Posterior Cruciate Ligament (PCL) Reconstruction Rehabilitation Program

Introduction

The Posterior Cruciate Ligament (PCL) is the strongest ligament in the knee. It is injured less commonly than the others. Injury to the PCL can often be managed with non-operative treatment. Partial injuries of the PCL are seen commonly, and these may leave the knee with an acceptable function after appropriate rehabilitation. PCL reconstruction surgery has become more common, particularly for complete ruptures, when a return to an active lifestyle is desired. It has undergone considerable changes over the last ten years, however function of the knee is rarely returned to pre injury levels.

The rationale for treatment is to stabilise an unstable joint, or a potentially unstable joint. Joint stabilisation has been shown to decrease meniscal and articular cartilage injury. This should, inturn, decrease the incidence of later osteoarthritic change. It will also allow return to activities that were difficult secondary to joint instability.

Rehabilitation following PCL reconstruction is an essential part of full recovery. Ideally this rehabilitation should be carried out under the guidance of a physiotherapist.

This Rehab program has been designed to guide your physiotherapist through your rehabilitation as I think it should be done. All rehabilitation programs are flexible. Individual progress varies greatly, and this will require some modifications of the program at the discretion of your physiotherapist. Different techniques may also be used by your physio depending on available equipment, and your individual needs to meet the described aims.

Surgical Procedure

The posterior cruciate ligament is an intraarticular ligament, and as such heals poorly. For this reason, it is almost always reconstructed with a substitute ligament, rather than being repaired.

In my practice the hamstring tendons are used most commonly, however if multiple ligaments need to be reconstructed as part of a severe ligamentous injury to the knee, other grafts may be used and include patella tendon, Quadriceps tendon, and donor (allograft) tendons.

At the time of surgery, the ruptured PCL is removed and the autologous hamstring graft is placed anatomically and held with screws and occasionally a staple.

Aims of Physiotherapy

Physiotherapy should ideally commence preoperatively. Patients who have a pain-free, mobile, healthy joint recover far quicker post operatively than those patients with acutely painful joints. It is ideal to learn the required exercises pre-operatively. The treatment goals are:

1. Diminish post-operative pain and swelling
2. Restore full range of motion
3. Restore muscle tone and strength
4. Maintain and develop aerobic conditioning
5. Proprioceptive retraining allowing a safe return to work and sport as soon as possible

Rationale of this program's design:

- Early mobilisation has advantages in maintaining articular cartilage nutrition, and helps to prevent "arthrofibrosis"
- Early weight bearing decreases in muscle atrophy, improved proprioception, and decreases loss of bone mineral density.
- The new graft needs some stimulus to encourage collagen healing and regeneration.
- The graft complex is actually at its weakest at around the 6 week post operative mark.
- Accelerated rehab helps prevent loss of knee extension, and long term knee stiffness.
- Active hamstring contraction (particularly open chain) will stress the graft.

Brief Timeline:

Day 1	Begin physiotherapy
Day 10-14	Wounds usually healed enough to remain uncovered
	Can start swimming (walking in pool etc)
	Can usually return to work for "light duties" if available
	Usually walking reasonably comfortably
	Wean off crutchers
Week 6	Can commence running in a straight line on the flat
	Brace removed
Week 12	Commence sport specific training. Can start to jump.
Week 25 (6 months)	Return to contact sport

The Rehabilitation Program

Stage 1 ***Wound Healing phase***

Day 1- Day 14

Aims

Adequate pain relief

Progressively stop using crutches

Decrease leg and joint swelling

Restore full extension

Establish muscle control and aim for normal gait

Treatment Guidelines

- Weight bearing as tolerated, decreasing dependence on crutches
- Pain and swelling reduction techniques including

  Ice

  Elevation

  Co-contraction

  Pressure pump

  Biofedback and selective muscle stimulation if necessary
- Range of motion exercises aiming for full extension at 14 days

  Stationary bike- start with seat high, low resistance

  Prone leg hangs

  Patella mobilizations

  Gait retraining with full extension at heel strike

  Gentle hamstring stretching

  Aim to achieve 0-70 degrees by 14 days
- Strengthening program

  Static Quads co-contraction emphasizing VMO control and various angles of knee flexion (up to 60 degrees) progressing to weight bearing positions.

  Begin quad sets, straight leg raises, knee extension 70-0 degrees
- Balance and proprioception training

  Single leg stance with eyes open / closed

Stage 2 ***Hamstrings and Quadriceps Control***

Week 2- week 6

Aims

Obtain a 0-90 degrees ROM

Develop good muscle control and early proprioceptive skills

Maintain cardiovascular fitness

Treatment guidelines

- Use active and passive extension techniques to aim for full range of motion
- Passive knee flexion (prone)

  Include hamstring stretching
- Can commence swimming once wounds healed (no whip kick)
- Gym equipment can be introduced once the effusion is decreasing

  Stepper

  Leg Press

  Mini Trampoline
- Progress Co-contraction for muscle control

  Increase reps / length of contraction

  2 leg quarter squats

  Lunges

  Stepping

  Elastic cords
- Avoid active hamstring contraction until 6 weeks

Watch for other problems

E.g. Gluteal control

Tight ITB

Gastroc and soleus etc

McConnell taping if necessary

Stage 3 ***Proprioception***

Weeks 6-12

Although the patient may feel good, it is important to note that the PCL graft complex is now at its weakest

Aims

Improve neuromuscular control and proprioception

Continue working on cardio fitness

Improve endurance capacity of muscles

Improve patient confidence

Regain full Range of Motion

Treatment Guidelines

- Progress with resistance on gym equipment
    - Leg press
    - Stairmaster
    - Treadmill power walking
- Progress with strength training
    - Progress co-contractions to dynamic
    - Step lunges
    - Half squats
    - Wall squats
- Can commence active knee flexion to 70 degrees
- Can begin jogging in straight lines on the flat
    - Start cycling on a normal bicycle
    - Progress with proprioceptive work
        - Lateral stepping
        - Slide board
        - Wobble board
        - Trampoline balance

Stage 4 ***Sport specific***

Weeks 12-20

Aims

Prepare to return to sport

Incorporate more sport specific activities

Introduce agility and reaction time into proprioceptive work

Increase leg strength

Develop patient confidence

Treatment Guidelines

- General strength work
    - Half squats with resistance
    - Leg press
    - Leg curls
    - Wall squats
    - Step work on progressively higher steps
    - Stepper and rowing machine
- Active knee flexion through full range
    - Can commence leg curls initially with low weight
- Sport specific
    - Shuttle runs
    - Ball skills
    - Sideways running
    - Skipping rope
- Low impact step aerobics class
- Swimming can include using flippers

Stage 5 ***Return to sport***

Months 5-6 (20-25 weeks)

Aims

Return to sport safely with confidence

Treatment Guidelines

- Continue with progression of plyometrics and sport specific drills

  Zigzag running

  Figure 8's gradually decreasing in size

  Cross over stepping

  Backwards with cutting

  Stop and go drills

- Continue with power and endurance training
- Return to training in running shoes for skills exercises

Month 6

Return to contact sport if limb strength and neuromuscular control adequate.

Strength usually 90% contralateral limb on Cybex testing if available

Possible Complications

Infection

The patient complains of a constant, severe pain. The patient may be sweaty, ill, have a temperature and often a tense effusion.

Post operative haemorrhage into the donor graft site

Results in a hot tender area over the posteromedial thigh. May be difficult to distinguish from infection. Knee motion is usually not restricted.

Hamstring strain or pain

Hamstring tears with the patient reporting a "pop" about the posteromedial thigh are common within the first 2 and even up to 6 weeks.

Deep Venous Thrombosis

The patient has calf, popliteal, thigh or groin pain and tenderness associated with swelling. Should have a venous duplex performed if this concern exists

Stiffness

May occur at any stage of the rehabilitation. The causes include:

Arthrofibrosis

Complex regional pain syndrome

Misplacement of the graft

Graft Failure

May occur at any stage, but usually between the 6-12 week mark

The graft may remain intact, but stretch

Patellofemoral irritability

Less common with hamstring reconstruction

If any concerns please contact the rooms, the private hospital, or the orthopaedic registrar through the public hospital ASAP