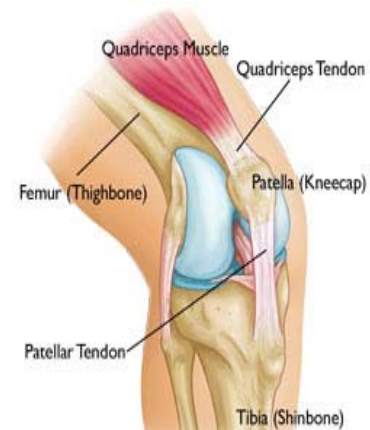


## Quad/Patella Tendon Repair

### Anatomy and Biomechanics

The knee is composed of two joints, the tibiofemoral and the patellofemoral. The patellofemoral joint is made up of the patella (knee cap) and the groove of cartilage on the femur in which it sits. The purpose of the patella and the patellofemoral joint is to allow for greater force development through the quadriceps muscle by creating a fulcrum mechanism as the knee is extended (straightened). Normally the knee cap slides up and down following the track of the groove in the middle of the femur. This joint is subject to tremendous forces when the knee is repetitively loaded in flexion and extension during sports and physical activity.



<http://orthoinfo.aaos.org/topiccfm?topic=A00512>

The Quadriceps muscle is anchored to the patella via the Quadriceps tendon. The patella, in turn is anchored to the shin bone via the patellar tendon (see picture above). When the tensile load through the tendon is greater than the tissue can bear it will tear. These tears often come in the form of one single traumatic event, but the the events leading up to the tear may be a culmination of a series of actions (repetitive microtrauma), or a medical predisposition for breakdown. Typically, a strong force such as an explosive jump, is required to rupture the tendon. However, with a history of chronic tendon inflammation (tendinitis), the tendon may be weakened and could tear with less force. Some medical conditions can also weaken the tendons and make a tear more likely. These include, but are not limited to: aging and degenerative changes, diabetes, kidney disease, and rheumatoid arthritis.

Regardless, when the Patellar or Quadriceps tendon tears there is often a tearing or popping sensation, followed by pain and swelling. Additional symptoms include:



<http://orthoinfo.aaos.org/topiccfm?topic=A00512>

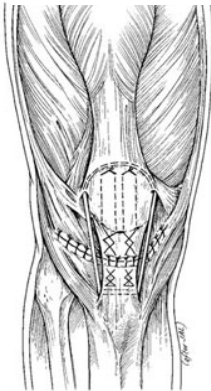
- An indentation above or below the patella where the tendon is torn
- Bruising
- Tenderness
- Muscle cramping
- The kneecap may move up into the thigh because it is no longer anchored
- Inability to straighten the knee
- Knee buckling or giving way

### Treatment Options

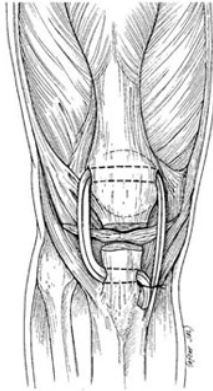
The severity, and resulting dysfunction, of Patella/Quadriceps tendon tears, varies greatly. In each case the physician and his or her staff evaluates the individual case and determines the best plan of care for each patient. A period of rest and modified activity, including the use of knee brace for 3-6 weeks, may be enough to

manage some cases (usually minor partial tears). Use of anti-inflammatory medication and ice may also be recommended. The physician and his or her staff may also ask the patient to undergo a course of physical therapy to address the underlying mechanical causes of patella femoral joint stress. In most cases surgery is required to reattach the torn tendon to its attachment point.

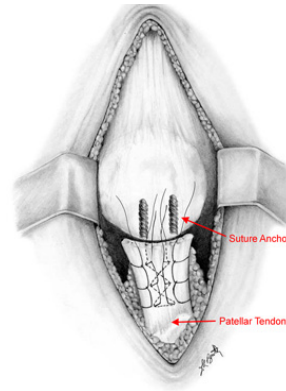
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### **Surgery**

Surgical repair reattaches the torn tendon to the bone. Patients who require surgery often do better if the repair is performed early after the injury. Early repair may prevent the tendon from scarring and retracting in a shortened position. The surgical technique and specific procedure can vary from case to case. The goal of the procedure is always to restore the correct tension and positioning of the patella so that the fulcrum mechanism can be maintained. The most common complications of patellar tendon repair include weakness and loss of motion. Your doctor will likely require you to have physical therapy, so as to minimize loss of strength and mobility. In most cases a full return to pre-injury activity levels is expected.

### **Recovery/Time off Work**

Recovering from Patellar/Quadriceps tendon repair surgery is not easy. It is very important that the patient knows the recovery process is difficult and time consuming. He or she must be an active participant during this process, performing daily exercises to ensure there is proper return of range of motion and strength. There is a large amount of variability in the time it takes to fully recover from this procedure. It is usually estimated that it will take at least 6 months for the patient to feel as though he or she has completely returned to a pre-injury level of activity. Some cases may take as long as a year to make a full recovery. People with desk jobs should plan to take at least 1 week off from work. Manual laborers will likely be out of work for at least 4-6 months. **Recovery is different in each case.** Your individual time table for return to activities and work will be discussed by your surgeon during post operative office visits.

### **Hospital Stay/Post Operative Visits**

After having surgery to repair the Patellar/Quadriceps tendon you may be required to stay in the hospital for a few days. You will be discharged home as soon as it is safe for you to be so. Your first post-op visit to the doctor's office will be approximately two weeks after the operation. At this visit your stitches will be removed and you will review the procedure with the surgeon or his/her assistant. At this time you will most likely be cleared to make an appointment to begin Physical Therapy. Your surgeon will determine the frequency of subsequent follow up visits.

**At Home**

You should replace your post-op dressing daily and inspect your incision for signs of infection. If you have staples closing your incision they will likely be scheduled to be removed around two weeks after the operation. If your surgeon used stitches to close the wound do not remove the strips of tape (steri-strips) that are across your incision. Allow them to fall off on their own or to be removed at your doctor's office visit.

**Medication**

Your surgeon will prescribe pain medicine for you after the operation. Please call the doctor's office if you have any questions regarding medication.

**Ice**

You must use ice on your knee after the operation for management of pain and swelling. Ice should be applied 3-5 times a day for 10-20 minutes at a time. Always maintain one layer of protection between ice and the skin. Putting a pillow case or towel over your ice pack works well for this.

**Walking**

It is very important for you to use crutches (or a walker) after the surgery. Putting too much weight on your knee in the early phases of recovery can create excessive and persistent swelling, poor gait mechanics and may cause undue stress on the healing repair. You will be instructed on how much weight you can bear on your leg while using your crutches (walker) right away after surgery. With your doctor's permission your therapist will instruct you on how to safely wean from using your crutches (walker) after 2 weeks post op.

**Brace**

After surgery your doctor will require you to wear a hinged knee brace. If your doctor has specific instructions regarding the use of this brace then he or she will go over them with you and your family after the operation, or at your first post operative appointment. Generally, it is recommended that you keep the brace locked in extension while walking at all times. The doctor will inform you when you may walk with the brace unlocked. You may be allowed to unlock the brace to allow some bending when sitting. Your doctor will tell you exactly how much you are allowed to bend your knee after the operation. Generally, patients are not allowed to bend the knee past 90 degrees for the first six weeks after surgery. You will need to use this knee brace for at least six weeks after the operation.

**Driving**

After surgery you will not be allowed to drive as long as you are taking narcotic pain medicine. If you had surgery on your left leg you may drive an automatic transmission car, if your doctor allows you, as soon as you are no longer taking narcotics. If you had surgery on your right leg your doctor will let you know when you are clear to drive. Driving is generally not permitted when your leg is weak enough that you still need to use the post operative brace.

## Rehabilitation

**\*\*The following is an outlined progression for rehab. Advancement from phase to phase as well as specific exercises performed should be based on each individual patient's case and sound clinical judgment by the rehab professional. \*\***

### Phase 1: Inpatient Phase (Surgery- Hospital Discharge)

#### Goals

Control Pain and Swelling  
Protect Healing Tissue  
Restore independent functional mobility  
Work with Case Management to Develop Appropriate Discharge Plan

#### Precautions

WBAT with Crutches/Walker, unless otherwise ordered  
Brace locked in extension at all times unless otherwise ordered

#### Recommended Exercises

##### Range of Motion

Ankle pumps  
Heel Prop (passive extension)  
Contralateral leg exercise

##### Functional Mobility

Gait training on level surfaces  
Stair training  
Transfer training  
ADL's with adaptive equip as needed

##### Positioning (when in bed)

Use a towel roll under ankle to promote knee extension  
Never place anything under the operative knee. This can cause difficulty reaching the goal of full extension.

#### Inpatient Plan of Care

##### Day of Surgery

Out of bed to chair  
PT Evaluation

##### Post Op Day 1

PT service and OT Evaluation  
Therapeutic Exercise including ROM, Strengthening, and Functional Mobility as appropriate  
ADL Training as appropriate

##### Post Op Day 2-Discharge

Progression of Therapeutic Exercise and Functional Mobility  
Continued ADL Training

## **Phase 2 (Immediate Post Operative Phase Hospital Discharge - 2 Weeks)**

### **Goals**

Control Pain and Swelling  
Protect Healing Tissue  
Begin to Restore Range of Motion (ROM) Especially Full Extension  
Establish Good Quadriceps Activation

### **Precautions**

WBAT with Crutches or walker (unless otherwise specified)  
Brace locked in extension with ambulation and while sleeping  
Brace unlocked when sitting (**flexion angle per MD order**)

### **Recommended Exercises**

#### Range of Motion

Heel Slides (with in flexion limitations) 2 Sets of 20 Repetitions  
Assisted Knee Flexion/Extension in Sitting (within flexion limitations) 2 Sets of 20 Repetitions  
Heel Prop (passive extension) 5 Minutes  
Belt Stretch (Calf/Hamstring) Hold 30 Seconds 3-5 Repetitions  
Ankle Pumps without resistance at least 2 Sets of 20 Repetitions

#### Strength

Quad Sets 2-3 Sets of 20 Repetitions

### **Guidelines**

Perform Range of Motion and Strengthening exercises 3-5 times a day as tolerated.

## **Phase 3 (Protected ROM Phase 2-6 Weeks)**

### **Goals**

Continued protection of healing tissue  
Continue to improve ROM (continue MD guided restrictions for flexion)  
Continue to establish quad activation

### **Precautions**

WBAT with progressive weaning of crutches or walker as able  
Continue limited knee flexion (0-90 degrees)  
Brace locked with ambulation

### **Recommended Exercises**

#### Range of Motion

Continue ROM exercises from Phase 1 (slowly progress flexion to 90 degrees)

#### Strengthening

Continue Quad Sets (as needed for VMO activation)  
Open chain hip abduction, extension, adduction (add ankle weight or resistance band as appropriate)  
Active Knee Flexion (0-90 degrees only)

Heel Raises

\*No SLR or Open Chain Active Knee Extension Until 6 Wks\*

### **Guidelines**

Perform all ROM and strengthening exercises once a day. Do 2-3 sets of 15-20 repetitions.

## **Phase 4 (Early Strengthening Phase 6-12 Weeks)**

### **Goals**

Progressive Restoration of Normal Knee Flexion

Wean from Brace and establish proper gait pattern

Begin closed chain strength and proprioceptive training (0-30 degrees of flexion)

### **Precautions**

Stress proper gait as wean from brace

Must avoid painful patella femoral stress and excessive loading

No running or ballistic movements

### **Recommended Exercises**

#### Range of Motion and Flexibility

Continue ROM exercises from phase 1 and 2 (slowly progress to full knee flexion)

Add Lower Extremity stretching (Hamstring, Calf, Glutes, Adductors, ITB, etc)

\*No Quadriceps Stretching until 12 wks

#### Cardio

Cycle with minimal resistance

#### Strengthening

Continue Progression of Open chain hip abduction, extension, adduction and Hamstring Curls  
Squats to 30°

Low Load, Low Flexion Angle Leg Press

Closed Chain Terminal Knee Extension

#### Proprioception

Single Leg Stance

Static Balance on Bosu/Wobble Board/Foam/Etc

### **Guidelines**

Perform ROM and stretching exercises once a day until normal ROM is achieved. Hold stretches for 30 seconds and perform 2-3 repetitions of each.

Cardio exercise is recommended 3-5 times a week for 20-30 minutes.

Perform strengthening exercises 3-5 times a week. Do 2-3 sets of 15-20 Reps. Strict attention must be paid to form and minimal patella femoral pain with exercises.

## Phase 5 (Advanced Strengthening Phase 12-24 Weeks)

### Goals

Continue to avoid patella femoral and extensor mechanism pain  
Progress to single leg strengthening with progressive increase in flexion angle

### Precautions

No Running, Jumping, Plyometric Progressions until 20-24 Wks (per MD)  
No sports (gradual return to sports after 6 months)

### Recommended Exercises

#### ROM and Stretching

Continue daily stretching  
Add gentle Quadriceps stretching

#### Cardio

Continue cycle with increased resistance  
Add elliptical, swimming

#### Strengthening

Continue SLR Program  
Slow Progression to gym Equipment (Leg Press, Ham Curl, Multi-Hip)  
Begin Step-Up Progressions (lateral step-ups, cross over step-ups) \*Forward Step Downs are not recommended due to increased patella femoral load\*  
Lunge progression (static to dynamic)  
Lateral Lunge  
Progressive Single Leg Strengthening late in phase (single leg squat, split squat, single leg dead lift)

#### Proprioception

Dynamic Balance (Bosu/Foam/Etc)

#### Dynamic Progressions

May begin slow progression of jogging and agility training with MD approval at 20 Wks  
Work with PT or MD to create patient specific plan  
Jumping Progressions after 24 Wks with MD approval

### Guidelines

Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.  
Cardio program is recommended 3-5 times a week for 20-40 minutes  
Perform strengthening/proprioception exercises 3 times a week. Do 2-3 sets of 15-20 Reps.  
Perform dynamic progression exercises 2 times a week

## Phase 6 (Return to Sport/Activity Phase 24 Weeks and Beyond)

### Goals

Maintain adequate ROM, flexibility and strength  
Continue progressive/dynamic strengthening, proprioceptive, plyometric and agility training  
Achieve adequate strength to begin return to sport progressions (pending surgeon's clearance)

**Precautions**

Limited and controlled plyometric/ballistic movements

Gradual return to sport pending surgeon's clearance (6-9 months or greater)

Work with surgeon or Physical Therapist to develop specific return to sport progression

**Recommended Exercises**Stretching

Continue daily lower extremity stretching

Cardio

Continue cardio program and progress intensity and duration

Strengthening

Continue strengthening program from phase 4 (increase load and decrease volume)

Proprioception

Continue and advance proprioceptive training (increase difficulty of drills)

Dynamic Progressions

Progress plyometric/jumping program as outlined by PT or MD

Outline specific return to sport/activity program with PT and/or MD

**Guidelines**

Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.

Cardio program is recommended 3-5 times a week for 20-40 minutes

Perform strengthening/proprioception exercises 3 times a week. Do 2-3 sets of 15-20 Reps.

Perform plyometric/jumping/agility exercises 2 times a week

Perform return to sport activities as directed by P.T. or MD



Time	Weight Bearing and Gait	Focus	Range of Motion	Recommended Exercises	Precautions
<b>Phase 1</b> Surgery to Discharge	*WBAT with crutches and brace locked at 0°	*Control Pain and Swelling *Protect Repair *Restore independent functional mobility *Develop Appropriate Discharge Plan	*Emphasize 0° Extension *Limit Flexion per MD order *May Have Specific ROM Instructions per MD	<b>ROM</b> Ankle pumps Heel Prop (passive extension) Contralateral leg exercise <b>Functional Mobility</b> Gait training on level surfaces Stair training Transfer training ADL's with adaptive equip as needed <b>Positioning (when in bed)</b> Use a towel roll under ankle to promote knee extension	*Protect Repair *Limit Flexion per MD order *Lock Brace with Weight Bearing
<b>Phase 2</b> 0-2 Weeks	*WBAT with crutches and brace locked at 0°	*Wound Healing *Protect Repair *Establish Early ROM in Extension and limited Flexion *Establish Good Quadriceps Contraction with Quad Set	*Emphasize 0° Extension *Limit Flexion per MD order *May Have Specific ROM Instructions per MD	<b>ROM</b> Heel Slides, Seated Assisted Knee Flexion/Extension, heel prop, <b>Strengthening</b> Quad Sets, Hip Abd/Add/Extension, Standing or Prone Hamstring Curl	*Limit Flexion per MD order *Minimize Joint Effusion and Edema
<b>Phase 3</b> 2-6 Weeks	*Progress WBAT and wean crutches as tolerated *Continue Brace locked at 0° for ambulations	*Continue to Protect Repair *Progress ROM slowly to 90° of flexion over 6 Wks *Continue isometric Quadriceps Strengthening	*Continue Emphasis on 0° of Extension *Slowly progress ROM to 90° of flexion over 6 Wks *May Have Specific ROM Instructions per MD based on operative findings	<b>ROM</b> Continue Phase 1 Exercises: slowly progress flexion to 90 degrees <b>Strengthening</b> Quad Sets, Hip Abd/Add/Extension, Standing or Prone Hamstring Curl	*Still protective of repair so progress flexion slowly *Minimize Joint Effusion and Edema * Stress Locked Brace with Gait *Avoid Patella Femoral Joint Stress
<b>Phase 4</b> 6-12 Weeks	*Unlock Brace with Gait. * Wean From Brace as Gait Improves and Quad gets stronger	*Normalize Gait Mechanics *Initiate Active Knee Extension and Isotonic Quad Strengthening in OKC and CKC	*Slowly progress to full flexion *Begin Lower Extremity Stretching Program for uninvolved muscle groups.	<b>ROM/Stretching</b> Continue ROM work as needed. Start Lower Extremity Stretching Program of Hamstring, Calf, Hip Muscle Groups <b>Cardio</b> Introduce Cycle with minimal resistance <b>Strengthening</b> Progress Open Chain Hip Program, Add SLR and Active Low Load Open Chain Knee Extension Squats or Wall Slides to 30° Low Load, Low Flexion Angle	*Continue to Take Care Not to Overload Patella Femoral Joint

				<p>Leg Press Closed Chain Terminal Knee Ext</p> <p><b>Proprioception</b> Single Leg Stance, Static Balance on Bosu/Wobble Board/Etc</p>	
<p><b>Phase 5</b> 12-24 Weeks</p>	<p>*Straight Ahead Jogging per MD Approval</p>	<p>*Focus on regaining strength *Progress from Double leg to single leg CKC strengthening through phase</p>	<p>*Continue Lower Extremity Stretching Daily *Initiate gentle Quad Stretching</p>	<p><b>ROM/Stretching</b> *Continue Daily Stretching *Add Gentle Quad Stretch</p> <p><b>Cardio</b> *Continue cycle with increased resistance *Add elliptical, swimming</p> <p><b>Strengthening</b> *Continue SLR and Low Load Open Chain Program * Slow Progression to gym Equipment (Leg Press, Ham Curl, Multi-Hip) Begin Step-Up Progressions (lateral step-ups, cross over step-ups) *Lunge progression (static to dynamic) Lateral Lunge Progressive Single Leg Strengthening late in phase (single leg squat, split squat, single leg dead lift, etc)</p> <p><b>Proprioception</b> Dynamic Balance with Bosu/Foam/Etc</p> <p><b>Dynamic Progressions</b> *Jogging, agility, jumping all per MD</p>	<p>* Continue to Take Care Not to Overload Patella Femoral Joint *Jogging generally held until 20 Wks *Agility generally held until 20 Wks *Jumping generally held until 24 Wks</p>
<p><b>Phase 6</b> 24 Weeks and Beyond</p>	<p>*Return to Sport per MD Approval</p>	<p>*Continue Preparation for Return to Sport and Physical Activity *Progressive Strengthening and Jumping</p>	<p>* Continue Lower Extremity Stretching Daily</p>	<p><b>Stretching</b> Continue daily</p> <p><b>Cardio</b> Continue cardio program and progress intensity and duration</p> <p><b>Strengthening</b> Continue strengthening program from phase 4 (increase load and decrease volume)</p> <p><b>Proprioception</b> Continue and advance proprioceptive training</p> <p><b>Dynamic Progressions</b> Progress plyometric/jumping program as outlined by PT or MD Outline specific return to sport/activity program with PT and/or MD</p>	<p>* Must Have Full ROM, 90% Return of Strength and No Patella Femoral Pain to Begin Return to Sport Progressions * Gradual return to sport/activity pending surgeon's clearance (6-9 months or greater)</p>

\*Reviewed by Michael Geary, MD