

# Anterior Cruciate Ligament Reconstruction

Information about your  
operation and recovery

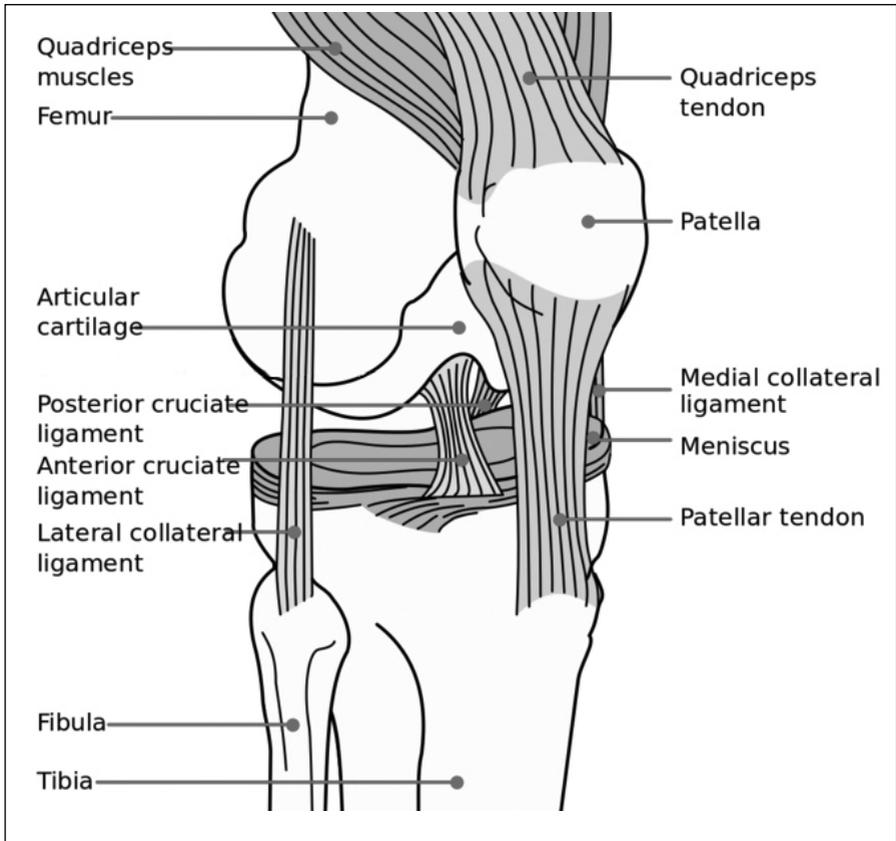


This booklet has been written to give you information and advice about:

- the injury you have had to your Anterior Cruciate Ligament (ACL)
- reconstructive surgery
- rehabilitation following surgery
- how to reduce the risk of re-injury.

This information should help you prepare for surgery. It also includes advice and exercises to help with your recovery, and guidance so you will know what to expect during this time.

# The Anterior Cruciate Ligament (ACL)



## Right knee

The ACL is one of the main ligaments, deep within your knee. It runs diagonally through the centre of your knee, from the bottom of your thigh bone (femur) to the front of your shin bone (tibia).

The ACL acts as a mechanical link between the femur and the tibia, giving stability to the knee, especially during twisting movements.

Stability is also provided by another deep ligament, the Posterior Cruciate ligament (PCL). This is damaged less often and is not covered in this booklet.

Ligaments connect bone to bone and are supported by the strength and control of the leg muscles. **This is why it is very important to strengthen these muscles following surgery.**

**The ACL is also important in providing information to the brain and muscles, helping you control your knee movement and balance. This is called proprioception and it is reduced when the ligament is ruptured and after ligament surgery.**

When the ACL has been torn or ruptured, the knee may give way or feel unstable. This can make daily activities and/or sports difficult or impossible. ACL reconstruction surgery replaces the ACL ligament, which will help to re-establish stability in your knee, allowing you return to work and sport.

**The exercises in this booklet are designed to enable you to safely regain the muscle strength and proprioception around your knee, without damaging your new ligament repair. This will allow you to regain the best possible function of your knee.**

## Exercises before surgery

It is important to exercise before your surgery, as this will help to strengthen your muscles and give the best possible result. You should try and do some of the exercises shown in this booklet either at home or in the gym. You could also swim or cycle to help with your preparation.

The most important goals you should aim for before your operation are:

- Try to get your knee fully straight.
- Reduce the swelling to a minimum.
- Improve your leg muscle strength.
- Understand the proposed operation and the length of the rehabilitation afterwards.

## ACL reconstruction surgery

The reconstruction involves replacing your damaged ACL with a graft. This is some 'spare' tendon taken from another place in your body. Grafts are most commonly taken from either a section of two hamstring tendons at the back of your knee or the middle third of the patellar tendon, which runs from the knee cap to the top of the shin bone.

The aims of this surgery are:

- to improve the stability of your knee, to prevent it from giving way
- to help your knee to return to full function, including sporting activities.

## What happens during the surgery?

This is a day case procedure, which means you shouldn't need to stay in hospital overnight. During the surgery you will be under a general anaesthetic, which means you will be unconscious.

To take the graft, a small incision (cut) approximately 4cm long, will be made on the front of your knee (depending on which type of graft is used). The graft is then passed through the knee joint, via tunnels drilled in the tibia and femur, and then secured to these bones. During surgery two more small keyhole incisions will be made, to allow accurate positioning of the graft. These incisions will be closed with dissolving stitches and Steristrips.

The graft ends will gradually heal and attach to the bone over the next 12 weeks.

The operation lasts approximately 1 hour. The anaesthetic wears off quickly, and you should be able to go home on the same day.

You will not be able to drive or use public transport when you leave hospital, so will need to arrange transport to take you home. You will need to be taken home by car. This will be more comfortable for you and also quicker for you to return to the hospital if there are any complications on the journey home.

In the next 24 hours:

- do not go to work
- do not drive a motorised vehicle (your insurance will not cover you)
- do not operate machinery
- do not make important decisions
- do not sign legally binding documents
- do not drink alcohol.

You must also arrange to have someone to stay with you for 24 hours after your surgery. If this hasn't been arranged when you come into hospital, we may have to cancel your operation.

## Rehabilitation following ACL reconstruction

### **Will I be in pain after the surgery?**

You will experience some pain and discomfort following the surgery. This is normal in the first few days. When you are in hospital it is important that you tell your nurse if you need more pain relief. When you leave hospital you will be given painkillers to take at home. You will be given more information about these before you are discharged from hospital.

### **How long will I be in hospital?**

Most people will go home on the same day as their surgery. If you take more time to recover from the anaesthetic, you may need to stay in hospital overnight.

You will be able to go home when:

- you have recovered from the anaesthetic and have had something to eat and drink
- you have started to bend your knee and are able to do the Phase 1 exercises from this booklet
- you are walking safely with crutches and can go up and down the stairs
- everyone in the medical team looking after you is happy with your progress.

### **Can I put weight on my knee?**

You will be able to put as much weight on your knee as is comfortable, unless you are told not to do so by your surgeon.

In the first week it may be painful to put your full weight on your leg. During this time you must use your crutches. You can stop using the crutches when the pain reduces, you have good muscle control while standing and you can walk comfortably without a limp. This may take one to two weeks, or sometimes longer.

A physiotherapist will guide you through the Phase 1 exercises and show you how to use crutches before you leave hospital.

## Points to consider when walking

- wear good footwear, such as trainers
- step length – make sure both your steps are of equal length
- rhythm – try to spend the same amount of time on each leg
- when stepping, always put your heel to the ground first.

## Stair climbing

If available, it is best to use a banister when going up and down stairs, rather than having a crutch in both hands. Hold the banister with one hand and the spare crutch in the opposite hand in a 'T' shape, as shown in the picture below. Remember to carry it on the outside, so that if you drop the crutch it won't hit your legs or trip you up.

### **Climbing up stairs:**

1. Step up with your unaffected (good) leg first, supporting your affected (bad) leg by holding onto the banister.
2. Lift up your affected leg and place it on the step.
3. Place your supporting crutch safely on the same step, so that it can't slip back off the edge.

(Note the position of the unused crutch.)



## Climbing down stairs

1. Stand close to the banister and hold on with one hand. Hold onto both crutches in your other hand, as when going up.
2. Put the supporting crutch down first, to support your affected leg. You can also support yourself with the handrail.
3. Lower down your affected leg.
4. Lower down your unaffected (good) leg last.

If there is no banister, continue to use both of your crutches, with one on either side of your body.



## What can I do to reduce the swelling?

It is normal to have swelling around your knee following surgery. However, excessive swelling will slow your recovery, as it can stop your thigh muscles from working.

You can help reduce the swelling by raising your whole leg on a pillow or pillows when you are sitting or lying down. Keep your foot higher than your knee and your knee higher than your hip. Keep your knee fully straight. Do not rest with your knee bent, as this may then prevent it from fully straightening, which is essential for a good recovery.

You can use ice to reduce the swelling (an ice pack or packet of frozen peas can be used). This can be applied as needed, for ten

minutes at a time. Protect your skin from ice burns and keep your wounds dry by wrapping the ice pack in a thin clean tea towel.

It will also help if you temporarily reduce your activity levels, especially time spent on your feet, until the swelling goes down.

**If you have severe pain or excessive swelling in either your knee or calf, contact your GP or out of hours service urgently.**

### **Will I have further appointments?**

You will need to make an appointment with your GP's practice nurse 12-14 days after your surgery for the wound to be checked and any remaining stitches to be removed.

A clinic review with the surgical team will be arranged for you 6 weeks after your surgery. You will also have a physiotherapy appointment, which will be arranged after you've left hospital, to assess your progress and monitor your rehabilitation.

### **When can I return to driving?**

You should not try to drive until you have achieved good muscle control and you are not using crutches. This can vary from person to person, but most people can return to driving between two and six weeks after this surgery. It is up to you to decide when to drive, but you must make sure you are able to do an emergency stop and are completely in control of the vehicle. It is also best to start with short journeys, to make sure you are fully capable of driving safely.

### **When can I return to work?**

This very much depends on how difficult it is for you to get to work and the nature of your job. As a rough guide, you can expect to return to an office job about two weeks after surgery. If you have a physical job, but can return on lighter duties that involve minimal walking, you may be able to return at about 4-6 weeks. It may take up to three months to return fully to more physically active jobs, particularly if they involve squatting or lifting.

If you require a fitness for work certificate, please ask one of your medical care team before you are discharged.

## Knee exercises

Your rehabilitation will be supervised by a physiotherapist, firstly when you are in hospital and then as an outpatient in a Physiotherapy department. You will be given exercises to help you to regain full movement, muscle strength and function in your knee. These exercises will change as you improve.

Much of the success of your surgery will depend on how well you do your exercises. **The responsibility for doing the exercises is yours**, but please discuss any difficulties or worries you have about them with the physiotherapist.

You are likely to be seen regularly by a physiotherapist as an outpatient for the first 3-4 months after surgery. Depending on how you progress, you will then be seen less frequently for up to a year. The physiotherapists will help you get back to your full functional ability, including sport if appropriate.

The ACL graft is a biological tissue and needs time to heal. This exercise programme is based on current recommendations and aims to avoid putting excess stress on the graft. This booklet should be used as a guide only – your physiotherapist will give you specific advice about the exercises.

Everyone's recovery after surgery is different. Your physiotherapist will tailor the exercises for you and help you progress through them as an individual.

## Exercises – Phase 1

### Day of operation to end of week two.

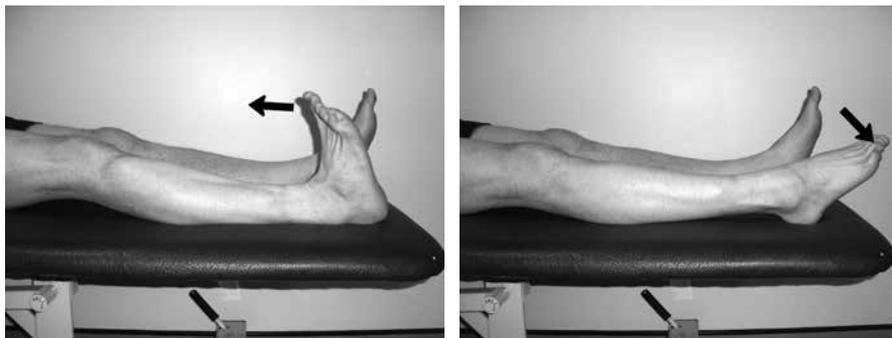
The most important goals of Phase 1 are:

1. to get your knee fully straight (full extension)
2. to reduce the swelling to a minimum
3. to get your quadriceps and hamstring muscles working effectively again.

Perform these exercises at least twice a day, 10-15 times each, or as you find comfortable. Little and often is best.

It is normal for you to feel aching, discomfort or stretching sensations whilst doing these exercises. If you feel intense and lasting pain (e.g. for more than 30 minutes) it may be a sign that you need to change the exercise, by doing it less forcefully or less often.

Note: all the exercises are shown for the right knee. Please copy them with your other leg if your left leg is affected.



### 1. Ankle pumps

- Lie on a bed, straighten your knee and pump your foot and ankle up and down by pointing your toes and ankle up towards you then away from you.
- Aim to repeat this 10-15 times.

## 2. Static quadriceps contraction

- Sit or lie with your legs stretched out straight in front of you.
- Tense your quadricep muscles by pulling your toes up towards you and pushing the back of your knee down onto the floor or bed. Try and raise your heel off the bed at the same time. Hold for a count of five. Relax completely.



- Aim to repeat 10-15 times.

## 3. Knee bending exercise

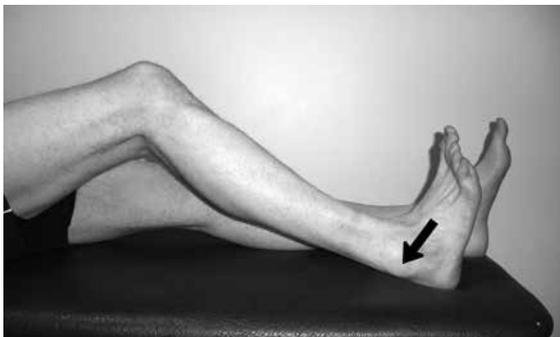
- Lie on your back with your legs stretched out in front of you, then slide your heel up towards your bottom, allowing your knee to bend gently. Increase the amount of knee bend as comfort allows.



- Slide your heel back down again.
- Relax completely.
- Aim to repeat 10-15 times.

#### 4. Static hamstring

- Lie on your back with your legs stretched out in front of you.
- Bend your operated knee to about 30-40 degrees (as shown in the picture above) then push your heel down into the bed and towards your bottom (as shown by the arrow in the picture). This is the same action as bending your knee, but no movement occurs in the knee. You should feel your hamstring muscles at the back of your thigh tighten.
- Relax completely and aim to repeat 10-15 times.



## Exercises – Phase 2

### **Week two to week six following your operation**

By the second or third week after your operation, the pain and swelling in your knee should have reduced and your ability to walk will have improved. Ideally you will be less reliant on the crutches or will have stopped using them completely. If you have reached this point, you can start the following exercises (exercises 5 to 14), alongside exercises 2, 3 and 4 from Phase 1.

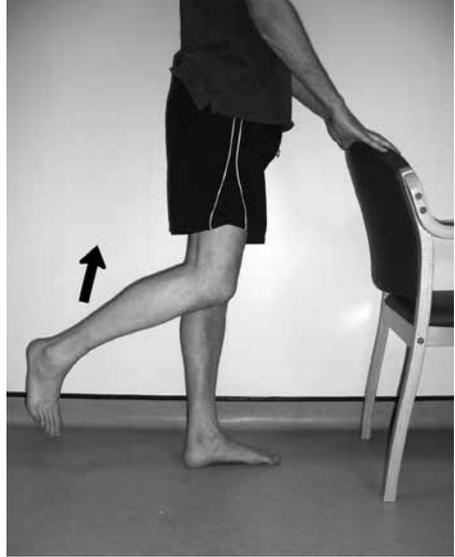
The quality of how you do these exercises is more important than the number of repetitions you do, so try and complete them correctly – with good ‘form’. A small number of well performed exercises are better than many exercises performed incorrectly. It is recommended that you perform the Phase 2 exercises twice a day.

It is common to experience pain at the graft site. If you have had a hamstring graft you may also feel sudden sharp pain in the hamstring muscles themselves. This can be caused by awkward movements and tends to settle over a couple of days.

Use knee pain and swelling as a guide for all activities. If either or both are increasing, this means your knee isn’t tolerating what you are doing. You may be over-doing the exercises. Reduce your activity and the exercises until the pain and swelling subside. Stop any exercise that causes a sudden increase in pain or severe swelling. Speak to your physiotherapist if you have any questions.

## 5. Knee bending exercise

- Stand with your hands supported on a table, stable high-backed chair or windowsill. Keep your knees side by side. Bend your operated knee by taking your heel up towards your bottom as far as you can. Hold for a count of five.
- Lower your foot until your toes touch the floor.
- Aim to repeat this 20 times.
- To make this more challenging, add a small weight to your ankle. Start with 0.5kg and increase as you are able. Ankle weights can be bought from sports retailers or online.



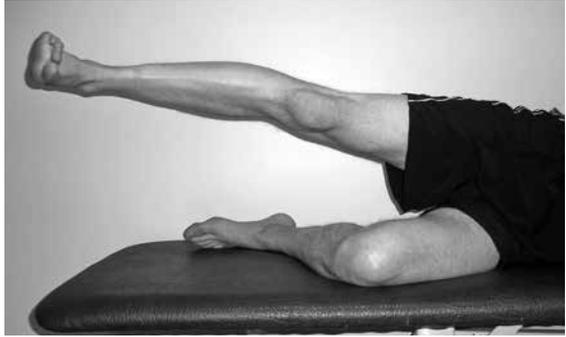
## 6. Leg raise

- Lie on your stomach.
- Keeping your leg straight, lift and lower each leg, one at a time, keeping the front of your pelvis in contact with the bed/floor.
- Aim to repeat 20 times.
- To make this more challenging, add a small weight to your ankle on your operated leg. Start with a 0.5kg weight and increase as you are able.



## 7. Leg raise

- Lie on your side with your operated leg uppermost.
- Lift and lower your operated leg in a slow and controlled way, using the outer muscles of your thigh. Keep your big toe facing forward (see picture 7a).



**Picture 7a**

- Lie on your other side and lift your operated leg in the same way, but this time using the inner muscle of your thigh (see picture 7b).



**Picture 7b**

- Aim to repeat this 20 times on each side.
- To progress, add a small weight around your ankle. Start with a 0.5kg weight and increase as you are able.

## 8. Bridging

- Lie on your back with your knees bent. Fold your arms across your chest.
- Push your heels into the floor/bed and lift your bottom clear of the surface (see picture 8a).
- Aim to repeat this 20 times.
- To progress, do the exercise with your weight on your operated leg only (see picture 8b).



**Picture 8a**



**Picture 8b**

## 9. Wall squats

- Stand with your back against the wall, with your feet shoulder-width apart and your heels about 40 centimetres away from the wall. Keep your weight evenly on both feet.
- Slowly slide down the wall as far as your pain and strength in your knee allows. Do not squat lower than 90° (when your thighs are horizontal, parallel to the floor).
- Hold for five seconds then slide up the wall again.
- You may only be able to slide a few centimetres down the wall to start with, but you can gradually improve this by squatting a little lower the next time.
- Aim to repeat 20 times.



## 10. Hamstring catches

- Stand on your good leg and bring the heel of your operated leg towards your bottom (as shown by arrow 'a'). To help keep your balance you can rest your hands on a chair or window sill. Keep your knees side by side at all times.
- Let your operated leg fall down to nearly straight (as shown by arrow 'b') then "catch" it by rapidly contracting your hamstring muscles, and bending your knee back up to the starting position (as shown by arrow c).
- Aim to repeat 20 times.
- To progress this exercise, add a small weight around your ankle (start with 0.5kg and increase as able).



## 11. Single leg balance

- Stand, holding onto the back of a chair to get your balance.
- Try to balance on your operated leg, taking your hands off the back of the chair if you are able.
- Aim to stand on one leg for 10-30 seconds.
- To make this more of a challenge, close your eyes.



## 12. Calf raises

- Stand, holding onto the back of a chair.
- Balance your weight evenly through both legs.
- Rise up onto your toes, lifting your heels off the ground. Hold for 3 seconds then lower your heels to the floor.
- Aim to repeat 20 times.
- To progress, do this on your operated leg only.



### **13. Calf stretch**

- Stand with your good leg in front and your operated leg behind, with your feet pointing forward.
- Lean on the back of a stable chair.
- Keeping your operated knee straight and heel down on the floor, lean towards the chair until you feel a stretch in the calf on your operated leg.
- Hold for 20-30 seconds.
- Release and repeat 3 times.



## 14. Hamstring stretch

- Lie flat on your back.
- Bend your operated knee to 90 degrees (as shown in picture 14a).
- Hold the back of your thigh.
- Straighten your leg until you feel a stretch in the back of your thigh (as shown in picture 14b).
- Hold for 20-30 seconds.
- Bend your leg back down and repeat 3 times.



**Picture 14a**



**Picture 14b**

## Exercises – Phase 3

### Week 6 to week 12

At this stage, Phase 2 exercises can be progressed by increasing the speed, the weight used or the number of repetitions. You could also try adding in some of the following exercises. Speak with your physiotherapist if you have any questions about the exercises.

#### 15. Quadriceps stretch

You can either do this stretch when standing or when lying on your stomach.



- Bend your operated leg.
- Hold your ankle and gently pull your heel towards your buttocks until you feel a stretch at the front of your thigh.
- If you cannot reach your foot, use a scarf or belt around your ankle.
- Hold for 20-30 seconds.
- Release and repeat 3 times.

## 16. Single leg dips

- Stand on your operated leg, using a stable chair for support.
- Raise your good leg off of the ground.
- Bend your operated knee, keeping your heel on the ground (see picture 16a).
- It is important to make sure your operated knee remains over your toes (see picture 16b).
- Aim to repeat 20 times.



**Picture 16a**



**Picture 16b**

## 17. Lunges

- Stand with your operated leg in front of your good leg, with your feet pointing forward.
- Bend both of your knees, making sure your weight is equally distributed over both legs (see picture 17a).
- It is important to make sure your front knee remains over your toes (see picture 17b). Don't let it fall inwards.
- Return to a standing position.
- Repeat 20 times.



**Picture 17a**



**Picture 17b**

## Other exercise during Phase 3

In Phase 3 you also have the option to increase your activities with other types of exercise. Speak with your physiotherapist if you have any questions about the following suggestions or any part of your rehabilitation.

- **Gym work**

At this stage you could begin to do some exercises in your local gym. This could include using the treadmill, stepper, cross trainer and lower limb weight machines. However, we would recommend that you don't use the knee extensor machine at this stage in your recovery, as this may put excessive strain on your ACL graft.

You can also increase your core stability and balance work. If you need to, ask your physiotherapist for advice.

As with all exercises, start with gentle activities and small weights. Progress slowly and gradually, so your tendon graft gets accustomed to the forces involved and you gain good muscle control.

- **Cycling**

You may want to start off on a static exercise bike before you feel safe to progress to outdoor cycling on a road bicycle.

- **Gentle jogging**

Towards the end of Phase 3 you can gradually add some gentle jogging in a straight line on a flat surface to your exercise regime. We recommend that you don't do any rapid turning or changes of direction at this stage, to avoid possible damage to the graft. You will move on to this in Phase 4.

- **Swimming**

We recommend starting with front and back crawl but avoiding breaststroke until 6 months after your surgery. As with all exercises, build up the amount you do gradually.

## Phase 4

### **3 - 6 months**

You can now supplement the earlier exercises with more activity based exercise. Your physiotherapist will guide you, depending on what you wish to return to and how well you are progressing.

Try a gentle jog in large circles with a change of direction, slowly at first but turning faster as you gain confidence in your knee. Try jogging in a figure of 8 – again changing direction. Increase your speed from a jog to a run.

Towards the end of this phase try skipping, jumping and hopping. Always make sure you have a good landing technique and do not let your knee fall inwards.

You may consider sports specific neuromuscular training, for example the PEP programme (Prevent injury and Enhance Performance programme). This programme was developed by the Santa Monica Orthopaedic Sports Medicine Research Foundation.

It has 5 specific parts, designed to improve neuromuscular conditioning and muscle reactions, which will reduce the risk of further ACL injury. These include a warm up, stretching, strengthening, plyometrics and agility exercises. They will enable you to gradually increase your ability and confidence to run, hop and change direction.

You can find the programme at:

**<http://smsmf.org/smsf-programs/pep-program>**

## Phase 5

### **6 - 9 months**

Continue to progress the exercises from Phase 4 and begin some activities to prepare you for a return to your desired sport.

You may be able to begin activities such as badminton, tennis and other non-contact sports. This depends on your progress, so please speak with your physiotherapist or surgeon before returning to your sport.

## Phase 6

### **9 months to a year**

You may be able to return to competitive and contact sports. It is advisable to carry out at least three months of thorough sports-specific training before returning to full level competitive sport.

## Prevention of re-injury

Most ACL injuries and re-injuries occur in non-contact situations, usually from either a rapid change of direction or landing badly on one leg from a jump. ACL prevention programmes aim to train safer neuromuscular patterns during these movements.

It is important that you continue to improve your balance, strength and good jumping and landing ability in the long term, to help prevent re-injury. The PEP programme (page 29) is a good example of a highly specific 15 minute training session that replaces the traditional warm up and should be carried out on a regular basis.

## Contact details

If you are unsure who to contact or if you have an appointment query, please contact your Consultant's secretary between 8.30am and 5.00pm. They will contact the correct person, depending on the nature of your enquiry.

If your wound changes in appearance, weeps fluid or pus or you feel unwell with a high temperature, contact your GP or out of hours service.

If you have any problems or questions at any stage in your rehabilitation, please ask your physiotherapist for advice.

### **Nuffield Orthopaedic Centre**

Oxford University Hospitals NHS Foundation Trust  
Windmill Road  
Headington  
Oxford  
OX3 7LD

### **Trauma Service**

John Radcliffe Hospital  
Oxford University Hospitals NHS Foundation Trust  
Headley Way  
Oxford  
OX3 9DU

OUH switchboard:

**0300 304 7777**

NOC Physiotherapy reception:

**01865 738 074**

John Radcliffe Trauma Service – Physiotherapy reception:

**01865 221 540**

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