



Orthopedic Surgery, Sports Medicine & Arthroscopy Specialists

Jonathan Watson, MD

REHABILITATION PROTOCOL- ACI (Femur)

The rehabilitation guidelines are presented in a criterion based progression program. General time frames are given for reference to the average, but individual patients will progress at different rates depending on their age, associated injuries, pre-injury health status, rehab compliance, tissue quality and injury severity. Specific time frames, restrictions, and precautions may also be given to protect healing tissues and the surgical repair/reconstruction. It should not be a substitute for one's clinical decision making regarding the progression of a patient's post-operative course based on their physical exam findings, individual progress, and/or the presence of post-operative complications. The therapist should consult the referring physician with any questions or concerns.

Special attention must be given to impairments that caused the initial problem. For example, if the patient is s/p partial medial meniscectomy and they have a varus alignment, post-operative rehabilitation should include correcting muscle imbalances or postures that create medial compartment stress.

INDIVIDUAL CONSIDERATIONS: S/p

PHASE 1- Surgery to 2 weeks

REHAB GOALS	<ol style="list-style-type: none">1. Protection of the post-surgical repair2. Full passive knee extension with gradual increase of passive knee flexion3. Restore leg control – no lag with straight-leg-raise4. Safe crutch walking
PRECAUTIONS	<ol style="list-style-type: none">1. Crutches and toe touch weight bearing (TTWB). Brace locked at passive flexion limitation (e.g. patient obtains 75 deg of passive flexion in PT, brace should be limited in flexion to 75)2. Brace on for sleep for 2 weeks, afterwards can remove for sleep.3. Ok to remove brace for exercises except straight leg raises4. Cryocuff 3-5 times per day for 20 minutes and ice after every therapy session
RANGE OF MOTION EXERCISES	<ul style="list-style-type: none">○ Heel props, prone hangs for passive knee extension○ Grade 2-3 anterior-posterior mobilizations to tibiofemoral joint○ Patellar mobilization- superior/inferior and medial/lateral○ Passive knee flexion, progress as tolerated○ Hamstring & calf stretches
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none">○ Quad sets○ SLRs in 4 planes as tolerated○ Calf pumps, ankle strengthening exercises○ Gait training with crutches

	<ul style="list-style-type: none"> ○ Terminal knee extensions starting week 2 ○ NMES as tolerated
CARDIOVASCULAR EXERCISE	Upper body circuit training or UBE. Stationary bike when sufficient passive knee flexion obtained (limited periods-10/15 min, low resistance)
PROGRESSION CRITERIA	<ul style="list-style-type: none"> ○ Straight leg raise without extension lag ○ No effusion ○ Knee flexion to 90 degrees and full extension

PHASE 2- 2-6weeks

REHAB GOALS	<ol style="list-style-type: none"> 1. Protection of the post-surgical repair 2. Restore knee range of motion – full knee extension and Knee flexion 3. Regain quadriceps control 4. Minimize pain and swelling
PRECAUTIONS	<ol style="list-style-type: none"> 1. Crutches and toe touch weight bearing Brace unlocked but limited at flexion limit obtained in PT. Progress to 50% weight bearing at 6 weeks, full weight bearing at 8 weeks. Wean crutches with full weight bearing. 2. Brace on for sleep for 2 weeks, afterwards can remove for sleep. 3. Ok to remove brace for exercises except straight leg raises 4. Cryocuff 3-5 times per day for 20 minutes and ice after every therapy session
RANGE OF MOTION EXERCISES	<ul style="list-style-type: none"> ○ Calf, IT band, hip flexor and hamstring stretches ○ Soft tissue mobilization ○ Patellar mobilizations ○ Passive knee flexion- should be at least 105 by week 3, 115 by week 4
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none"> ○ Quad sets ○ SLRs in all planes ○ Calf pumps, ankle strengthening exercises ○ Gluteal strengthening ○ Core- single leg planks, superman, single leg pushups, reverse planks (operative leg is non weight bearing and held off ground) ○ Nonsurgical leg single leg balance retraining, manual rhythmic stabilization of trunk & core in seated position
CARDIOVASCULAR EXERCISE	<p>Upper body circuit training (seated) or UBE</p> <p>Low resistance stationary bike</p> <p>Ok to start aquatic treadmill at week 4. Chest high water until 6 weeks, waist high water weeks 6-8</p>
PROGRESSION CRITERIA	<ul style="list-style-type: none"> ○ Straight leg raise in all 4 planes without extension lag ○ No effusion ○ Full knee range of motion

PHASE 3- 6-10 weeks postop

REHAB GOALS	<ul style="list-style-type: none"> ○ Maintain full ROM ○ Improve quad strength & endurance ○ Progress functional activities
PRECAUTIONS	<ul style="list-style-type: none"> ○ Discontinue brace at week 6 if no lag ○ No impact activities or plyometrics ○ Progress to 50% weight bearing at 6 weeks, full weight bearing at 8 weeks. Wean crutches with full weight bearing.
RANGE OF MOTION EXERCISES	<ul style="list-style-type: none"> ○ Continue exercises from phase 2. ○ Can add hip ROM, avoid torque on knee joint with hip ER/IR ○ Thomas test stretching, piriformis/glute stretch if tolerated
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none"> ○ Straight leg raises in 4 planes ○ Increase resistance for terminal knee extensions ○ Isometric leg press at week 6 ○ Stationary minilunge with cable chop at week 8 ○ Minisquats (0-45 deg) at week 8. Avoid knee valgus, prevent knee over toes ○ Week 8-double leg press, double leg heel raises ○ Week 9-front step ups ○ Week 10- lateral step ups (target eccentric quad & hip abductor) ○ Weightshift exercises standing, rocker board and wobble board balance. Can progress to single leg at week 8-9 ○ Closed chain proprioception- rocker board, wobble board, BOSU for double & single leg stance ○ Open chain strengthening- short arc quads, VMO holds
CARDIOVASCULAR EXERCISE	<p>Non-impact endurance training: stationary bike (high seat low tension), elliptical and stairmaster at week 8.</p> <p>Continue pool walking</p> <p>Treadmill walking at week 9/10</p>
PROGRESSION CRITERIA	<ul style="list-style-type: none"> ○ Normal gait on all surfaces without assistive device ○ Reciprocal stair walking ○ Full range of motion ○ Equivalent weight bearing in each limb during sit to stand

PHASE 4- 10-14 weeks postop

REHAB GOALS	Improve muscle strength & endurance
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	Progress functional activity
PRECAUTIONS	Post-activity soreness should resolve within 24 hours Avoid post activity swelling
RANGE OF MOTION EXERCISES	Continue with flexibility exercises
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none"> ○ Progress phase 3 activities with resistance/weight ○ Increase leg press through full range, progress to single leg at week 12 ○ Leg curls, single leg heel raises ○ Step ups- progress to waist height ○ Backward stationary lunges, double leg squats ○ Open chain knee extension (0-20) ○ Progress balance and proprioceptive exercises from Phase 3 ○ Lower limb agility drills with fast walking without sudden direction change or pivoting
CARDIOVASCULAR EXERCISE	Elliptical, pool walking, stationary bike.
PROGRESSION CRITERIA	<ul style="list-style-type: none"> ○ Full range of motion ○ Balance testing within 30% of contralateral ○ Able to walk 2 miles or bike 20 min ○ 50 lateral step ups (8 inch height)

PHASE 5- 14-24 weeks

REHAB GOALS	Avoid overuse Progress functional activity & strengthening Balance & hamstring and quad strength within 10% of contralateral
PRECAUTIONS	Post-activity soreness should resolve within 24 hours Avoid post activity swelling
RANGE OF MOTION EXERCISES	Continue with flexibility exercises
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none"> ○ Progress strengthening from phase 4 ○ Single leg curls and leg extensions at week 14 ○ PNF lower limb supine. PNF upper limb & trunk half kneel & static lunge ○ High step ups progress to waist height

	<ul style="list-style-type: none"> ○ Lunges, progress to backward walking, then forward walking ○ Double leg squats, progress to single leg, vary surface, add perturbations, add upper body/trunk ○ Speedskaters, increase resistance, can add BOSU/rocker ○ Cable kicks in PNF pattern ○ Progress balance/proprioception exercises
CARDIOVASCULAR EXERCISE	<ul style="list-style-type: none"> ○ Continue to progress from phase 4. No impact exercise yet
PROGRESSION CRITERIA	<ul style="list-style-type: none"> ○ Balance, hamstring & quad strength within 10% of normal side ○ No patellofemoral irritation, pain or swelling

PHASE 6- 24+ weeks

REHAB GOALS	Return to sport
PRECAUTIONS	Post-activity soreness should resolve within 24 hours Avoid post activity swelling
RANGE OF MOTION EXERCISES	Continue with flexibility exercises
SUGGESTED THERAPEUTIC EXERCISES	<ul style="list-style-type: none"> ○ Progress strengthening from phase 5 ○ Single leg standing on wobble board, add ball toss close eyes, etc ○ PNF lower limb advance to standing ○ Advance balance and proprioception exercises ○ Closed chain progression- single leg squats standing on wobble board, lunges on two BOSU surfaces, lateral step ups with trunk perturbations ○ Open chain- restrict open chain knee extension 0-20. If participates in kicking sport, begin open chain kicking agility exercises ○ Agility- carioca, cones fast walking only until 7 months. Then speed and complexity can progress ○ Cone touches- 2 cones slightly more than hip width, stand on one leg, reach left hand to right cone and reverse, 20 reps. ○ Single leg deadlifts- PVC pipe vertical behind back, single leg deadlift maintaining contact of pipe against head and tailbone ○ Deep knee bends ○ Upper body plyometrics months 4-7 ○ Months 7-8: box jumps. Teach form. Advance from double leg forward, double leg sideways, double leg over box. Continue to

	<p>single leg forward, single leg sideways. Discontinue if form not maintained</p> <ul style="list-style-type: none"> ○ Months 8-9: Single leg hopping agility drills
CARDIOVASCULAR EXERCISE	<ul style="list-style-type: none"> ○ Pool running at 6 months. ○ Treadmill running at 7 months (ensure correct form) ○ Increase endurance on elliptical, bike, stairmaster
PROGRESSION CRITERIA- RETURN TO SPORT	<ul style="list-style-type: none"> ○ 90% quad & hamstring strength of contralateral ○ No patellofemoral irritation, full range of motion ○ Minimum 15% difference on hop test, with normal alignment ○ Low impact (golf, swimming, skating, cycling) permitted at 6 months. Moderate impact (running, aerobics) at 7-8 months. High impact (tennis, volleyball, basketball, football, baseball) at 12 months. Above are permitted as long as patient is equal/ahead of rehab milestones.