

ACL Reconstruction Protocol

PHASE 1

Goals:

- **Protect ACL graft**
- **Control pain and effusion**
- **Preserve patellofemoral mobility**
- **Preserve/restore ROM, Terminal extension ASAP**
- **Aim for $\geq 130^\circ$ flexion within 6/52**
- **Muscle activation**
- **Normal gait and movement patterns**

Earliest timeframes:

Driving: left knee 2/52, right knee 6/52
Breaststroke swimming 12/52
*Return to pivoting/contact sports 6/12

Monitor for increasing pain, effusion and local heat and modify rehabilitation accordingly. If required consider NSAIDs.

If patient develops signs of distal neurovascular deficit, DVT/PE or a temperature $>38^\circ\text{C}$ urgently refer to operating surgeon, if unavailable advise patient to attend A&E as wound infection or septic arthritis needs to be excluded

Immediately post-op (O/P physio arranged for 1/52)

Initial precautions:

- Restricted OKC knee extension for **12 weeks** (more important for hamstrings grafts)

Pain, effusion and ROM:

- Cryocuff beneath cricket splint, applied in theatre.
- **PEACE* protocol for the management of pain and swelling/effusion
NB: cryotherapy only influences pain, not drainage
- Terminal extension **ASAP**, patella mobilisation if required
- Full, symmetrical knee flexion **ASAP**, aiming for $\geq 130^\circ$ withing **6 weeks**

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

Muscle activation and strength:

- SQ's, SLR in brace until able to perform without extension lag
 - Consider electrostimulation if unable to voluntarily contract quadriceps
- CKC (e.g. leg press, squats, step ups), **adding resistance** as comfort allows
- OKC knee extension with resistance between $90-45^\circ$ from **4 weeks**
- Concentric and eccentric training of the gluteal, hamstrings and calf muscles
- Add resistance to strengthening ex's as symptoms and signs allow

Neuromuscular training:

- Double legged proprioceptive ex's (e.g. Bosu balance).
- Increase difficulty by adding perturbation, progressing to single leg once FWB.
- Correct alignment of trunk and lower limb during exercises and gait.
- Encourage explicit learning in the early rehab phases

Cycling:

- Static bike with no resistance once able to fully rotate on pedals.

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
- Normal FWB gait and correct quality of movement patterns with exercises.

PHASE 2

Goals:

- **Protect ACL graft**
- **Full patellofemoral and tibiofemoral FROM**
- **Increase strength progressively**
- **Increase difficulty of neuromuscular and perturbation training**
- **Maintain good quality movement patterns**
- **Start jogging and sports specific training**

Precautions:

- Restricted OKC knee extension for **12 weeks** (more important for hamstrings grafts)
- Do not commence running until patient has fulfilled return to running criteria

Pain, effusion and ROM:

- Monitor for increasing pain, effusion or localised temp. modify rehabilitation prn
- If required, consider NSAIDs or hydrotherapy
- Maintain full extension, patella mobility and regain full/symmetrical flexion

Strength:

- OKC knee extension (90-0°) with resistance **from week 12** as comfort allows
- Progress CKC and OKC ex's to single leg as able.
- Add weight/resistance to OKC and CKC ex's as able
- Quadriceps, gluteal and calf muscle strengthening
- Progressively increase resistance and decrease repetitions for all strengthening ex's

Neuromuscular training:

- Increase difficulty of proprioceptive ex's (e.g. unsteady surfaces, two motoric tasks).
- Increase intensity of perturbation, progressing to single leg once able.
- Correct alignment of trunk and lower limb during exercises, walking and jogging.

Cycling, running and other cardiovascular exercise:

- Static bike with resistance and outdoors cycling
- Cyclic exercises (e.g. cross trainer or rower)
- **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
 - NB: the median time for return to running after ACL reconstruction is **12 weeks**
- Increase cardiovascular training (mainly aerobic)
- Introduce backwards and sideways running once competent with forward running
- Introduce multi-plane, sportsspecific agility movements once competent linear running

Criteria for progressing to Phase 3:

- Correct qualitative performance of phase 2 exercises
- Limb symmetry index (LSI) $\geq 80\%$ for quads and hamstrings strength
- LSI $\geq 80\%$ for hop battery test (e.g. hop for distance, vertical jump, side hop)

If patient is registered on www.uknlr.co.uk, questionnaires will be automatically emailed to patient

PHASE 3

Goals:

Return to sport or physically demanding work

Strength/power:

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

Neuromuscular training:

- Increase difficulty of neuromuscular and perturbation training
e.g. single legged jumps
- Introduce reactive/unanticipated movements
- Emphasise sports specific movements based on patient's goals
- Maintain quality of movement/performance during strength /sports exercises

Cycling, running and other cardiovascular exercise:

- Build sports specific load regarding energy expenditure (aerobic, anaerobic)
- Build sports specific load regarding surface (grass, court etc.)

Sports specific training

- Increase intensity of agility training (e.g. cutting, pivoting)
- 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
and confidence in return to sports
- UKNLR Patient questionnaires will be automatically emailed to patient
- *Minimum 6 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.

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Short form ACL-RSI

Instructions: you may prefer to use an app: <https://apps.apple.com/gb/app/acl-rsi/id980148388> OR

Place a mark in the box, which best describes you in relation to the descriptors.

1. Are you confident that you can perform at your previous level of sport participation?

Not at all confident											Fully confident
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	

2. Do you think you are likely to re-injury your knee by participating in your sport?

Extremely likely											Not likely at all
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	

3. Are you nervous about playing your sport?

Extremely nervous											Not nervous at all
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	

4. Are you confident that you could play your sport without concern for your knee?

Not at all confident											Fully confident
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	

5. Do you find it frustrating to have to consider your knee with respect to your sport?

Extremely frustrating											Not at all frustrating
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	

6. Are you fearful of re-injuring your knee by playing your sport?

Extremely fearful											No fear at all
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	10	20	30	40	50	60	70	80	90	100	