

REHABILITATION AFTER REPAIR OF THE PATELLAR AND QUADRICEPS TENDON

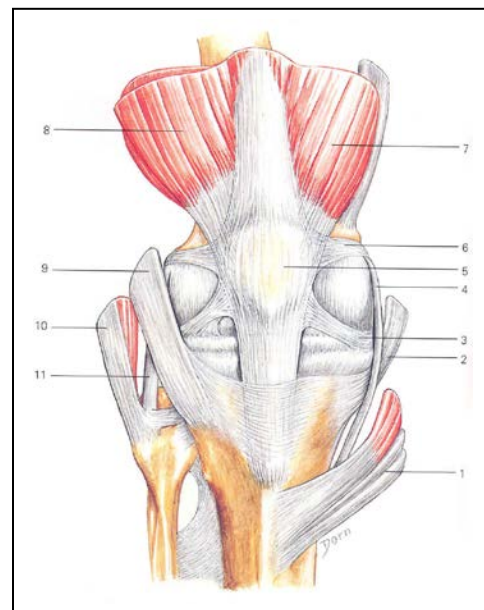
The **patellar tendon** attaches to the tibial tubercle on the front of the tibia (shin bone) just below the front of the knee. It also is attached to the bottom of the patella (kneecap). At the top of the patella, the **quadriceps tendon** is attached. Attaching to the quadriceps tendon is the quadriceps 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 or overnight stay. 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



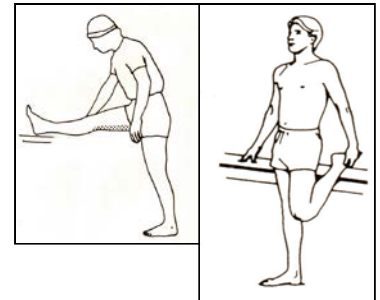
ONE LEGGED TOE RAISES

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.



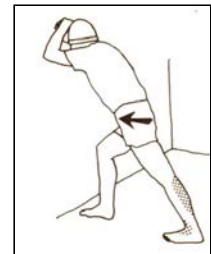
HAMSTRING STRETCH

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



QUADRICEPS STRETCH

This stretch is performed in the position illustrated. Lean gently backward as if bringing your 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

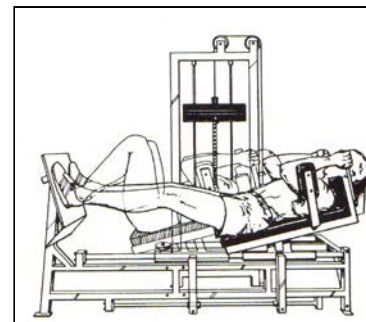
In the position illustrated, keep the heel flat on the floor and the knee fully extended. Lean forward at the hips with the arms supporting your weight. When you feel a gentle stretch in the back of your calf and knee, hold for 15 to 20 seconds for 3 to 5 repetitions.

OPTIONAL ADDITIONAL EXERCISES

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

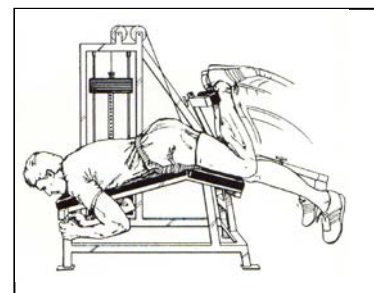
SEATED LEG PRESS

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



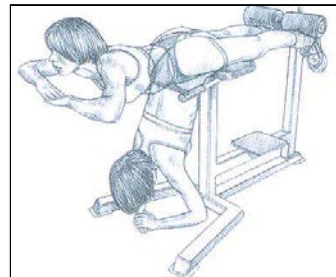
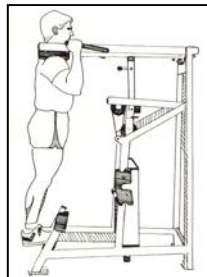
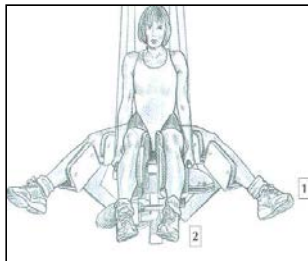
RESISTED HAMSTRING CURLS

If you have access to a hamstring curl machine (illustration), 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



Phase 4 Exercise Program Summary:

Frequency: 3 times a week

Sets and repetitions: 3 sets of 15 repetitions

- Leg Press
- Hamstring Curl
- Wall Slides
- Roman Chair
- Chair Squat
- Calf Raises or Calf Raise machine
- Hip Abductor/Adductor machine
- Step-up-down strengthening progression
- Hamstring, Calf and Quadriceps stretching
- Quadriceps setting 20 repetitions, 3 times a day

If you do not have access to gym equipment, the following exercises from phase 3 should be continued using ankle weights. In general, start with 1 lb and add 1 lb per week:

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

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



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- Do aerobic workouts *after* strength workouts
- Cool-down by stretching after finishing exercise

The following exercises are ***not*** recommended 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

Rehabilitation after Patellar and Quadriceps Tendon Repair Surgery

Post-op Phase	Weight bearing status	Use of brace	Passive ROM and Active ROM	Strength training	Return to running and sports	Recommen Restriction
Phase One The first 2 weeks after surgery	WBAT crutches	Knee immobilizer or post-op brace locked in full extension	Quad sets, ankle pumps No Knee flexion	None	None	No weight bearing on knee No stairs
Phase Two 2 to 6 weeks after surgery	WBAT Crutches Progressively wean	Continue knee immobilizer for walking	Quad sets, active knee flexion, side leg lifts, toe raises CPM 10 hours a day	None OK for non-involved limbs	None	No SLRs yet No active knee extension exercises antigravity No stairs. Limit flexion to 90° maximum
Phase Three 6 to 12 weeks after surgery	FWB	Wean immobilizer per MD	Progressive active and gradual passive knee flexion Active stretching all uninvolved muscle groups Stationary bike	Progressive leg lifts antigravity, progress to ankle weight PRE Wall slides Partial squats	Progressive walking on level surfaces	Continue to avoid bearing full weight on stairs Avoid patellofemoral overload Limit OC and CC knee extension arc to 0-30
Phase Four 12 to 16 weeks after surgery	FWB	Neoprene support as needed	Full ROM Stretch all muscle groups	Cautious use of weight training machines Step-up-down progression	Walking on level surfaces and gentle inclines	Step up stairs gradually Avoid jumping
Phase 4 16 to 20 weeks after surgery	FWB	Neoprene support	Same as phase 3	Progressive strengthening avoiding overload	Walk-to jog progression	Step down stairs gradually
Phase 5 20 to 24 weeks after surgery	FWB	Neoprene support	Same	Same	Progressive run/speed/agility Jump training after 24 weeks post-op	Proceed gradually with caution