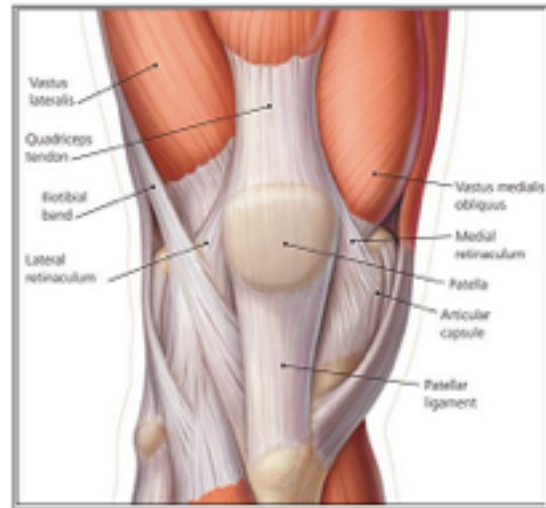


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REHABILITATION AFTER REPAIR OF THE PATELLAR AND QUADRICEPS TENDON

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 (kneecap). At the top

of the patella, the **quadriceps tendon** is attached. Attaching to the quadriceps tendon is the quadriceps muscle. The quadriceps muscle is the large muscle on 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 to move the knee from a flexed (bent) position to an extended (straight) position. Conversely, when the quadriceps muscle relaxes, it lengthens. This allows the knee to move from a position of extension (straight) to a position of flexion (bent).



When the patellar tendon ruptures, the patella loses its anchoring support to the tibia. Without this anchoring effect of the intact patellar tendon, the patella tends to move upward (towards the hip) as the quadriceps muscle contracts. Without the intact patellar tendon, the patient is unable to straighten the knee. If a rupture of the patellar tendon occurs, and the patient tries to stand up, the knee will usually buckle and give way because the quadriceps muscle is no longer able to hold the knee in a position of extension (straight).

When the quadriceps tendon ruptures, the patella loses its anchoring support in the thigh. Without this anchoring effect of the intact quadriceps tendon, the patella tends to move inferiorly (towards the foot). Without the intact quadriceps tendon, the patient is unable to straighten the knee. If a rupture of the quadriceps tendon occurs, and the patient tries to stand up, the knee will also usually buckle and give way, again, because the quadriceps muscle is no longer able to hold the knee in a position of extension (straight).

The office examination consists of palpating the quadriceps and patellar tendons and the patella. Usually, when these tendons rupture, the patella moves upwards on the thigh for patellar tendon ruptures and slips downward for quadriceps tendon ruptures. At the same time, the gap between the ends of the ruptured tendon is palpable on the front of the knee. X-rays of the knee usually reveal the abnormal position of the patella, indicating a rupture of the patellar/quadriceps tendon.

This is an injury that must be treated surgically. Since the tendon is outside of the joint, it cannot be repaired arthroscopically. Usually, the repair is done as an outpatient surgery. An incision is made on the front of the knee, over the tendon. The site of the tendon rupture is identified. The tendon ends are identified and then sewn together. Afterwards, a knee immobilizer or hinged brace is often used to protect the repair. The length of time required for bracing is usually a minimum of 6 weeks followed by several weeks of rehabilitation. The usual risks of surgery are involved including: infection, stiffness, suture reaction, failure of satisfactory healing, risks of anesthesia, phlebitis, pulmonary embolus (blood clot in the lungs), and persistent pain or weakness after the injury and repair.

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Rehabilitation after Repair of the Quadriceps and Patellar Tendons

Phase One: 0-14 days

Goals:

1. Control pain and swelling
2. Initiate knee motion
3. Activate the quadriceps muscles

Knee Range of Motion:

There are no knee range-of-motion exercises at this time. Keep the knee in the post-op brace, locked in full extension (fully straight).

Brace and Crutches:

You will go home with crutches and a knee brace locked in full extension (straight). Unless otherwise instructed by the doctor, use crutches when walking and **bear weight as tolerated** (with brace-on and your knee locked straight) on the operated leg. When walking with the crutches, follow the instructions below:

Walking (weight bearing as tolerated):

- Put the crutches forward about one step's length.
- Put the injured leg forward; level with the crutch tips.
- Touch the foot of the involved leg to the floor and bear weight as tolerated (brace-on).
- While bearing weight (on the crutches if there is pain in the knee) on the involved leg, take a step through with the uninjured leg.

Exercise Program:

QUADRICEPS SETTING - to maintain muscle tone in the thigh muscles and straighten the knee.

Lie or sit with the knee extended fully straight as in figure. Tighten and hold the front thigh muscle making the knee flat and straight. If done correctly, the kneecap will slide slightly upward toward the thigh muscle. The tightening action of the Quadriceps should make your knee straighten and be pushed flat against the bed or floor. Hold 5 seconds for each contraction. Do 20 repetitions three times a day.



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

OFFICE VISIT

Please return to see Dr. Nelson approximately **10-14 days** after your surgery. At this time, your sutures will be removed and your progress will be checked.

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Rehabilitation after Repair of the Patellar and Quadriceps Tendon

Phase Two: 2 to 6 weeks after surgery

Goals:

1. Protect the tendon repair from overstress and allow healing
2. Regain knee motion, limiting knee flexion to 90 degrees
3. Begin muscle strengthening

Knee Range of Motion:

You can fully extend (straighten the knee). To avoid placing excess stress on the tendon repair, do not bend your knee beyond 90 degrees (bent to a right angle). Your doctor will give you instructions if this limit will be different than outlined here.

Brace and Crutches:

Unless otherwise instructed by Dr. Nelson, use crutches when walking and **bear weight as tolerated** on the operated leg. Wear the post-operative brace for walking. Lock the brace with the knee fully straight when walking to protect the knee in case of a fall. You can unlock the brace to sit or move the knee when not walking if the doctor allows you to. When walking with the crutches, follow the instructions below:

Walking (Weight bearing as tolerated), brace locked in full extension:

- Put the crutches forward about one step's length.
- Put the injured leg forward; level with the crutch tips.
- Touch the foot of the involved leg to the floor and bear as much weight as you can without pain.
- If you cannot bear full weight without pain, place some of your weight on the crutches so that there is no pain with weight bearing
- If you are able to bear full weight without pain, you can taper to one crutch, held on the opposite side of your affected knee.
- If you continue to have no pain with weight bearing, you can discontinue the crutch and walk with the brace only locked in full extension.

EXERCISE PROGRAM

Perform daily

Quadriceps sets	3 sets of 10 reps
Heel Prop	5 minutes
Heel slides	20 reps
Sitting knee flexion	20 reps
Hip abduction	20 reps
Standing toe raises	20 reps
Ankle pumps	10 times an hour

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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.**



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.

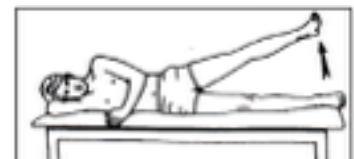


SITTING KNEE FLEXION - to regain the bend (flexion of the knee).

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 to a **limit or maximum of 90°**. Hold five seconds and slowly relieve the stretch by lifting the foot upward, with the uninvolved leg, to the straight position (passive assist). Repeat exercise 20 times, three times a day.



HIP ABDUCTION - lie on your unoperated side. Keep the knees fully extended. Raise the operated limb upward to a 45 degree angle as illustrated. Hold one second, then lower slowly. Repeat 20 times, once or twice a day



STANDING TOE RAISES

With the knee brace on, use a table for support and balance. 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.



ANKLE PUMPS - move your foot up and down at the ankle to stimulate circulation in the leg. You should do at least 10 ankle pump exercises each hour.



OFFICE VISIT

Please make an appointment with Dr. Nelson at 6 weeks after surgery.

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Rehabilitation after Repair of the Patellar and Quadriceps tendon

Phase Three: 6 to 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 you overload it. You should be careful walking up and down steps or inclined surfaces.
2. You may begin to wean from the knee immobilizer as instructed by your doctor. It is recommended that if walking without the immobilizer, you use one crutch on the side opposite your injured knee, in case you slip or stumble.
3. Avoid squatting, deep knee bends, and lunging movements and do not try to step up or down stairs.
4. Bear full weight on level surfaces and try to avoid limping, and walk slowly but normally.
5. Continue to ice the knee if there is pain and swelling. Place a towel or cloth between the skin and the ice to prevent skin injury.

Brace and Crutches:

Unless otherwise instructed by the doctor, you can gradually discontinue crutches when walking and **bear full weight** on the operated leg. Wear the post-operative brace for walking. Your doctor may make an adjustment to the brace so that you can bend your knee when you walk. Be sure that you get specific instructions from the doctor before making any changes to your support when walking.

Exercise Program:

The following exercise program will 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 also 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.

(see phase 2 for descriptions and illustrations)

Days per week-5-7 Times per day 1

Quadriceps set	3 sets of 10 reps
Heel prop	5 minutes
Heel slides	3 sets of 10 reps
Straight leg raise	3 sets of 10 reps
Short arc lift	3 sets of 10 reps
Standing toe raise	3 sets of 10 reps
Hip abduction	3 sets of 10 reps
Wall slides	3 sets of 10 reps

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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 make an appointment with Dr. Nelson's office at 12 weeks after surgery.

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Rehabilitation after Patellar Tendon and Quadriceps Tendon Repair

Phase 4: Twelve weeks after surgery onward

ACTIVITIES

1. Walking/Stairs

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. It is not recommended that you lower yourself down-stairs on the operated limb until you complete the enclosed 'Step up-down progression'.

2. Knee Support – for excess activities

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.

3. Stationary Bicycle – good exercise

Utilize a stationary bicycle to both strengthen the thigh muscles and increase knee flexion. If you cannot yet 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. You may ride the cycle with mild resistance for up to 10 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 actually ride the bicycle with your forefoot resting on the pedal.

4. Swimming –good exercise

Swimming is good exercise at this time, if available.

5. Exercises

You should add the following exercises, every other day, as instructed by the physical therapist:

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. Pause five 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, or your second toe. This exercise is illustrated in phase 2.

SQUAT TO CHAIR

In the chair squat exercise, you lower your buttocks toward the chair until your buttocks touch the chair. Do not sit or rest at the chair, but instead immediately and slowly return to the standing and starting position. Remember to keep your head over your feet and bend at the waist as you descend. When doing a squat, you should position your thighs so that your kneecaps are in line with the tips of your shoes, or your second toe. After the first week, you may hold dumbbells while performing this exercise and the wall slide. Start with 3 to 5 pounds each hand. You may add 2 to 3 pounds per week until you reach 10 pounds in each hand.

STEP-UP-DOWN EXERCISE

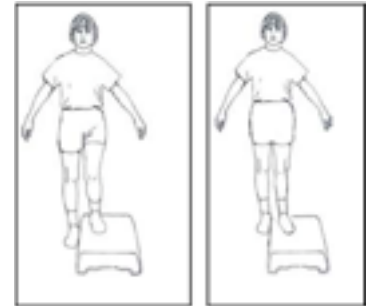
At this time, it is important to begin the development of single-leg strength. Begin to follow the "Step-up-down Strengthening progression" outlined below, if you are able to do the exercises without pain. The instructions estimate a time period of 6 to 8 weeks for you to progress through the

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whole program. This time line will vary for different people and knees, depending upon the presence of other knee problems. Place the foot of the operated limb on the stool. Maintain balance, if necessary, by holding onto the wall or chair. 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.

Step Up-Down exercise Progression (12-20 weeks after surgery)

Start with a step of 3 inches in height. Start with 3 sets of 5 repetitions for the first 2 weeks. If pain free, 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 for 2 weeks. After that, if pain free, 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 progression starting with 3 sets of 5 repetitions for 2 weeks. After that, if pain free, Add one repetition per set until you can do 3 set of 10 (about 2 weeks) **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 2, but now try to raise up and down slowly on just the operated side. Hold the unoperated foot off the floor and hold the wall or a chair or table for balance and support. Build to 3 sets of 15 repetitions.

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. Hold the stretch for 15 to 20 seconds and repeat 3 to 5 times.

QUADRICEPS STRETCH

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 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 for 3 to 5 repetitions.

OPTIONAL ADDITIONAL EXERCISES

The following exercises may be added to your exercise program at **16weeks** after surgery:

SEATED LEG PRESS

If you are using a leg press machine for strengthening, use an amount of weight that feels easy enough to perform 20 repetitions as the starting weight for this exercise. Use this weight for the first week before raising the weight. The weight may be increased by about 5 pounds every 7 to 10 days thereafter, as long as you can perform 20 repetitions per set for 3 sets, and as long as the weight used does not exceed body-weight when using both legs, or 1/2 body weight when using the one leg. In this exercise, avoid letting the knees **snap** or drop suddenly into extension when reaching the fully straightened position. Avoid starting the exercise with the knees bent past 90 degrees. Adjust the seat position to limit the excursion of the machine

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RESISTED HAMSTRING CURLS

If you have access to a hamstring curl machine, you may start using it. As with the leg press, start with a reasonable weight and use that weight for the first week. You may increase the weight by 3 to 5 pounds every 10 days as long as you can perform 3 sets of 20 repetitions slowly, with good form. If you do not have access to a hamstring machine, continue doing the standing hamstring curl adding an ankle weight for resistance. Start with 3 to 5 pounds and add 1 pound per week until you build to 10 pounds for 3 sets of 15 repetitions.

Additional Weight Training

Hip Abductor/Adductor machine
Roman Chair
Calf Raise Machine

Precautions When Exercising

- Avoid pain at the tendon repair site
- Avoid pain and/or crepitus at the patella
- 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

The following exercises are *not* recommended until full knee strength recovered because they may overload the patella and the tendon repair:

1. Knee extension using a weight lifting machine
2. Lunges
3. Stairmaster
4. Step exercises with impact
5. Running
6. Jumping
7. Pivoting or cutting

OFFICE VISIT

Please make an appointment to see Dr. Nelson in 12 weeks (6 months after surgery).

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Dr. Nelson's Quad/Patellar Tendon Repair Rehabilitation Protocol

Diagnosis:															
Procedure date:															
S/P:															
WEEK															
MONTH															
	1	2	3	4	5	6	7	8	9	10		3	4	5	6
<i>PHASE 1 EXERCISES (week 0-2)</i>															
No knee motion, WBAT with crutches	•	•													
Quad sets	•	•	•	•	•	•	•	•	•	•					
Ankle pumps	•	•	•	•	•	•	•	•	•	•					
<i>PHASE 2 EXERCISES (week 3-6)</i>															
ROM from 0-90 do not push it pain be key, in brace			•	•	•	•	•	•	•	•					
Heel Prop			•	•	•	•	•	•	•	•					
Heel slides			•	•	•	•	•	•	•	•					
Sitting knee flexion			•	•	•	•	•	•	•	•					
hip abduction			•	•	•	•	•	•	•	•					
standing toe raises with brace locked in extension			•	•	•	•	•	•	•	•					
<i>PHASE 3 EXERCISES (week 6-12) continue prior +</i>															
Motion as tolerated						•	•	•	•	•		•			
SLR						•	•	•	•	•		•			
Short arc lift						•	•	•	•	•		•			
Wall slides						•	•	•	•	•		•			
<i>PHASE 4 (weeks 12-and on) continue previous plus</i>															
Elastic sleeve for first 6 months contact sports year												•	•	•	•
Stationary bike												•	•	•	•
Swimming												•	•	•	•
Squat to chair												•	•	•	•
Step up/down exercise												•	•	•	•
one leg toe raises												•	•	•	•
Stretch hamstring, quads and calves												•	•	•	•
Leg press													•	•	•
resisted hamstring curls													•	•	•
Add additional weight training and sport specific exercise														•	•
Call or email Dr. Nelson with any concern															
Additional Instructions:															