THE STEADMAN CLINIC
STEADMAN PHILIPPON RESEARCH INSTITUTE

U.S. OLYMPIC NATIONAL MEDICAL CENTER

Armando F. Vidal, MD
Complex Knee, Shoulder and
Sports Medicine

MOON ACL Protocol

Multicenter Orthopedics Outcomes Network Group

General Information: The following ACL rehabilitation guidelines are based on a review of the randomized controlled trials related to ACL rehabilitation. For many aspects of ACL rehabilitation there are either no studies that qualify as "best-evidence" or the number of studies is too few for conclusions to be drawn with confidence. In these circumstances, the recommendations are based upon the guidance of the MOON panel of content experts.

The guidelines have been developed to service the spectrum of ACL injured people (non-athlete to the elite athlete). For this reason, example exercises are provided instead of a highly structured rehabilitation program. **Attending rehabilitation specialists should tailor the program to each patient's specific needs.**

The multi-center nature of the MOON group necessitates that the MOON ACL Rehabilitation Program only include treatment methods that can be employed at all sites without purchasing expensive equipment. Consequently, some treatment methods with supporting evidence (e.g., using a high-intensity electric stimulation training program for strength, aquatic therapy) are not included in the program because the expert panel believed that it is unreasonable to expect all sites to carry out such treatments.

Progression from one phase to the next is based on the patient demonstrating readiness by achieving functional criteria rather than the time elapsed since surgery. The timeframes identified in parentheses after each phase are approximate times for the average patient, NOT guidelines for progression. Some patients will be ready to progress sooner than the timeframe identified, whereas others will take longer.

The recommended number of visits to the rehabilitation specialist (including visits merely for evaluation / exercise progression) is 16 to 24 visits with the majority of the visits occurring early (BIW x 6 weeks). However, it is recognized that some patient's health plans are severely restrictive. For this reason, the minimum number of post-ACL reconstruction visits to a rehabilitation specialist has been set at 6 visits for the MOON group patients.

If there are any questions regarding the MOON ACL Rehabilitation Guidelines, then please contact Dr. Vidal's clinical team at 970-401-8940.

PHASE 0: Pre-operative Recommendations

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

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PHASE 1: Immediate Post-operative Phase (Approximate timeframe: 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- roughly 1-2 weeks as needed
Crutch D/C Criteria:

- Normal gait pattern
- Ability to safely ascend/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 D/C)

EXERCISE SUGGESTION

ROM

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

Muscle Activation/Strength

- Quadriceps sets emphasizing vastus lateralis and vastus medialis activation
- SLR emphasizing no lag
- Electric Stimulation: *Optional* if unable to perform no lag SLR
    - Discontinue use when able to perform 20 no lag SLR
- Double-leg quarter squats
- Standing theraband resisted terminal knee extension (TKE)
- Hamstring sets
- Hamstring curls

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- 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 (when incision is fully healed)

CRITERIA FOR PROGRESSION TO PHASE 2
- 20 no lag SLR
- Normal gait
- Crutch/Immobilizer D/C
- ROM: no greater than 5° active extension lag, 110° active flexion

PHASE 2: Early Rehabilitation Phase (Approximate timeframe: weeks 2 to 6)

GOALS
- Full ROM
- Improve muscle strength
- Progress neuromuscular retraining

EXERCISE SUGGESTIONS

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

Strengthening

Quadriceps:
• Quad sets
• Mini-squats/wall-squats
• Steps-ups
• Knee extension from 90 degrees to 40 degrees

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- 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: progress from double to single leg support
- Seated calf press against resistance
- Multi-hip machine in all directions with proximal pad placement

Neuromuscular training
- Wobble board
- Rocker board
- Single-leg stance with or without equipment (e.g. instrumented balance system)
- Slide board
- Fitter

Cardiopulmonary
- Bike
- Elliptical trainer
- Stairmaster

CRITERIA FOR PROGRESSION TO PHASE 3
- Full ROM
- Minimal effusion/pain
- Functional strength and control in daily activities
- KDC Question # 10 (Global Rating of Function) score of > 7

PHASE 3: Strengthening & Control Phase (Approximate timeframe: weeks 7 through 12)

GOALS
• Maintain full ROM
• Running without pain or swelling- **NO RUNNING UNTIL CLEARANCE FROM DR. VIDAL IN CLINIC @ 3 MONTHS**
• Hopping without pain, swelling or giving-way

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EXERCISE SUGGESTIONS

Strengthening

- Squats
- Leg press
- Hamstring curl
- Knee extension 900 to 00
- Step-ups/down
- Lunges
- Shuttle
- Sports cord
- Wall squats

Neuromuscular Training

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

Cardiopulmonary

- Straight line running on treadmill or in a protected environment (NO cutting or pivoting)
  - **NO RUNNING UNTIL CLEARANCE FROM DR. VIDAL IN CLINIC @ 3 MONTHS**
- All other cardiopulmonary equipment

CRITERIA FOR PROGRESSION TO PHASE 4

- Running without pain or swelling
- Hopping without pain or swelling (Bilateral and Unilateral)
- Neuromuscular and strength training exercises without difficulty

PHASE 4: Advanced Training Phase (Approximate timeframe: weeks 13 to 16)

GOALS

- Running patterns (Figure-8, pivot drills, etc.) at 75% speed without difficulty
- Jumping without difficulty
- Hop tests at 75% contralateral values (Cincinnati hop tests: single-leg hop for distance, triple-hop for distance, crossover hop for distance, 6-meter timed hop)

EXERCISE SUGGESTIONS

Aggressive Strengthening

- Squats
- Lunges
- Plyometrics

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Agility Drills
- Shuffling
- Hopping
- Carioca
- Vertical jumps
- Running patterns at 50 to 75% speed (e.g. Figure-8)
- Initial sports specific drill patterns at 50 – 75% effort

Neuromuscular Training
- Wobble board / rocker board / roller board
- Perturbation training
- Instrumented testing systems
- Varied surfaces

Cardiopulmonary
- Running
- Other cardiopulmonary exercises

CRITERIA FOR PROGRESSION TO PHASE 5
- Maximum vertical jump without pain or instability
- 75% of contralateral on hop tests
- Figure-8 run at 75% speed without difficulty
- IKDC Question # 10 (Global Rating of Knee Function) score of 8

PHASE 5: Return-to-Sport Phase (Approximate timeframe: weeks 17 to 20)

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

EXERCISE SUGGESTIONS

Aggressive Strengthening
- Squats
- Lunges
- Plyometrics

Sport Specific Activities
- Interval training programs
- Running patterns in football
- Sprinting

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- Change of direction
- Pivot and drive in basketball
- Kicking in soccer
- Spiking in volleyball
- Skill / biomechanical analysis with coaches and sports medicine team

RETURN-TO-SPORT EVALUATION RECOMMENDATIONS:

- Hop tests (single-leg hop, triple hop, cross-over hop, 6 meter timed hop)
- Isokinetic strength testing (60 degrees/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, jumping at full speed
- 85% contralateral values on hop tests
- IKDC Question #10 (Global rating of knee function) of 9 or greater

IKDC Question #10

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?

CURRENT FUNCTION OF YOUR KNEE

Cannot perform daily activities — No Limitation

0 1 2 3 4 5 6 7 8 9 10