



UNIVERSITY OF CALGARY
Sport Medicine Centre

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION REHABILITATION PROGRAM

UNIVERSITY OF CALGARY SPORT MEDICINE CENTRE

PATIENTS

The following protocol should be used as a guide during rehabilitation after surgery in consultation with a physiotherapist or athletic therapist. A physiotherapist or athletic therapist can teach and individually modify the exercises. Your surgeon will advise when you should start physiotherapy or athletic therapy at your first follow-up appointment.

PHYSIOTHERAPISTS & ATHLETIC THERAPISTS

Please use this protocol and the “Surgeon’s Instructions” to guide this patient’s rehabilitation.

PLEASE NOTE:

If you have a repaired meniscus (cartilage shock absorber) at the same time as your ACL reconstruction, the protocol may be delayed or modified.

SURGEON'S INSTRUCTIONS

THE FOLLOWING FORM IS TO BE FILLED OUT BY THE SURGEON FOR THE PHYSIOTHERAPIST OR ATHLETIC THERAPIST.

In addition, the surgeon should provide the patient with pictures of their knee and a surgical diagram.

SURGEON: Dr. Nick Mohtadi Dr. Alex Rezansoff Other

DATE OF SURGERY: _____

SURGERY DETAILS:

ACL RECONSTRUCTION: Hamstring Tendon Patellar Tendon Quadricep Tendon Allograft

LATERAL EXTRA-ARTICULAR TENODESIS: Yes No

OTHER LIGAMENT RECONSTRUCTIONS/REPAIR: Yes No

Details: _____

MEDIAL MENISCUS: Debridement Partial Meniscectomy Repair:

Longitudinal

Root Repair

Radial Repair

LATERAL MENISCUS: Debridement Partial Meniscectomy Repair:

Longitudinal

Root Repair

Radial Repair

REHABILITATION RESTRICTIONS:

Follow ACL Rehab protocol with the following restrictions (if applicable):

WEIGHT BEARING STATUS:

Weight bearing as tolerated

Partial weight bearing for ___ weeks

Feather weight bearing for ___ weeks

Non-weight bearing for ___ weeks

ROM RESTRICTIONS:

ROM limited to ___ degrees to ___ degrees for ___ weeks

No restrictions

BRACE:

ROM Brace: from ___ degrees to ___ degrees for ___ weeks

Knee Immobilizer for ___ weeks

No brace necessary

OVERVIEW OF PROTOCOL

This rehabilitation program has been devised to help people who have had Anterior Cruciate Ligament Reconstruction (ACLR) surgery. The program will describe the range of motion (ROM) and strengthening exercises relating to your calf, quadriceps, hamstrings and buttock muscles to assist in your rehabilitation after surgery.

There are always differences in one's ability, goals and time availability. For this reason, the program is designed with flexibility in mind. The exercises are presented in a progressive manner and are organized into different stages. Not every exercise will be necessary but achieving the goals of each stage is essential.

Try to plan a period each day to perform these exercises. You may be performing exercises multiple times per day. Daily activities can be split up over the day if you wish or can be performed at one time. Daily performance of the prescribed exercises is more important than the time of day that they are performed. Remember to follow your body's lead. Do not continue exercises that cause pain, especially if it lingers after you stop or if your knee starts to swell significantly. If this happens, reduce the intensity of the exercise or the number of repetitions. If this still causes discomfort, stop the exercise for a couple of days and then try again, starting off slowly.

BENEFITS OF FOLLOWING THE PROTOCOL

This is a progressive program aimed to increase the types and intensity of exercises in coordination with the healing of your new ACL graft and your knee. It is very important to follow the progression outlined in this program. Advancing too fast may result in increased pain and swelling in your knee or a loosening or rupture of the new ACL graft.

However, not progressing, especially with your range of motion (ROM) exercises, may result in stiffness, additional pain, loss of ROM, a delayed return to activity, occasionally requiring additional surgery to correct.

For these reasons, we recommend working with a physiotherapist/athletic therapist to rehabilitate your knee after surgery. A physiotherapist/athletic therapist can determine your ability to progress your rehab.

It is very important that you DO NOT progress to the next stage without discussing this with your physiotherapist/athletic therapist. They will help decide whether or not it is safe for you to start the next stage of the rehabilitation program.

OVERVIEW OF EXERCISE PROGRESSIONS

This table provides an overview of the exercise progressions. It is important to adapt the progression based on each individual's presentation. Criteria for progression are presented at the end of each stage and it may be beneficial to continue with exercises from previous stages.

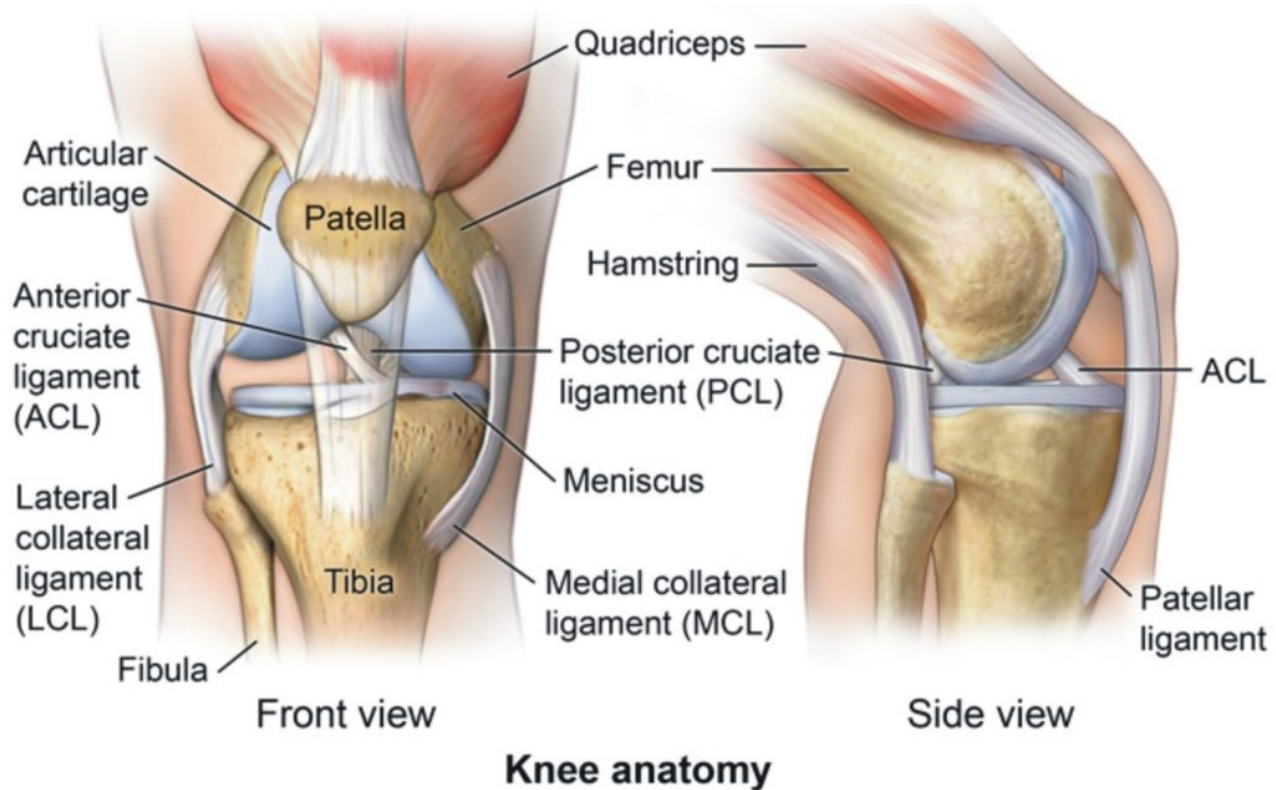
STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5
RECOVERY FROM SURGERY	WALKING	STRENGTHENING	RUNNING & AGILITY	RETURN TO SPORT OR ACTIVITY

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5
RANGE OF MOTION (ROM)					
Heel Over Roll Stretch	✓				
Heel Slides	✓				
Knee Extension Isometric	✓				
Knee Extension and Flexion in Sitting	✓				
Prone Hangs		✓			
Wall Slides		✓			
Cycling on a Stationary Bike (very little or no resistance)		✓			
Hamstrings Stretch		✓			
Gastroc Stretch With Towel		✓			
Standing Gastroc/Soleus Stretch		✓			
STRENGTHENING					
Active Knee Flexion	✓				
Seated Calf Raise	✓				
Hip Abduction (Countertop)	✓				
Hip Flexion AROM Bent Knee (Chair)	✓				
Hip Extension AROM (Chair)	✓				
Knee Extension Concentric End Range (Band+Chair)		✓			
Hamstring Curls With Tubing While Sitting		✓			
1/4 Double and Single Leg Squats with support		✓			
Hip Adduction (Band)		✓			
Hip Abduction (Band)		✓			
Hip Extension (Band)		✓			
Calf Raises		✓			
Hamstring Curls in Sitting With Tubing (as previously)			✓		
Standing Hamstring Curls			✓		
Hamstring Curls Lying on Your Stomach			✓		
Squat - Arms Forward			✓		
Single Leg Squat Straight Leg			✓		
Double Leg Squats with Tubing			✓		
Step-Ups and Step-Downs			✓		
Bridging			✓		
Bridging Single Leg			✓		
Single Leg Calf Raises Without Support			✓		
Deadlift Single Leg and Arm (Dumbbell)			✓		

OVERVIEW OF EXERCISE PROGRESSIONS (Cont'd)

	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
STRENGTHENING (Cont'd)					
Knee Flexion Machine			✓		
Knee Flexion Machine Single Leg			✓		
Leg Press (Machine)			✓		
Runner's Step Up				✓	
Reverse Lunge				✓	
Lateral Lunge (Bosu)				✓	
Lunge Forward (Bosu)				✓	
Monster Walk (Band)				✓	
BALANCE					
One Legged Stance		✓			
Wobble Board			✓		
Balance Variations			✓		
Single Leg Balance with Arm Movements			✓		
Airplane			✓		
Advanced Wobble Board				✓	
Double Leg Use of Wobble Board				✓	
Single Leg use of Wobble Board				✓	
Two-legged Squats on Wobble Board				✓	
Ball Toss (Wobble Board)				✓	
CARDIO					
Walking - Gait Cycle		✓			
Brisk Walking/Longer Walks/Stairs			✓		
Walking Treadmill			✓		
Swimming Strokes No Breaststroke/Whipkick, Eggbeater			✓		
Water Running			✓		
Elliptical			✓		
Rowing Machine			✓		
Jogging / Running				✓	
Skip Rope				✓	
AGILITY					
Icky Shuffle (Ladder)				✓	
Two Foot Hop Forward				✓	
Forward Run One Foot (Every Space)				✓	
Two Feet In and Out (Every Space)				✓	
Two Feet In and Out (Every Other Space)				✓	

OVERVIEW OF ANATOMY



WHAT IS AN ACL RECONSTRUCTION?

The anterior cruciate ligament (ACL) is one of the key ligaments that controls rotational stability of the knee joint by resisting the combined motions of anterior (forward) tibial movement and internal tibial rotation.

The ACL connects your thighbone (femur) to your shinbone (tibia). It's most commonly torn during sports that involve sudden stops and changes in direction — such as basketball, soccer, tennis and volleyball.

ACL reconstruction surgery uses a graft to replace the ligament. The most common grafts are autografts using part of your own body, such as the tendon of the kneecap (patellar tendon) or one of the hamstring tendons. Sometimes the quadriceps tendon from above the kneecap is used. Another choice is allograft tissue, which is taken from a deceased donor.

STAGE 1 RECOVERY FROM SURGERY

In Stage 1 it is important to improve the range of motion (ROM) of your knee. **Getting your knee straight is the most important initial goal.** The early motion will reduce the risk of developing a stiff knee. Learning to activate the muscles on the top of the thigh, called the quadriceps, will help restore and maintain the ROM.

Arrange a visit with a physiotherapist/athletic therapist to ensure you understand the specifics of this stage.

STAGE 1 GOALS

- Full knee extension (straightening)
- Minimize swelling
- Minimum of 0-90 degrees of ROM
- Appropriate wound healing

STAGE 1 PATIENT EDUCATION

WEIGHT BEARING

- Weight bearing using your brace and crutches that allow quality movement within your pain tolerance.
- Start at about 50% and increase as tolerated to full weight bearing.
- The diagrams and descriptions below will outline how to properly navigate different environments.

WALKING | STEP-THROUGH (CRUTCHES)

Preparation:

- Make sure crutches are properly fitted

Execution:

- Crutches and operated leg come forward at the same time
- Step-through with the non-operated leg

Tip:

- Squeeze the crutch handles against your ribs - Don't let them ride into your armpits



Make sure crutches are properly fitted



Crutches and operated leg come forward



Step-through with non-operated leg



Repeat

STAGE 1 RECOVERY FROM SURGERY

STAIRS | ASCENDING (CRUTCHES + RAILING)

Preparation:

- Make sure crutches are fitted properly
- Both crutches on the side opposite the rail

Execution:

- Press down on crutches and rail to unweight affected leg
- Step up with strong leg first
- Bring operative leg and crutches up to meet strong leg



STAIRS | DESCENDING (CRUTCHES + RAILING)

Preparation:

- Make sure crutches are fitted properly
- Both crutches on the side opposite the rail

Execution:

- Step forward with operated leg and crutches
- Press down on crutches and rail to unweight operated leg
- Step down with strong leg



Step forward with operated leg and crutches

Use crutches to unweight operated leg and step down with strong leg

ICE / ELEVATION

- CryoCuff™ or ice pack applied immediately after surgery and used 20 minutes every hour, especially after exercises.
- Operated knee should be elevated when icing and at rest.

Duration: 15-20 min | Frequency: min 5x/day

STAGE 1 REHABILITATION EXERCISES

To maintain range of motion and prevent stiffness from developing, it is important to keep moving with the exercises below.

RANGE OF MOTION

HEEL OVER ROLL STRETCH

Preparation:

- Lay on back with knee straight
- Put a roll (ie: towel) under your ankle

Execution:

- Passively (ie: allowing gravity) stretch the knee into extension
- Start with 2 minutes at a time, working up to 2-5 minutes as long as you are pain free

Sets: 5x/day | Duration: Start 2 min at a time, work up to 5 min



Place a roll (i.e. towel) under your ankle and passively stretch your knee

HEEL SLIDES

Preparation:

- Lay on back with knee straight

Execution:

- Keeping the heel in contact with the floor, gently pull the heel of your operated leg towards you buttock
- You may use a towel to assist with bending your knee
- Relax back to the start position
- Use the opposite leg to assist straightening the knees

Sets: 5x/day | Reps: 5-10 | Hold: 5-10 sec



Start position



Gently pull towel to assist with bending your knee



Slide heel up

KNEE EXTENSION ISOMETRIC

Preparation:

- Lie flat on your back

Execution:

- Tighten the muscles on the top of your thigh by pushing the back of your knee into the floor and lifting your heel off the ground
- Relax

Sets: 5x/day | Reps: 15-20



Push back of knee to ground, lift heel

STAGE 1 REHABILITATION EXERCISES

KNEE EXTENSION AND FLEXION IN SITTING

Sets: 5x/day | Reps: 5-10 | Hold: 5 sec

Preparation:

- Sit in a chair with the ankle of your operated leg under the ankle of your good foot

Execution:

- Gently pull your operated leg back, supported with your good leg, until you feel a stretch
- Use your good leg to assist with straightening the operated knee



Start in a sitting position



Gently pull your operated leg back, supported with your good leg, until you feel a stretch



Use your good leg to assist with straightening the operated knee

STRENGTHENING

ACTIVE KNEE FLEXION

Sets: 5x/day | Reps: 20

Preparation:

- Lie on your stomach on a table or bed and position yourself so that your foot hangs off the edge of the bed

Execution:

- Bend your operated knee to raise your lower leg off of the surface
- Then slowly lower your leg, controlling this movement with your other leg
- Avoid letting your foot drop down



Lie on your stomach with your foot hanging off the edge of the bed



Slowly bend your knee up and down

SEATED CALF RAISE

Sets: 5x/day | Reps: 15

Preparation:

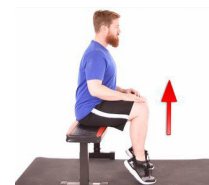
- Sit with good posture

Execution:

- Raise heels up
- Lower down with control



Start position



Raise heels up

STAGE 1 REHABILITATION EXERCISES

HIP ABDUCTION (COUNTERTOP)

Sets: 5x/day | Reps: 10

Preparation:

- Standing in front of a counter
- Hands placed firmly on the counter

Execution:

- Lift leg straight out to the side
- This exercise should be completed with both legs



Hands firmly on the countertop for support



Leg straight out to the side



Trunk stays tall

HIP FLEXION FROM BENT KNEE (CHAIR)

Sets: 5x/day | Reps: 10

Preparation:

- Standing next to a chair

Execution:

- Lift your knee up as if marching



Standing with a chair for support



Lift bent knee up high, do not lean or bend trunk

HIP EXTENSION FROM (CHAIR)

Sets: 5x/day | Reps: 10

Preparation:

- Stand with good posture
- Use chair or counter to stabilize yourself

Execution:

- Lift one straight leg behind
- Return to the start position with control



Start position



Lift leg behind

STAGE 1 MOVING ON TO STAGE 2

STAGE 1 OTHER CONSIDERATIONS

CRITERIA FOR PROGRESSION TO STAGE 2

1. No quads lag during straight leg raise
2. Full Extension ROM
3. 90 degrees flexion ROM

STAGE 2 WALKING

The most important part of Stage 2 is to strengthen your quadriceps muscles and achieve full knee extension. Your knee extension range of motion should be the same as the non-operated knee.

Arrange visits with a physiotherapist/athletic therapist to ensure that you understand the specifics of this stage.

STAGE 2 GOALS

- Progress to full weight-bearing (use 2 crutches, then 1 crutch/cane (used on the opposite side), then walking without any support)
- Maintain knee extension at 0 degrees
- Swelling reduction
- Achieve 0-120 degree range of motion
- Return to activities of daily living (ADLs)
- Return to office-type jobs

STAGE 2 PATIENT EDUCATION

WEIGHT-BEARING

- Progress towards full weight bearing (FWB) (i.e. walking without crutches). This may vary, depending on pain level, quadriceps control and functional ability (i.e. the ability to walk up/down stairs).
- In order to stop using crutches, you **must** be able to walk **without** a limp while using crutches (i.e. you must be able to fully weight bear on the operated leg **without** compensation).
- If you have also had a repair to your meniscus, you may need more time before full weight bearing
- Work on normalizing walking pattern

ICE / ELEVATION

Duration: 15-20 min | Frequency: 2-3x/day

- Monitor and control swelling.
- Use ice and/or compression after exercise and as required (15-20 minutes per session)

STAGE 2 REHABILITATION EXERCISES

WALKING | GAIT CYCLE

1. Forward foot connects with the ground heel first
2. Forward foot flat to the ground
3. Shift weight forward - rise onto toes of back foot
4. Push off of back foot, swing back leg forward
5. Repeat



Forward foot connects with ground heel first



Forward foot flat to the ground



Shift weight forward - rise onto toes of back foot



Push off with back foot, swing back leg forward

RANGE OF MOTION

PRONE HANGS

Sets: 4x/day | Reps: 5 | Hold: 20-30 sec

Preparation:

- Lie on your stomach on a table or bed, with your knees approximately 2 inches off the end of the bed

Execution:

- Slowly allow your operated knee to straighten and then hang
- Straightened position should be pain-free
- ADD: Add a heavy shoe or 1-2 lb weight at the ankle



Lie on your stomach with your knees approximately 2" off the end of the bed/table



Slowly allow your operated knee to straighten and hang, pain-free

STAGE 2 REHABILITATION EXERCISES

WALL SLIDES

Preparation:

- Lie on your back, on the floor or a bed that has one end against the wall
- Place your feet on the wall with your knees almost straight

Execution:

- Slowly allow your heels to slide down the wall, causing your knees to bend
- Use your non-operated leg to return the operated leg to the starting position

Sets: 4x/day | Reps: 10-15



Place foot up on wall



Slide foot down wall, bending knee

HAMSTRINGS STRETCH

Preparation:

- Lie flat on your back
- Use a towel, belt or strap to hold ankle

Execution:

- Keeping your knee straight, lift your leg up until you feel a stretch in the back of the thigh
- Hold and then slowly lower the leg
- Alternate legs



Lie flat on your back



Lift your leg, keeping your knee straight, until you feel a stretch. Hold, then slowly lower leg.

Sets: 4x/day | Reps: 5 | Hold: 20-30 sec

GASTROC STRETCH WITH TOWEL

Preparation:

- Sit with your legs out in front of you
- Loop a towel or belt around the underside of your foot

Execution:

- Pull on the towel, drawing your toes towards you to stretch your calf muscles
- Do not bend your knee



Sit with your legs out in front of you, with a towel/belt around the underside of your foot



Pull on towel/belt bending ankle. Do not bend your knee.

Sets: 4x/day | Reps: 5 | Hold: 20-30 sec

STAGE 2 REHABILITATION EXERCISES

STANDING GASTROC/SOLEUS STRETCH

Sets: 4x/day | Reps: 5 | Hold: 20-30 sec

Preparation:

- Stand facing a wall

Execution:

- Lean against the wall first with your operated leg forward and knee bent
- **Gastroc Stretch:** Straighten the non-operated leg behind you, keeping a straight line from heel to head
- **Soleus Stretch:** Drop your back knee toward the ground
- Stretch out your calf muscles, ensuring that **both** heels stay on the floor. Hold.
- Then repeat with the operated leg
- Start with partial weight bearing on your operated leg and increase weight bearing as tolerated
- Ensure that you **do not hyperextend** your operated knee



Gastroc Stretch:
lean forward, back knee
locked, heel on ground



Soleus Stretch:
drop back knee toward
ground

STRENGTHENING

KNEE EXTENSION CONCENTRIC | END RANGE (BAND + CHAIR)

Sets: 4x/day | Reps: 10-15

Preparation:

- Loop band behind your knee slightly above the knee joint as shown
- Attach band to chair or door
- Stand with good posture, knee slightly bent

Execution:

- Straighten your knee as much as you can, pushing your bodyweight through your leg
- Relax your knee, returning to the start position



Knee slightly bent



Straighten knee

STAGE 2 REHABILITATION EXERCISES

HAMSTRING CURLS WITH TUBING WHILE SITTING

Perform all strengthening exercises on both legs so that your non-operated leg does not get weak.

Preparation:

- Sit on a chair
- Attach one end of the tubing to a secure, low level support (i.e. approximately mid-shin height)
- Loop the other end of the tubing around your ankle

Execution:

- Use your hamstrings to bend your knee
- Return to the starting position and repeat

Sets: 4x/day | Reps: 5-10



Sit in a chair with tubing looped around your ankle



Use your hamstrings to bend your knee

1/4 DOUBLE AND SINGLE LEG SQUATS WITH SUPPORT

Preparation:

- Stand with feet shoulder width apart
- Place your hands on a support (i.e. countertop), as required

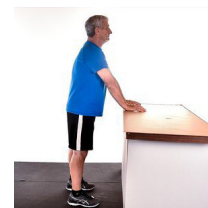
Execution:

- Squat down like you are going to sit
- Only go partially down (range 0-40 degrees maximum) then return to standing position
- Work up to performing squats without **constant** support
- For all double leg squats, concentrate on equal weight bearing
- Start with 1/4 **double** leg squats, then progress to 1/4 **single** leg squats, as tolerated and using support as required

Sets: 4x/day | Reps: 10-20



Double Leg Squat:
stand with feet shoulder width apart



If required, place hands on a support with feet shoulder width apart



Squat down only partially, with equal weight bearing on both legs



Work up to performing squats without constant support.



Single Leg Squat:
stand with weight on one foot



Squat down only partially

STAGE 2 REHABILITATION EXERCISES

HIP ADDUCTION (BAND)

Sets: 4x/day | Reps: 10-15

Preparation:

- Stand with band around thigh as shown
- Use chair to steady yourself

Execution:

- Bring legs together



Start position



Bring legs together

HIP ABDUCTION (BAND)

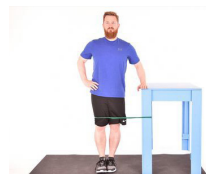
Sets: 4x/day | Reps: 10-15

Preparation:

- Stand with band around thigh as shown
- Use table to steady yourself

Execution:

- Bring leg out to the side



Start position



Bring leg out to side

HIP EXTENSION (BAND)

Sets: 4x/day | Reps: 10-15

Preparation:

- Stand with band around thigh as shown
- Use table to steady yourself

Execution:

- Lift leg behind you



Start position



Lift leg behind you

CALF RAISES

Sets: 4x/day | Reps: 15-20

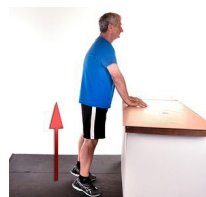
Progress from using both legs (bilateral) while using support, then to one leg at a time (unilateral) with support, then to bilateral without support.

Preparation:

- **For bilateral:** stand on both feet with your toes pointed straight ahead
- **For unilateral:** stand on one foot and bend your knee to hold up the other foot

Execution:

- Use your calf muscles to go up on your toes, lifting your heels off the ground, as high as you can
- Ensure a slow, controlled movement both up and down



Bilateral calf raises with support. Stand on tip toes, then lower back down with control



Unilateral calf raises with support. Stand on tip toes on one foot then lower back down with control



Bilateral calf raises without support. Stand on tip toes, then lower back down with control

STAGE 2 REHABILITATION EXERCISES

BALANCE

ONE LEGGED STANCE

The goal is to be able to balance comfortably and confidently on your operated knee.

Progress from standing on your operated leg (with support, as required) while looking down to standing while looking away, to performing an arm swing and then swinging the non-operated knee.

Progress further by performing these balance activities with your eyes closed.

Preparation:

- Stand on your operated leg beside a support (i.e. countertop)
- Start with fingertips on countertop

Execution:

- Lift your non-operated leg
- Lift hand off the countertop
- Balance in this position

Sets: 4x/day | Duration: 30 sec



Stand on your operated leg with your fingertips on the countertop



Balance on your operated leg with hand floating above the countertop



Balance on your operated leg while reaching to the side with your arm



Progress to balancing on your operated leg while swinging arms



Balance on your operated leg while bending forward at your hip to make an airplane



Balance on your operated leg with your eyes closed

CYCLING ON A STATIONARY BIKE (VERY LITTLE OR NO RESISTANCE)

- Use little or no resistance with the seat set higher than normal
- When getting on the bike, approach from your non-operated side. Be careful when mounting and dismounting the bike.
- Start with slow half circles forward and backwards
- Slowly work toward complete rotations, as you are able. You need between 105-110 degrees of flexion to make a full rotation.

Load: no resistance | Tempo: as able | Intensity: half circles
Duration: 10-20 min



STAGE 2 MOVING ON TO STAGE 3

STAGE 2 OTHER CONSIDERATIONS

CRITERIA FOR PROGRESSION TO STAGE 3

1. Walk without a limp or gait aid
2. 120 degrees flexion
3. Balance on a single leg without assistance

STAGE 3 STRENGTHENING

The most important part of Stage 3 is to perform all activities of daily living and to get back in the gym for workouts (low impact, controlled exercises).

Arrange visits with a physiotherapist/athletic therapist to ensure that you understand the specifics of this stage.

STAGE 3 GOALS

- Independent strengthening at the gym
- Eliminate swelling
- Achieve full range of motion
- Perform all activities of daily living (ADLs), example: stairs
- Return to work (all other jobs except heavy labour or difficult environmental conditions)
- Clear to do upper body and core strengthening that do not involve pivoting to the knee

STAGE 3 PATIENT EDUCATION

ICE

- After exercise / activity and as required to control swelling

STAGE 3 REHABILITATION EXERCISES

CARDIO

During this stage, it is important to build up endurance for the knee and cardiovascular system.

Choose one of the suggested options below.

Begin at a light intensity and progress as able. You may experience mild discomfort during the exercise, but the pain levels should not increase during exercise. There should be no pain or swelling the following day.

A physiotherapist/athletic therapist will be able to better guide you on the appropriate intensity and how to progress

BRISK WALKING/LONGER WALKS/STAIRS

- Full weight-bearing without limp, light cardio

WALKING TREADMILL



SWIMMING STROKES NO BREASTSTROKE/ WHIPKICK, EGGBEATER



WATER RUNNING



STAGE 3 REHABILITATION EXERCISES

ELLIPTICAL



ROWING MACHINE



STRENGTHENING

Strengthening during this stage involves the use of external resistance in the form of weights, machines, and bands. By the end of the third set of exercises, you should begin to feel some muscular fatigue. At no point should your form become compromised. If you are unable to achieve the appropriate form after the third repetition, discontinue the exercise and try the following day. As we increase the load, you may need to give your muscles a break in order to recover. In such cases, it is recommended to take a day off of certain exercises.

Below you will find a variety of exercises to meet your strengthening goals. It is not recommended to do all the exercises in one session. Begin at a light intensity and progress as able. You may experience mild discomfort during the exercise but the pain levels should not increase during exercise. There should be no pain or swelling the following day.

A physiotherapist/athletic therapist will be able to help guide you through this process.

STAGE 3 REHABILITATION EXERCISES

HAMSTRING CURLS

Sets: 3 | Reps: 8-15

Perform all strengthening exercises on **both** legs so that your non-operated leg does not get weak.

You can alternate any of the following exercises for variety.

HAMSTRING CURLS IN SITTING WITH TUBING

(as previously described)



Hamstring Curls in Sitting with Tubing

STANDING HAMSTRING CURLS

Preparation:

- Attach one end of the tubing securely at heel height and attach the other end to your ankle
- Stand with good posture
- Use a table or chair for support

Execution:

- Actively bend your knee to lift your heel up towards your buttocks as far as you can
- **Slowly** return to the starting position and repeat
- Maintain pelvic tilt throughout



Standing Hamstring Curls: bend knee toward your buttocks, as far as you can. **Slowly** return to start.

HAMSTRING CURLS LYING ON YOUR STOMACH

Preparation:

- Attach one end of the tubing securely at heel height and attach the other end to your ankle
- Lie flat on your stomach with your legs straight

Execution:

- Actively bend your knee to lift your heel up towards your buttocks as far as you can
- **Slowly** return to the starting position and repeat
- Maintain pelvic tilt throughout



Hamstring Curls Lying on Stomach: bend knee toward buttocks. **Slowly** return to start.

STAGE 3 REHABILITATION EXERCISES

SQUAT - ARMS FORWARD

Sets: 3 | Reps: 8-15

Preparation:

- Stand with good posture, feet shoulder width apart
- Hold arms out in front at shoulder height

Execution:

- Perform a squat by bending at the hip
- Rise up by straightening at the hip



Start position



Squat - bend at the hip, back flat



Knees aligned with toes



Finish position

SINGLE LEG SQUAT | STRAIGHT LEG

Sets: 3 | Reps: 8-15

Preparation:

- Stand with good posture on one leg

Execution:

- Begin to squat with one leg by bending at the hip and knee
- Keep the opposite leg straight
- Return to the start position in a controlled manner



Start position



Squat - opposite leg straight forward



Front view



Knee in line with toes!

STAGE 3 REHABILITATION EXERCISES

DOUBLE LEG SQUATS WITH TUBING

- Progress from 1/4 single leg squats to 1/3 single leg squats (as described previously). Squat deeper, but do not go beyond 90 degrees
- Progress to single leg squats using hand weights or tubing for extra resistance. Progress to 1 minute per set and 6 sets with 1 minute rest between sets

DOUBLE LEG SQUAT:

- Increase the resistance of double leg squats with hand weights or tubing
- Hold hand weights (dumbbells, plastic bottles filled with water or sand) in your hands
- Place tubing under both feet and hold it in your hands. Adjust the tension of the tubing so that you are stretching the tubing as you push upwards

Sets: 3 | Reps: 8-15



Progress to 1/3 Single Leg Squat. Squat deeper, but not beyond 90 degrees.



Double Leg Squat with hand weights



Double Leg Squat with tubing looped under feet

STEP-UPS AND STEP-DOWNS

Step-Downs, Forward and Lateral Step-Up Exercises:

- At graduated heights starting at 4" and increasing to < 6"
- Increase number of steps as tolerated

Preparation:

- Stand next to the box or step
- Hands resting at sides, pull belly button in

Execution:

- Step up with one leg, follow with the other
- Step down with the first leg
- Complete the repetition by stepping both feet down

Sets: 3 | Reps: 8-15



Forward Step-Ups: Step onto box



Rise on box with control



Step-Downs: Step back down from box



Lateral Step-Ups: Step onto box, one foot at a time, then back down

BRIDGING

Preparation:

- Lie flat on your back with your arms straight beside you
- Bend knees to 45 degrees

Execution:

- Use the muscles in your buttocks and the backs of your thighs to lift your hips off the floor
- Tighten your abdominal muscles for support
- Hold for 10 seconds and then lower down in a controlled manner

Sets: 3 | Reps: 8-15



Lie on your back with your arms straight beside you and knees bent to 45 degrees



Use the muscles in your buttocks and backs of your thighs to lift your hips off the floor

STAGE 3 REHABILITATION EXERCISES

BRIDGING SINGLE LEG

- Progress to single leg as able, can also have operated leg do 60%, 70%, etc. if unable to perform a complete single leg bridge. Focus on engaging your glute muscles

BRIDGING (AS PREVIOUSLY DESCRIBED):

- Raise buttocks from bed/floor

Sets: 3 | Reps: 8-15



Bridging while lifting knee:
alternate raising your knees

SINGLE LEG CALF RAISES WITHOUT SUPPORT

Progress from double leg to single leg calf raises without support.

Preparation:

- Stand on one leg next to a chair, counter or wall

Execution:

- Stand on your tip toes, lifting your heel as high as you can
- Relax your heel back down to the ground

Sets: 3 | Reps: 8-15



Stand on one leg



Rise onto tip toes as high as you can, then relax your heel back down to the ground

DEADLIFT | SINGLE LEG AND ARM (DUMBBELL)

Sets: 3 | Reps: 8-15

Preparation:

- Stand on one leg, dumbbell in the opposite hand as the stance leg

Execution:

- Bend at the hip, keeping the trunk aligned with the back leg
- Rise up from the hips



Knee will stay aligned over toes at all times

KNEE FLEXION MACHINE

Sets: 3 | Reps: 8-15

Preparation:

- Sit with good posture as shown

Execution:

- Bend legs against resistance



Start position



Finish position

STAGE 3 REHABILITATION EXERCISES

KNEE FLEXION MACHINE | SINGLE LEG

Sets: 3 | Reps: 8-15

Preparation:

- Sit with good posture as shown

Execution:

- Bend one leg against resistance



Start position



Finish position

LEG PRESS (MACHINE)

Sets: 3 | Reps: 8-15

Preparation:

- Sit with good posture as shown

Execution:

- Push weight away from body while straightening knees



Start position



Finish position

BALANCE

When completing the balance exercises, it is normal for your knee to shake. Your goal is to limit the amount of movement at the knee and maintain good upper body posture. It is important to ensure your knee does not collapse inwards or rotate during the movements.

WOBBLE BOARD

Sets: 3-5 | Duration: 30 sec

Preparation:

- Stand on wobble board

Execution:

- Maintain balance on wobble board
- Avoid touching the edges to the ground as long as possible



Balance on wobble board

STAGE 3 REHABILITATION EXERCISES

BALANCE VARIATIONS

Start with the first exercise, progressing to the others in the order listed, as you are able.

Do not perform balance exercises in **socks** - use either bare feet or sneakers to avoid slipping.

- Weight shifting forward / backward / laterally (as previously described)
- Continue with single leg balance exercises while standing on your operated leg (as previously described)

1. Perform arm circles in both directions
2. Raise your non-operated knee and swing it back and forth
3. Alternate leaning your upper body forward, backwards and to each side while maintaining your balance
4. Perform exercises while moving your head, with eyes closed and/or on different surfaces

Sets: 3-5 | Duration: 30 sec



Lateral Weight Shifting Without Support: shift weight to one side, then shift to the other



Forward/Backward Weight Shifting: stand with feet shoulder width apart, lean forward then return



Single Leg Balance Exercises: stand on your operated leg

SINGLE LEG BALANCE WITH ARM MOVEMENTS

Sets: 3-5 | Duration: 30 sec

Preparation:

- Stand with good posture

Execution:

- Balance on one leg
- Clasp hands together
- In a controlled fashion, draw wide circles with your arms



Balance on one leg, wave arms

AIRPLANE

Sets: 3-5 | Reps: 10

Preparation:

- Stand with good posture

Execution:

- Bend forward at the hip standing on one leg
- Keep the back leg and spine straight



Make an airplane

STAGE 3 MOVING ON TO STAGE 4

STAGE 3 OTHER CONSIDERATIONS

CRITERIA FOR PROGRESSION TO STAGE 4

1. Symmetrical ROM when compared to the non-operated limb
2. Successfully complete ½ depth single leg squat
3. Appropriate joint mechanics with closed kinetic chain exercises (Squats, lunges, etc)

STAGE 4 RUNNING & AGILITY

The most important part of the Stage 4 is to improve single-leg balance, control and agility, and to return to in-line impact activities.

Arrange visits with a physiotherapist/athletic therapist to ensure that you understand the specifics of this stage.

STAGE 4 GOALS

- Maintain full ROM - should be equal to the non-operated leg
- Continue strengthening
- Improve balance
- Improve agility

STAGE 4 PATIENT EDUCATION

ICE

Duration: 15-20 min | Frequency: as needed

- After exercise / activity and as required to control swelling

STAGE 4 REHABILITATION EXERCISES

CARDIO

JOGGING/RUNNING

- Start power walking
- Progress to jogging against tubing resistance (forward/backward) - increase time, resistance and speed gradually
- Increase distance and speed (avoid steep terrain, < 3% grade on treadmill)



SKIP ROPE

Duration: as tolerated



STRENGTHENING

RUNNER'S STEP UP

Sets: 3 | Reps: 15+ | Intensity: 6" then increase height

Preparation:

- Stand in front of a box or step that is below the level of the knee

Execution:

- Step up onto the box and bring the opposite leg up towards your chest
- Lower down in a controlled manner
- Repeat, alternating legs



Start position



Keep knee in line with toes



Rise with control, lifting opposite leg

STAGE 4 REHABILITATION EXERCISES

REVERSE LUNGE

Sets: 3 | Reps: 8-15

Preparation:

- Stand with good posture

Execution:

- Lunge backwards
- Return to start position or continue lunging backwards

Note:

- Keep your front knee aligned with your middle toe



Start position



Lunge backward



Front view



Knee aligned with toes!

LATERAL LUNGE (BOSU)

Sets: 3 | Reps: 8-15

Preparation:

- Stand with good posture

Execution:

- Lunge to the side on to the blue side of Bosu
- Keep your hip and knee aligned with your middle toe



Start position



Keep hip and knee in line with foot

LUNGE | FORWARD (BOSU)

Sets: 3 | Reps: 8-15

Preparation:

- Stand with good posture

Execution:

- Lunge forward, keeping your front knee aligned with your middle toe
- Rise up and step forward with the opposite foot, repeating the motion



Lunge



Rise up, lunge with opposite foot

STAGE 4 REHABILITATION EXERCISES

MONSTER WALK (BAND)

Sets: 3 | Duration: 30 sec

Preparation:

- Attach tubing to ankles as shown
- Wide stance, knees and hips slightly bent

Execution:

- Perform a partial squat
- Walk forward, keeping legs wide
- Keep tension on tubing throughout the whole exercise



Wide stance



Walk wide - keep tubing under tension



BALANCE

ADVANCED WOBBLE BOARD

Sets: 5 | Duration: 30 sec | Frequency: daily

Double Leg Use of Wobble Board:

- Move side to side, then front to back (i.e. 4 points of the compass)
 - Ensure there is no rotation
 - Progress from feet wide to feet close
 - Control is goal
- Try to keep the edges of the board off the floor for 10 seconds, increasing this time as you are able



Single Leg Use of Wobble Board: try to keep edges off floor for 10 seconds



Double Leg Use of Wobble Board: move side to side, front to back

Single Leg use of Wobble Board

- Progress to single leg
- As previously described, progress to balancing and performing controlled movement with one leg instead of two
- Place the foot in the middle of the board
- Perform the same activities as for Double Leg Use



Double Leg Use of Wobble Board: try to keep edges off floor for 10 seconds



Squats on Wobble Board: squat while keeping edges off floor

Two-legged Squats on Wobble Board

- 10 sets daily
- Start with you feet shoulder width apart
- Try to keep the edges of the wobble board off the ground while performing the squats

STAGE 4 REHABILITATION EXERCISES

BALL TOSS (WOBBLE BOARD)

Sets: 3 | Reps: 8-15

Preparation:

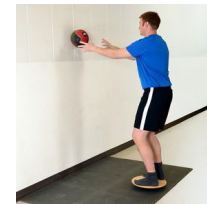
- Stand on a wobble board

Execution:

- Toss ball against the wall



Stand on a wobble board



Toss ball against wall

AGILITY

ICKY SHUFFLE (LADDER)

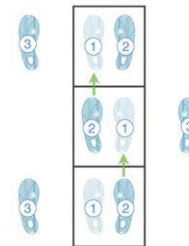
Frequency: 3-5x/week

Preparation:

- Stand on one side of the ladder

Foot Pattern:

- Shuffle into the first space with one foot
- Follow by bringing the other foot in and quickly shuffling the first foot out
- Repeat throughout the length of the ladder



Remember:

- Step as quickly as possible

TWO FOOT HOP FORWARD

Frequency: 3-5x/week

Preparation:

- Start facing the ladder with feet shoulder width apart

Foot Pattern:

- Hop forward, landing both feet in the first space
- Immediately hop forward, landing both feet in the second space
- Repeat through the whole ladder



Remember:

- Hop as quickly as possible
- Absorb the shock of the landing by bending at the hips, knees and ankles

STAGE 4 REHABILITATION EXERCISES

FORWARD RUN ONE FOOT (EVERY SPACE)

Frequency: 3-5x/week

Preparation:

- Stand facing the ladder

Foot Pattern:

- Run forward, landing one foot into each space
- Continue using the full length of the ladder

Remember:

- Step as quickly as possible
- Touch the floor only using the ball of your foot



TWO FEET IN AND OUT (EVERY SPACE)

Frequency: 3-5x/week

Preparation:

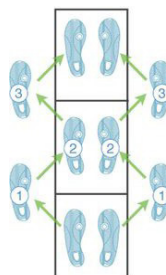
- Start with feet apart straddling either side of the ladder

Foot Pattern:

- Jump and land with feet together inside the first space
- Jump and land with feet apart landing on either side of the first rung
- Repeat throughout the length of the ladder

Remember:

- Absorb the shock of the landing by bending at the hips, knees and ankles



TWO FEET IN AND OUT (EVERY OTHER SPACE)

Frequency: 3-5x/week

Preparation:

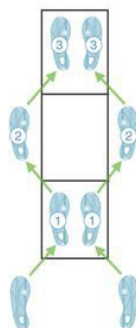
- Start with feet apart straddling either side of the ladder

Foot Pattern:

- Jump up and land with feet together inside the first space
- Jump up and land with feet apart on the outside of the second space
- Repeat throughout the length of the ladder

Remember:

- Absorb the shock of the landing by bending at the hips, knees and ankles



STAGE 4 MOVING ON TO STAGE 5

STAGE 4 OTHER CONSIDERATIONS

CRITERIA FOR PROGRESSION TO STAGE 5

1. Completed sport specific re-training
2. Completed a gradual return to running
3. Leg symmetry index over 90%, preferably 100%
 - Quad strength
 - Hamstring strength
 - Single leg hop test
 - Triple hop test
 - Triple crossover test

STAGE 5 RETURN TO SPORT OR ACTIVITY

You have completed the first four stages of your rehabilitation; however, the health of your knee still requires more work if you want to return to sport. The most important part of Stage 5 is to ensure your progress is done in a safe and gradual manner.

It is best to slowly expose yourself to activity-specific movements. While it is normal to be fearful of reinjury, it is necessary to simulate game like scenarios in order to develop confidence in unpredictable situations. Managing your risk of re-injury is essential to achieving a successful return to sport. You may be able to safely return to sport but be aware that returning to your pre-injury performance level will take time.

Risk factors for re-injury:

- Low hamstring strength compared to the quadriceps muscle
- Quadriceps strength asymmetry (operated vs. non-op)
- Poor hop performance (single hop for distance, triple hop for distance, triple crossover for distance)
- Time from surgery (< 9 months)
- Insufficient sport specific training

Your surgeon may recommend a brace to be used if engaging in contact sports. Please discuss the issue of a brace with your surgeon at your six-month checkup.

You may be able to start a progression of pivoting and cutting activities in this stage. The other activities you engage in will depend on your sport or recreational activity of choice. These should only be commenced under the advisement of your surgeon and/or physiotherapist/athletic therapist.

CRITERIA FOR PROGRESSION BACK TO SPORT OR ACTIVITY

No sooner than 9 months



UNIVERSITY OF CALGARY
Sport Medicine Centre

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION REHABILITATION PROTOCOL

provided by the

UNIVERSITY OF CALGARY SPORT MEDICINE CENTRE

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