



# Post Op **PATELLAR** Stabilization **REHABILITATION PROTOCOL**

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# PATELLAR INSTABILITY

P

atellar **DISLOCATION** is a condition that occurs when the kneecap **completely** moves out of its normal position.

Patellar **SUBLUXATION** happens when the kneecap **partially** moves out of its normal position. Patients who have patellar instability may experience patellar subluxation and/or patellar dislocation.

The knee joint is made up of three bones – the long bone of the thigh (femur), the shin bone (tibia) and the knee cap (patella). The patella (knee cap) is situated at the front of the knee and lies within a groove at the front of the thigh bone which is known as the trochlear groove. The tendon of the quadriceps muscle (the muscle at the front of the thigh) envelops

the patella and attaches to the top end of the tibia. The surfaces of all these bones are covered with cartilage (articular cartilage) and this allows for cushioning between the bones. The relationship of the patella and femur is referred to as the patellofemoral joint.

The patella also has strong bands of soft tissue known as the patella retinaculum and they attach the patella on either side of the femur. Normally, the patella is aligned in the middle of the patellofemoral joint and is held firmly in place by the quadriceps muscle and patella retinaculum.

Patellar instability may be caused by traumatic and atraumatic events. Patellar dislocations typically occur in a lateral direction (towards the outside of your knee). When a dislocation occurs, there may be tearing of the soft tissues on the inner side of the patella. Furthermore, there may be damage to the joint surfaces and occasionally there may be an

associated fracture.

In many cases of patellar dislocation, the patella spontaneously moves back into its original position when the knee is straightened. Often with knee extension (i.e. straightening of the knee).

**Causes of patellar dislocation**

Patellar dislocation typically occurs when the forces pushing the knee cap out of its normal position are greater than the quadriceps muscle and patella retinaculum can resist. This typically occurs traumatically due to excessive twisting or jumping forces or due to a direct blow (usually to the inner aspect of the patella). Occasionally however, it may occur in the absence of trauma especially in young girls who are hyper-flexible. Patients with this condition are frequently seen in contact sports or sports requiring rapid changes in direction such as football or rugby.

*The following rehabilitation guideline is intended as a guide and does not represent a fully inclusive list of all interventions that can be used in the rehabilitation process. The therapist should use their clinical experience/judgment to help guide their patient through their recovery, consulting with the referring physician should questions arise.*



## YOUNG ATHLETES

suffer patellar dislocations more commonly than any other age group. Patients most at risk for patellar instability are 12 - 20 years of age.

**T**

**the Patellofemoral  
Post Operative  
Rehabilitation  
Protocol** is designed  
to serve as a

guideline to assist the patient and the physiotherapist in terms of understanding the principles in the post-operative treatment of patients who undergo a surgical procedure to stabilize their patellofemoral joint.

Please ensure that you have read the **Patellar Instability Education**

**Magazine** before proceeding with patellar stabilization surgery. In this document, there is a section that contains "**Frequently Asked Questions**". In addition, please refer to the **Surgical Checklist** section which is at the end of the document to ensure that you are prepared for your surgical procedure.

It is important to understand that there are a variety of procedures to stabilize the patellofemoral joint.

Some patients require a proximal

only procedure while other patients require a distal procedure (Tibial Tubercle Transfer - **TTT**). There are some patients who require both a proximal **and** a distal procedure to treat their patellar instability. The rehabilitation protocol for patients requiring a distal procedure (Tibial Tubercle Transfer - **TTT**) is different initially as these patients need to heal their tibial tubercle osteotomy before they stress their knee too much. Furthermore, it is important





# Patellar Instability

## Rehabilitation

**“THE GOALS OF SURGICAL TREATMENT ARE TO HAVE A STABLE PATELLOFEMORAL JOINT AND TO RESTORE NORMAL STRENGTH AND FUNCTION IN THE KNEE JOINT.”**

to understand that patient's may progress through the rehabilitation protocol at different paces. In order to progress through each phase of the rehabilitation protocol, you should **meet the criteria** in that phase before you progress to the next phase of the rehabilitation program.

**Outcomes/Expectations:** It may take nine months to a year to “recover” from patellar instability surgery. There is a significant commitment required to follow the rehabilitation guidelines

in order to achieve maximal benefit from this surgery.

The following rehabilitation guideline is designed for patients who have undergone a patellar stabilization procedure. **PHASE 1** starts with the initial post-operative period and provides a lot of information on immediate post-operative care. It then progresses to **PHASE 2** which focuses on early strength training and regaining knee range of motion. **PHASE 3** continues to work on

strength exercises and balance exercises are initiated. **PHASE 4** focuses on agility and plyometric drills as well as sports specific retraining. It further emphasizes strength and neuromuscular control exercises.

# PHASE ONE

EARLY POST-OPERATIVE PERIOD

Weeks 0 - 2

## Goals:

- Control Pain and Swelling
- Achieve and Maintain Full Passive Extension
- Prevent shutdown of quadriceps muscles
- Gait Training
- Protect Reconstruction

**CONTROL PAIN:** You will be sent home with a prescription for a strong narcotic medication. You should take this for severe pain, as directed on the prescription bottle label. *If you had a femoral nerve block and have not taken any narcotic medication, you may want to take the prescribed dose before you go to bed as there is a possibility that you may wake up with significant pain when the nerve block wears off.* Most patients take the narcotic medication fairly regularly for 2 -3 days and then wean off this medication. For the first few days, you may also find it beneficial to take an anti-inflammatory such Ibuprofen 400 mgs every 6 hours (as long as you don't have any contraindications to taking this medicine) **AND** Tylenol (Acetaminophen) Extra Strength 2 pills every 6 hours (as long as you are **not** taking a medicine with Tylenol in it like Tylenol with Codeine or Percocet which also contains Acetaminophen). Taking this combination of medication regularly for the first few days after surgery will help control your pain and typically patients will not require as much narcotic medication after surgery.

**CONTROL SWELLING:** Following discharge from the hospital you should go home elevate your leg and regularly apply ice to the knee (5 times per day for 20 minutes at a time). *Do not put ice packs directly on the skin as this may cause damage to the skin.* If you purchased or rented a Cold Therapy Unit, please use this unit as directed by the manufacturer. You may get up as tolerated. As your pain and swelling decrease you can start to move around more and spend more time up on your crutches. Applying ice, gel packs or using the Cold Therapy Unit are very effective ways to reduce pain, swelling, inflammation and narcotic use.

**BLOOD CLOT PREVENTION:** If you have a personal or family history of blood clots, you need to let the surgeon know **before your surgery**. If you are on the birth control pill, are a smoker and/or have an increased BMI, you may want to take one baby Aspirin daily to help thin the blood and possibly reduce the chance of developing a blood clot. You can take



#### ELEVATE & ICE

It is very important to elevate your leg and apply ice or use your cryotherapy device on regular basis to help reduce swelling and control pain

**//** During this phase, the goal is to control pain and swelling. It is important to keep the leg elevated as much as possible. It is also important during this phase to prevent shutdown of the quadriceps muscles by performing the exercises included in this rehabilitation document.

this in addition to the Ibuprofen. It is important to perform calf pumps and move around to help reduce the chance of getting blood clots. If you develop calf pain and/or shortness of breath after surgery, you should go to your nearest Emergency Department.

**STOOL SOFTENER:** While on narcotic medication it is wise to take a

stool softener such as Colace™ (or other stool softener). Take 1 tablet daily with a plenty of water to help ease the risk of constipation after surgery.

#### CARING FOR YOUR KNEE:

You are allowed to put 30% of weight on the leg. Make sure that you wear your long leg post op hinged knee brace whenever you

are up and moving around. Please **DO NOT** put any pillows directly under your knee as this promotes a bent knee position.

You may remove the initial dressing and apply bandaids to the wounds 1 - 2 days after

surgery. Please keep your wounds clean and dry. Try to leave the steri strips in place until your first post-operative visit. You have an absorbable suture under these steri-strips but the ends of this suture will be cut during your first post-op visit. You also have black stitches in the portal sites, which will also be removed. You may shower two

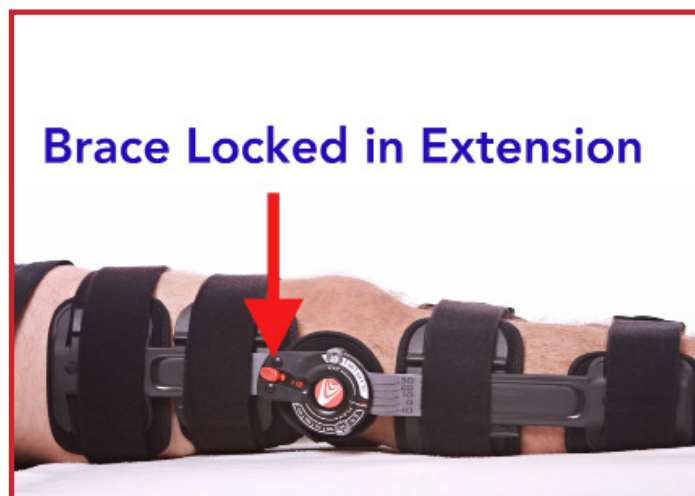
days after surgery as long as you keep your wounds clean and dry. Be careful not to slip, twist, or fall. A stool placed in the shower so you can sit is a great idea so you can stabilize your knee. Do not soak in a bathtub, hot tub, or pool until you are cleared to do so. Once you are done showering pat the wound dry.

You may develop a painful swelling, redness +/- bruising in the *front* of your shin area. This can be very uncomfortable. This is typically not an infection; it is the result of blood tracking down your leg from the surgery. It is known as periostitis. If this occurs, make sure that the brace is not too tight, as the swelling will accumulate between the straps of the brace. You may find it more comfortable to open your brace if you are in a protected environment and apply ice to your shin area to reduce the swelling and pain. It is also important to elevate your leg several times a day to help reduce the swelling. Make sure you take Ibuprofen as outlined above in pain control section. You may also notice an area of skin numbness around your knee or down your leg. Unfortunately, this is one of the risks of having knee surgery. This is due to the cutaneous (skin) nerves that cause the skin numbness. It does not cause any motor weakness or impair the use of your leg. This may or may not improve in the months following surgery.

#### **BRACE:**

Your brace will be locked at zero degrees in the Operating Room.

- **If you have had a TIBIAL TUBERCLE OSTEOTOMY with or without a proximal stabilization (MPFL):** your brace is to remain locked in extension until you are reassessed in the Orthopaedic Clinic post-operatively.
- **If you have had an MPFL RECONSTRUCTION or proximal soft tissue stabilization procedure *WITHOUT* a tibial tubercle osteotomy:** you may unlock your brace 3 - 4 days after surgery and if you are comfortable moving your knee from 0 degrees to 30 degrees, you can change the setting to 0 - 30 degrees on your brace.

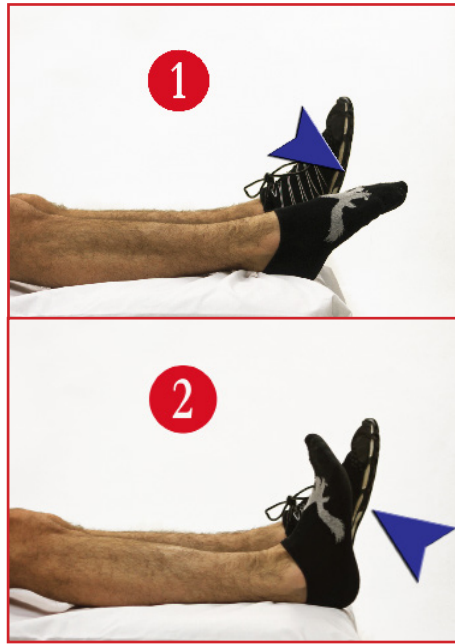
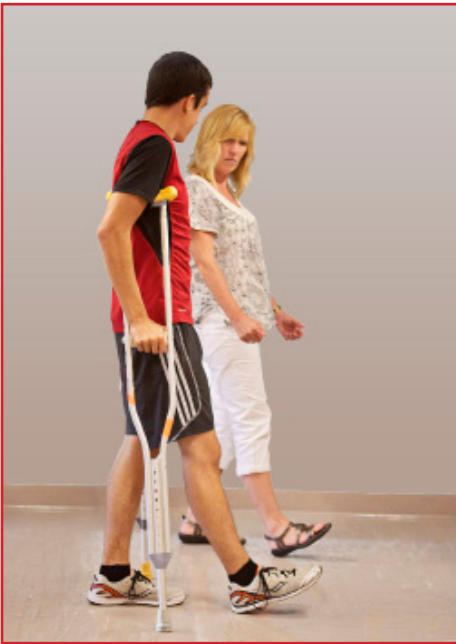


Please follow the specific post-operative settings that have been recommended for you in your post-operative instructions. Please be very careful on uneven ground, slippery surfaces and stairs to minimize falling. You may open or remove the knee brace while doing exercises or if you are in a safe, protected environment. However, the long leg post op hinged knee brace should be worn while sleeping for at least two weeks after surgery. When you are advised, you may transition into your patellar stabilization brace. This brace should be worn regularly for at least 2 months after surgery (not during sleep). It may be recommended that you wear it for high risk activities for 6 - 12 months after your surgery.

**FOLLOW-UP:** A follow-up visit should be scheduled around 2 weeks following your surgery. If you do not have an appointment, please contact the office at (345) 640-6360. During this visit your sutures will be removed, your range of motion will be assessed (especially full extension). Instructions will be provided regarding your weight bearing status as well as your brace settings during this visit.

**PHYSIOTHERAPY:** Rehabilitation after patellar stabilization surgery requires careful monitoring by a physiotherapist. This protocol is not meant as a home exercise program. Each patient should have a discussion with their physiotherapist about how to best utilize the physiotherapy visits that they can afford. Patients will generally need physiotherapy care and guidance for 6 - 12 months post-operatively.





One of the most important goals of this phase is to ensure that you regain your full extension of your knee joint. Please do not place a pillow directly under your knee joint as this will promote a bent knee position in the knee joint. It is also important to walk with a heel to toe gait when ambulating with your crutches.

## CRUTCH Walking

- 1** Please walk with a heel to toe gait using your crutches and your post-operative hinged knee brace. You should aim to put 30% weight on your operative leg unless instructed otherwise. In order to get a sense what 30% of your weight is, place your foot on a scale and place roughly 1/3 of your body weight on your foot. Please aim to walk with a heel-to-toe gait.

## ANKLE Pumps

- 2** The foot and ankle should be actively "pumped" up and down 10-20 times every hour. This will help reduce swelling in your lower leg and may help reduce the risk of blood clots in your leg. It is also helpful in maintaining tone in your lower leg muscles.

## KNEE Extension

- 3** Passive extension of the knee by using a rolled towel under your heel. Note the towel must be high enough to raise the calf and thigh off the table.
  - Remove the knee brace from your knee every 2 - 3 hours while awake. Position the heel on a pillow or rolled blanket with the knee unsupported.
  - Passively let the knee sag into full extension for starting at 1 minute and increase to 5 minutes. Relax your muscles, and gravity will cause the knee to sag into full extension. Do not **hyperextend** your knee.





### ISOMETRIC QUADRICEPS CONTRACTION

This exercise may be performed in a sitting or laying position (1). Tighten the muscles in the front of your thigh (quadriceps) and hold the contraction for 5 - 10 seconds (2). Repeat this six to ten times. Please do these exercises every hour that you are awake. At first, you may have difficulty initiating this isometric contraction but please continue to try to do this exercise and eventually it will become quite easy to perform. This exercise is very important to perform early in your rehab.



### MUSCLE STIMULATION

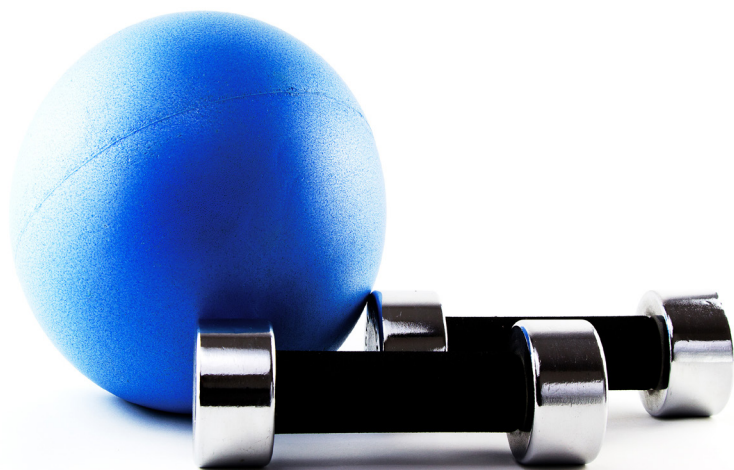
If you have a personal muscle stimulator unit, you may use it as directed by the manufacturer post-operatively. If you do not have one, muscle stimulation will be used during your physiotherapy sessions in addition to other modalities.

**Hip Adduction:** While lying with your knees bent as shown, squeeze a soft ball or a pillow between your knees. Perform exercise 5 - 10 times holding each contraction for 5 seconds. Progress to 30 times holding each contraction for 10 - 15 secs, resting for 5 secs between reps.

**Heel Slides:** While lying, place your good foot in front of your foot on the operative leg and gently bend your knee. Repeat 5 times.

**//** It is extremely important to start activating your quadriceps muscles as quickly as possible after surgery. You may find it difficult to contract your quadriceps muscles initially, but with steady practice, it will return. This should be your main focus during PHASE ONE of your rehabilitation.





## EXERCISES

- You may do hip exercises as tolerated.
- You may do straight leg raises with brace locked in full extension.
- You can also perform resisted ankle exercises using Theraband.



### RETURNING TO SCHOOL/WORK:

1) As far as returning to school, when you are comfortable and you can safely maneuver around, you may return to school. You may need to use an elevator at school initially if this is available. Please be careful on uneven and slippery surfaces.

2) In terms of returning to work, please discuss this with your surgeon. If you need to drive to get to work, you will need to have someone drive you until you are safe to drive on your own. This will depend on which leg is operated on, whether you have a standard or automatic vehicle as well as on your progress with the rehab.

## CRITERIA TO PROGRESS TO PHASE TWO

- Minimal pain to allow for exercise progression
- Full Knee Extension
- Ability to activate quadriceps muscles
- Able to progress to full weight

# PHASE TWO

Initial Strengthening and  
Balance Phase

Weeks 3 - 8

## Goals:

- Control Pain and Swelling
- Progress to full weightbearing
- Quadriceps muscle strengthening, especially VMO
- Gradual range of motion improvement (0 - > 90° by week 6)
- Continue to protect reconstruction

**CONTROL PAIN:** It would be anticipated that you should wean off any narcotic medication by this stage. If necessary, please take an anti-inflammatory medication such as Ibuprofen (Advil, Motrin) 400 mgs every 6 hours (as long as you don't have any contraindications to taking this medicine) and/or Tylenol Extra Strength (Acetaminophen) 2 pills every 6 hours (as long as you are **not** taking a medicine with Tylenol in it such as Tylenol with Codeine or Percocet which also contains Acetaminophen). Do not take above the allowed dosages per 24 hours for these medications. The need to take this medication should diminish significantly.

**CONTROL SWELLING:** It is still important to apply ice regularly or continue to use your Cold Therapy Unit. If you still have significant swelling in your leg, you should continue to elevate your leg. Applying ice or using the Cold Therapy Unit is a very effective way to not only help with swelling but it is also very helpful with pain control.

### CARING FOR YOUR KNEE:

Once you have had your sutures removed, you may shower or bathe in a bathtub and you do not need to cover your wounds. Continue to be very careful not to slip, twist, or fall. If necessary, you may want to continue with a stool placed in the shower so you can sit. Patient who had a tibial tubercle osteotomy need to be especially careful.

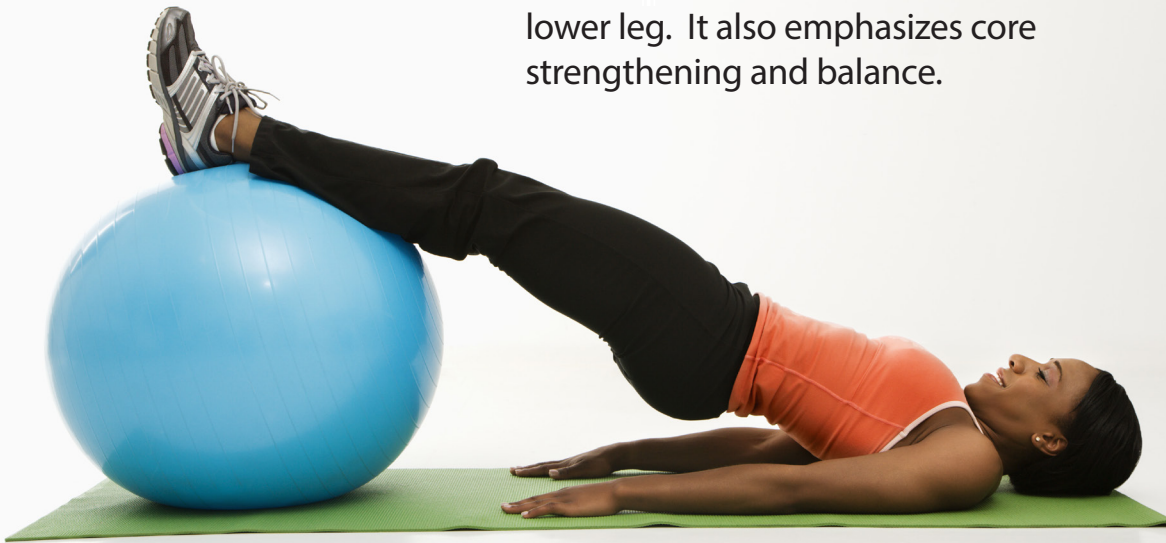
### WEIGHT BEARING:

- **MPFL RECONSTRUCTION / MEDIAL IMBRICATION PATIENTS:** You may progress to full weight bearing with crutches. When you are safe and have good quadriceps control, you may discontinue the use of your crutches.
- **TIBIAL TUBERCLE TRANSFER +/- MPFL RECONSTRUCTION PATIENTS:** You may progress to 50% weight bearing and increase to WBAT over the next 2 - 3 weeks.

In order to stop using crutches, you must be able to walk without a limp while using crutches. Continue to use your crutches until you can fully weight bear and have good quadriceps control.

## Strength & Balance

This phase emphasizes progressive activation of the quadriceps muscles as well as the other muscles in the lower leg. It also emphasizes core strengthening and balance.



### BRACE:

- **MPFL RECONSTRUCTION / MEDIAL IMBRICATION PATIENTS:** You can open your post-op hinged knee brace to 0 - 90 degrees and transition into your patellar stabilization brace whenever you can fit into it.
- **TIBIAL TUBERCLE TRANSFER +/- MPFL RECONSTRUCTION PATIENTS:** PLEASE FOLLOW THE FOLLOWING RECOMMENDATIONS UNLESS ADVISED OTHERWISE:
  - ▶ 0-30 degrees for 1 week
  - ▶ 0-45 degrees for 1 week
  - ▶ 0-60 degrees for 1 - 2 weeks
  - ▶ 0-90 degrees until you can transition into your patellar stabilization brace.

### RANGE OF MOTION:

- **MPFL RECONSTRUCTION / MEDIAL IMBRICATION PATIENTS:** You should aim to achieve at least 60 degrees of knee flexion by 3 - 4 weeks post-operatively and 90 degrees of knee flexion by 6 weeks. It is anticipated that you should have near normal range of motion by 8 - 10S weeks post-operatively.
- **TIBIAL TUBERCLE TRANSFER +/- MPFL RECONSTRUCTION PATIENTS:** Although your brace will be set as outlined above, under the guidance of your physiotherapist, you may remove the brace to gently progress your range of motion as tolerated.

### EXERCISES:

During this phase it will be important that you work on strengthening of your quadriceps, hamstrings and your gluteal muscles. You will also be working on exercises that will help you regain your core strength as well as your proprioception/balance. Please follow the following exercises. *Of note, patients who have had the tibial tubercle transfer osteotomy will progress at a slower rate due to the recovery process involved in having a realignment osteotomy of their patella.*



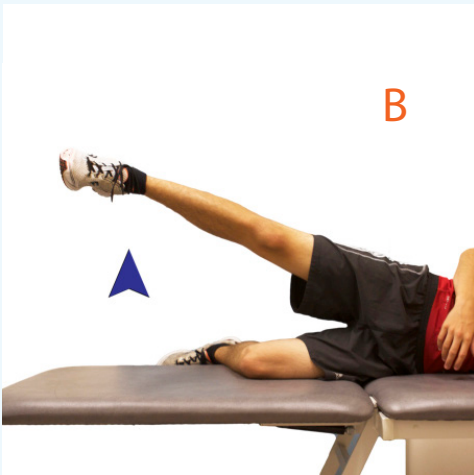
### SITTING PASSIVE KNEE FLEXION:

Sitting with knees flexed to 90 degrees, place your “good leg” foot in front of your operative leg foot. Gently push backwards to passively flex your knee past 90 degrees. Perform this exercise at least 3 - 4 times per day with 5 - 10 repetitions each time.



### SITTING PASSIVE KNEE EXTENSION:

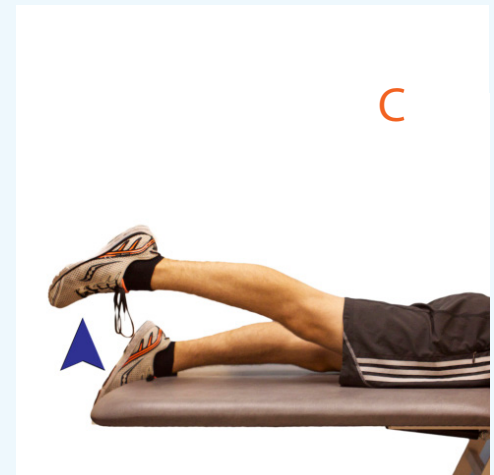
Sitting with knees relaxed. Place your good foot under operative leg (1) and slowly bring your knee into full extension (2). Perform this exercise at least 3 - 4 times per day with 5 - 10 repetitions each time.



### LYING HIP EXERCISES:

- (1) Lying on your side, lift leg upward and hold for 5 seconds.
- (2) Lying on your stomach, lift leg upwards, tightening your gluteal muscles and hold for 5 seconds.

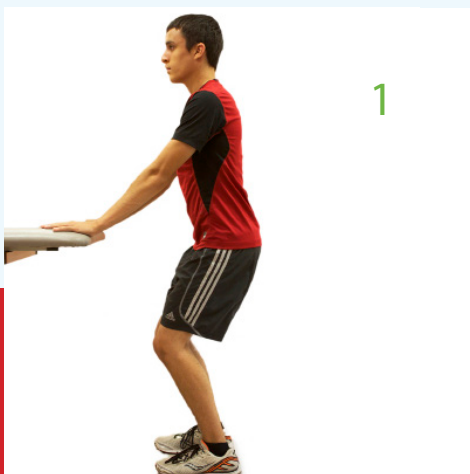
REPEAT BOTH OF THE EXERCISES  
5 - 10 TIMES PER DAY (10 REPS).



### STANDING MINI-SQUATS:

CHOOSE BETWEEN (1) OR (2)

(1) Stand upright with hands supported on a table OR (2) Stand upright against a wall. Tighten your core, gluteal and hamstring muscles. Gently squat down 30 - 45 degrees and hold for 5 seconds. Repeat 5 - 10 times. Do not let your knees extend past your toes.







Elliptical

# PHASE TWO

## STRENGTH & BALANCE

**"** During phase two, the focus is on regaining your range of motion in your knee as well as working on regaining your lower leg strength and balance.

**R**emember to allow pain and swelling to be your guide on how you progress through the rehabilitation process. The rehabilitation phases serve as guidelines for you and you may take longer to achieve the proposed guidelines. It is important to understand that each patient

may progress at a different rate. Furthermore, patients who have had a tibial tubercle transfer will progress through the rehabilitation program slower initially than patients who do not have the tibial tubercle transfer.



T

he exercise bike is one of the safest and most effective ways of building up the muscles in your leg as well as improving your endurance. A recumbent bike might be easier to use initially if you have access to one. You may be only able to partially pedal the bike initially. Keep working on it until you are able to pedal freely. Start with 5 - 10 minutes on the bike with little resistance. As your mobility and strength in your leg improve, you may start increasing the resistance on the exercise bike as well as the amount of time you spend on the bike.

**PRONE HAMSTRING CURL:**

Lying on your stomach, Place a resistance band around your ankle as shown and anchor the other end to the bed. Slowly bend your knee against the resistance of the band by pulling your foot towards your buttock. Do not arch your back when you are doing this exercise. Start with one set or 10 reps and increase to 3 sets of 15 reps.

**GLUTEALS:**

Lying on your back with your arms rested by your side. Squeeze your buttocks and lift them upward off the bed. Use your gluteal muscles to do the work. Support the weight on your shoulders, do not strain your neck. Hold for 5 seconds and then lower. Start with one set of 10 and gradually increase to two sets of 15 repetitions.





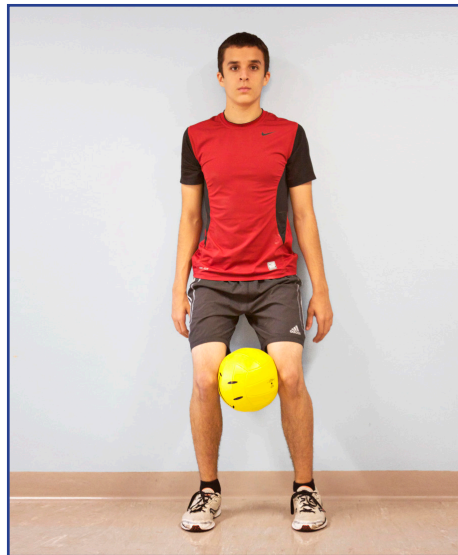
# Balance Exercises

**Weight Shifting:** *Start with this balance exercise.* Stand with both feet on the ground. Slowly shift your weight from your non-operative leg to your operative leg. Slowly increase the amount of weight supported through your operative leg.

**Single Leg Stance:** Once you are comfortable with weight shifting to your operated leg, you can progress to balancing. Stand on your operative leg for 5 seconds and slowly increase the amount of time you can balance to 20 seconds. Repeat 5 times.



# Wall Squats With Ball Squeeze



Stand with you back flat against a sturdy wall and place a lightweight ball between your thighs (just above your knees). With straight legs, walk your feet forward until they are roughly 12 inches in front of the wall. Keep your back flat against the wall and squeeze against the medicine ball with your inner thighs as you bend your knees to squat down. As you get stronger, try to squat low enough that your thighs are parallel with the floor. Make sure that your knees don't extend past your toes. Hold this squat for 20 seconds and increase to 40 - 60 seconds. Repeat 2 times.

## ADDITIONAL PHASE 2 EXERCISES

- Calf Raises
- Adductors/abductor with resistance tubing
- Clam shells
- Isometric exercises for quadriceps, hamstrings, hip flexors and hip extensors
- Patellar mobilizations
- Abdominal and core strengthening

## CRITERIA TO PROGRESS TO PHASE THREE

- Minimal inflammation and pain
- ROM: 0 degrees to near full flexion
- Strong quadriceps contraction
- Straight leg raise with no quadriceps lag
- Good core strength

# PHASE THREE

Strength and Control

Weeks 9 - 15

## G oals:

- Normalize gait
- Regain full range of motion
- Improve lower leg, hip and core strength
- Aerobic activity
- Proprioceptive and neuromuscular control

**BRACE:** You should wear your patellar stabilization brace for all high risk activities such as pivoting, twisting, slippery or uneven ground activities.



**WEIGHT BEARING:** You should be full weight bearing without walking aids (crutches/canes) at this phase of your rehabilitation.

**RANGE OF MOTION:** You should have full, painless range of motion of your knee by the end of this phase. You should continue with patellar mobilization exercises in all planes to minimize scar tissue forming in your patellofemoral joint.

**SWELLING/INFLAMMATION:** Continue use of ice, compression, and elevation, as needed.

**EXERCISES:** Continue muscle stimulation to quadriceps (if needed). Quadriceps and hamstrings isometrics can be done anytime. You may want to start incorporating a pool therapy program to help you with your rehabilitation. You can initially start a walking program in the shallow end of the pool. You can then progress to easy jogging in waist deep water. You may also use the pool for running in cardio exercises (running with a weight belt) to help with your aerobic endurance. You can then start doing straight kicks with a flutter board and progress to using your arms as your



## Strength & Control

**//** In phase 3 it is important to work on improving your lower leg , hip and overall core strength. It is also important to continue working on improving your balance sense in your lower extremity (proprioception)

strength and endurance improves. Avoid whip kick and flip turns until phase 4. Continue with the bike and/or elliptical machine as they help with range of motion, muscular strength and aerobic fitness as well. It is important to work on core strengthening exercises as well. You will start more advanced balance exercises during this phase. Flexibility exercises for your lower extremities are also an important component of this phase. You may want to join a gym at this phase of your rehabilitation. Please en-

this phase. Flexibility exercises for your lower extremities are also an important component of this phase. You may want to join a gym at this phase of your rehabilitation. Please ensure that you use proper form and technique with all exercises. You should continue to be under the supervision of a physiotherapist or a certified kinesiologist and/or trainer.

***Standing on a wobble board is one of the exercises you can do to help regain your balance sense.***

## Wobble Board

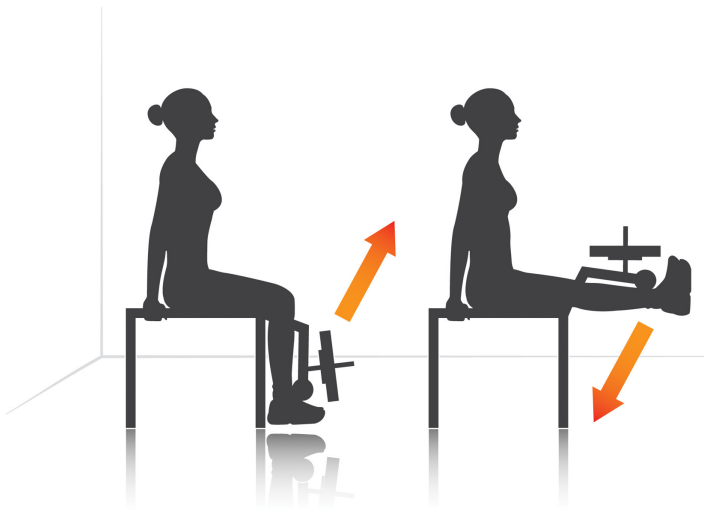




## Leg Extensions

This exercise should be done under the guidance of a physiotherapist

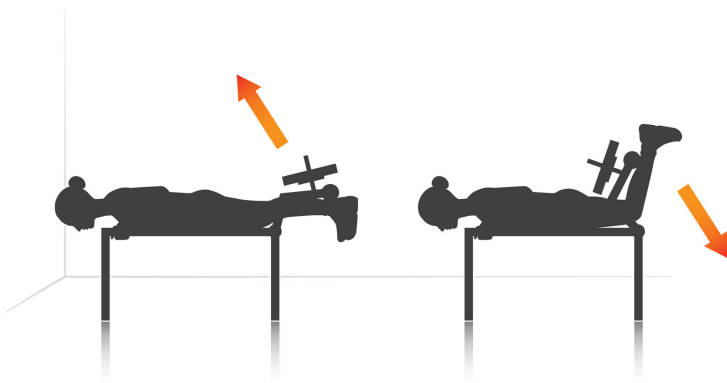
or trainer until you become familiar with this exercise. Leg extensions help strengthen your quadriceps muscles (the muscles in the front of your thighs). Sit on the padded seat of the machine. Select a light weight initially to ensure that you can do the exercise properly. Hook your feet under bar of the machine. Adjust the bar so that it rests comfortably at the lower end of the leg. Slowly extend your legs straight. You should feel your quadriceps muscles exercising however it should not strain your muscles. Perform 2 - 3 sets of 8 to 10 repetitions. Ensure that you use proper form and technique while doing this exercise to minimize the chance of injury.



## Leg Curls

This exercise should be done under the guidance of a physiotherapist or trainer until you become familiar with this exercise. Leg curls help

strengthen your hamstrings muscles (back of the legs). Adjust the machine to fit your height. Start with a light weight initially. Lie face down on the leg curl machine. The pad of the lever should be placed just a few inches under your calf muscles. Keep your torso flat on the bench, do not arch your back and hold onto the handles of the machine or the side of the bench. Exhale as you curl your legs upward and hold the contraction for a second. Inhale as you slowly bring the legs back to the initial position. You should feel your hamstrings working, but you should not strain your muscles. Perform 2 sets of 8 to 10 repetitions.



### CAUTION:

*Do not use too much weight while doing leg curls as this may cause you to start using bad form. It is very easy to injure your hamstrings and/or to cause a lower back strain. Ensure that you have proper form and technique.*

THERE ARE A FEW VARIATIONS FOR THIS EXERCISE INCLUDING: LYING HAMSTRINGS CURLS WITH AN EXERCISE BALL, SEATED LEG CURLS, STANDING LEG CURLS AND CABLE LEG CURLS.

**C**ore training exercises are an important way of building strength and stability. The basic plank exercise is a great starting place if you want to improve your core strength and stability. Abdominal exercises are also a great way to build on core strength.

## Plank Exercises

Begin in the plank position with your forearms and toes on the floor.

Keep your torso straight and rigid and your body in a straight line from ears to toes with no sagging or bending.

Your head is relaxed and you should be looking at the floor.

Hold this position for 10 seconds to start.

Over time work up to 30, 45 or 60 seconds.

There are several more advanced plank exercises such as side plank, stability ball plank and plank pose leg lift. These types of plank exercises can be added to your regime as you get stronger.



## Abdominal Crunches

*Many people do not use good form when doing abdominal crunches. This may cause back and/ or neck problems and it will make your workout less effective. Use proper technique.*

1. Lie down on the floor on your back and bend your knees, placing your hands behind your head or across your chest.
2. Pull your belly button towards your spine, and flatten your lower back against the floor to prevent straining your back.
3. Slowly contract your abdominals, bringing your shoulder blades about one or two inches off the floor.
4. Exhale as you come up and keep your neck straight, chin up.
5. Hold at the top of the movement for a couple of seconds
6. Inhale as you slowly lower back down.

### VARIATIONS:

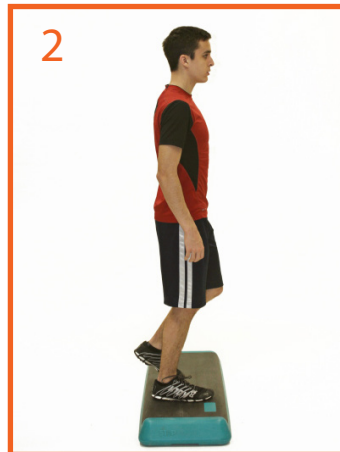
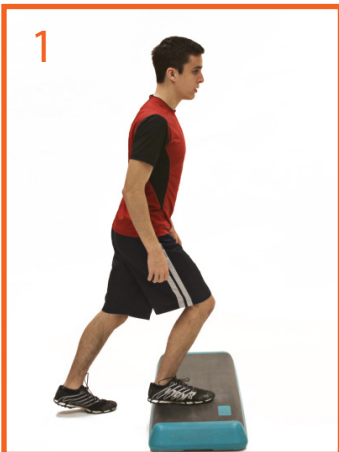
1. Bring your knees in at the same time you lift your upper body off the floor (full body crunch)
2. To make it more difficult, you can do your abdominal crunches while you balance on an exercise ball.





### Aerobic Conditioning

Aerobic conditioning is usually achieved through cardiovascular exercise such as running, swimming, skipping, cycling, etc. This type of training targets the large muscle groups in the body so that as the intensity of physical activity is increased, overall fitness is improved.



## STEP UPS

Stand in front of a stair or low rise platform and place one foot on the step in front of you. Rise up to the step by shifting all of your weight onto this leg and tighten your quadriceps muscles. Start with one set of 10 repetitions and increase to 20 repetitions.



## SINGLE LEG SQUATS

Initially, use something for support such as a chair or a railing. Standing on one leg, slowly squat bending your knee from 0 degrees to 45 and increase 70 degrees when able. Make sure that your knee does not go in front of your foot. Hold each squat for 5 seconds. Start with one set of 10 and increase the number of repetitions as your strength improves.





**POOL PROGRAM:** A pool program is an excellent way to recover from your patellar stabilization surgery. You may do the flutter kick, easy jogging in waist deep water and/or running in deep water with an aqua-belt. Avoid doing the whip kick while you are recovering from your surgery.

### ADDITIONAL PHASE 3 EXERCISES

- Hip abduction, adduction, extension (open chain) in standing; progress to resistance with tubing or weights
- Open kinetic chain weight-training exercises
- Flexibility exercises
- Proprioception drills
- Walking, hiking, jogging, cycling as tolerated

### CRITERIA TO PROGRESS TO PHASE FOUR

- Full Non-Painful ROM
- Good strength, endurance and balance control
- Knee extension strength 80% of opposite (contralateral) knee.
- Good core control

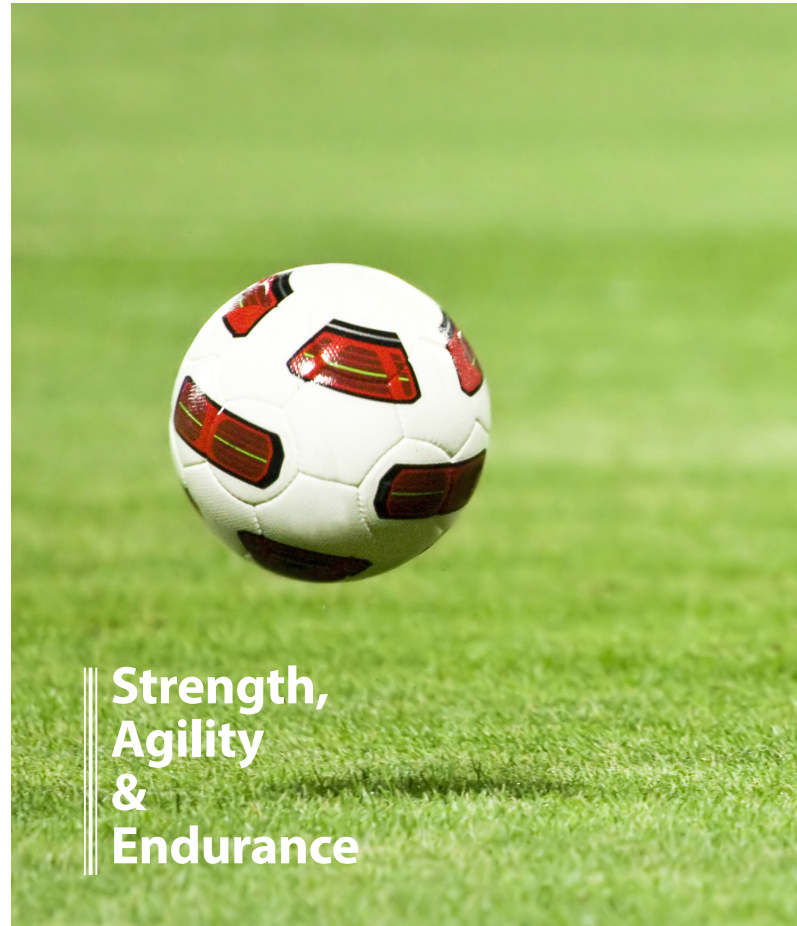
# PHASE FOUR

Maximizing strength and endurance

Weeks 16 - 26+

## G oals:

- Maximize muscle strength and endurance
- Improve balance & neuromuscular control (proprioception)
- Improve aerobic endurance
- Plyometric drills
- Sport specific drill training



Strength,  
Agility  
&  
Endurance

**P**hase 4 generally starts around week 16 to 18 and may last up to 12 months depending on the progress through the rehabilitation program. This phase focuses on improving agility and strength through plyometric exercises, and return to functional activities including sports. Phase 4 of the rehabilitation program concentrates on improving your agility and strength through plyometric exercises and to return to functional activities including sports.

**BRACE:** You should wear your patellar stabilization brace for all high risk activities until advised otherwise by your physician.

**SWELLING/INFLAMMATION:** Continue use of ice, compression, and elevation, as needed.

**EXERCISES:** During this phase you want to continue working on your strength. You should continue doing open kinetic chain weight training exercises





**“**Phase four focuses on improving strength and agility through plyometric exercises and sport specific retraining exercises and drills. Continued balance exercises are highly recommended.

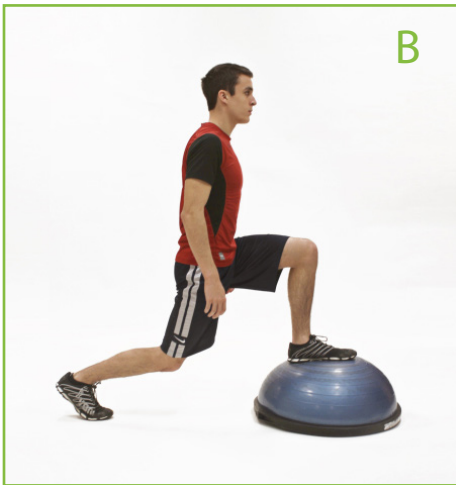
such as leg press, leg extension, leg curls and 4 way hip exercises. You should also continue with your abdominal and core strengthening exercises. Cardio conditioning is important especially if you want to return to a sport that involves aerobic or anaerobic activities. Agility exercises will be incorporated during this phase. Balance exercises remain a key component in the rehabilitation program. Your abil-

ity to know where your joint is in space is known as proprioception.

**PROPRIOCEPTION:** Proprioceptive ability can be trained. Learning any new motor skill involves training our proprioceptive sense. Anything that involves moving our arms or legs in a precise way without looking at them invokes it such as jumping rope, basketball, walking on uneven ground, or even

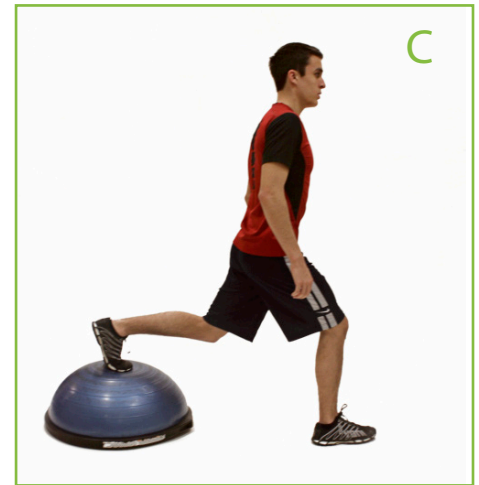
painting. Proprioception involves the sense of where one's body is in space, and is closely related to another important but often overlooked sense, one's sense of balance.

Proprioception affects the ability to balance. Balance sense is also maintained from your eyesight (visual information), skin pressure (such as walking on sand), and information from your inner ear. For example, if you have inflammation in your inner ear nerve, you will have difficulty balancing. Proprioceptive exercises are extremely important to work on during this phase of the rehabilitation program.



## Lunges on a Bosu

Standing with feet together lunge forward and backward with one leg at a time as shown. Control your movement to ensure that your knee does not move beyond your toes. Start with one set of 10 lunges holding for 5 seconds with each lunge. Increase the number of reps on each leg as tolerated to two sets of 10 lunges as your strength increases.



## Single Leg Squat

Standing on one leg on a mini-trampoline, slowly squat down bending your knee making sure that your knee does not extend past your toes. Start with one set of 10 and hold each squat 5 seconds. Increase to 2 - 3 sets of 10. Perform this exercise on both legs.



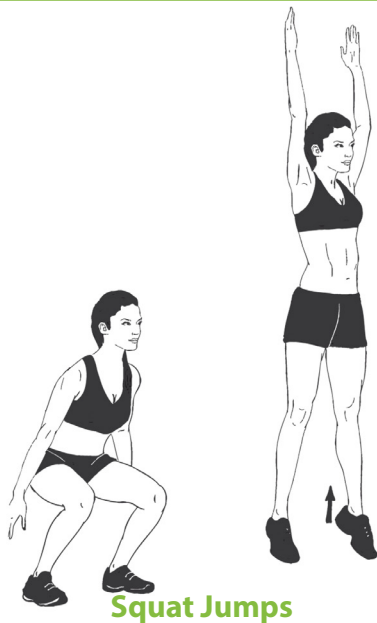
## Single leg stance with ball toss

S

teady yourself and stand on a BOSU ball. Initially use both legs to do this exercise.

When you are more adept with the exercise, progress to standing on one leg at a time. Slightly bend your knee(s). Initially, you can throw and catch a light ball against a wall. Once you are

stronger and your balance sense improves, you try throwing and catch the ball to a partner. Start with 1 set of 10 throws and increase to 2 sets of 15 throws as your strength and balance improves.



## Plyometrics

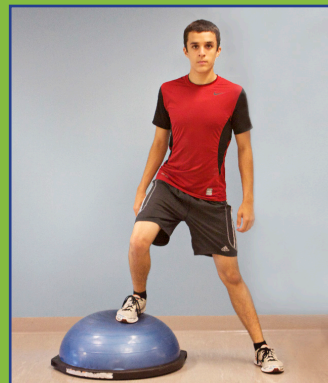
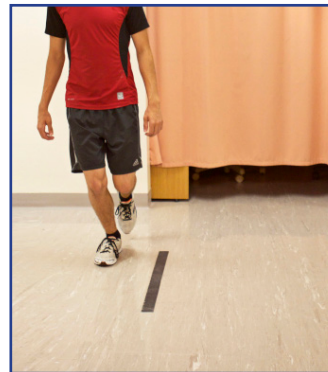
**P**lyometric drills (also known as jump training) are a type of training technique designed to increase muscular power and explosiveness. Plyometric training conditions the body with dynamic resistance exercises that rapidly stretch a muscle (eccentric) and then rapidly shorten it (concentric). Hopping and jumping exercises can strengthen the quadriceps

muscles, increase vertical jump and reduce the force of impact on the joints.

**Caution:** Plyometric training is associated with a risk of injury if you do not have adequate strength. You **must** be able to perform a controlled single leg squat and have very good quadriceps muscle and core strength before attempting these drills.

## Agility Jumping

**S**tart with straight-line jumping, backward/forward/side to side jumping using both legs. Progress to diagonals and combined patterns when able. Once speed and agility are good with jumping, progress through the same drills with single leg hopping.



## Side To Side Jump Steps

Perform quick steps in both directions over BOSU ball. Start with 1 set of 10 temps in both directions and progress to 3 sets of 15 steps in both directions as your strength increases.



# Sport Specific Drills



**Basketball:** lay-up drills, lateral shuttle runs while throwing/catching ball off wall, run-pivot-vertical jump, dodging drills, defence drills (running/jumping backwards)

**Soccer:** dribble around cones, shooting drills, defence drills, lateral shuttle runs while kicking ball off wall, tackling drills

**Football/Rugby:** dodging/deking drills, running and throwing drills (all directions), defence tackling drills

**Hockey:** skating figures, stick handling drills, shooting drills, deking drills

## Agility Exercises

1. Quick lateral shuttles from cone to cone
2. Skipping rope - double and single leg
3. Grapevine/Cariocas
4. Figure of 8's around cones
5. Agility Ladder

## ADDITIONAL PHASE 4 EXERCISES

- Wobble-board balance activities +/- perturbation (throwing/catching ball, raising arms)
- Box hops (up/down starting with 6" block)
- Rocker board lunges (forwards/backwards)





**R**eturn to sport is based on progression to sport specific activities and depends on quadriceps and hip strength and control. Most patients take 6 - 12 months to rehabilitate well enough to return to sport although some patients may return slightly earlier with dedication to their rehabilita-

tion program. You should have full painless range of motion and your strength should be close to 90% compared to the non-operative leg. Your proprioceptive ability should also be very good before you return to full sporting activities. If you return to sport too early, you may run the risk of injury.

