamstrings and quadriceps (quadriceps should be good to normal).
- Start agility and early plyometric work (quick movements of the leg to strengthen it).
- May start swimming but no breaststroke.
- Return to work.

Week 24

Knee Injury Clinic appointment (KOOS questionnaire)

Weeks 24-36

Goals

- Enhance lower limb confidence and function.
- Start harder agility work.
- Maintenance of strength and endurance through home exercises.
- Start sports specific training (no pivoting sport for at least 6 months).
- Preparation for return to full sport / activity. Able to return to pivoting sports, e.g. basketball, football, skiing from 9 months.
- It is advised that 3 months training be completed to regain confidence and skill acquisition prior to first competitive game i.e. return to play at 12 months.

Week 36+

Goal

- Quadriceps strength 90% of uninvolved leg.
- No significant knee cap or soft tissue irritation.
- Patient demonstrates a clear understanding of their possible limitations.
- Unrestricted confident function.

Week 52

Knee Injury Clinic appointment (KOOS questionnaire)

NB. It is advised that the strengthening programme you have been taught by your physiotherapist should be completed on a regular basis for 1-2 years following surgery to maximise any benefits.

Post-operative progress

As listed above you will be reviewed at regular intervals in the Knee Injury Clinic at the Royal Berkshire Hospital by a specialist physiotherapist who will assess your progress. The most important component of your recovery is your regular attendance at physiotherapy classes where you will be given strict instructions regarding appropriate exercises and the 'dos and don'ts'.

At certain points before and after your surgery we will be going through one or two questionnaires with you to provide us with information about your functional improvement not only to make sure you are getting better but also to ensure that our surgery has been successful for our own records.

Long term outlook

70% (7 out of 10) of people get benefit from the operation and are back doing the activities they wish between 9 and 12 months from the time of the operation, depending on their commitment and their level of sporting activity. The long-term stability of the knee once achieved, seems to last indefinitely with graft failure being unusual unless another specific injury occurs. Re-rupture of the original graft is relatively unusual. We are not sure whether wear and tear (degenerative arthritis) is inevitable in everyone who has had a ligament injury or whether surgery can delay this somewhat but even with a successful stabilising operation, it is possible wear and tear arthritis will ensue at some point in the future.

Further information sources

An immense amount of information is available on the internet. If you find something that is of interest or controversial and you wish to discuss it, we will be delighted to do so.

Useful numbers and contacts

Redlands Ward	0118 322 7484 / 7485
Clinical Admin Team (CAT 5)	0118 322 7415 or email: rbb-tr.cat5@nhs.net
Orthopaedic Physiotherapy	0118 322 7812
Royal Berkshire Hospital	0118 322 5111 (switchboard)

If you have any concerns during the first 24 hours of your discharge please phone the ward /unit you were admitted to. After 24 hours, please seek advice from your GP.

Approved by the Knee Research and Audit Group (KRAG), Royal Berkshire Hospital, Reading.

To find out more about our Trust visit www.royalberkshire.nhs.uk

Please ask if you need this information in another language or format.

Debbie Burden, Orthopaedic Physiotherapy Specialist, Sean O'Leary FRCS, Trauma & Orthopaedic Surgeon, RBFT Orthopaedic Unit/Physiotherapy, August 2022.

Next review due: August 2024

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