

Noyes Knee Institute Rehabilitation Protocol for Primary ACL Reconstruction:
Early Return to Strenuous Activities

	Postoperative Week					Postoperative Month				
	1-2	3-4	5-6	7-8	9-12	4	5	6	7-12	
Brace: immobilizer for patient comfort	X	(X)								
Range of motion minimum goals: 0-110° 0-120° 0-135°	X	X	X							
Weight bearing: 50% body weight Full	X	X								
Patella mobilization	X	X	X							
Modalities: EMS Biofeedback Pain/edema management (cryotherapy)	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X	
Stretching: Hamstring, gastroc-soleus, iliotibial band, quadriceps	X	X	X	X	X	X	X	X	X	
Strengthening: Quadriceps isometrics, straight leg raises, active knee extension Closed-chain: gait retraining, toe raises, heel raises, wall sits, mini-squats Knee flexion hamstring curls (90°) Knee extension quadriceps (90-30°) Hip abduction-adduction, multi-hip Leg press (80-10°) Upper body weight training Dynamic hip and core training	X X X X X X X X	X X X X X X X X	X X X X X X X X	X X X X X X X X	X X X X X X X X					
Balance/proprioceptive training: Weight-shifting, cup walking, BBS BBS, BAP, single-leg stance Step-ups Resistance band walking, perturbation training, ball toss mini-trampoline	X	X	X X	X X X	X X X	X X X	X X X	X X X		
Conditioning: UBC Bike (stationary) Aquatic program Stair climbing machine Ski machine Swimming (kicking) Walking Elliptical machine	X	X X X X X X X	X X X X X X X	X X X X X X X	X X X X X X X	X X X X X X X	X X X X X X X	X X X X X X X	X X X X X X X	
Running and agility program					(X)	X	X	X	X	
Functional (plyometric) training, sports-specific drills						(X)	X	X	X	
Full sports								X	X	

AP, anteroposterior; BAP, Biodex Ankle Platform; BBS, Biodex Balance System; CRPS, complex regional pain syndrome; EMS, electrical muscle stimulation; ROM, range of motion; UBC, upper body cycle.

Brace: (x) if needed.

Running, functional training: (x) based on symptoms and isokinetic testing goals, see detailed protocol.

Return to Sports Criteria

Return to sports activities is based on successful completion of the running and agility program and functional training that is required for the sport the patient desires to return to, along with the following:

1. Knee examination
 - Range of motion: International Knee Documentation Committee (IKDC) rating of normal or nearly normal.
 - Lachman test: IKDC rating of normal or nearly normal.
 - Pivot shift test: IKDC rating of normal or nearly normal.
 - Patella pain: none.
 - Effusion: none.
2. KT-2000 joint arthrometer (if available)
 - ≤ 3 mm reconstructed - contralateral knee (if normal), 134 N total AP displacement.
3. Quadriceps and hamstrings muscle strength and endurance tests: $\leq 10\%$ deficit compared with contralateral side, based on equipment available:
 - Isokinetic $180^\circ/\text{sec}$ and $300^\circ/\text{sec}$.
 - Isometric portable fixed or hand-held dynamometer: quadriceps 60° flexion, hamstrings 60° or 90° flexion, 3 reps each, use average.
 - If equipment is not available, a 1-repetition maximum bench press and leg press are recommended with weight room equipment, along with an experienced test administrator and a sufficient amount of time to safely conduct these tests.
4. Single-leg hop tests: $\leq 15\%$ deficit lower limb symmetry on any two tests (single hop, triple hop, triple crossover hop, 6 m timed hop). May videotape to provide subjective analysis of balance and landing position.
5. Video drop-jump
 - If software is available, $\geq 60\%$ normalized knee separation distance.
 - If software is not available, use video for subjective analysis of landing position (varus, valgus, neutral): no valgus, knees flexed for controlled landing.
6. Single-leg squat, 5 reps: no knee valgus, medial-lateral movement, or pelvic tilt.
7. Video plant and cut drill: subjective rating of high hip and knee flexion, upright posture, no valgus collapse. The patient runs 5 m to a spot designated on the floor with tape, plants on the reconstructed leg, and then performs a 45° cut. If the right leg was reconstructed, the cut should be to the left. Cones may be set up to direct the patient to perform the angle of 45° .

Other tests to consider include the multi-stage fitness test to determine VO_2max and the 60-second sit-up test or other core strength measures. A single-leg vertical jump test may be conducted to determine if a deficit exists between the reconstructed and contralateral leg.