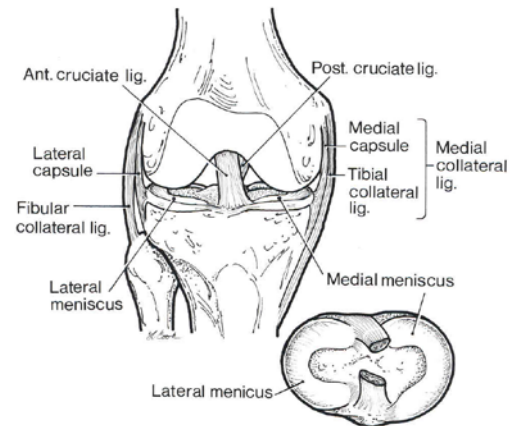


## ACTIVITIES AND EXERCISES AFTER INJURY TO THE MEDIAL COLLATERAL LIGAMENT (MCL) OF THE KNEE

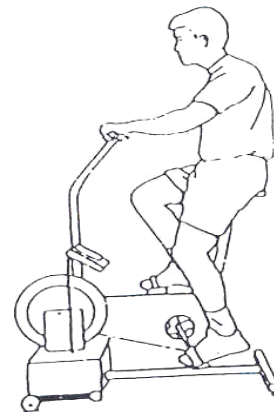
### PHASE 1: THE FIRST SIX WEEKS AFTER INJURY (grade 2 and 3) THREE WEEKS AFTER INJURY (grade 1)

The knee should be to be protected with a hinged brace for 3 to 6 weeks, depending upon the severity of the injury. Crutches and restricted weight bearing may be needed, as instructed by Dr. Gill. Apply ice to control swelling. Elevate the leg and use elastic stockings if the leg is swollen. As the pain lessens and the swelling decreases, try to gradually regain knee motion. Avoid pivoting or twisting the knee because it might be unstable and give out. Be careful getting out of cars, or catching your toe on a rug. When walking, bear weight according to Dr. Gill's instructions. Progress to no crutch(es) or brace when you can walk without a limp and there is no pain (per doctor instructions). Ice the knee if there is pain and swelling. Place a towel or cloth between the skin and the ice to prevent skin injury. Ice for 20 minutes, three times a day. At about two or three weeks following injury, the pain is usually subsiding and the swelling is lessened. You can now try to stretch the knee to regain motion. Stationary cycle, swimming (flutter kick only) and the following exercise program are recommended.



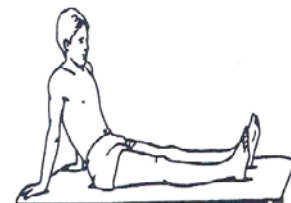
### STATIONARY BICYCLE

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. Most people are able to achieve a full cycle revolution backwards first, followed by forward. You may ride the cycle with no resistance for 20 to 30 minutes 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 ride the bicycle with your forefoot resting on the pedal.



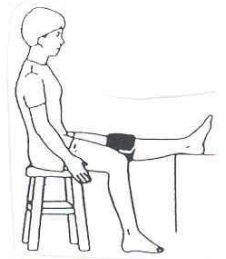
### QUADRICEPS SETTING

To maintain tone in the thigh (quadriceps) muscles and straighten the knee, lie on your back with the knee extended fully straight as in the figure. Contract and hold the front thigh muscles (quadriceps) making knee flat and straight. If done correctly, the kneecap will slide slightly upward toward the thigh muscles. The tightening action of the quadriceps muscles should make your knee straighten and be pushed flat against the bed or floor. Hold five seconds for each contraction. Do at least 20 repetitions three or four times a day until you can fully straighten your knee equal to the uninjured side.



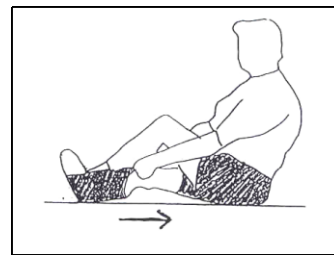
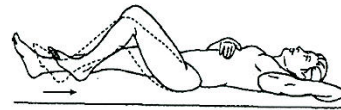
**HEEL PROP**- to straighten (extend) the knee.

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.**



**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 five seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight, you may repeat the quadriceps setting exercise. Continue this exercise until you can fully bend your knee equal to the uninjured side. Also, as you start to gain flexion, you can assist your efforts to gain flexion by assisting the heel slide with a towel. See illustration. Repeat 20 times, three times a day.



You can advance to the following exercise program to help you regain knee motion and strength. If the exercises can be performed easily after the first week, then an ankle weight may be used to increase the resistance of the exercise and to build strength. Start with one pound and add one pound per week until you reach five pounds. Do the exercises daily for the first week, then decrease to every other day when using ankle weights. You may ride the stationary bicycle daily for 10 to 20 minutes. Avoid using stair-stepper machines, doing deep knee bends and squats or any exercise that causes crunching, clicking or pain at the kneecap.

### **STANDING HAMSTRING CURL**

Stand facing a table, using the table for balance and support. While standing on the unoperated limb bend the knee of the operated side and raise the heel toward the buttock. Hold this flexed position for one second. Slowly lower the foot back to the floor. Keep the thighs aligned as illustrated. Repeat 20 times.



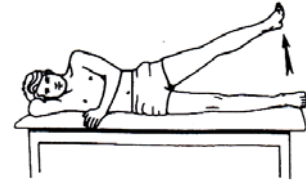
### **STANDING TOE RAISE**

Stand facing a table, hands on the table 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. Repeat 20 times.



### HIP ABDUCTION

Lie on your uninjured 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. Repeat 20 times.



### 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. Do 3 sets of 10 to 15 repetitions.



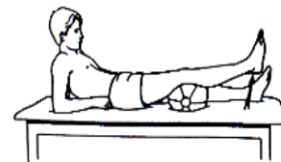
### STRAIGHT LEG LIFT

Tighten the quadriceps muscle so that the knee is flat, straight and fully extended. Try to raise the entire operated limb off of the floor or bed. If you are able to keep the knee straight raise the limb to about 45 degrees, pause one second and then lower slowly to the bed. Relax and repeat. If the knee bends when you attempt to lift the limb off of the bed, **do not** do this exercise. Keep trying to do the quadriceps setting exercise until you can lift the limb without letting the knee bend. Repeat 20 times.



### SHORT ARC LIFT

With the knee bent over a rolled up towel or blanket, lift the foot so that the knee fully straightens. Hold the knee locked in extension for five seconds, then slowly lower. Repeat 20 times.



You can view a video clip of most of the listed exercises by going to the Boston Sports Medicine and Research Institute website: <http://www.bostonsportsmedicine.com/therapy>

## **ACTIVITIES AND EXERCISES AFTER INJURY TO THE MEDIAL COLLATERAL LIGAMENT (MCL) OF THE KNEE**

### **PHASE 2: SIX WEEKS AFTER INJURY ONWARD (grade 2 and 3) THREE WEEKS AFTER INJURY ONWARD (grade 1)**

This handout is to help you rebuild the strength of the knee muscles after injury to the MCL of the knee. It is intended as a guideline to help you organize a structured approach to strengthen the knee.

#### **Precautions When Exercising:**

- Avoid pain at the patellar tendon
- Avoid pain and/or crepitus (grinding) at the patella (kneecap)
- 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

#### **Before Starting Your Workout**

- Warm-up prior to exercising by stationary cycling, elliptical machine or treadmill walking uphill
- You are “warmed –up” when you have started sweating
- Gently stretch all muscle groups next (see attachment for recommended stretches)
- 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

#### **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 to 10 %
- Resistance can be increased gradually every 10 to 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**

- Frequency: 2 to 3 Times per week
- Sets: 3
- Repetitions per set: 10-15
- Emphasis is to build muscle strength using BOTH legs
- Progress according to the PRE principle

### Basic Program Exercises- see illustrations attached.

- Leg Press
- Hamstring Curl
- Wall Slides
- Roman Chair
- Chair Squat
- Calf Raises
- Hip Abductor/Adductor machine
- Step Up/Down (see attachment for progression)

If you do not have access to gym equipment, the following exercises can be substituted using ankle weights (see illustrations attached):

- Straight leg raise
- Short-arc lift
- Side lying abduction
- Standing hamstring curl
- Toe raises

In General, the Basic Knee Strengthening Program is good for most people who are 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**

- Frequency: 2 to 3 Times per week
- Sets: 3

- Repetitions per set: 10
- Emphasis is to continue to build muscle strength using both legs and progress to Advanced Exercises using the Single leg.
- 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 (see attachment for progression of single leg drills)

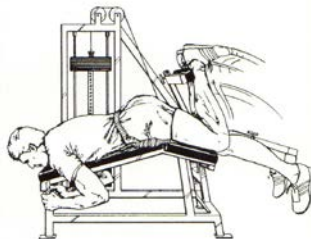
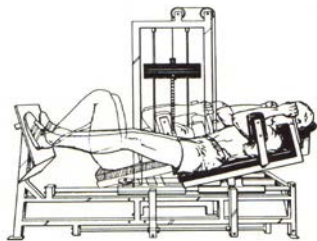
So that the Advanced Knee Strengthening Program would be as follows:

- Leg Press
- Hamstring Curl
- Wall Slides
- Roman Chair
- Chair Squat
- Calf Raises
- Step up/down
- 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 repetition per set, per workout until you can do 3 sets of 10.
- When 3 sets of 10 are easy and pain free, then you can hold dumbbells to increase resistance and strength.

### **PRECAUTIONS**

The following exercises are known to cause injury to the knee and are **NOT** recommended:

- Leg extension machine (quadriceps extensions)
- Stairmaster or stair climber machines
- Lunges
- Squats past 90 degrees of knee flexion
- High Impact and plyometric exercises





Leg Press

Hamstring Curl

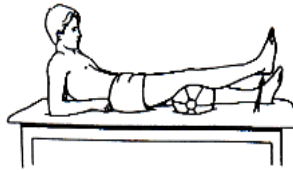
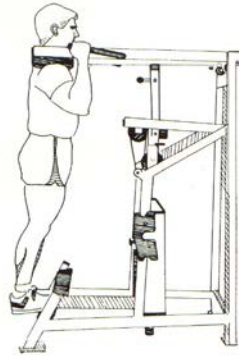
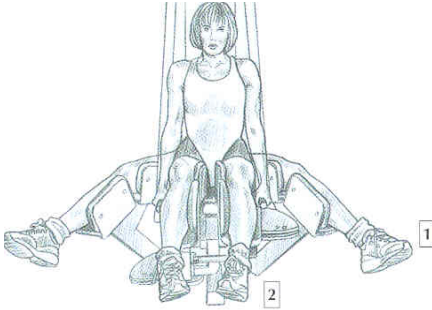
Knee Extension

Wall slide

Abductor-Adductor  
Chair

Calf Raise

Roman

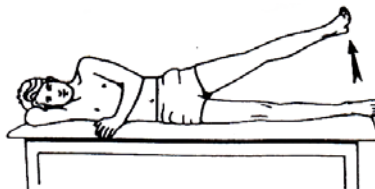


Straight leg lift

Short arc lift

Standing hamstring curl

Chair squat

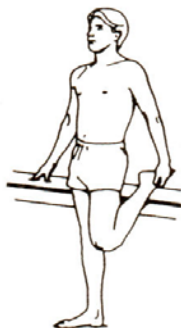


Side leg lift

Quadriceps stretch

Hamstring stretch

ITB stretch



## Progression for Single Leg Strengthening

### Step Up-Down exercise

Start with a step of 3 inches in height

Start with 3 sets of 5 repetitions

Add one repetition per set, per workout, until you can do  
3 sets of 10 ( about 2 weeks)

If pain free, progress to a step of 6 inches in height

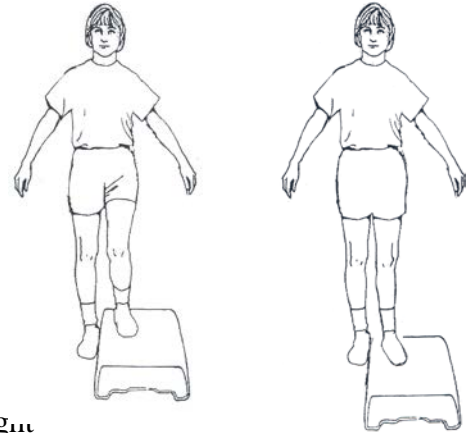
Repeat progression starting with 3 sets of 5 repetitions

Add one repetition per set until you can do

3 set of 10 (about 2 weeks)

If pain free, progress to a step of 9 inches in height (the height  
of a standard stair)

Repeat process of progression from 3 sets of 5, to 3sets of 10 (about 2 weeks)



At this point, you can begin to add the single leg wall slide exercise. The strength workouts should be practiced 3 times a week (every other day).

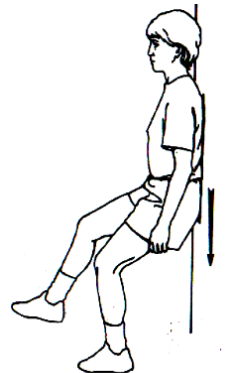
### Single Leg Wall Slide

Start with 3 sets of 5 repetitions

Add one repetition per set, per workout, until you can do 3 sets of 10  
(about 2 weeks minimum)

At this point, you can begin to add the single leg squat exercise.

The strength workouts should continue every other day at the most, with  
more time between workouts if the knee gets sore after a session. Continue  
doing the step-up exercise each workout. Alternate the workouts between the  
single leg wall slide and the single leg squat, e.g.,



Monday      Single leg squat  
Wednesday   Single leg wall slides  
Friday        Single leg squat

### Single Leg Squat

Start with 3 sets of 5 repetitions

Add one repetition per set, per workout, until you can do 3 sets of 10  
( about 2 weeks minimum).





After working up to the point where you can do 3 sets of ten of all three drills, you can hold dumbbells to add resistance. Start with 3 pounds in each hand and add 1 to 2 pounds a week until you reach 10 pounds in each hand. As you get stronger and gain better control of you leg muscles, try not to hold onto anything for balance.

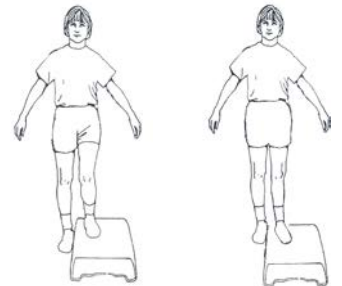
When you return to sports or recreational activities, decrease the strength workouts to 2 times a week and do 1 set of 10 of each of the three drills only, as a maintenance workout.



## Instructions for Single Leg Exercises

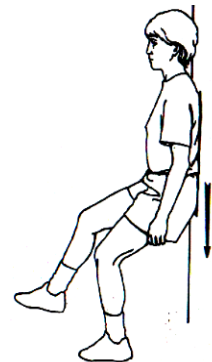
### Step Up- Down Exercise

Place the foot of the operated limb on the stool. Maintain balance, if necessary, by holding onto the wall or chair (illustration). Standing **sideways** to the step, slowly step up onto the stool and slowly straighten the knee using the quadriceps muscles. Slowly lower the opposite foot to touch the floor. Do not land on the floor, just touch gently and repeat the step up.



### Single Leg Wall Slide Exercise

Stand on the single leg with your back and buttocks touching a wall. Place the foot about 6 inches from the wall. Slowly lower your body by bending the knee and slide down the wall until the knee is flexed about 45 degrees (illustration). Pause five seconds and then slowly slide back up to the upright starting position. Keep the hips level and be sure you are using your knee muscles to perform the exercise.



## **Return to Sports Running Progression after Injury to the Medial Collateral Ligament (MCL) of the Knee**

### **Goals:**

1. Safely recondition the knee for the demands of sports activity.
2. Provide a logical sequence of progressive drills for pre-sports conditioning
3. Provide objective criteria for safe return to sports.

### **Sports Specific Training**

**Phases of Training**    Straight-ahead running phase  
                                  Direction change running phase  
                                  Unrestricted direction change and impact phase

**Prerequisites**        Full Range of Motion  
                                  Strength at least 80 % of uninjured limb  
                                  Thigh girth within ½ inch of unaffected limb  
                                  No tenderness at the graft harvest site  
                                  Symmetrical quadriceps and hamstring flexibility  
                                  Perform and pass functional tests

### **Functional Tests**

Before starting the **running sequence** you must be able to:

1. Hop forward on both legs at least 2 feet
2. Hop to either side at least 1 foot
3. Hop up and down on both feet 10 times
4. Jog with no limp for 100 feet

Before starting **unrestricted direction change and impact training** you must be able to:

1. Hop forward on the affected limb for at least 80% of the distance of the unaffected side.
2. Hop to either side for 80% of the distance of the unaffected limb
3. Hop up and down on the operated limb 10 times with no pain

### **Warm-up and Stretch and Ice**

**Be careful to be sure that you warm-up well and stretch lightly before workouts, and stretch well again after workouts.** Generally, you should do some walking, cycling

or jogging so that you break a sweat before starting the running program. You should **then** stretch **before** beginning the running drills. Ice your knee for 20 minutes following workouts after stretching again as you are cooling down.

### **The criteria to progress**

Do not progress to the next step in the progression until the present step is pain free, without swelling.

### **Frequency:**

2 or 3 times per week. Repeats can be skipped, on occasion, if the running causes no problems.

### **Phase 1 Straight Ahead Running**

- DAY 1 Run ½ speed 100 yards, 10 repetitions
- 2 No Run
- 3 Repeat Day 1
- 4 Run ¾ speed 100 yards, 10 repetitions
- 5 No Run
- 6 Repeat Day 6
- 7 No Run
- 8 Run ½ speed, 100 yards, 3 repetitions
- Run ¾ speed, 100 yards, 3 repetitions
- Run full-speed, 50 yards, 4 repetitions
- 9 No Run
- 10-27 Continue workout from Day 12, adding one 50 yard run each workout until you can do (10) 50 yard full speed runs.

### **Phase 2 Basic Direction Change Running**

- DAY 28 Continue 100 yard run ½ speed, 2 repetitions; ¾ speed, 2 repetitions; full speed, 2 repetitions
- Start zig-zag run, round corners, 50 yards, 5 repetitions
- 29 No Run
- 30 Repeat Day 1
- 31 No Run
- 32 Repeat Day 1, add backward run 25 to gradual stop, then forward run 25 yards to gradual stop, 5 repetitions
- 33 No Run
- 34 Repeat Day 5
- 35 No Run
- 36 Repeat Day 7, add circle run, 20 foot or greater diameter circle, 3 repetitions to left and 3 reps to right.

- 37 No run
- 38 Repeat Day 9
- 39 No Run
- 40 Repeat Day 11, add figure of eight run, 20 foot or greater length, 5 repetitions
- 41 No Run
- 42 Carioca, 50 yards, 5 repetitions left, 5 repetitions right

Phase 3 *Unrestricted Direction Change Running*

Current workout:

100yd  $\frac{1}{2}$  speed,  $\frac{3}{4}$  speed and full speed each distance 2 repetitions  
zig-zag run 5 repetitions  
forward backward run 5 repetitions  
circle run 6 repetitions  
figure 8 runs 5 repetitions  
carioca 5 repetitions each way

- 43 No run
- 44 Continue Current Workout above and Add:  
Shuttle run, 50 yards, direction change every 10 yards, 5 repetitions, alternate hands touching.
- 45 No run
- 46 Repeat Day 42
- 47 No Run
- 48 Repeat day 42
- 49 No run
- 50 Repeat day 42 and add Box drill, 20 yards square, 6 repetitions, alternate starting side.
- 51 No run
- 52 Repeat day 48
- 53 No run
- 54 Repeat day 48
- 55 No run
- 56 Repeat day 48 and add agility run, 5 repetitions, alternate starting side.
- 57 No run
- 58 Repeat day 54
- 59 No run
- 60 Repeat day 54
- 61 No run
- 62 Repeat day 54



Final workout:

100yd ½ speed, ¾ speed and full speed each distance 2 repetitions

zig-zag run 5 repetitions

forward backward run 5 repetitions

circle run 6 repetitions

figure 8 runs 5 repetitions

carioca 5 repetitions each way

Shuttle run, 50 yards, direction change every 10 yards, 5 repetitions, alternate hands touching.

Box drill, 20 yards square, 6 repetitions, alternate starting side.

Agility run, 5 repetitions, alternate starting side

*Phase 4 Return to Sports Practice. Days 60 to 90*

Do 1 to 2 repetitions of each drill of final workout to warm-up before practice.

*Phase 5 Return to Sports Competition, Day 90 onward.*