

POST-OPERATIVE PROTOCOL FOR:

- **POSTEROLATERAL CORNER RECONSTRUCTION / REPAIR**
 - **COMBINED POSTEROLATRAL CORNER plus ACL and/or PCL**
 - **COMBINED POSTEROLATERAL CORNER plus MCL plus ACL and/or PCL**
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- **Ensure patient achieves milestone prior to progression.**
 - **No return to contact sports prior to 9 months post-op**
 - **Return to gentle non-contact, non-competitive sports at physiotherapist's discretion but must be over 8 months post-op**
 - **Any problems during rehabilitation please contact your physiotherapist or your Consultant Secretary.**

PHASE 1: Post reconstructive surgery. Day 1 to day 14.

Goal	Treatment	Milestones to Progress
Graft protection	<ul style="list-style-type: none"> • Cricket pad splint to be worn at all times when mobilizing and for sleeping • Use of crutches TOUCH WB ONLY 	<ul style="list-style-type: none"> • Ensure patient has attended first post-operative clinic review (at 2 weeks post-op)
Minimise swelling and pain	<ul style="list-style-type: none"> • Use of ice or Game Ready if available • Elevate leg • Ensure adequate pain relief 	
Prevent post-operative complications	<ul style="list-style-type: none"> • Circulatory exercises • Patella mobilizations 	
Maintain muscle strength	<ul style="list-style-type: none"> • Regular static quads • SLR if able 	

PHASE 2: 2 weeks to 6 weeks

Goal	Treatment	Milestone to Progress
Graft protection	<ul style="list-style-type: none"> Hinged knee brace (ROM 0°- 90°) to be worn at all times when mobilizing. Cricket pad split to be worn in bed Use of crutches PARTIAL WB ONLY 	<ul style="list-style-type: none"> Minimal effusion Full or nearing full extension 90° knee flexion SLR with no lag (10 reps) Normal, symmetrical gait pattern with crutches Ensure patient has attended their 6 week clinic review
Minimise swelling and pain	<ul style="list-style-type: none"> Use of ice or Game Ready Ensure adequate pain relief Elevate leg 	
Regain full range of extension	<ul style="list-style-type: none"> Active extension exercises: static quads Passive stretching Initially avoid hyperextension 	
Increase knee flexion as pain allows	<ul style="list-style-type: none"> Passive flexion exercises in prone (no active ROM, do not engage hamstrings) Passive flexion over edge of bed Patella mobilisations 	
Improve quads control and muscle strength	<ul style="list-style-type: none"> Static quads, SLRs. Ensure patient can SLR with no lag Co-contraction quads and hams Active OKC Qs (60° to full extension) NO OKC QS IF COMBINED WITH ACL Early gluteal strengthening Early core stability strengthening 	
Ensure flexibility	<ul style="list-style-type: none"> Hamstrings stretches in supine Calf stretches 	
Restoration of normal gait pattern	<ul style="list-style-type: none"> Gait re-education with elbow crutches PWB 	
Attention to donor leg if graft harvested from contralateral side	<ul style="list-style-type: none"> Restore full range of motion ASAP Commence muscle strengthening Commence muscle stretching 	

PHASE 3: 6 weeks to 12 weeks

Goal	Treatment	Milestone to Progress
Graft protection	<ul style="list-style-type: none"> Hinged knee brace (no restriction to ROM) to be worn at all times when mobilizing. 	<ul style="list-style-type: none"> Minimal/no activity related effusion Full range of extension Normal gait pattern without crutches Full range of flexion Single leg stand eyes shut at least 5 seconds Bilateral squat, thighs parallel to floor with even, symmetrical weight bearing Ensure patient has attended 12 week clinic review
Minimise swelling and pain (ensure no swelling before progression) Prevent anterior knee pain	<ul style="list-style-type: none"> Continue as above, as necessary Patella mobilisations 	
Regain/maintain full range of extension/hyperextension (compare to non-operative knee)	<ul style="list-style-type: none"> Extension exercises as above Heel props, prone hangs Passive stretching 	
Restoration of normal gait pattern	<ul style="list-style-type: none"> FWB gait re-education Treadmill walking 	
Regain full range of flexion	<ul style="list-style-type: none"> Active flexion exercises with overpressure Progress to quads stretch Passive stretching as required Hydrotherapy as required 	
Improve quads, hamstring and general lower limb strength	<ul style="list-style-type: none"> CKC – wall slide squats (start at 60° flexion and progress), squats, leg press (start at 60° flexion and progress), single leg squats etc. NO LUNGES IF PCL Progress OKC Qs – add resistance NO OKC IF ACL Bridging on gym ball or feet on sofa (less than 30° flexion), progress to normal bridge (further knee flexion) Calf raises, hip extensions, hip abd/add, glut med/max 	
Increase aerobic capacity	<ul style="list-style-type: none"> Exs bike Treadmill walking (incline) Step ups Cross trainer and Rower 	
Improve proprioception	<ul style="list-style-type: none"> Single leg stand eyes open/eyes closed Wobble board and Sitfit and Trampoline 	
Neuromuscular control	<ul style="list-style-type: none"> Core stability work Knee alignment/prevent hip IR/knee valgus – squats, step ups (ensure good hip/knee/ankle alignment) 	

PHASE 4: Upon achievement of phase 3 milestones and no sooner than 12 weeks post-op.

Goal	Treatment	Milestone to progress
Control activity related swelling and pain	<ul style="list-style-type: none"> Use of cryotherapy post exercise if knee swells with increased activity 	<ul style="list-style-type: none"> Minimal/no activity related effusion Full ROM Normal gait and stair pattern – good alignment and control 10 x single leg squats to 60° with good biomechanical alignment and control (i.e. no valgus and good hip/knee/ankle alignment)
Regain/maintain full range of movement	<ul style="list-style-type: none"> Continue stretches 	
Normalise gait and stair pattern	<ul style="list-style-type: none"> Discontinue brace on instruction at 12 week clinic review (continue with brace if patient has not attended clinic). Treadmill walking – forward/backward/incline 	
Improve quads, hamstring, and general lower limb strength	<ul style="list-style-type: none"> Continue CKC – double & single leg press, squats, single leg squats, commence lunges, increase weight OKC Qs – increase load Commence OKC Hamstring curls – double & single leg, increase weight gradually Gluteals, calf, adductors 	
Increase aerobic capacity	<ul style="list-style-type: none"> Exs bike Treadmill walking Step ups Cross trainer and Rower Pool walking/running 	
Improve proprioception	<ul style="list-style-type: none"> Single leg stand eyes closed Wobble board Sitfit BOSU Trampoline 	
Neuromuscular control	<ul style="list-style-type: none"> Core stability work Knee alignment/prevent valgus as above – add trunk rotation 	
Commence bilateral load acceptance/early plyometrics	<ul style="list-style-type: none"> Bilateral drop jumps Jumps with symmetrical squat landing Progress to straight line jogging when good load acceptance 	

PHASE 5: Upon achievement of phase 4 milestones.

Goal	Treatment	Milestone to progress
No swelling or pain	<ul style="list-style-type: none"> Continue as above if necessary 	<ul style="list-style-type: none"> Normal straight line running pattern Single leg press >75% body weight Single leg stand eyes shut >80% unaffected leg Hop tests >85% LSI: single hop, triple hop, cross over hop, 6m timed hop, side to side hop
Normal straight line running pattern without pain and in full control	<ul style="list-style-type: none"> Progress from jogging to running Increase speed/distance Change surface/incline Forward running/backward running 	
Increase muscle strength and endurance	<ul style="list-style-type: none"> Increase load on strengthening exs (60-80% 1RM) Single leg press – push for >75% x body weight Commence open chain quads if not already performing and gradually increase resistance 	
Improve proprioception	<ul style="list-style-type: none"> Increase dynamic proprioception 	
Progress bilateral load acceptance/commence unilateral load acceptance/plyometrics	<ul style="list-style-type: none"> Tuck jumps with stable landing Squat jumps, forward/ back/ rotational Bilateral plyometric static and multi-plane exs Single leg hop with controlled landing Forward, side hops/ drops from step with controlled single leg landing Unilateral plyometric static and multi plane activities 	

PHASE 6: SPORTS SPECIFIC. Upon achievement of phase 5 milestones.

Goal	Treatment	Milestone to progress
Increase muscle strength and endurance	<ul style="list-style-type: none"> Increase load on resistance work 	<ul style="list-style-type: none"> Symptom free sports specific training Hop tests >90% LSI : single hop, triple hop, cross over hop, 6m timed hop, side to side hop Single leg stand eyes shut, equal to unaffected side
Progress unilateral load acceptance and work to fatigue	<ul style="list-style-type: none"> As above – increase speed/intensity to fatigue 	
Commence sports specific running agility drills	<ul style="list-style-type: none"> Sprinting Cutting and pivoting Acceleration/deceleration 	
Commence sports specific skills	<ul style="list-style-type: none"> Ball skills Dribbling Boxing Kicking Sports specific activity with controlled opposition e.g. one on one practice drills 	
Neuromuscular control following fatigue	<ul style="list-style-type: none"> Ensure ability to control alignment under random practice and after fatigue 	
Return to non-contact sports (only when nearing 8 months post-op)	<ul style="list-style-type: none"> Golf/gentle racquet sports 	

PHASE 7: FULL UNRESTRICTED SPORTS TRAINING. Upon completion of phase 6.

- **MUST BE AT LEAST 9 MONTHS POST-OP**

Goal	Treatment
Symptom free training	<ul style="list-style-type: none"> • Full, unrestricted training
ROM and muscular flexibility equal to other side	<ul style="list-style-type: none"> • Continue stretching
Good results of all functional testing	<ul style="list-style-type: none"> • Functional tests prior to returning to contact sports
Return to full unrestricted, confident activity	<ul style="list-style-type: none"> • Progress to uncontrolled practice situations and competition

References:

Bien, D, Dubuque, T (2015) Considerations for late stage ACL rehabilitation and return to sport to limit re-injury risk and maximize athletic performance. *The International Journal of Sports Physical Therapy*, 10 (2), 256-271

Cavanaugh, J, Saldivar, A, Marx, R (2015) Postoperative rehabilitation after posterior cruciate ligament reconstruction – posterolateral corner surgery. *Operative Techniques in Sports Medicine*, 23 (4), 372-384

Cox, C, Spindler, K, (2008) Multiligamentous Knee Injuries – surgical treatment algorithm. *North American Journal of Sports Physical Therapy*, 3 (4), 198-204

Edson, C, Fanelli, G, Beck, J (2011) Rehabilitation after multiple-ligament reconstruction of the knee. *Sports Med Arthrosc Rev*, 19 (2), 162-166

Escamillia, R, Macleod, T, Wilk, K, Paulos, L, Andrews, J (2012) Anterior cruciate ligament strain and tensile forces for weight-bearing and non-weight-bearing exercises: a guide to exercise selection. *Journal of Orthopaedic & Sports Physical Therapy*, 42 (3) 208-220

Glass, R, Waddell, J, Hoogenboom, B (2010) The effects of open versus closed kinetic chain exercises on patients with ACL deficient or reconstructed knees: a systematic review. *North American Journal of Sports Physical Therapy*, 5 (2), 74-84

Herrington, L, Myer, G, Horsley, I (2013) Task based rehabilitation protocol for elite athletes following Anterior Cruciate Ligament reconstruction: a clinical commentary. *Physical Therapy in Sport*, 14, 188-198

Imwalle, L, Myer, G, Ford, K, Hewett, T (2009) Relationship between hip and knee kinematics in athletic women during cutting manoeuvres: a possible link to noncontact anterior cruciate ligament injury and prevention. *J Strength Cond Res*, 23 (8), 2223-2230

Kim, J, Lee, Y, Yang, B, Oh, S, Yang, S (2013) Rehabilitation after posterior cruciate ligament reconstruction: a review of the literature and theoretical support. *Arch Orthop Trauma Surg*, 133, 1687-1695

Kruse, L, Gray, B, Wright, R (2012) Rehabilitation after anterior cruciate ligament reconstruction. *Journal Bone Joint Surg Am.*, 94, 1737-1748

LaPrade, R, Johansen, S, Agel, J, Risberg, M, Moksnes, H, Engebretsen, L (2010) Outcomes of an anatomic posterolateral knee reconstruction. *J Bone Joint Surg Am*, 92, 16-22

Lee, B, Nam, S (2011) Rupture of Posterior Cruciate Ligament: Diagnosis and treatment principles. *Knee Surg Relat Res*, 23 (3), 135-141

Manske, R, Hosseinzadeh, P, Giangarra, C (2008) Multiple Ligament Knee Injury: Complications. *North American Journal of Sports Physical Therapy*, 3 (4), 226-233

Mikkelsen, C, Werner, S, Eriksson, E (2000) Closed kinetic chain alone compared to combined open and closed kinetic chain exercises for quadriceps strengthening after anterior cruciate ligament reconstruction with respect to return to sports: a prospective matched follow-up study. *Knee Surg, Sports Traumatol, Arthrosc*, 8, 337-342

Moatshe, G, Chahla, J, LaPrade, R, Engebretsen, L (2017) Diagnosis and treatment of multiligament knee injury: state of the art. *JISAKOS* [online] Available <https://jisakos.bmj.com> [27 June 2017]

Morrissey, M, Drechsler, W, Morrissey, D, Knight, P, Armstrong, P, McAuliffe, T (2002) Effects of distally fixated versus non-distally fixated leg extensor resistance training on knee pain in the early period after anterior cruciate ligament reconstruction. *Physical Therapy*, 82 (1), 35-43

Morrissey, M, Hudson, Z, Drechsler, W, Coutts, F, Knight, P, King, J (2000) Effects of open versus closed kinetic chain training on knee laxity in the early period after anterior cruciate ligament reconstruction. *Knee Surg, Sports Traumatol, Arthrosc*, 8, 343-348

Myer, G, Ford, K, Brent, J, Hewett, T (2007) Differential neuromuscular training effects on ACL injury risk factors in "high-risk" versus "low risk" athletes. *BMC Musculoskeletal Disorders*, 8 (39), 1-7.

Myer, G, Ford, K, Brent, J, Hewett, T (2012) An integrated approach to change the outcome part 2: Targeted neuromuscular training techniques to reduce identified ACL injury risk factors. *The Journal of Strength and Conditioning research*, 26 (8) 2272-2292

Myer, G, Paterno, M, Ford, K, Hewett, T (2008) Neuromuscular training techniques to target deficits before return to sport after anterior cruciate ligament reconstruction. *Journal of Strength and Conditioning research*, 22 (3), 987-1014

Narducci, E, Waltz, A, Gorski, K, Leppla, L, Donaldson, M (2011) The clinical utility of functional performance tests within one-year post-ACL reconstruction: A systematic review. *The International Journal of Sports Physical Therapy*, 6 (4), 333-342

Nasab, S, List, R, Oberhofer, K, Fucentese, S, Snedeker, J, Taylor, W (2016) Loading patterns of the posterior cruciate ligament in the healthy knee: a systematic review. *PLoS ONE* [online], 11 (11) Available <https://www.ncbi.nlm.nih.gov/pubmed/27880849> [27 June 2017]

- Perry, M, Morrissey, M, King, J, Morrissey, D, Earnshaw, P (2005) Effects of closed versus open kinetic chain knee extensor resistance training on knee laxity and leg function in patients during the 8 to 14 week post-operative period after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc*, 13, 357-369
- Pierce, C, O'Brien L, Griffin, L, LaPrade, R (2013) Posterior cruciate ligament tears: functional and postoperative rehabilitation. *Knee Surg Sports Traumatol Arthrosc*, 21, 1071-1084
- Reid, A, Birmingham, T, Statford, P, Alcock, G, Giffen, J (2007) Hop testing provides a reliable and valid outcome measure during rehabilitation after anterior cruciate ligament reconstruction. *Physical Therapy*, 87 (3), 337-349
- Risberg, M, Holm, I, Myklebust, G, Engebrestsen, L (2007) Neuromuscular training versus strength training during first 6 months after anterior cruciate ligament reconstruction: a randomized clinical trial. *Physical Therapy*, 87 (6), 737-750
- Risberg, M, Lewek, M, Snyder-Mackler, L (2004) A systematic review of evidence for anterior cruciate ligament rehabilitation: how much and what type? *Physical Therapy in Sport* 5 125-145
- Silvers, H, Mandelbaum, B (2007) Prevention of anterior cruciate ligament injury in the female athlete. *Br J Sports Med*, 41 (Suppl 1), 52-59
- Thomeé, R, Kaplan, Y, Kvist, J, Myklebust, G, Risberg, M, Theisen, D, Tsepis, E, Werner, S, Wondrasch, B, Witvrouw, E (2011) Muscle strength and hop performance criteria prior to return to sports after ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc*, 19, 1798-1805
- Thomeé, R, Neeter, C, Gustavsson, A, Thomeé P, Augustsson, J, Eriksson, B, Karlsson, J (2012) Variability in leg muscle power and hop performance after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc*, 20, 1143-1151
- Weber, A, Kopydlowski, N, Sekiya, J (2015) Nonsurgical management and postoperative rehabilitation of medial instability of the knee. *Sports Med Arthrosc Rev*, 23 (2), 104-109