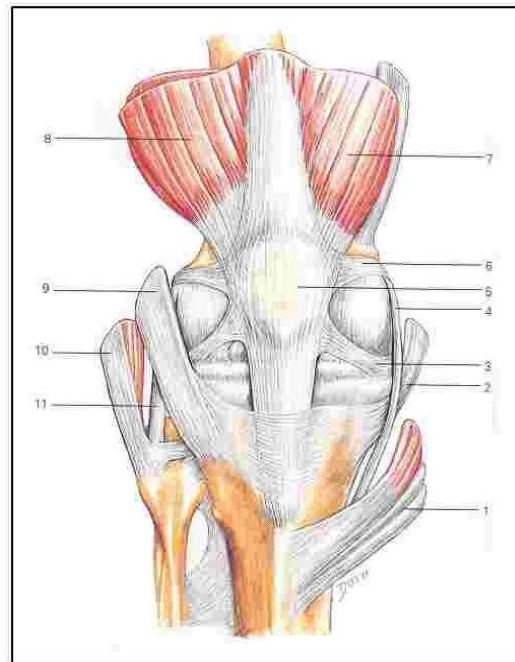


QUADRICEPS AND PATELLAR TENDON REPAIR

The patellar tendon attaches to the tibial tubercle on the front of the tibia (shin bone) just below the front of the knee. It also is attached to the bottom of the patella (knee cap). At the top of the patella, the quadriceps tendon is attached. The quadriceps muscle is the large muscle at the front of the thigh. As the quadriceps muscle contracts (shortens), it pulls on the quadriceps tendon, the patella, the patellar tendon, and the tibia. This moves the knee from a flexed (bent) position to an extended (straight) position.

When the patellar tendon ruptures, the patella loses its anchoring support to the tibia. Without this anchoring effect, the patella tends to move upward (towards the hip) as the quadriceps muscle contracts and you are unable to straighten your knee. After a patellar tendon rupture, if you try to stand up the knee will usually give way and buckle because the knee is no longer able to be held straight.

Similarly, when the quadriceps tendon ruptures, the patella loses its anchoring support in the thigh. Without this anchoring effect the patella tends to move inferiorly (towards the foot). Without the intact quadriceps tendon, the patient is unable to straighten the knee. After a quadriceps tendon rupture, if you try to stand up the knee will also usually buckle and give way because the knee is also not able to be held straight.



This is an injury that often must be treated surgically. Because the tendon is outside the joint it cannot be repaired arthroscopically. Usually the repair is done as either an outpatient or overnight stay. An incision is made on the front of the knee over the tendon. The site of the tendon rupture is identified and the ends of the tendon are sewed together. It is possible that the tendon tore away from the bone. In this circumstance, holes will be drilled in the bone to reattach the tendon.

The risks of surgery include but are not limited to:

- Infection
- Knee stiffness
- Failure of healing
- Persistent pain or weakness
- Blood clots
- Risks of anesthesia

Afterwards a knee immobilizer or hinged knee brace is used to protect the repair. The length of time required to wear the brace is usually a minimum of 6 weeks followed by several weeks of rehabilitation.

Postoperative Instructions

You will wake up in the operating room with a brace in place. You will go to the recovery room at and then either to a private room or home (often on the 3rd floor) after a few hours. You can get out of bed when you wish. You should continue to apply ice to your knee to reduce pain and swelling. If you are admitted overnight you will likely be discharged home on the first postoperative day.

Activities and advice for in the hospital and while at home:

1. Please call with any concerns: (949) 581-7001
2. Apply ice to the knee, as it will be quite helpful. After two days, you can change the dressing to a smaller one to allow the cold to better get to the knee. Be sure to leave the little pieces of tape (steri-strips) in place.
3. After two days it is okay to shower and get the wound wet, but do not soak the wound as you would in a bath tub or hot tub.
4. After knee surgery there is a variable amount of pain and swelling. This will dissipate after several days. Continue to take the pain medicine you were prescribed as needed. Remember it is called pain control, not pain elimination.
5. It is important to look out for signs of infection following surgery. These can include: fever (temperature > 101.5⁰, chills, nausea, vomiting, diarrhea, redness around your incision, or yellow or green drainage from your incision. Should any of these be present please contact Dr. Duggan's office immediately.
6. You will have an office visit scheduled approximately 10-14 days after your surgery.

REHABILITATION AFTER QUADRICEPS OR PATELLAR TENDON REPAIR

Phase I: The first week after surgery

Goals:

1. Control pain and swelling
2. Initiate knee movement
3. Activate the quadriceps muscles
4. Protect the repair

Activities:

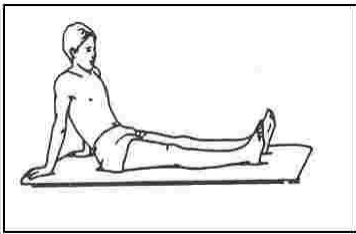
1. Knee range of motion: You can fully extend (straighten) the knee. You will receive written instructions after surgery telling you how much you can flex (bend) your knee.
2. Brace and crutches: You will go home with crutches and a knee brace locked in full extension (straight). Unless you have been instructed otherwise by Dr. Duggan, use crutches when walking and bear weight as tolerated as long as your brace is on and your knee is locked straight. That is, you can put your full weight down on your leg as long as you are wearing your brace locked in extension and have your crutches for protection.
3. Your nurse or therapist will demonstrate the proper form for walking with crutches:
 - a. Put the crutches forward about one step's length
 - b. Put the injured leg forward in line with the crutch tips
 - c. Touch the foot of the injured leg to the floor and put as much weight down as is comfortable (brace on and locked)
 - d. While bearing weight on the injured leg, take a step through with the uninjured leg.
4. Continuous passive motion (CPM): This is not always required, however may be prescribed by Dr. Duggan. Use the CPM machine at home as much as possible. Do not wear the brace while in the CPM machine. You should try to use the CPM machine at least 10 hours per day. You may move the machine to various rooms or positions in your house. You should use the machine at night while sleeping. Extension (knee straight) should be set to -5° to help your knee extend all the way. **It is very important that you straighten the knee completely.** The machine should be programmed to allow an extension pause of 5 seconds. You will receive written instructions that detail how much flexion is allowed (typically the range recommended is 0° to 40°).

5. Elastic stockings: wear an elastic stocking below the knee until your first postoperative visit. Do at least 10 ankle pump exercises each hour to help prevent blood clots
6. Continue to use ice several times per day, 15-20 minutes at a time.

Exercises

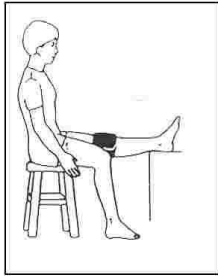
Program: 7 days per week, 3x per day

Quadriceps setting	1-2 sets	20 reps
Heel prop	5 minutes	2 reps
Sitting heel slides	1-2 sets	20 reps
Ankle pumps	10 per hour	



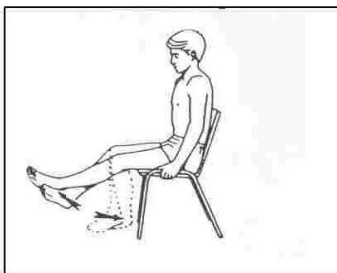
Quadriceps Setting

Lie or sit with knee fully straight. Tighten and hold the front thigh muscle making the knee flat and straight (this should make your knee flatten against the bed or floor). Hold 5 seconds for each contraction.



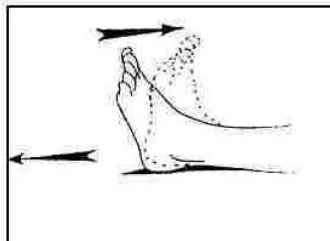
Heel Prop

Lie on your back with a rolled up towel under your heel, or sit in a chair with the heel on a stool. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a small weight (2-5 lbs) on the thigh just above the kneecap. Try to hold for 5 minutes. Try to practice quadriceps setting in this position.



Sitting Heel Slides

While sitting in a chair or over the edge of the bed, support the operated leg with the uninvolved leg. Lower the operated leg, with the unoperated leg controlling, allowing the knee to bend. **Do not go past 60° of bend at the knee.** Hold for 5 seconds and slowly relieve the stretch by lifting the foot upward with the uninvolved leg to the straight position.



Ankle Pumps

Move the ankle up and down to help stimulate circulation in the leg.

Phase II: 2-6 weeks after surgery

Goals:

1. Protect the tendon repair and allow healing
2. Regain knee motion
3. Begin muscle strengthening

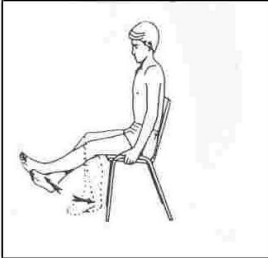
Activities:

1. Knee range of motion: you can fully extend (straighten) the knee. Do not bend past 90 degrees. If the limit of your bending is different, you will receive instructions from Dr. Duggan.
2. Brace and crutches: Continue to use crutches and wear the brace locked in extension (straight) when walking. You can unlock the brace to sit or move the knee when not walking.
3. Continuous passive motion machine: continue to use the machine until you knee flexion setting is 90 degrees. Once you have achieved this you no longer need to use the machine.
4. Check with Dr. Duggan to see if it is okay to get the wound wet in such as in a bathtub or hot tub.
5. Check with Dr. Duggan to see if it is okay to start driving. If your right leg was the operated leg, it is unlikely that you will be allowed to drive at this point.

Exercises

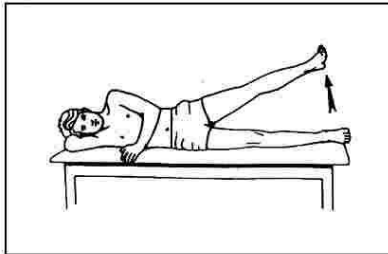
Program: 7 days per week, 3x per day

Quadriceps setting	1-2 sets	20 reps
Heel prop	5 minutes	2 reps
Heel slides	1-2 sets	20 reps
Sitting knee flexion	1-2 sets	10-20 reps
Hip abduction	1 set	20 reps
Standing toe raises	1-2 sets	10-20 reps
Ankle pumps	10 per hour	



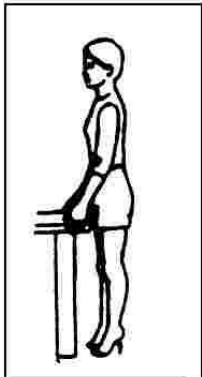
Sitting knee flexion

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 unoperated leg controlling, allowing the knee to bend (limit to a maximum of 90°). Hold 5 seconds then slowly relieve the stretch by lifting the foot upward to a straight position.



Hip abduction

Lie on your unoperated side. Keep your knees fully extended (straight). Raise the operated limb upward to a 45° angle. Hold for one second then lower slowly.



Standing toe raises

With your knee brace on, use a table for support and balance. Tighten the quadriceps to hold the knee fully straight. Rise up on your “tip toes” while maintaining the knees in full extension (straight). Hold for one second then lower slowly to the starting position.

Phase III: 6-12 weeks after surgery

Goals:

1. Walk normally
2. Regain and improve range of motion
3. Start muscle strengthening exercises

Activities:

1. The repaired tendon is still weak and subject to injury if your overload it. You should continue to be careful when walking up and down steps and inclined surfaces.
2. Unless instructed otherwise by Dr. Duggan, you may begin to wean off using the knee brace. It is recommended that if you are walking without the brace you use one crutch on the side opposite your operated leg (in case you slip or stumble).
3. Unless instructed otherwise by Dr. Duggan, you can gradually discontinue use of the crutches while walking and bear full weight on the operated leg. Wear the brace for walking long distances, though. Dr. Duggan may make an adjustment to your brace so that you can bend the knee when you walk.
4. Avoid squatting, deep knee bends, or lunging movements. Do not try to step up or down stairs.
5. Continue to use ice if there is knee pain or swelling.
6. If your left leg was the operated leg, it should be okay to drive at this point. Check with Dr. Duggan prior to driving, however.

Exercises

This program will help 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 build strength. Start with one pound and add one pound per week to a maximum of five pounds.

Program: 7 days per week, 1-2x per day.

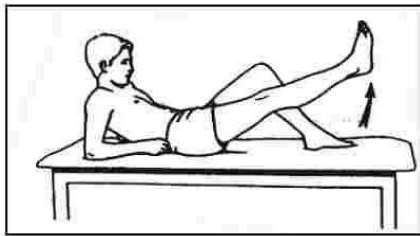
***decrease to 3 days per week when using ankle weights.

Stationary bicycle	10-20 minutes per day	
Continue phase II exercises		
Straight leg lift	1-2 sets	10-20 reps
Short arc lift	1 set	20 reps
Wall slides	1 set	20 reps



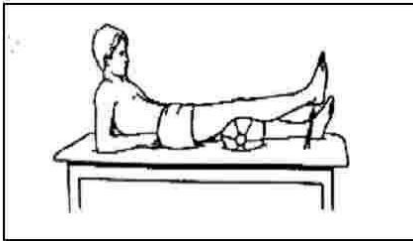
Stationary bicycle

Use 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 (backwards first, then forwards). Do not put any resistance on the bicycle. Set the seat height so that when you are sitting your knee is fully extended with the heel resting on the pedal at the bottom position. Ride with your forefoot on the pedal.



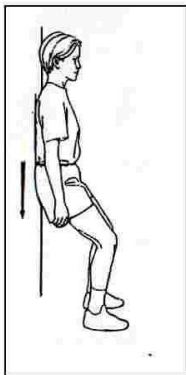
Straight leg lift

Tighten the quadriceps as much as you can. Lift your heel 4-6 inches from the floor. Tighten the quadriceps harder. Lower your leg back to the floor while continuing to tighten the quadriceps. If your knee bends when you attempt to lift do not do this exercise.



Short arc lift

With the knee bent over a rolled up towel (height 4-5 inches), lift the foot so that the knee fully straightens. Hold the knee locked in extension 5 seconds then slowly lower.



Wall slides

Stand upright with your back and buttocks touching a wall. Place your feet about 12 inches apart and about 6 inches from the wall. You will be bearing about 50% (or less on the affected side) on each leg. Slowly lower your hips by bending the knees and slide down the wall until the knees are flexed about 45°. Pause 5 seconds, and then slowly slide back up to the upright starting position. When doing a wall slide you should position your thighs so that your kneecaps are in line with the tips of your shoes.

Phase IV: 12 weeks after surgery onward

Goals:

1. Progress strengthening of quadriceps
2. Preserve range of motion
3. Protect repair

Activities:

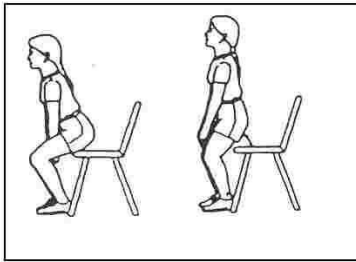
1. Walking: you should be walking without the aid of a brace or crutches. If you feel confident walking on the operated limb and have good strength and knee motion you can begin attempting to walk up stairs on the operated limb.
2. Knee support: Buy an elastic knee sleeve (made of neoprene rubber and available at most sporting good or drug stores). It should have an opening for the kneecap and Velcro straps, but does not need hinges on the sides. Use this sleeve if you are on your feet for a prolonged period of time.
3. Stationary bicycle: continue to use the stationary bicycle on a regular basis, as this is good for both flexibility and strengthening the thigh muscles. You may now use mild resistance.
4. Swimming is a good exercise at this time (if available).

Exercises:

Continue with your phase III exercise program, at least every other day. Add the following exercises to your routine.

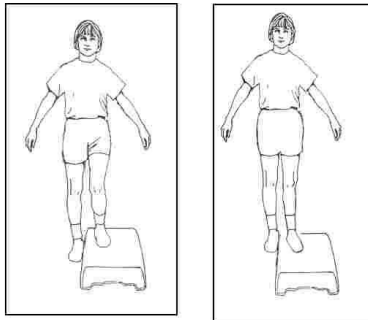
Program: every other day, once per day

Squat to chair	2-3 sets	10-20 reps
Step up-down exchange	3 sets*	10 reps*
One legged toe raises	2-3 sets	10-20 reps
Hamstring stretch	15-30 seconds	3-5 reps
Quadriceps stretch	15-30 seconds	3-5 reps
Calf stretch	15-30 seconds	3-5 reps



Squat to chair

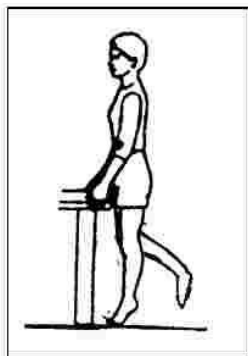
Stand with your back to a chair. Lower your buttocks toward the chair until they touch the chair. Do not sit or rest on the chair, though, instead immediately and slowly return to the standing position. Keep your head over your feet and bend at the waist as you descend. After the first week you may add weights up to 10 lbs in each hand.



Step up-down exchange

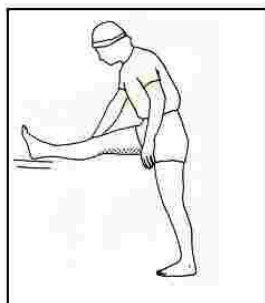
Start with a step of 3 inches in height. Place the foot of the operated leg on the step. Hold on to the wall or a chair for balance, if necessary. Standing sideways on the step, slowly step up onto the step and slowly straighten the knee using the quadriceps muscle. Slowly lower the opposite foot to touch the floor, but do not land. Touch the floor gently and step up.

***Start with 3-5 reps for the first two weeks. If pain free add one repetition per workout until you can 3 sets of 10 (for 2 weeks). If pain free, progress to a step of 6 inches and repeat progression of repetitions over next two weeks. After two weeks, progress to 9 inches. Do not continue to raise the height of the step if there is pain or crepitus at the kneecap.



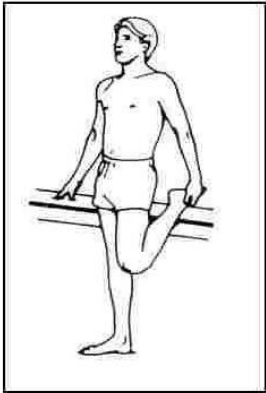
One-legged toe raises

Continue the toe raises from Phase II but now try to raise up and down slowly on just the operated side. Hold the unoperated side off the floor and use the wall or a table to help with balance and support.



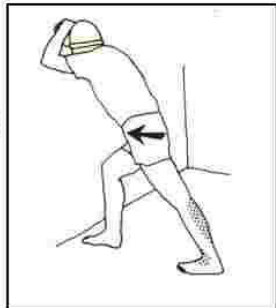
Hamstring stretch

Bend slowly forward at the hips, keeping the knee fully extended until you feel gentle stretch in the back of your thigh and knee. Do not bend at the waist or back. Hold for 15-30 seconds then relax.



Quadriceps stretch

Lean gently backward as if bringing your heel toward your buttock. When a stretch is felt in the front of the thigh hold for 15-30 seconds. This should not produce pain.



Calf stretch

Keep your heel flat on the floor and the knee fully extended. Lean forward at the hips with your arms supporting your weight. When you feel a gentle stretch in the back of your calf and knee hold for 15-30 seconds.

For the future...

Many patients return to the gym at the 16-week mark and resume their normal gym routine. We would advise the following to protect your current repair and avoid future injury:

1. Avoid pain at the tendon repair site
2. Avoid pain and/or crepitus at the patella
3. Build up resistance and repetitions gradually
4. Warm up prior to exercising – you are warmed up when you start sweating
5. Do aerobic workouts after strength workouts
6. Cool down by stretching after exercise

The following exercises are not recommended because they may overload the patella and the tendon repair:

1. Knee extension using a machine
2. Deep knee lunges
3. Stairmaster
4. Step exercises with impact

Return to sports

1. 16-20 weeks walk to light jog progression
2. 20-24 weeks progressive run/speed/agility
3. Jump training is allowed after 24 weeks postop
4. Full return to sports is when quadriceps are pain free, motion is full and strength is symmetric to the uninjured side. This is usually around 6-9 months from surgery.