LATERAL KNEE RECONSTRUCTION PROTOCOL APPROPRIATE FOR ISOLATED LCL AND/OR PLC RECONSTRUCTIONS

– PHASE 1

Monitor for evidence of:

- Infection: if patient develops a temperature >38°, 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, CPN* involvement)

Goals:

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

Initial precautions:

- Avoid knee flexion >90° until **2 weeks**
- PWB (40% body weight) for **6 weeks** using long lever brace initially (locked at 0˚)
- If able to SLR without extension lag, change long lever brace to Össur *CTi* brace at **2 weeks**
- Wean off crutches from **6 weeks** if normal gait, brace to be worn at all times for **12 weeks**
- Avoid excessive hyperextension, external tibial rotation, tibial sag and varus postures for **16 weeks**
- Avoid open chain isolated hamstrings exercises for **16 weeks**

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˚ for **2 weeks**, FROM thereafter (avoiding hyperextension)
- 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 (≤40% body weight)
- OKC knee extension with resistance as symptoms allow

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 ≥0-120°
- Voluntary quadriceps contraction
- Normal FWB gait (from 6-8 weeks post-op)

AECS: Acute extremity compartment syndrome
CPN: Common peroneal nerve
CTI: Össur CTi (carbon titanium) brace
PEACE: Protection, Elevation, Avoid anti-inflammatories, Compression, Elevation.

LATERAL KNEE RECONSTRUCTION PROTOCOL – PHASE 2

Goals:

- Protect the graft
- Full patellofemoral and tibiofemoral ROM
- **Correct movement patterns during exercises**
- Increase muscular endurance
- Protected lower limb strengthening
- **Wean off brace**

Precautions:

- Brace to be worn at all times until **12 weeks**, then wean off as able
- Avoid excessive hyperextension, external tibial rotation, tibial sag and varus postures for **16 weeks**
- Avoid open chain isolated hamstrings exercises until **16 weeks**
- Avoid breaststroke, side stroke and whip kicking action in pool until **16 weeks**
- Avoid running until **20 weeks**

Strength:

- Double leg CKC ex's, progress to single leg as able
- Double leg bridging from **week 10**
- OKC knee extension with resistance
- Increase load on the quadriceps, gluteal and calf muscles.
- Start open chain isolated hamstrings exercises from **16 weeks**
- 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 varus and tibial external rotation at lower flexion angles (<45°) during weight bearing exercises, using verbal, manual and visual cues as required
- Progress to single leg proprioceptive ex's as able

Cardiovascular exercises:

- Static bike with resistance from **9 weeks**
- Incline treadmill (7% gradient)
- Brisk walking programme over changing terrains as able
- Cross trainer or rower from **12 weeks**
- Stair/stepper machine from **16 weeks**
- Breaststroke, side stroke and whip kicking action in pool until **16 weeks**

Criteria for progressing to Phase 3:

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

LATERAL 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:

- Avoid excessive hyperextension, external tibial rotation, tibial sag and varus postures for **16 weeks**
- Avoid running until **20 weeks**
- Avoid functional testing (hop for distance, vertical hop, side hop) until **24 weeks**

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

Cardiovascular exercise:

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

Running:

- Start running if:
  - full ROM
  - pain $\leq$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

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

LCL RECONSTRUCTION PROTOCOL – PHASE 4

Goals:

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

Post-operative time-based restrictions:

- Do not initiate progressive return to play programme until confirmation of restoration of lateral stability (<2mm side-side difference on varus stress X-ray) at **6 months** post-op

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.) and restart training with patient's team if confirmation of restoration of lateral stability at 6 months post-op

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
- Patient psychologically ready/confident to return to sports
- Restoration of lateral stability confirmed by varus stress X-ray
- Expected return between 7-9 months since surgery

Originator: Richard Norris, Orthopaedic Physiotherapy Specialist.
Ratified by: Mr M McNicholas, Consultant Orthopaedic Surgeon.
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