



ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION REHABILITATION GUIDELINES

Dr. Ed Tingstad
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PHASE 0: Pre-Operative Recommendations

Goals	<ul style="list-style-type: none"> <input type="checkbox"/> Normal Gait <input type="checkbox"/> AROM 0 -120 <input type="checkbox"/> Minimal effusion <input type="checkbox"/> Strength: 20 SLR with no lag <input type="checkbox"/> Patient education on post-op exercises and need for compliance
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General Guidelines: 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 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 multicenter 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 **16-24** 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, please contact Dr. Tingstad at (509) 332-2828.



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PHASE 1: Immediate Post-Op (Surgery – 2 Weeks)

Goals	<input type="checkbox"/> Full knee extension <input type="checkbox"/> Good quadriceps control <input type="checkbox"/> Minimize pain <input type="checkbox"/> Normal gait pattern	
Crutches	<input type="checkbox"/> Weight bearing as tolerated beginning the day of surgery <input type="checkbox"/> Can discontinue use of crutches if the patient is able to have a normal gait pattern, can ascend and descend stairs without pain or instability <input type="checkbox"/> Patient does NOT require a knee immobilizer	
Cryotherapy	<input type="checkbox"/> Cold with compression and elevation <input type="checkbox"/> First 24 hours: ice every hour for 25 minutes <input type="checkbox"/> After 24 hours: ice 3 times daily for at least 15 minutes	
Exercises	ROM	<input type="checkbox"/> Extension: low load, long duration stretching <ul style="list-style-type: none"> ○ Heel prop and Prone hang <input type="checkbox"/> Flexion: low load, long duration stretching <ul style="list-style-type: none"> ○ Wall/heel slides, Seated assisted knee flexion, Bike riding <input type="checkbox"/> Patellar mobilization: medial and lateral initially, then superior and inferior
	MUSCLE ACTIVATION	<input type="checkbox"/> Quad sets emphasizing VMO and vastus lateralis <input type="checkbox"/> Straight leg raises emphasizing no lag <input type="checkbox"/> Double leg quarter squats <input type="checkbox"/> Standing TheraBand resisted terminal knee extensions (TKA) <input type="checkbox"/> Hamstring curls, hamstring sets <input type="checkbox"/> Side lying adduction/abduction <input type="checkbox"/> Quad/hamstring co-contraction supine <input type="checkbox"/> Prone hip extension <input type="checkbox"/> Ankle pumps with TheraBand and heel raises
	CARDIOVASCULAR	<input type="checkbox"/> Upper body circuit training or upper body ergometer
Progression Criteria	<input type="checkbox"/> Crutches and immobilizer are discontinued <input type="checkbox"/> Normal gait pattern <input type="checkbox"/> ROM: no greater than 5-degree active extension leg and 110 degrees of flexion <input type="checkbox"/> 20 no lag SLR	



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PHASE 2: Early Rehabilitation (Weeks 2 - 6)

Goals	<input type="checkbox"/> Full ROM <input type="checkbox"/> Improved muscle strength <input type="checkbox"/> Progress neuromuscular retraining	
Cryotherapy	<input type="checkbox"/> Continue with cryotherapy as needed	
Exercises	ROM	<input type="checkbox"/> Extension: low load, long duration stretching <ul style="list-style-type: none"> ○ Heel prop ○ Prone hand <input type="checkbox"/> Flexion: low load, long duration stretching <ul style="list-style-type: none"> ○ Wall/heel slides ○ Seated assisted knee flexion ○ Bike riding ○ Rocking <input type="checkbox"/> Patellar mobilization: medial and lateral initially, then superior and inferior
	MUSCLE ACTIVATION	<input type="checkbox"/> Quad sets emphasizing VMO and vastus lateralis <input type="checkbox"/> Mini squats/wall squats <input type="checkbox"/> Step-ups <input type="checkbox"/> Leg press or shuttle (NO JUMP) <input type="checkbox"/> Hamstring curls <input type="checkbox"/> Resistive SLR with sports cord <input type="checkbox"/> Hip adduction/abduction <input type="checkbox"/> Standing heel raises: double to single <input type="checkbox"/> Seated calf press <input type="checkbox"/> Multi-hip machine in all directions
	CARDIOVASCULAR	<input type="checkbox"/> Bike, elliptical, stair master
Progression Criteria	<input type="checkbox"/> Full ROM <input type="checkbox"/> Minimal effusion/pain <input type="checkbox"/> Functional strength and control in daily activities <input type="checkbox"/> IKDC Question #10 score of >7	



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PHASE 3: Strengthening and Control (weeks 7-12)		
Goals	<ul style="list-style-type: none"> <input type="checkbox"/> Maintain full ROM <input type="checkbox"/> Running without pain or swelling <input type="checkbox"/> Hopping without pain, swelling, or giving way 	
Exercises	STRENGTH	<ul style="list-style-type: none"> <input type="checkbox"/> Squats <input type="checkbox"/> Leg press <input type="checkbox"/> Hamstring curls <input type="checkbox"/> Knee extension 90 to 0 degrees <input type="checkbox"/> Step-ups and downs <input type="checkbox"/> Lunges <input type="checkbox"/> Shuttle <input type="checkbox"/> Sports cod <input type="checkbox"/> Wall squats
	NEUROMUSCULAR TRAINING	<ul style="list-style-type: none"> <input type="checkbox"/> Wobble board/rocker board <input type="checkbox"/> Perturbation training <input type="checkbox"/> Instrumented testing systems <input type="checkbox"/> Varied surfaces
	CARDIOVASCULAR	<ul style="list-style-type: none"> <input type="checkbox"/> Straight line running on a treadmill or in a protected environment (NO cutting or pivoting) <input type="checkbox"/> All other cardio equipment
Progression Criteria	<ul style="list-style-type: none"> <input type="checkbox"/> Running without pain or swelling <input type="checkbox"/> Hopping without pain or swelling (bilateral and unilateral) <input type="checkbox"/> Neuromuscular and strength training exercises without difficulty 	



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PHASE 4: Advanced Training (weeks 13-16)									
Goals	<ul style="list-style-type: none"> <input type="checkbox"/> Running patterns (figure 8, pivot drills) at 75% speed without difficulty <input type="checkbox"/> Jumping without difficulty <input type="checkbox"/> 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) 								
Exercises	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; text-align: center; vertical-align: middle;">AGGRESSIVE STRENGTHENING</td> <td> <ul style="list-style-type: none"> <input type="checkbox"/> Squats <input type="checkbox"/> Leg press <input type="checkbox"/> Hamstring curls <input type="checkbox"/> Step-ups and downs <input type="checkbox"/> Lunges <input type="checkbox"/> Shuttle </td> </tr> <tr style="background-color: #d9e1f2;"> <td style="text-align: center; vertical-align: middle;">AGILITY DRILLS</td> <td> <ul style="list-style-type: none"> <input type="checkbox"/> Shuffling <input type="checkbox"/> Hopping <input type="checkbox"/> Carioca <input type="checkbox"/> Vertical jumps <input type="checkbox"/> Running patterns at 50-75% speed <input type="checkbox"/> Initial sports specific drill patterns at 50-75% effort </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">NEUROMUSCULAR TRAINING</td> <td> <ul style="list-style-type: none"> <input type="checkbox"/> Wobble board/rocker board <input type="checkbox"/> Perturbation training <input type="checkbox"/> Instrumented testing systems </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">CARDIOVASCULAR</td> <td> <ul style="list-style-type: none"> <input type="checkbox"/> Straight line running on a treadmill or in a protected environment (NO cutting or pivoting) <input type="checkbox"/> All other cardio equipment </td> </tr> </table>	AGGRESSIVE STRENGTHENING	<ul style="list-style-type: none"> <input type="checkbox"/> Squats <input type="checkbox"/> Leg press <input type="checkbox"/> Hamstring curls <input type="checkbox"/> Step-ups and downs <input type="checkbox"/> Lunges <input type="checkbox"/> Shuttle 	AGILITY DRILLS	<ul style="list-style-type: none"> <input type="checkbox"/> Shuffling <input type="checkbox"/> Hopping <input type="checkbox"/> Carioca <input type="checkbox"/> Vertical jumps <input type="checkbox"/> Running patterns at 50-75% speed <input type="checkbox"/> Initial sports specific drill patterns at 50-75% effort 	NEUROMUSCULAR TRAINING	<ul style="list-style-type: none"> <input type="checkbox"/> Wobble board/rocker board <input type="checkbox"/> Perturbation training <input type="checkbox"/> Instrumented testing systems 	CARDIOVASCULAR	<ul style="list-style-type: none"> <input type="checkbox"/> Straight line running on a treadmill or in a protected environment (NO cutting or pivoting) <input type="checkbox"/> All other cardio equipment
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CARDIOVASCULAR	<ul style="list-style-type: none"> <input type="checkbox"/> Straight line running on a treadmill or in a protected environment (NO cutting or pivoting) <input type="checkbox"/> All other cardio equipment 								
Progression Criteria	<ul style="list-style-type: none"> <input type="checkbox"/> Maximum vertical jump without pain or instability <input type="checkbox"/> 75% of contralateral on hip tests <input type="checkbox"/> Figure 8 run at 75% speed without difficulty <input type="checkbox"/> IKDC Question #10 score of >8 								

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

Goals	<input type="checkbox"/> 85% contralateral strength <input type="checkbox"/> 85% contralateral on hop tests <input type="checkbox"/> Sport specific training without pain, swelling, or difficulty	
Exercises	AGGRESSIVE STRENGTHENING	<input type="checkbox"/> Squats <input type="checkbox"/> Leg press <input type="checkbox"/> Hamstring curls <input type="checkbox"/> Step-ups and downs <input type="checkbox"/> Lunges <input type="checkbox"/> Shuttle
	SPORT SPECIFIC ACTIVITIES	<input type="checkbox"/> Interval training programs <input type="checkbox"/> Running patterns in football <input type="checkbox"/> Kicking in soccer <input type="checkbox"/> Spiking and hitting in volleyball <input type="checkbox"/> Pivot and drive in basketball <input type="checkbox"/> Sprinting <input type="checkbox"/> Change of direction <input type="checkbox"/> Skill/biomechanical analysis with coaches and sports med team
Return to Sport Evaluation Recommendations	<input type="checkbox"/> Hop tests <input type="checkbox"/> Isokinetic strength test <input type="checkbox"/> Vertical Jump <input type="checkbox"/> Deceleration shuttle test <input type="checkbox"/> MOON outcomes measure packer (mandatory; should be completed post-testing)	
Return to Sport Criteria	<input type="checkbox"/> No functional complaints <input type="checkbox"/> Confidence when running, cutting, jumping at full speed <input type="checkbox"/> 85% contralateral values on hop tests <input type="checkbox"/> IKDC Question #10 score of >9	

*These guidelines are adapted from the Multicenter Orthopaedics Outcomes Network and the following institutions: Cleveland Clinic, Hospital for Special Surgery, Ohio State University, University of Colorado, University of Iowa, Vanderbilt University, and University of Washington