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## The Posterior Cruciate Ligament

The Posterior Cruciate Ligament (PCL) is the strongest ligament in the knee (2 times as strong as the ACL) and provides a significant amount of knee stability. PCL deficient knees are susceptible to degeneration at the medial femoral compartment and the patello-femoral joint due to the increased translation at these joint surfaces. The PCL is approximately 38mm in length and 13mm wide. It runs from the medial femoral condyle to the posterior tibia. It is composed of two distinct bands (anterolateral and posteromedial) and is closely connected to the menisco-femoral ligament. The bands are named with respect to their anatomic location with the femoral insertion specified first followed by the tibial insertion. The anterolateral band is twice as large as the posteromedial band and 1.5 times stronger. It becomes taut with knee flexion whereas the posteromedial band tightens with knee extension.



The PCL provides 95% restraint to posterior tibial translation and acts as a secondary restraint to tibial external rotation, varus, and hyperextension. With PCL rupture, there is an increased posterior translation when a posterior load is applied to the tibia and this translation increases as knee flexes with maximum translation from 70-90°, where the ACL is on full slack. Isolated PCL tears are uncommon due to the strength of the PCL.

There is much debate as to whether one should reconstruct a ruptured PCL or opt for conservative treatment. Many studies have shown that isolated PCL tears do well with conservative treatment. Conservative treatment of the PCL should focus on quadriceps rehab and protective weight bearing. Hamstring activity should be restricted due to the posterior pull the hamstrings elicit on the tibia. Quad activity helps counteract this posterior pull and should be addressed aggressively. Open kinetic chain activities are advised from 60-0° and closed chain activities from 0-60°. The therapist must watch for patellar pain due to the increased tibial drop back present with a ruptured PCL. The therapist must also be aware that the lateral structures of the knee act as secondary stabilizers to posterior translation and need to be guarded initially.

### Overview

The Posterior Cruciate Ligament or PCL, and the Anterior Cruciate Ligament (ACL), limit the motion of the tibia backward and forward, respectively.

The lateral collateral ligament (on the outside of the knee) and the medial collateral ligament (on the inside of the knee) limit side-to-side knee motion. Fifty percent of PCL injuries occur in conjunction with other knee ligament injuries, while the other 50 percent occur alone and are referred to as isolated PCL injuries. PCL tears usually result from high force impacts, generally vehicular accidents or contact sports such as football, soccer, or hockey. PCL injuries also can occur in non-contact sports, such as gymnastics or skiing, but are much less common.

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A PCL injury usually occurs during a direct hit below the knee while the leg is bent. In other cases, you may land directly on a bent knee, driving the tibia up and behind the knee and tearing the PCL. Extreme hyperextension of the leg (straightening beyond the normal limit) is a third type of trauma that may result in tears to the PCL and other knee ligaments.

If untreated, a torn PCL can change knee mechanics, resulting in abnormal motion and subsequent pain and instability. Over years, this wear and tear can lead to progressive degenerative arthritis.

#### Diagnosis

Symptoms of PCL injuries include:

- Marked, immediate swelling (within three hours of injury)
- Difficulty in walking after the injury
- Pain when moving the knee
- An occasional feeling of instability or the knee “giving way”

Unlike the "pop" and severe pain that may occur with a torn ACL, an isolated PCL injury may manifest itself simply as swelling in the knee that subsides over a few days or weeks. In many cases, patients may overlook the initial injury and fail to visit a doctor or specialist for evaluation. Unlike ACL injuries, isolated PCL injuries may not initially limit knee function, allowing you to return to normal activities.

Diagnosis of a PCL injury begins with an extensive history to learn how the injury occurred. The doctor must determine what position the leg was in at the time of injury and whether the injury involved contact or a noncontact mechanism (for example, twisting). In an acute, isolated PCL injury, there is usually a history of mild pain and swelling. If the PCL and other knee ligaments are torn, the knee is severely swollen and the person is completely disabled.

Once a thorough history is obtained, the examiner performs a physical exam of the knee to assess the stability of the ligaments. Using specific tests, the physician can diagnose PCL injuries by applying forces to the knee and feeling for abnormal motion.

The examiner also must assess other knee ligaments to rule out combined ligament injuries. In severe, multiple ligament injuries, nerves and blood vessels also may be damaged. These injuries must be evaluated immediately by a doctor.

It is difficult at times to completely assess all the damage that may have occurred in conjunction with a PCL injury. In this case, obtaining additional studies such as magnetic resonance imaging (MRI) exams can be very helpful. Magnetic resonance can show the ligaments, cartilage, and bone to give an accurate picture of the extent of the injury.

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## **Posterior Cruciate Ligament Reconstruction**

This protocol is a guideline for your rehabilitation after posterior cruciate ligament reconstruction. You may vary in your ability to do these exercises and to progress from one phase to the other. Please call Dr. Nelson's office if you are having a problem with your knee or if you need clarification of these instructions.

### **PHASE I: 0 – 2 weeks after surgery**

You will go home with a knee brace, crutches, possibly a cryocuff cold therapy unit machine.

### **GOALS:**

1. Protect the reconstruction – avoid falling
2. Ensure wound healing
3. Attain and maintain full knee extension
4. Gain knee flexion (knee bending) to 90 degrees
5. Decrease knee and leg swelling
6. Promote quadriceps muscle strength
7. Avoid blood pooling in the leg veins

### **ACTIVITIES:**

#### **BRACE/CRUTCHES**

For the first two weeks after surgery, your knee brace will be locked in extension (straight). Use the brace when walking. You will be asked to use crutches to walk after surgery. You will be instructed in partial weight bearing with the crutches for at least the first 6 weeks after surgery. Your doctor will give special instructions in some cases.

Remove the brace for exercises

#### **CRYOCUFF (COLD APPLICATION)**

If you are experiencing pain, swelling, or discomfort, we suggest icing for 15-20 minutes with at least a 60-minute break in between. Use your cryocuff or place ice in a zip lock bag and/or in a towel and apply to the injured area. Never place ice directly on the skin.

#### **WOUND CARE**

Remove your bandage on the second morning after surgery but leave the small pieces of white tape (steri strips) across the incision. You can wrap an elastic bandage (ace) around the knee at other times to control swelling. You may now shower and get your incision wet, but do not soak the incision in a bathtub or Jacuzzi until the stitches have been removed.

#### **ASPIRIN / ELASTIC STOCKINGS**

Take an aspirin each morning; optional to wear elastic stocking (TED) below the knee for 2 weeks, to help prevent phlebitis (blood clots in the veins).

#### **FREE/MACHINE WEIGHTS**

##### **Upper Body/Trunk Only**

We suggest that you do not use any lower extremity free or machine weights. If you are doing free or machine weights for the upper body and trunk, we suggest a very light resistance of 3 sets of 15-20 repetitions. Do not place yourself in a compromising position with your recently operated knee. Do not do exercises while standing. Use a bench or chair to support your body weight.

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## EXERCISE PROGRAM

- You can start formal physical therapy about 3 to 5 days after the operation.
  - We ask that your PT follow our written protocol.
  - If your PT has questions, please ask them to call us to discuss them.
- Days per week: 5-7 Times per day: 1-2

Quadriceps set	3 sets of 10 reps
Heel prop	5 minutes
Sitting Heel slides	3 sets of 10 reps
Straight leg raise	3 sets of 10 reps
Patellar mobilization	1-3 sets of 3 minutes
Hip abduction	3 sets of 10 reps
Ankle pumps	10 pumps per hour

**Quad Sets**- Isometric exercise. This can be done where ever the knee is straight. (laying in bed, standing, or reclined in the lax-y-boy) Tighten up your thigh muscle as tight as you can make it. Hold for a count of 10. Relax and repeat 3 sets of 10 repetitions.



**HEEL PROP**- to straighten (extend) the knee.

Lie on your back with a rolled up towel under your heel or sit in a chair with the heel on a stool as shown in the figure. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a weight (2 to 5 pounds) on the thigh, just above the kneecap.

Try to hold this position for **5 minutes, three times a day. While maintaining this extended position, practice quadriceps setting.**



**SITTING HEEL SLIDES** - to regain the bend (flexion of the knee). See figure in phase 1. While sitting in a chair or over the edge of your bed, support the operated leg with the uninvolved leg. Lower the operated leg, with the nonoperative leg controlling, allowing the knee to bend but **DO NOT exceed 90 degrees of bend at the knee.** Hold five seconds and slowly relieve the stretch by lifting the foot upward, helping with the uninvolved leg, to the straight position (passive assist).

**STRAIGHT LEG RAISE**- Lay flat on back, unaffected knee bent to 90 degrees. Keep involved leg straight and raise it so that your thighs are equal. Hold for count of 6. Perform 3 sets of 10



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reps.

#### **PATELLAR MOBILIZATION-**

**Inferior Glide** - With thumbs on upper border of kneecap, gently push your knee cap towards your foot. Hold 5 sec.

**Superior Glide** - With thumbs on lower border of kneecap, gently pull kneecap towards your body. Hold 5 sec.

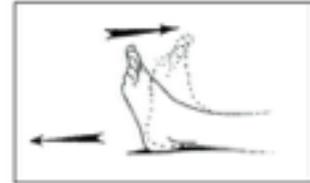
**Medial Glide** - Utilizing a pincer grip, grab the inside and outside edges of your kneecap and gently push your kneecap in towards your other leg. Hold 5 sec.

**Lateral Glide** - Utilizing a pincer grip, grab the inside and outside edges of your kneecap and gently push your kneecap out. Hold 5 sec.

**HIP ABDUCTION**-Lie on your non operative side. Keep the knees fully extended. Raise the operated limb upward to a 45 degree angle as illustrated. Hold one second, and then lower slowly.



**ANKLE PUMPS** -to stimulate circulation in the leg. You should do at least 10 ankle pump exercises each hour.



#### **OFFICE VISIT**

Please return to Dr. Nelson's office approximately two weeks after your surgery. At this time, your sutures will be removed and your progress will be checked.

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## **Posterior Cruciate Ligament Reconstruction**

**PHASE 2:** 2 – 6 weeks after surgery

### **Goals:**

1. Protect the reconstruction, avoid falling
2. Ensure wound healing
3. Maintain full knee extension (straighten knee fully)
4. Begin quadriceps muscle strengthening
5. Attain knee flexion of 90 degrees or more
6. Decrease knee and leg swelling
7. Protected gait with crutches and partial weight bearing

### **ACTIVITIES**

**Motion-** It is important to work on regaining your motion by simply moving your knee. It is very important to regain full extension during this time period.

**Cryocuff -**Use the cryocuff or ice bags to decrease swelling for 20 minutes three times a day after each exercise session.

**Brace / Crutches -**Always wear the post-operative brace when walking in extension. (the brace should be set to allow full extension and 60 degrees of flexion for weeks 2-4 and 90 degrees of flexion at 6 weeks). Always use your crutches and bear only partial weight on the operated leg. Follow these instructions until you return for your follow-up with your doctor at six weeks after surgery

**Swelling -** You may continue using the elastic stockings (TED) for the lower leg and wrapping the knee with an elastic bandage (ACE) to control swelling.

### **Exercise Program**

#### **Stationary Bicycle**

Utilize a stationary bicycle to move the knee joint and increase knee flexion. If you cannot pedal all the way around, then keep the foot of your operated leg on the pedal, and pedal back and forth until your knee will bend far enough to allow a full cycle. Use the non-operated ('good') leg to move the pedals while your operated (PCL) leg just travels around as a 'passenger'. Most people are able to achieve a full cycle revolution backwards first, followed by forward. You may ride the cycle with no resistance for up to 10-15 minutes, 1 to 2 times a day. Set the seat height so that when you are sitting on the bicycle seat, your knee is fully extended with the heel resting on the pedal in the fully bottom position. You should then actually ride the bicycle with your forefoot resting on the pedal.

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**RANGE OF MOTION AND STRENGTHENING EXERCISES (brace off)**

Days per Week: 5-7

Times per Day: 1-2

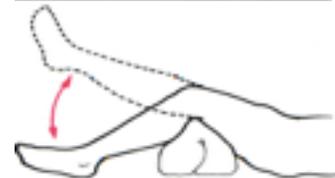
Quadriceps Sets	1-2 sets of 15-20 reps
Heel prop	5 minutes
Heel slides with towel assist	1 set of 5 to 15 minutes
Straight leg raises	1-2 sets of 15-20 reps
Short arc lift	3 sets of 10
Standing toe-raises	3 sets of 10
prone hip extension	3 sets of 15
Hip abduction	3 sets of 10

**HEEL SLIDES** - to regain the bend (flexion) of the knee.

While lying on your back, actively slide your heel backward to bend the knee. Keep bending the knee until you feel a stretch in the front of the knee. Hold this bent position for 5 seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight, you may repeat the quadriceps setting exercise.



**SHORT ARC LIFT**- Place 2-3 towels rolled up under the knee to the affected knee. This will have the knee bent to 30 degrees. Bring the leg up into full extension. Hold for a count of 6 and repeat 3 sets of 10 repetitions.



**STANDING TOE RAISES**-Stand facing a wall, hands on the wall for support and balance. keep the knees extended fully. Tighten the quadriceps to hold the knee fully straight. Raise up on ‘tip-toes’ while maintaining the knees in full extension. Hold for one second, then lower slowly to the starting position.



**PRONE HIP EXTENSION**- Lie face down as shown in the illustration. Keep the knee fully extended. Tighten up your glutes and lift your leg off the ground.



**OFFICE VISIT**-Please return to Dr. Nelson’s office approximately 6 weeks after your surgery.

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## **Posterior Cruciate Ligament Reconstruction**

**PHASE 3:** 6-12 weeks after surgery

### **Goals**

1. Protect the reconstruction, avoid falling
2. Ensure wound healing
3. Maintain full knee extension (straighten knee fully)
4. Begin quadriceps muscle strengthening
5. Attain knee flexion of 90 degrees or more
6. Decrease knee and leg swelling
7. Return to normal walking without crutches

### **ACTIVITIES**

**Cryocuff** -Use the cryocuff or ice bags as needed to decrease swelling for 20 minutes.

**Brace / Crutches** -You can discontinue use of the brace and crutches according to your Dr. Nelson's instructions

### **Exercise Program**

Stationary Bicycle- Continue to use daily for 20-30 minutes

### **Range of Motion and Strengthening Exercises** (brace off)

For the straight leg raise, hip abduction and prone hip extension, if the exercise can be performed easily after the first week, then an ankle weight may be used to increase the resistance of the exercise and build strength. Start with 1 pound and add 1 pound per week until you reach 5 pounds. Do the exercises daily for the first week, and then decrease to every other day when using ankle weights.

**Days per week: 5 Times per day: 1-2**

Quadriceps Sets	1-2 sets of 15-20 reps
Heel prop	5 minutes
Heel slides with towel assist	1 set of 5 to 15 minutes
Straight leg raises	1-2 sets of 15-20 reps
Short arc lift	3 sets of 10
Standing Hamstring Curl to 45 degrees	3 sets of 10
Standing toe-raises	3 sets of 10
prone hip extension	3 sets of 15
Hip abduction	3 sets of 10
Wall Slides	3 sets of 10

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**STANDING HAMSTRING CURLS**-Stand facing the wall, using the wall for balance and support. While standing on the non operative limb, bend the knee of the operated side and raise the heel toward the buttock only to 45 degrees. Hold this flexed position for one second. Slowly lower the foot back to the floor. Keep the thighs aligned as illustrated.



### **WALL SLIDES**

Stand upright with your back and buttocks touching a wall. Place the feet about 12 inches apart and about 6 inches from the wall. Slowly lower your hips by bending the knees and slide down the wall until the knees are flexed about 45 degrees (illustration). Pause five seconds and then slowly slide back up to the upright starting position.



**OFFICE VISIT**-Please return to Dr. Nelson's office approximately 12 weeks after your surgery.

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## Posterior Cruciate Ligament Rehabilitation Protocol

**PHASE 4:** 12 to 16 weeks after surgery

### Goals:

1. Protect the reconstruction; avoid falling.
2. Maintain full knee extension.
3. Attain full knee flexion.
4. Walk with a normal heel-toe gait with no limp.
5. Muscle strength and conditioning improvements.

### Activity

**Brace / Crutches-** The brace and crutches are usually discontinued after you see the doctor at your 6-week post-operative office visit. Concentrate on walking with a heel-toe gait without a limp.

**Cryocuff-** Continue to use the cryocuff or Ice bags, as needed, for 20 minutes after each workout.

**Knee Support** -Buy an elastic knee sleeve (made of neoprene rubber) at a sporting goods store. It should have an opening for the kneecap and velcro straps but does not need hinges on the sides. Use this support if you are on your feet for a prolonged period of time.

**Stationary Bicycle** -Continue to use daily for 20-30 minutes

**Swimming** -You may begin swimming at this time, if available, using only the flutter kick and doing the freestyle and backstroke. Do not swim breast-stroke, butterfly or side-stroke yet. Swimming with a kick-board is safe as long as the flutter-kick is used. You can swim up to 15 to 20 minutes, 3 to 4 times per week.

### Exercises

Days per week: 3 to 5 Times per day: 1

Quadriceps Sets	1-2 sets of 15-20 reps
Heel prop	5 minutes
Heel slides	1 set of 5 to 15 minutes
Straight leg raises	1-2 sets of 15-20 reps
Short arc lift	3 sets of 10
Standing Hamstring Curl to 45 degrees	3 sets of 10
Standing toe-raises single leg	3 sets of 10
prone hip extension	3 sets of 15
Hip abduction	3 sets of 10
Wall Slides	3 sets of 10

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Single leg strength progression	see timeline
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**Stretching Exercises**

Days per week 5-7 Time per day 1

Hamstring stretch	3-5 reps holding 15-30 seconds
Quadriceps stretch	3-5 reps holding 15-30 seconds
Calf Stretch	3-5 reps holding 15-30 seconds

**Hamstring Stretch**

Perform this stretch against a table or chair. Bend slowly forward at the hips, keeping the knee fully extended until you feel gentle stretch in the back of your thigh and knee. Hold the stretch for 15 to 20 seconds and repeat 3 to 5 times.

**Quadriceps Stretch**

This stretch is performed on your stomach or standing. Lean gently backward as if bringing you heel toward the buttock. When a stretch is felt in the front of the thigh and knee, hold 15 to 20 seconds for 3 to 5 repetitions.

**Calf/Achilles Stretch**

Keep the heel flat on the floor and the knee fully extended. Lean forward at the hips with the arms supporting your weight. When you feel a gentle stretch in the back of your calf and knee, hold for 15 to 20 seconds, 3 to 5 repetitions.

**Optional Additional Weight Training**

Days per week: 2-3                      Times per day: 1                      3 sets of 20 reps

- Seated leg press
- Hamstring curl
- Hip abductor/adductor machine
- Roman chair
- Calf raise machine
- Hip flexor machine

**SINGLE LEG STRENGTHENING PROGRESSION**

At this time, it is important to begin the development of single-leg strength. Begin to follow the “Progression for Single Leg Strengthening ” included in this packet if you are able to do the exercises without pain. The instructions estimate a time period of 10 to 12 weeks for you to progress through the whole program. This time line will vary for different people and knees,

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depending upon the presence of other knee problems. Again, limit flexion of the knee to 60 degrees or less during these exercises.

#### Precautions When Exercising

- Avoid pain at the surgical incision site
- Avoid pain and/or crepitus at the patella

**-When using a leg press machine, squatting or doing wall slides, limit the flexion of the knee to 60 degrees or less to avoid over stressing the PCL graft.**

- Build up resistance and repetitions gradually
- Perform exercises slowly avoiding quick direction change and impact loading
- Exercise frequency should be 2 to 3 times a week for strength building
- Be consistent and regular with the exercise schedule

#### Principles of Strength Training

- Warm-up prior to exercising by stationary cycling or other means
- You are “warmed –up” when you have started sweating
- Gently stretch all muscle groups next
- Do exercises involving multiple muscle groups first and individual muscle groups last
- Do aerobic workouts after strength workouts -Cool-down by stretching after finishing exercise

**DO NOT** do any of the following exercises:

1. Knee extension using a weight lifting machine
2. Resisted Hamstring curls or hamstring weight machine
3. Lunges
4. Step exercises with impact
5. Running sprint until progressed
6. Jumping
7. Pivoting or cutting

#### **OFFICE VISIT**

Please make an appointment to see Dr. Nelson at six months after surgery.

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## **Posterior Cruciate Ligament Rehabilitation Protocol**

**Phase 5:** from the 16<sup>th</sup> week onward

**Goals:**

1. Regain full muscle strength.
2. Work on cardiovascular conditioning.
3. Do sports-specific training.

**ACTIVITIES**

**Muscle-Strengthening Exercises**

You should continue muscle-strengthening exercises from Phases 2 and 3 three times a week. You can now decrease the number of repetitions per set from 15 to 10. This will allow you to work with heavier weights. Remember to do all exercises slowly with good form. Weights can be increased when you can do a particular weight easily for 3 sets of ten repetitions for 3 consecutive workouts.

**Cardiovascular Conditioning**

Use Nordic track, stationary bicycle, rowing machine or swimming workouts to build cardiovascular fitness. Three to five times per week for 20 to 30 minutes is sufficient for improvement in conditioning. Excessively long duration cardiovascular exercise can retard or delay muscular strength development. Strength improvement and gains in muscle size are your primary goals at this time.

**Sports-Specific Training**

To reach your ultimate goal of returning to sports participation, you must follow an orderly sequence of drills which are designed to re-train coordination that is necessary to provide the proper control of your knee. The following time-table gives an approximate sequence for returning to activities:

<b>Sport</b>	<b>Months Post-Operative</b>
Golf	4-5
Running	5
Tennis	6
Sprinting	6
Running with quick starts and stops	7
Backward running	7
Circle running	7
Carioca	7-8
hopping and jump training	8-9
quick pivoting and cutting	8-9
Full return to sport	9

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#### Progressive Resistance Exercise (PRE) Principle

- To build muscle strength and size, the amount of resistance used must be gradually increased.
- The exercises should be specific to the target muscles
- The amount of resistance should be measurable and gradually increased over a longer period of time
- To avoid excess overload and injury, the weight or resistance must be gradually increased in increments of 5-10%
- Resistance can be increased gradually every 10-14 days when following a regular and consistent program
- Adequate rest and muscle recovery between workout is necessary to maximize the benefit of the exercise
- If the PRE principle is followed too strictly, the weights potentially will go higher and higher
- At a certain point, the joints and muscles will become overloaded and injury will occur.
- This eventuality can be avoided by refraining from using excessive weight during strength training.

#### **Basic Knee Strengthening Program (weeks 18 to 24)**

Frequency 2-3 times per week

Sets: 3    Reps per set: 10-15

—Emphasis is to build muscle strength using BOTH legs

—Progress according to the PRE principle

#### Basic Program Exercises-

- Leg press
- standing hamstring curl with ankle weights
- wall slides (hold dumbbells for resistance)
- Roman Chair (strengthens hamstrings)
- Chair squats (hold dumbbells for resistance)
- Calf Raises
- Hip abductor/Adductor machine
- Step UP/Down Progression

In general, the basic knee program is good for most people who active recreationally, but who do not participate in running and jumping sports. For people who will participate in running and jumping sports, the following Advanced knee strengthening program can be used to develop a higher level of knee strength.

#### **Advanced Knee Strengthening Program (Week 24 onward)**

Frequency 2-3 times per week

Sets: 3    Reps per set: 10-15

—Emphasis is to continue to build muscle strength using both legs and progress to Advanced Exercises using the Single Leg.

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—Advanced single leg exercises are integrated with the exercises from the Basic Knee Strengthening Program

The following single leg drills are integrated into the workout on a rotating basis:

- Step Up/Down
- Single leg wall slide
- Single leg squat

So that the Advanced Knee Strengthening Program would be as follows:

- Leg Press
- Hamstring curl machine (limit knee flexion to 60 degrees)
- wall slides (hold dumbbells for resistance)
- Roman Chair (strengthens hamstrings)
- Chair squats (hold dumbbells for resistance)
- Calf Raises
- Step UP/Down Progression

Alternate workouts with single leg wall slide and single leg squat

—When starting the new single leg drills, start with 3 sets of 5 and add one rep per set, per workout until you can do 3 sets of 10.

—When 3 sets of 10 are achieved easy and pain free, then you can hold the dumbbells to increase resistance and strength.

Once these have been achieved. Sports specific drills can be added at the discretion of the therapists or Dr. Nelson

**OFFICE VISIT-** Please set up an appointment to see Dr. Nelson at 9 months post operative prior to clearance to return to sport.

# Dr. Nelson's PCL (Allograft) Rehabilitation Protocol

**Diagnosis:** PCL insufficiency

**Procedure date:**

**WEEK**

**MONTH**

	1	2	3	4	5	6	7	8	9	10	3	4	5	6	
<b>PHASE 1 EXERCISES</b>															
Extension/Flexion sitting prone			•	•	•	•	•	•	•	•		•	•	•	•
Quad sets with straight Leg Raises			•	•	•	•	•	•	•	•					
Hamstring sets			•	•	•	•	•	•	•	•					
Patella Mobs/Quad patellar Tendon			•	•	•	•	•	•	•	•					
Wall slides					•	•	•	•	•	•					
Toe and Heel Raises			•	•	•	•	•	•	•	•		•	•	•	•
<b>MUSCLE STRETCHES</b>															
Sit and Reach for Hamstrings			•	•	•	•	•	•	•	•		•	•	•	•
Lying Rectus			•	•	•	•	•	•	•	•		•	•	•	•
Stork Stand for Quadriceps						•	•	•	•	•		•	•	•	•
Runners stretch for calf and achilles			•	•	•	•	•	•	•	•		•	•	•	•
<b>CARDIOVASCULAR EXERCISES</b>															
Bike with Both Legs			•	•	•	•	•	•	•	•		•	•	•	•
Aquajogging								•	•	•		•	•	•	•
Swimming												•	•	•	•
Eliptical trainer									•	•		•	•	•	•
Rowing								•	•	•		•	•	•	•
Stair Stepper										•		•	•	•	•
Treadmill										•		•	•	•	•
<b>PHASE 2 SPORT CORD EXERCISES</b>															
Double Knee Bends (Knee not over foot)							•	•	•	•		•	•	•	•
Carpet Drags							•	•	•	•		•	•	•	•
Forward Backward Jogging												•	•	•	
Side to side agilities												•	•	•	
<b>PHASE 3 WEIGHTS</b>															
Leg press down to 90 degrees				•	•	•	•	•	•	•		•	•	•	•
Leg Curls				•	•	•	•	•	•	•		•	•	•	•
Ab/Adduction				•	•	•	•	•	•	•		•	•	•	•
Balance squats							•	•	•	•		•	•	•	•
Knee Extension Pain free Arc				•	•	•	•	•	•	•		•	•	•	•
<b>NO LUNGES</b>															
<b>PHASE 4 HIGH LEVEL EXERCISES</b>															
Biking Outdoors												•	•	•	
Rollerblading												•	•	•	
Running												•	•	•	
Skiing, basketball, Tennis, football, soccer															+
Golf												•	•	•	
Agility Exercises															+
Trail Riding												•	•	•	

**\*Weight bearing:** Touch down (1/6 body weight) with brace locked in extension WB weeks 0-2 post-op

PWB (50% body weight) with crutches weeks 2-6 post-op -> WBAT >6wks post op

**\*Brace:** Hinged knee brace (set for 0-30 degrees) weeks 0-2 post-op (locked in extension for ambulation, 0-6wks)

Brace set for 0-60 weeks 2-4, 0-90 weeks 4-6

**Additional Instructions:**