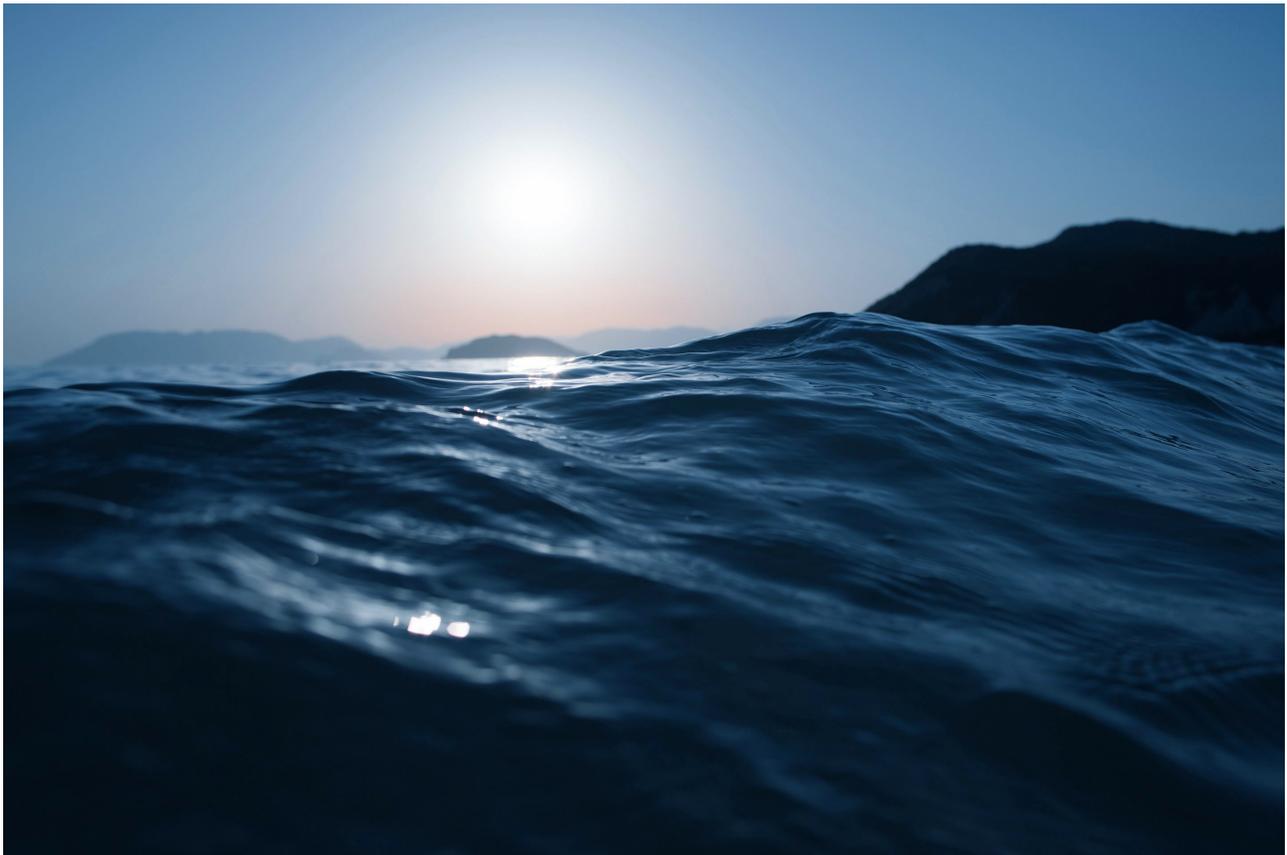


ACL Rehabilitation Protocol



Section One: For Patients

Section Two: For Physiotherapists

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SECTION ONE

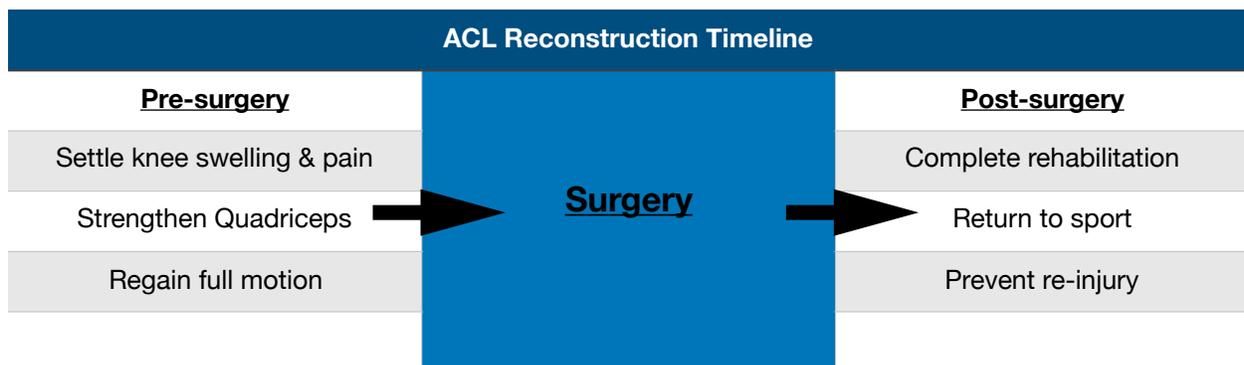
For Patients

Background

Anterior Cruciate Ligament tear is a common injury usually sustained during sports that require twisting, jumping and pivoting movements, like football (all codes), netball, skiing and basketball. Once the diagnosis confirming ACL rupture is made, your surgeon should discuss the options with you in detail; not every patient needs reconstructive surgery. Certainly those with a desire to return to high level athletic activities that require twisting, jumping and pivoting movements are typically advised to have surgery to prevent further chondral and meniscal injury. ACL injury is commonly seen in context of other knee injuries (menisci, cartilage surfaces and even other knee ligaments), and these can influence decision making further.

The patient should be aware that the surgery itself is but one component of a rehabilitation process that takes around one year for most patients. Although the strong ACL graft is placed in the knee at the time of surgery, the process of “**ligamentisation**”, where the body incorporates the graft and strengthens it, is slow and the graft is especially vulnerable during the first year. An emphasis is placed on carefully guided rehabilitation commencing as soon as possible after surgery. Close liaison between the patient and physiotherapist is important.

The figure below shows elements the patient should focus on both before and after surgery.



Pre-Surgery

This period is important - the patient can greatly optimise their speed of recovery by addressing simple key issues:

1. Settle knee swelling & pain
2. Strengthen Quadriceps
3. Regain full range of motion

Settle Knee Swelling & Pain

The trauma of ACL injury causes a great swelling (effusion) in the knee. It is important to get rid of this before surgery as it can hinder the surgical procedure, and make recovery after surgery more difficult.

The best way to resolve knee swelling is use of ice packs in the first week after injury, regular use of anti-inflammatories and focusing on gentle, cyclic exercises. It is critical to avoid sudden, jarring movements to the knee that can cause a flare up of the swelling (jumping, pivoting, side-stepping).

Knee pain is common after ACL injury - the anti-inflammatories will help with pain as well as swelling, and paracetamol can be added on a regular basis. Pre-operatively, it is uncommon to require stronger medication, in the form of opioids, unless there are extenuating circumstances.

The anti-inflammatory we prefer is **meloxicam** (Mobic) which is taken daily, and requires a doctor's prescription. **Ibuprofen** (Neurofen, Advil, Bugesic), **diclofenac** (Voltaren, Dinac, Fenac) and **naproxen** (Naprosyn, Naprogesic, Aleve) also work well, and most of the anti-inflammatories have very similar effect. Some patients with high blood pressure, stomach ulcers and kidney issues will need special advice from their GP.

Strengthening The Quadriceps

The bulky muscle group on the front of the thigh that straightens the knee is called the quadriceps. After almost any significant knee injury the quadriceps loses size and strength, as the patient avoids using the painful knee. To speed recovery, a large bulky quadriceps is advantageous; this makes regaining full range of motion easier, and gives significantly more stability to a knee that is tender in the early period.

One of the best ways to regain quadriceps muscle bulk is to spend time on a bicycle, out on the trails or inside on a stationary bike. This avoids the constant impacts of running, does not risk knee subluxation or sliding that might occur with contact sports, and is an efficient cardiovascular workout that maintains fitness. Rental of a stationary bike is an option that patients who are not keen cyclists often consider.

Regain Full Range of Motion

Immediately following knee trauma, the joint becomes swollen and stiff. A stiff joint makes the surgery more difficult, and impairs rehabilitation after the surgery. Once the swelling begins to resolve, a focus is made on gaining a similar range of motion to the uninjured knee, typically from out straight, to a full bend where the foot comes near to the buttock.

Working with a physiotherapist in “pre-habilitation” can help you regain your full range of motion pre-operatively.

Surgery

On the day of surgery, you must bring your X-rays and MRI scans. It is best to have a physiotherapy appointment already organised for the day after surgery. This ensures you give your knee the best start to rehabilitation possible.

You will be able leave the operating suite on the day of your surgery (unless other arrangements are made). Although full weight bearing is permitted for most ACL reconstructions (provided there is no additional surgery required), crutches are provided for assisting with balance. These are typically used for the first week to help with balance.

A bulky dressing is placed over the knee at the time of surgery. You can debulk the dressing (composed of both an outer layer of crepe, and an inner layer of cotton-like material called Velband) on the next morning (i.e. about 24hrs after surgery). But the waterproof plastic dressings **must** stay on the knee; these are only to be removed by the surgeon at 7-10 days after surgery. They are not completely waterproof, and you should not submerge the wounds in water or a shower during this first week.

Rehabilitation

Rehabilitation is divided into four phases. Patients progress at very different rates through rehab, and professional athletes typically advance more quickly than the rest of us.

First Phase - Recovery

The first month

This phase consists of the immediate post-operative period. The emphasis here is similar to the pre-surgical period - settle pain and swelling, and regain range-of-motion. You are encouraged to walk without crutches after the first week. Strengthening is not a priority here.

Second Phase - Gentle Strengthening

Approximately 1 to 4 months

In this phase, the focus is on specialised exercises that restore muscle endurance and strength. This includes the full complement of muscles around the knee (not just the quadriceps). You will start to work on retraining the knee's sense of position in space, called "proprioception". Jogging and cycling are possible. You will also learn about injury prevention programs, which are crucial warm-up drills performed before sports that reduce rates of re-injury by around 50%[1-3].

Third Phase - Balance and Return to Full Function

Approximately 4 to 9 months

Further work on strengthening and regaining proprioception - longer sessions, greater weights, and subtle changes in the exercises. A limited return to certain sports, mostly on your own, begins. It is critical to avoid pivoting, side-stepping and twisting sports in this phase. You will begin working on an injury prevention program.

Fourth Phase - Return to Competition

Approximately 9-12 months

This is the final phase, and involves drills and education that prepare the patient to return to their desired level of activity. The timing of return to competition is critically important and is a shared decision between you, your surgeon (Dr Facek) and your physiotherapist.

SECTION TWO

For Physiotherapists

Overview

Our rehabilitation protocol for ACL reconstruction consists of 5 components:

Pre-habilitation	<i>Painfree, full ROM</i>
First Phase	<i>Restore ROM</i>
Second Phase	<i>Restore Endurance and Strength</i>
Third Phase	<i>Restore Balance and Return to Training</i>
Fourth Phase	<i>Return to Competitive sport</i>

The progression through these is based on attainment of physical goals rather than anchored strictly to timepoints. However, a rough timeframe is provided for each phase as a guide. Key concepts features throughout the protocol include:

- Ensuring prompt appointment with designated physio (**within 3 days post-op**)
- Emphasis on restoring ROM early
- Avoidance of open chain exercises in early phases
- Avoidance of twisting, side-stepping and pivoting movements throughout the rehab
- Avoid compulsion to add new exercises at every rehabilitation appointment - focus on quality, and progression in force or repetitions
- Education on physiology of graft incorporation process and why 3-9 month period is high risk for graft rupture
- Necessity of an Injury Prevention Program - PEP, FIFA-11, FootyFirst, Netball Australia's Knee Program
- Rehabilitation continuing for 9-12 months [4]

Prehabilitation

Prehabilitation is important, and data has shown that prehabilitation can make a significant difference to two year outcomes of ACL reconstruction surgery. [5-7]

Patients are encouraged to visit their physiotherapist at least twice prior to ACL surgery, to ensure they are regaining a full ROM, strengthening the quadriceps, and make arrangements for physiotherapy to commence 1-3 days after surgery.

The focus in this phase is to obtain a full ROM, with particular focus on deep flexion, and resolution of swelling and pain. ACL reconstruction is typically performed at a minimum of 2 weeks after ACL rupture, and most commonly at 4-6 weeks. If a full ROM can not be achieved prior to the booked date, the surgeon (Dr Facek) should be alerted and often the surgery will simply be delayed by 2 to 4 weeks. Direct physiotherapist to surgeon correspondence is welcomed - please contact our office for further details - (07) 5611 5050.

Early Phase

Timeframe

Typically up to 1 month

Indicators of completion: swelling resolved, walking comfortably, flexion to 110°, wounds healed

Focus

Restore ROM and resolve swelling

Activities

Wear crutches over first week

Icing before and after exercises as required

Encourage weight bearing and active ROM - but discourage strengthening

Swelling: encourage icing of the knee, anti-inflammatory tablets (Mobic preferred)

Range of Motion: regaining full extension and at least 100° flexion by 14 days

Exercises: static co-contractions (quads + hamstrings) at 0°, 30°, 60°, 90° (as range permits); heel slides, seated calf and hamstring stretches, side-lying gluteal exercises, prone hip extension, ankle pumping; also stationary bike work with no resistance

Avoid open chain exercises in this early phase, avoid squats (single or double)

Gait training: ensure proper heel strike, ensure full terminal knee extension

No jogging (gait kinetics are too abnormal until quadriceps strength >90% of normal)

Massage of soft tissues (thigh muscles, gluteal muscles)

Wounds: remove crepe/Velband bandaging at 48hrs - don't touch waterproof dressings

Measure quadriceps circumference (right/left) at 10cm above patella pole (weeks 1, 2, 6, 12, 26)

Education:

Wound check will take place in rooms at 10-14 days

Re-assure patient about simple bruising, which is common

DVT: Explain reproducible pain at back of calf (which is rare) may be sign of DVT and should be medically reviewed; if concerning, first step is usually doppler US

Braces are not required (unless special circumstances); and stockinette, tubigrip are discouraged - often these are poorly applied and can increase DVT risk

It is common for patient to feel like they have a "pulled hammy" due to graft harvest

Set expectations - usually no competitive sports until after 12 months

Background to graft incorporation: the autograft undergoes slow process of necrosis and then revascularisation and proliferation after surgery; weakest at around 3 months and must be protected from pivoting, side-stepping and twisting moments during this period

Second Phase

Timeframe

Typically 1 to 4 months

Indicators to commence: swelling resolved, walking comfortably, flexion to 110°, wounds healed

Indicators to complete: can run comfortably, jogging comfortably, has full ROM

Focus

Gentle strengthening (light intensity but high repetitions) - especially quadriceps

Closed chain exercise

Proprioceptive work

Cardiovascular exercise

Activities

Commence proprioceptive exercises

Eccentric quadriceps training

Early exercises: Wall squat holds, single leg shuttle squats, supine bridge with hamstring curls, resisted lateral steps

Later exercises: Single leg squats, front squats with dumbbells or kettle bells, weighted reverse lunges, nordic hamstring curls, bilateral shuttle jumps, step-ups/step-downs

Proprioceptive training: single leg stance (30-60 seconds), wobble boards with support; progress this by starting with open eyes, later eyes closed and on unstable surfaces

Focus still on closed chain exercises, but limited open chain may now commence (particularly jogging)

Gluteal strengthening [8]

Regular exercise in gym (at least 3x weekly) plus daily home exercises - increase time periods

Stationary bike - slowly introduce resistance

Squats and lunges can be introduced

Add in exercises for muscles about the knee, particularly thigh/buttock region (especially gluteals and core muscles)

Measure quadriceps circumference (right/left) at 10cm above patella pole (weeks 1, 2, 6, 12, 26)

Education

Clinical check at 6 weeks

ACL graft is at its weakest at around 3 months, with 30% of strength of normal ACL - avoid pivoting, twisting and side-stepping moments

Discuss injury prevention program - we favour FIFA-11, but Prevent injury & Enhance Performance (PEP) is also excellent; there are exercises specific to the sport you wish to resume that can be practiced

Third Phase

Timeframe

Typically 4 - 9 months

Indicators to commence: can run comfortably, jogging comfortably, has full ROM

Indicators to complete: surgeon/physiotherapist/patient decision (**critical**)

Focus

Return to most solo sports training, except where pivot/side-step/twist is involved

Further Strengthening

Further Balance

Activities

Returning to non-competitive sports - running, swimming, surfing

Critical to avoid pivoting, side-stepping and twisting in this phase - any training that includes these exercises is high risk for re-rupture

Power clean, front squats, nordic hamstring curls, burpees, box jumps, abdominal crunches

Commence using an Injury Prevention Program - FIFA-11 or PEP are preferred

Not ready yet for team training

Measure quadriceps circumference (right/left) at 10cm above patella pole (weeks 1, 2, 6, 12, 26)

Education

Clinical check at 6 months

If swelling or pain is occurring with graduated return to sports, these should be avoided and patient should return to gym for further strengthening

This phase is high risk - patient feels the knee is "returning to normal" and may be over-confident and keen to return to competition

Fourth Phase

Timeframe

Typically at 9-12 months +

Indicators to complete: surgeon/physiotherapist/patient decision (**critical**)

Professional Athletes: around 9 months

Non-athletes: around 12 months

Useful indicators/metrics for Return to Sport

Knee Scores - scoring > 90 on IKDC

Psychological - patient *feels* confident to return to sport

Physical - quads strength > 90% contralateral side,
examination stable

Preparation - performs prevention program warmups

Focus

Injury prevention program at every warm-up

Patient education

Activities

Continue gym work 3x weekly

Continue daily home exercises

Injury Prevention program

Can now return to team training, and ultimately competitive sports

Education

Must execute an Injury Prevention Program - warmup prior to all sports

Most graft ruptures occur in first two years. In an ideal situation, players would delay returning to sports for up to 24 months - as this is simply impractical, the patient should understand that we are balancing their needs to return to sport against risk of re-rupture[9]. Professional athletes are often ready at 9 months. Most non-athletes should be ready at closer to 12 months.

Patients are as likely to rupture their reconstructed side as they are to rupture their uninjured knee - roughly 1% per side per year.[10]

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