

ACL + MEDIAL KNEE RECONSTRUCTION PROTOCOL : APPROPRIATE FOR COMBINED ACL + MCL AND/OR PMC

- PHASE 1

Monitor for evidence of:

- Infection: if patient develops a temperature $>38^{\circ}$, refer urgently to the operating surgeon. If the surgeon is unavailable, advise patient to attend A&E to exclude wound infection or septic arthritis
- Distal neurovascular deficit (DVT, AECS, saphenous nerve involvement)

Goals:

- Protect the grafts
- Control pain and swelling/effusion
- Restore/preserve range of motion
- **Muscle activation**
- Normal gait and movement patterns

Initial precautions:

- Avoid knee flexion $>90^{\circ}$ until **2 weeks**
- Restricted OKC knee extension until **12 weeks** (more important for hamstrings ACL grafts)
- PWB (40% body weight) for **6 weeks** using long lever brace (initially locked at 0°)
- Once able to SLR without extension lag, open brace within range of functional quadriceps control
- Wean off crutches from **6 weeks** if normal gait, aiming for FWB in brace by **8-9 weeks**
- Brace to be worn for **12 weeks** at all times except when showering and changing clothes
- Avoid excessive valgus, internal and external tibial postures

Pain, effusion and ROM:

- PEACE protocol for the management of pain and swelling/effusion
NB: cryotherapy only influences pain, not drainage
- Passive/active assisted ROM $0-90^{\circ}$ for **2 weeks**, FROM thereafter
- Patella mobilisation if required (medial/lateral, superior/inferior)

Muscle activation and strength:

- TAQ's, SLR in brace until able to perform without extension lag
Consider electrostimulation if unable to voluntarily contract quadriceps
- Double leg CKC ex's $\leq 70^{\circ}$ flexion (e.g. leg press) within weight bearing restrictions
- OKC knee extension with resistance between $90-45^{\circ}$ from **4 weeks**

Neuromuscular training:

- Double leg proprioceptive exercises (e.g. Bosu ball)

Cycling:

- Static bike with no resistance from **2 weeks** if sufficient ROM, increasing time as able

Criteria for progressing to Phase 2:

- Closed wound
- No/minimal pain with phase 1 exercises
- No/minimal synovitis/effusion
- Normal patellofemoral mobility, tibiofemoral ROM $\geq 0-120^{\circ}$
- Voluntary quadriceps contraction
- Minimum **6 weeks** since surgery

AECS: Acute extremity compartment syndrome

DVT: Deep vein thrombosis

PEACE: Protection, Elevation, Avoid anti-inflammatories, Compression, Elevation.

MEDIAL KNEE RECONSTRUCTION PROTOCOL – PHASE 2

Goals:

- Protect the grafts
- Full patellofemoral and tibiofemoral ROM
- **Aim for full weight bearing with normal gait by 8-9 weeks**
- **Correct movement patterns during exercises**
- Protected lower limb strengthening
- **Wean off brace**

Precautions:

- Wean off crutches if normal gait, aiming for FWB in brace by **8-9 weeks**
- Brace to be worn at all times until **12 weeks**, then wean off as able
- Restricted OKC knee extension until **12 weeks** (more important for hamstrings grafts)

Strength:

- Double leg CKC ex's $\leq 70^\circ$ flexion, progress to single leg as able
- Full range OKC knee extension with resistance from **12 weeks**
- Hamstrings, gluteal and calf muscle strengthening ex's
- Progressively decrease repetitions and increase resistance for all strength exercises

Neuromuscular training:

- Increase difficulty of double leg proprioceptive ex's (e.g. perturbations, two motoric tasks)
- Control of knee valgus and tibial rotation during weight bearing exercises
- Progress to single leg proprioceptive ex's as able

Cycling, walking and other cardiovascular exercise:

- Static bike with resistance
- Increase walking distance/speed on even surfaces
- Progress walking to changing terrains
- Elliptical train and flutter-kick swimming from **week 12**

Criteria for progressing to Phase 3:

- No/minimal pain with phase 2 exercises
- No/minimal synovitis/effusion
- Full/symmetrical knee ROM
- Correct qualitative performance of phase 2 exercise
- Successfully weaned off brace
- Able to walk briskly 3-5km over changing terrains without pain
- Minimum **16 weeks** since surgery

MEDIAL KNEE RECONSTRUCTION PROTOCOL – PHASE 3

Goals:

- Maintain good quality movement patterns
- Improve strength and power/rate of force development
- Increase difficulty of neuromuscular and perturbation training
- Start jogging and sports specific training

Precautions:

- Do not commence running until patient has fulfilled return to running criteria

Strength/power:

- Continue progressive loading for strengthening exercises
- Sports-specific progressions e.g. power development, jumping and landing

Neuromuscular training:

- Increase difficulty of neuromuscular and perturbation training
- Emphasise sports specific movements
- Maintain quality of movement/performance during strength and sports exercises

Running:

- Start running if:
 - full ROM
 - pain ≤ 2 VAS and no effusion despite adequate loading
 - limb symmetry index (LSI) $\geq 70\%$ for quadriceps and hamstrings strength
- Graduated running programme: start with 4-minute walk, 1-minute run (4:1) for 20 minutes
Decrease walking time and increase running time by 1 minute each week (3:2, 2:3, 1:4, 0:5)
Patient should be able to run for 20 minutes after 5 weeks
- Once running programme complete, introduce backwards and sideways running
- Progress running from single to multi-plane specific agility drills

Cardiovascular exercise:

- Increase intensity and duration of cardiovascular exercise
- Build sports specific load regarding energy expenditure (aerobic, anaerobic)

Criteria for progressing to Phase 4:

- No/minimal pain with phase 3 rehabilitation
- Correct qualitative performance of phase 3 exercises
- Limb symmetry index (LSI) $>80\%$ for quads and hamstrings strength
- LSI $>80\%$ for hop battery tests

MEDIAL KNEE RECONSTRUCTION PROTOCOL – PHASE 4

Goals:

- Sports specific drills and gradual return to play program
- Return to sport or physically demanding work

Strength/power:

- Sports-specific progressions e.g. power development, jumping and landing.

Neuromuscular training:

- Increase difficulty of neuromuscular and perturbation training (e.g. single legged jumps)
- Introduce reactive/unanticipated movements
- Emphasise sports specific movements
- Maintain quality of movement/performance during strength and sports exercises

Sports-specific training

- Increase intensity of agility training (e.g. cutting, pivoting)
- Build sports specific load regarding energy expenditure (aerobic, anaerobic)
- Build sports specific load regarding surface (grass, court etc.)
- Restart training with patient's team

Criteria for returning to play:

- No knee pain with sports specific activities
- No giving way or fear of giving way during sports specific activities
- Active dynamic gait pattern and symmetrical jogging pattern
- Correct quality of performance with all sports-specific activities
- Limb symmetry index (LSI) >90% for quads and hamstrings strength
- LSI >90% for hop battery tests
- Drop test with analysis of movement (trunk, knee valgus and knee flexion when landing)
- Use ACL-RSI to measure patient's psychological readiness/confidence in return to sports
- Restoration of medial and rotary stability confirmed clinically
- Expected return between 6-9 months* since surgery

***Returning to sports >9 months post-op and ensuring the patient has completed the return to sport criteria significantly reduces knee re-injury rate.**

Isometric knee extensor torque values >3Nm/kg are associated with positive outcomes after ACLR.

Originator: Richard Norris, Orthopaedic Physiotherapy Specialist.

Ratified by: Mr M McNicholas, Consultant Orthopaedic Surgeon.

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