ACL RECONSTRUCTION MOON GUIDELINES

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These guidelines are based on a review of the randomized controlled trials related to ACL rehabilitation; where evidence is insufficient, recommendations follow the guidance of the MOON panel of content experts. **Example exercises** are provided rather than a highly structured program — attending rehabilitation specialists should tailor the program to each patient's specific needs. **Progression from one phase to the next is based on the patient achieving functional criteria, not on the time elapsed since surgery.** The timeframes shown after each phase are approximate times for the average patient, **not** guidelines for progression.

VISIT FREQUENCY | Recommended: **16–24 visits** to the rehabilitation specialist, with the majority occurring early (twice weekly × 6 weeks). Minimum for MOON group patients: **6 visits**. Only treatments available at all sites are included, so some evidence-supported methods (high-intensity electrical stimulation, aquatic therapy) are omitted.

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
0–2 WEEKS	**WEEKS 2–6**	**WEEKS 7–12**	**WEEKS 13–16**	**WEEKS 17–20**
Immediate post-op	Early rehabilitation	Strengthening & control	Advanced training	Return to sport

PHASE 0 — PRE-OPERATIVE

RECOMMENDATIONS

- Normal gait
- AROM 0 to 120° of flexion
- Strength: 20 SLR with no lag
- Minimal effusion
- Patient education on post-operative exercises and the need for compliance
- Educated in ambulation with crutches
- Wound care instructions
- Educated in MOON follow-up expectations

1 IMMEDIATE POST-OPERATIVE PHASE · APPROXIMATE: SURGERY TO 2 WEEKS

GOALS Full knee extension ROM · good quadriceps control (≥20 no-lag SLR) · minimize pain · minimize swelling · normal gait pattern

CRUTCH USE	• WBAT with crutches, beginning the day of surgery	
CRUTCH D/C CRITERIA	• Normal gait pattern	• Ability to safely ascend and descend stairs without noteworthy pain or instability (reciprocal stair climbing)
KNEE IMMOBILIZER	• None — **exception:** first 24 hours after a femoral nerve block	
CRYOTHERAPY	• Cold with compression / elevation (e.g. Cryo-Cuff, ice with compressive stocking) • First 24 hours or until acute inflammation is controlled: every hour for 15 minutes	• After acute inflammation is controlled: 3 times a day for 15 minutes • Crushed ice in the clinic (post-acute stage until discharge)

RANGE OF MOTION — PHASE 1

- **Extension:** low load, long duration (~5 minutes) stretching (e.g. heel prop, prone hang, minimizing co-contraction and nociceptor response)
- **Flexion:** wall slides, heel slides, seated assisted knee flexion, bike rocking-for-range
- Patellar mobilization — medial / lateral initially, followed by superior / inferior while monitoring reaction to effusion and ROM

MUSCLE ACTIVATION & STRENGTH — PHASE 1

- Quadriceps sets emphasising vastus lateralis and vastus medialis activation
- SLR emphasising no lag
- **Electric stimulation:** *optional* if unable to perform a no-lag SLR — discontinue when able to perform **20 no-lag SLR**
- Double-leg quarter squats
- Standing theraband resisted terminal knee extension (TKE)
- Hamstring sets · hamstring curls
- Side-lying hip adduction / abduction *(avoid adduction moment in this phase with concomitant grade II–III MCL injury)*
- Quad / ham co-contraction supine · prone hip extension
- Ankle pumps with theraband · heel raises (calf press)

CARDIOPULMONARY
- UBE or similar exercise is recommended

SCAR MASSAGE
- Begin when the incision is fully healed

CRITERIA FOR PROGRESSION TO PHASE 2

1. 20 no-lag SLR
2. Normal gait
3. Crutch / immobilizer discontinued
4. ROM: no greater than 5° active extension lag, 110° active flexion

2 EARLY REHABILITATION PHASE · APPROXIMATE: WEEKS 2 TO 6

GOALS Full ROM · improve muscle strength · progress neuromuscular retraining

RANGE OF MOTION — PHASE 2

- Low load, long duration (assisted PRN)
- Heel slides / wall slides
- Heel prop / prone hang (minimize co-contraction and nociceptor response)
- Bike: rocking-for-range → riding with low seat height
- Flexibility stretching, all major groups

STRENGTHENING — PHASE 2

- **Quadriceps:** quad sets · mini-squats / wall-squats · step-ups · knee extension from 90° to 40° · leg press · shuttle press **without jumping action**
- **Hamstrings:** hamstring curls · resistive SLR with sports cord
- **Other musculature:** hip adduction / abduction (SLR or with equipment) · standing heel raises, progressing from double to single leg support · seated calf press against resistance · multi-hip machine in all directions with proximal pad placement

NEUROMUSCULAR TRAINING — PHASE 2

- Wobble board · rocker board
- Single-leg stance with or without equipment (e.g. instrumented balance system)
- Slide board · fitter

CARDIOPULMONARY — PHASE 2

- Bike
- Elliptical trainer
- Stairmaster

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CRITERIA FOR PROGRESSION TO PHASE 3

1. Full ROM
2. Minimal effusion / pain
3. Functional strength and control in daily activities
4. IKDC Question #10 (global rating of function) score ≥7

3 STRENGTHENING & CONTROL PHASE · APPROXIMATE: WEEKS 7 THROUGH 12

GOALS Maintain full ROM · running without pain or swelling · hopping without pain, swelling or giving-way

STRENGTHENING — PHASE 3

- Squats · leg press · wall squats
- Hamstring curl
- Knee extension 90° to 0°
- Step-ups / step-downs · lunges
- Shuttle · sports cord

NEUROMUSCULAR TRAINING — PHASE 3

- Wobble board / rocker board / roller board
- Perturbation training
- Instrumented testing systems · varied surfaces

CARDIOPULMONARY — PHASE 3

- Straight-line running on a treadmill or in a protected environment **(no cutting or pivoting)**
- All other cardiopulmonary equipment

CRITERIA FOR PROGRESSION TO PHASE 4

1. Running without pain or swelling
2. Hopping without pain or swelling (bilateral and unilateral)
3. Neuromuscular and strength training exercises without difficulty

4 ADVANCED TRAINING PHASE · APPROXIMATE: WEEKS 13 TO 16

GOALS Running patterns (figure-8, pivot drills) at 75% speed without difficulty · jumping without difficulty · hop tests at 75% of contralateral values (Cincinnati hop tests: single-leg hop for distance, triple hop for distance, crossover hop for distance, 6-metre timed hop)

AGGRESSIVE STRENGTHENING & AGILITY — PHASE 4

- Squats · lunges · plyometrics
- **Agility drills:** shuffling · hopping · carioca · vertical jumps
- Running patterns at 50–75% speed (e.g. figure-8)
- Initial sport-specific drill patterns at 50–75% effort

NEUROMUSCULAR TRAINING — PHASE 4

- Wobble board / rocker board / roller board
- Perturbation training
- Instrumented testing systems · varied surfaces

CARDIOPULMONARY — PHASE 4

- Running
- Other cardiopulmonary exercises

CRITERIA FOR PROGRESSION TO PHASE 5

1. Maximum vertical jump without pain or instability
2. 75% of contralateral on hop tests
3. Figure-8 run at 75% speed without difficulty
4. IKDC Question #10 score ≥8

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5 RETURN-TO-SPORT PHASE · APPROXIMATE: WEEKS 17 TO 20

GOALS 85% contralateral strength · 85% contralateral on hop tests · sport-specific training without pain, swelling or difficulty

AGGRESSIVE STRENGTHENING — PHASE 5

- Squats · lunges · plyometrics

SPORT-SPECIFIC ACTIVITIES — PHASE 5

- Interval training programs
- Running patterns in football · sprinting · change of direction
- Pivot and drive in basketball · kicking in soccer · spiking in volleyball
- Skill / biomechanical analysis with coaches and the sports medicine team

RETURN-TO-SPORT EVALUATION — RECOMMENDED

- Hop tests (single-leg hop, triple hop, cross-over hop, 6-metre timed hop)
- Isokinetic strength test (60°/second)
- Vertical jump · deceleration shuttle test
- MOON outcomes measure packet (**mandatory**; should be completed post-testing)

RETURN-TO-SPORT CRITERIA

- No functional complaints
- Confidence when running, cutting and jumping at full speed
- 85% contralateral values on hop tests
- IKDC Question #10 score ≥9

IKDC QUESTION #10 — GLOBAL RATING OF KNEE FUNCTION

How would you rate the function of your knee on a scale of 0 to 10, with **10 being normal, excellent function** and **0 being the inability to perform any of your usual daily activities**, which may include sports?

Cannot perform daily activities **0** **1** **2** **3** **4** **5** **6** **7** **8** **9** **10** No limitation

Adapted from the MOON ACL Rehabilitation Guidelines (Multicenter Orthopaedic Outcomes Network, acltear.info).

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