Anterior Cruciate Ligament Reconstruction

Hamstring tendon (single or double)

Post-Operative Rehabilitation Protocol

This protocol has been developed by the Dr. Van de Pol and the RBWH Physiotherapy Department – **Version: June 2017**

The principles of this protocol also apply to non surgical management of ACL injured knees.

It should be noted that this protocol only provides guidelines to management and should be modified for the surgeon's specific requests and patient's individual needs.

Progression should be by **functional control** rather than post-op time period.

(ie. do not progress automatically to the next exercise unless the previous one can be performed adequately. It cannot be stressed enough that it is ***not*** beneficial to give patients exercises they are not neuromuscularly ready for. It is very important to observe the *quality* of the exercises that are being performed. Weaknesses in specific muscle groups lead to compensations, which produce faulty movement patterns. These faulty patterns are then integrated into unconscious motor programs, which perpetuate the original weakness. Specifically, the research has indicated that knee extensor moment deficits are compensated for by hip and/or ankle extensor moments. If these are allowed to occur and are not corrected, any joint or structure along the kinetic chain may be exposed to injury. (Fowler Kennedy 2009)

Post op Protocol : Day 0 (Day of Surgery) or Day 1 (Day after Surgery)

- Mobilise with crutches for 1-2wks, WBAT
- Knee ROM as able (aiming for 90' F by 2 weeks post op, earlier is ok)
- Debulk bandage and apply double Tubigrip and TED stocking
- Start gentle co-contractions (Quads/Hams) exs in supine/sitting
- A Physiotherapy appointment should be scheduled for 1-2 weeks post-op.

Aims of Rehabilitation

0 – 2 months: Aim for full ROM and muscle control

2 – 4 months: Maximise muscle strength

4 – 6 months: Sport specific activities

Retrain proprioception early, Correct gait defects early, Don't forget: Patello-femoral joint; Pelvic, ankle stability; Cardiovascular fitness

(ie. when full weight bearing and safe with program in a supervised environment)

NB. Return to Sport = > 85% quadriceps and 100% hamstring control/strength through range

Ideal period for return to competitive sport is 12 months

0-2 weeks

Aims: Reduce swelling and pain

ROM	• If prescribed, ROM brace (or splint) remains on at all times. Can be removed for shower/bending as directed by Physiotherapist • Aiming for active knee flexion to 90° (by 2 wks, or earlier) and 0° extension (by 4 weeks)
Strength	• Quadriceps/Hamstrings isometric co-contraction exercises at 30° and 60° flexion • Electrical muscle stimulation if unable to contract quadriceps +/- hamstrings
Other	• Joint mobilisations: patello-femoral joint glides. Take care not to touch the wound. • Pelvic stability exercises: pelvis tilting in various positions, weight shift exercise maintaining pelvic position • Active ankle exercises: Theraband, calf raises • Bike pendulums ½ circles • (Minitramp with support – only if safely able and close s/v by Physiotherapist)

2-4 weeks

Add the following exercises:

ROM	• Progress to FWB off crutches. Gait retraining. (ie. single crutch at 2-3wks, no crutches 3-4 wks) • Progress flexion range. Aiming for 90°+ Flexion and full Extension
Strength	• Q/H co-contraction exercises with EMG biofeedback – In supine, foot against wall in 30° and 60° flexion – In step stance ¼ lunge (gentle and controlled cocontraction) – Gentle controlled Squat to 45° flexion • Hamstrings: – Slow wobbles in prone at 90°, 60° and 30° flexion, mirror feedback, build speed before progression to flicks. – Slow flicks 90°- 20° flexion • Calf: bilateral heel raises with Q/H co-contraction
Proprioception	• PWB stance, eyes closed, balance board, minitramp
Other	• Single leg stance (if allowed to FWB) 30-60secs • Stationary cycling if flexion >100° avoiding EOR extension, 10-30min session, Icepack afterwards

1-2 months

Add the following exercises:

ROM	• Aim for full range of motion
Strength	• Q/H co-contraction exercises with EMG biofeedback – single ¼ squats – step up/down from small step. Aim 18cm up, 12cm down. – stepping lunge – ensure pelvic control – wall squats increasing weight to affected side – bilateral leg press • Hamstrings: curls with light resistance – progress wobbles and flicks – bridging with feet on fitball • Calf: single leg heel raises with Q/H co-contraction
Proprioception	• Single leg standing, balance boards, standing ball drills (eg roll ball with unaffected limb) • Bilateral jumps, on/off step, minitramp • Balance board: single leg stance
Other	• Elliptical Cross trainer +/- hand holds • FWB gait with co-contraction control, gait retraining, backward walking, figure 8 walking

2-3 months

Ensure correct gait pattern, full range of knee motion, good pelvic control

Add the following exercises:

Strength	• Q/H co-contraction exercises with EMG biofeedback – progress to single leg press and squat – progress step up/down to higher step and/or weights – forward and lateral step ups/downs – progress to backward step up – high stepping lunge off block – single leg jumps on reformer • Open kinetic chain quads exercises 90°- 40° • Theraband kickback (Mule kicks) • Hamstrings: – progress curls – ensure good inner range contraction – progressing bridging on fitball

	• Calf: resisted single calf press • Gym: Leg press; inclined leg press; calf machine; rowing machine; prone curl machine
Proprioception	• Progress bilateral jumping drills, obstacle course • Single leg jumps in parallel bars • Balance board: single leg stance + ¼ squats, ball catch
Other	• Jogging on minitramp +/- high knees • Treadmill walking • Skipping rope • Swimming: freestyle with pull buoy, kickboard can begin at 3 months *Avoid breast stroke kicking • Hydrotherapy: Deep water running. Need to ensure excellent technique

3-4 months

Add the following exercises:

Strength	• Q/H co-contraction exercises: – high step up – deep lunges to forward kneel position – lunges with theraband resistance or leg pulley exercises in standing – (ie. pulley attached to unaffected leg, stabilising with affected leg) • Open kinetic chain quads exercises 90°- 20°
Proprioception	• Progress single leg jumps: 90° turns, up/down step • Balance board/durasdisc: single leg ¼ squat +/- theraband resistance • Ladder drill
Other	• Jogging smooth surface straight ahead *ensure good pelvic control • Treadmill jogging • Plyometric drills – Trampoline: 2 feet jump + land → jogging → hopping – Spilt squat jumps, tuck jumps • Cycling: normal seat height (ie not full knee Ext). outdoors but no cleats

Once above program can be performed with correct technique and control, the Physiotherapist can consider assessing functional tests: **Bilateral only in this phase** - Long jump; Cross over jump; Vertical jump

4-6 months

This is a key phase of rehabilitation with regards to preparing for return to sport.

Particular emphasis should be made on plyometric and agility training

Aim for 100% hamstring and >85% quad strength: test with leg press and ham curl machine

Add the following exercises:

Strength	• Open kinetic chain quads exercises 90°- 10°
Proprioception	• Box hop up and down • Forward and lateral hop – maintain 5sec balance upon landing • Increase plyometric work and agility and strengthening
Other	• Jogging: begin 1-2kms after 4 months – progress to uneven surfaces, slopes, figure 8 • Running: acceleration and deceleration, shuttle runs, cutting *ensure good pelvic control • Assess sprinting • Sport specific drills as able • Carioca ¾ pace • Progress to cycling outdoors

Reassess functional tests: bilateral, then progress to single closer to 6 months

***Ensure excellent control**

- Hop for distance (hands behind back) (within 15% of uninvolved side)
- Vertical power hop (within 15% of uninvolved side)
- Cross over triple hop for distance (within 15% of uninvolved side)
- Timed hop over 6m (within 15% of uninvolved side)

6-12 months

Gradual return to sport training sessions.

Aim for return to competitive sport at approximately 12 months.

Discharge from exercise class, continue gym program, monthly reviews as required

Reassess functional tests at 12 months: should be at 90% of uninjured side

Return to sport shuttle run criteria based on times of healthy individuals in a study measuring readiness to return to sport following knee surgery (Keays et al 2010)

4 x 6.25m Shuttle Runs	Males (secs)	Females (secs)
Forwards	8	9
Side Step	10	11
Carioca	12	13

ACL Protocol RBWH 2015 - References

This protocol has been developed utilising the following references:

1. Fowler Kennedy ACL Protocol 2009 (references 58 Articles)
2. Literature Review of medical databases re ACLR rehab regarding: exercise types; timeframes for progression; reassessment procedures; return to sport
3. Dr Sue Keays ACLR Rehab (Physiotherapist – Knee Specialist)
4. Review of ACLR rehab protocols from major Brisbane Orthopaedic Hospitals
5. Review of rehab guidelines from multiple Orthopaedic surgeons across Australia
6. Discussion with Senior physiotherapists with ACLR rehab experience