



REHABILITATION FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION (using Hamstring Graft)

PHASE 1: (0-3 WEEKS)

Goal: Protect graft, manage pain, decrease swelling and improve range of movement.

To optimise reduction in swelling, follow the 'POLICE' principles.

Protect – use crutches to assist with walking in first few weeks. May or may not have a knee brace.

Optimal – using swelling and pain as a guide; if you are doing too much swelling will increase, if you are not moving enough then the knee will feel stiffer

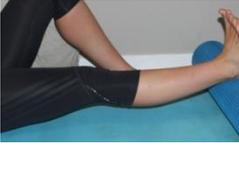
Load

Ice – 10 – 15minutes every 1-2 hours to control pain, especially following exercise.

Compress – using a tubigrip or compression bandage when not icing will help clear swelling.

Elevate – knee above the heart if possible. Swelling follows gravity so lifting leg up will help clear swelling from knee.

WEEK 1 EXERCISES

<p>Ankle pumps Move foot up and down 20 x hour. This helps to clear swelling and maintain movement in ankle.</p>	
<p>Heel slides in sitting and lying on back. Bend knee up and down. 10-20 x hour. <u>IMPORTANT – if you have also had a meniscal repair, do not bend past 90deg for the first 6 weeks</u></p>	
<p>Quads contraction (VMO) – lying or sitting with small pillow under knee, tighten quadriceps muscle by pushing knee into pillow. Try to lift your ankle off the floor. Hold for 5seconds, x10 each hour, progress to 10sec holds x15 each hour.</p>	
<p>Straight leg raise (SLR)– lying on back straighten knee and tighten quadriceps and lift leg off ground 10cm. If you cannot keep your knee straight, then you should not perform this exercise.</p>	
<p>Passive extension in lying, place a rolled towel/cushion under your heel. Allow gravity to assist your knee straightening. Start with 30sec-2mins as tolerated and increase to 5-10mins 2-3 x day.</p>	

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WEEK 2-3 EXERCISES

<p>Heel slides, VMO, SLR, and Passive extension as above</p>	
<p>Bridging Lying on back with knees bent up, push down through heels and lift bottom off floor. Try and have equal weight through each foot. Hold for 3-5 seconds, x10-15 3x day.</p>	
<p>Calf raises heels off the edge of a step, push up onto toes. Try and have equal weight through each foot. Hold for 3-5seconds, x10-15 reps 3xday</p>	
<p>Glute squeezes Lying on back, squeeze buttock muscles and hold for 5 seconds. x10-15 3x day.</p>	
<p>Exercycle to help movement. Set seat on highest setting for your height. Use minimal resistance with focus on smooth movement. If you cannot perform a complete revolution then working in the bottom half or three-quarters of the revolution can still be beneficial. Note – if you have had a meniscal repair you will not start biking until 6 weeks post op.</p>	

To progress to Stage 2 the patient should have:

- ✓ **Full knee extension**
- ✓ **Knee flexion >100degrees**
- ✓ **Good activation of VMO (able to straighten knee from 20deg flexion)**
- ✓ **Swelling in knee under control**
- ✓ **Pain levels in knee under control so can progress exercises.**

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STAGE 2 (approx 2 – 6 WEEKS)

Goal: Improve range and gait pattern, control swelling, introduce proprioception, strengthen

Still follow the POLICE principles to control swelling in knee. Monitor swelling and pain in knee as a guide to progressing exercise intensity and volume.

To come off crutches will require full knee extension and not limping heavily when walking.

EXERCISES

<p>Side lying hip abduction lift top leg up to around 30deg and hold for 5 seconds 2-3 x10-15 <i>Progress: add resistance band around ankles</i></p>	
<p>Standing hip abduction with resistance band around ankle. Holding onto a wall or chair for balance, take leg out to the side and hold for 1-2 seconds 2-3 x10-15</p>	
<p>Squats feet hip width apart, push back through your hips and bend knees to maximum of 90deg. Keep knees in line and do not move your knees in front of your toes. 2-3 x10-15 <i>Progress: swiss ball squats against a wall or weight in hand.</i></p>	
<p>Step ups use a low step to start . 2-3 x 8-10 each leg <i>Progress: increase step height, or increase reps.</i></p>	
<p>Prone knee bends lying on front bend knee up as far as comfortable. 2-3 x10-15</p>	
<p>Prone hip extensions lying on front, keep your leg straight and lift it off the bed 10cm and hold for 5 seconds 2-3 x10-15</p>	
<p>Chair Bridge: Lying on back with both feet on chair, lift bottom off floor. 2-3 x10-15</p>	
<p>Proprioception; keep your hands on your hip 2-3mins 2xday Feet together add eyes closed Heel toe standing add eyes closed 1 leg standing add eyes closed</p>	

To progress to Stage 3 the patient should have:

- ✓ **Active range of movement 0-120deg**
- ✓ **Good movement pattern of squat and step up**

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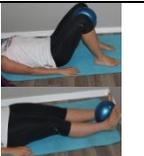
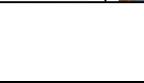
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STAGE 3 (approx 6 WEEKS – 4 MONTHS)

Goal: Increase strength, improve proprioception,

EXERCISES

<p>Sitting theraband hamstring curl Theraband attached to ankle, bend knee. 2-3 x 10-15</p>	
<p>Lunge Start with feet wide enough apart and drop down rather than forward. Keep feet in same position to start. Knees stay straight. <i>Progress to stepping forward lunges, then reverse lunges.</i></p>	
<p>Single leg squat Hold onto wall at first if needed. Goal is to have hip, knee and toes in line. <i>Progress: gradually increase depth of squat.</i></p>	
<p>Adductor squeezes Squeeze a soft ball in between knees. Straight leg and bent at 45deg. Hold for 5 sec at 50% 2 x 10-15.</p>	
<p>Crab walk Theraband around feet or knees. Step sideways. Straight knees and then ¼ and ½ squat positions. 2 -3 x 6-10 steps.</p>	
<p>Balance on wobble board/BOSU/eyes closed Start standing on 2 feet with eyes open. Increase difficulty with eyes closed or standing on 1 foot.</p>	
<p>Single leg bridge. Normal bridge to start with (on floor and chair), then lift one leg up keeping pelvis level. Hold for 3-5 seconds, 2-3 x 10-15. <i>Progress: moving up and down on 1 leg.</i></p>	
<p>Step down Standing on one leg, slowly take other foot in front to step below. Start with a low step and try to 'sit back' rather than moving your knee in front of toes. 2-3 x 6-10</p>	
<p>Stiff leg dead lift Soft knees, take bar down front of thighs until feel a tightening in hamstrings, then stand back up. Later exercise and start with broomstick progressing weight 2-3 x 10-12</p>	
<p>Side plank Do both sides, start on knees. 2-3 x 10sec <i>Progress to feet and max time holds.</i></p>	
<p>Gym: Bike, Row, Leg press, squat, deadlift, step ups, lunge, calf raise, Once cleared by surgeon/physio to start. Prioritise good technique over amount of weight lifted.</p>	

To progress to Stage 4 the patient should have:

- ✓ **Full active range of movement**
- ✓ **Good movement pattern of SL squat, lunge,**
- ✓ **Single leg standing eyes closed >20sec**

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STAGE 4 (approx 4-6 MONTHS)

Goal: Increase strength, improve proprioception, introduce plyometrics, rehab agility, prepare for running, introduce open kinetic chain exercises

EXERCISES

**Gym: at 4 months start leg extension and leg curl. Bike, Row, X-trainer
Single leg press, squat, deadlift, step up, walking or reverse lunge, calf raise,**

Home based: Crab walk, single leg bridge, single leg squat, side plank, 45 deg lunges Band around feet, lunge forward at 45deg x8-10 then backwards.

Balance work

Lunge, squat or step up on BOSU.

Standing on BOSU throwing ball or behind back.

Star excursion balance test (anterior, lateral, posterolateral, posteromedial)

Walking drills over small hurdles/ladders, shuttles, fig of 8s, zigzag

Jumping and landing mechanics

Vertical and horizontal. Focus on landing in good position (like a ¼ squat).

Progress increase height or distance jumped. Do 3-5 jumps in a row.

Progress 2 – take off on 2 feet land on 1 foot,

Progress 3 – Hopping. Vertical and horizontal. Focus on landing.

Start lateral jumping landing on 2 feet.

To progress to Stage 5 (running) the patient should have:

- ✓ **Full active range of movement**
- ✓ **Good movement pattern of SL squat, lunge,**
- ✓ **Strength: Single Leg press 1.5x BW or 10 single leg squats to 90deg**
- ✓ **Single hop distance >80% other limb**

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STAGE 5 (approx 5-9 MONTHS)

Goal: Introduce straight line running, improve lateral plyometric work ready for change of direction

EXERCISES

Gym based: Leg extension and leg curl. Single leg press, squat, deadlift, step up, walking or reverse lunge, calf raise, box jumps, power exercises such as clean and press/snatch if appropriately trained

Home based: Crab walk, single leg bridge, single leg squat, side plank, 45 deg lunges , jumping and hopping including multidirectional, Balance work, Star excursion balance test

Running

Start with jog/walk intervals eg jog 30sec walk 30sec x10 and increase distance run and intensity progressively depending on prior fitness. Avoid running on consecutive days for the first month. Ensure flat surface and avoid busy places that you may have to sidestep people/pets/cars.

To progress to Stage 6 the patient should have:

- ✓ **Good running pattern**
- ✓ **Single hop distance >90% other limb**
- ✓ **Triple x-over hop >80% other limb**
- ✓ **Star excursion balance >80% other limb (Anterior, posteromedial, posterolateral)**

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STAGE 6 (approx 6-9 MONTHS)

Goal: Introduce change of direction, top end running speed, non-contact sport specific training drills

AGILITY – key for change of direction is keeping good form and dropping through hips (SL squat pattern). This avoids putting the knee into a dangerous valgus position. Wear appropriate footwear.

4 cone drill set out 4 cones in a square (5m x 5m), number each cone and move from one cone to another. Always facing same direction. Can have partner saying numbers and increase length of sequence.

Shuttle - out and back to cones at various distances. Turn off alternate feet. Vary the running pattern to include forwards, backwards, sideways, carioca, down and ups.

Zigzag (weave/step) – set out cones in a zigzag pattern. Start with narrow width and increase the width as the weeks go on. Swerve around the cones and the next rep step around the cones.

Figure of 8 – running around cones in a fig of 8 pattern. Start with wide cones and narrow as control improves.

IMPORTANT Jog through the drills to start with. As you improve then increase the pace.

Mirroring exercise – when comfortable with the above drills at >90% then work with a partner. Follow/lead partner through running and stopping, forwards and back, sideways, then multidirectional so reacting to another person rather than a cone. Can also react to partners voice stating what to do eg *run forwards, stop, backwards, left, right, etc*

Speed

Progress through different running intensities until running at top speed. Vary length of sprint depending on the sport.



TO PROGRESS TO RETURN TO SPORT (9 month minimum – 12 months)

There is no single test presently, that can categorically state a person is safe to return to sport following an ACL reconstruction. If a person can pass this battery of tests, then the risk of re-injury will be decreased.

✓ **Strength:**

- Single leg press 1.8x BW or left = right,
- Knee extension left = right
- Leg curl left = right

✓ **Single hop distance >90% other limb**

✓ **Hop off 30cm box then two hops for distance >90% other limb**

- Stand on 30cm box, hop off (landing within 45cm line) and then hop forward twice as far as possible sticking the landing for 3seconds.

✓ **Triple x-over hop >90% other limb**

- Tape 2 lines 20cm apart. Client starts on outside of line and hops consecutively 3 times crossing the line each time. Has to hold landing foot for 3seconds to count.

✓ **30 sec Lateral hop test >90% other limb**

- Tape 2 lines 40cm apart. Client hops sideways over the lines for 30seconds. If touch either line it is an error. Count number of correct jumps.

✓ **30sec Square hop test >90% other limb**

- 40cm square, client hops in and out of the square (clockwise for right leg, anticlockwise for left leg). If touch a line it is an error. Count number of correct jumps.

✓ **Star excursion balance >90% other limb (anterior, posteromedial, posterolateral)**

- Tape three lines; straight and at 45 behind to left and right (Y). Client stands 1st MTP on middle junction and reaches as far forward, posterolaterally and then posteromedially lightly touching toe on the line. If the assessor thinks the touch is too strong (ie assisting balance) then the client must repeat. IF the client cannot maintain balance throughout the test then must repeat.

✓ **Approval of surgeon or physio**

- Negative Lachmaan's test
- Adequate biomechanics balance and hopping

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