

QUADRICEP TENDON REPAIR

The four quadriceps muscles converge at the distal thigh to form the quadriceps tendon. Tendons attach muscles to the bone. The quadriceps tendon attaches the quadriceps to the patella (knee cap). The patella tendon originates at the bottom of the patella and attaches the patella to the tibia (shin bone).

Quadriceps tendon tears are not common. They usually occur in individuals over the age of 40 engaging in sports involving running and jumping. Tears occur more frequently in males than females. Tendon tears can be partial or complete. Tears usually occur when the knee is in a loaded position with the foot planted such as when landing from a jump or stopping suddenly. A tear can also occur as a result of falling directly on the knee or from a forceful blow or laceration. Other predisposing factors to a tendon tear include the following:

- Tendonitis or inflammation of the quadriceps tendon which may cause small tears in the tendon in addition to weakening of the tendon
- Chronic diseases that disrupt the blood supply to the tendon. Examples include chronic renal failure, hyperparathyroidism, gout, leukemia, rheumatoid arthritis, system lupus erythematosus, diabetes mellitus, infection, and metabolic diseases.
- The use of corticosteroids over long periods of time has shown to cause weakness of muscles and tendons predisposing them to injury
- The use of Fluroquinolones, a type of antibiotic, has been associated with tendon ruptures
- Immobilization for long periods of time causes significant muscle and tendon weakness, predisposing one to injury.

If the tear is partial, only some of the fibers of the tendon are torn and some quadriceps function is available. If the tear is complete, however, the entire tendon is severed either from the bone or in the tendon body and no quadriceps function will be present. The quadriceps functions to extend, (straighten) the knee from a bent position. One way to confirm a complete tear is present is if one is unable to perform this function. X-rays and MRI can also confirm the presence of a partial or complete tear.

Symptoms of a tear include hearing or feeling a tearing and/or popping sensation followed by immediate pain and swelling. It may be difficult to fully straighten your knee as previously

described and bearing weight on the involved limb is often difficult or impossible. Other symptoms include bruising, tenderness just above the patella, knee buckling when attempting to bear weight, an indentation where the quadriceps tendon usually inserts into the patella, and patella sagging since the tendon is no longer attached.

Treatment of a quadriceps tendon rupture depends on many factors including the type and size of the tear, age, and activity level. Small, partial tears usually respond well to conservative treatment including rest, immobilization to allow healing, modalities, and physical therapy to return to activity. Large partial tears and complete tears often require surgical intervention in which the tendon is repaired back to the patella using multiple suture anchors.

Outcomes are improved when surgery is performed within a short period after the injury. Resumption of all ADLs and return to work are attainable and expected goals following surgery. Return to sport will depend on numerous factors including the age of the patient, severity of the injury, the desired sport, the individual is returning to, and the full return of necessary strength/function required to safely engage in the sport.

QUADRICEPS TENDON REPAIR

PHASE ONE: WEEKS 1-2

PRECAUTIONS

- NO ACTIVE KNEE EXTENSION
- Hinged knee brace locked in full extension at all times except during exercise
- WBAT in brace locked in extension with crutches
- Limit flexion ROM to 30°

EXERCISES

- Ankle pumps
- Quad sets X 10 minutes (10 sec hold, 10 sec relax)
- Abduction leg raise in side-lying
- Hamstring stretch (not aggressive if HSG) – hold 30 seconds
- Gastroc stretch with towel – hold 30 seconds
- Heel slides limit to 30°

MODALITIES

- EMS may be needed to facilitate quad if contraction cannot be voluntarily evoked
- EGS may be needed to help control swelling and increase circulation
- Ice should be used following exercise and initially every hour for 20 minutes

GOALS PHASE ONE

- Protection of repair
- Decrease pain and effusion
- Initiate ROM in safe ranges
- Improve quad recruitment

PHASE TWO: WEEKS 2-6

PRECAUTIONS

- NO ACTIVE KNEE EXTENSION
- WBAT locked in extension in brace using crutches
- Slowly increase ROM:
 - 0-45° week 3
 - 0-60° week 4
 - 0-75° week 5
 - 0-90° week 6

ROM/FLEXIBILITY

- Heel slides – see guidelines above
- Continue with HS and calf stretching

MANUAL

- Patella mobilization
- Scar mobilization once incision is healed

STRENGTH

- Continue previous
- Quad sets are continued until swelling is gone and quad tone is good
- SLR (4 way): perform flexion only when no extension lag is present; may need to perform in brace to protect repair
- Weight shifting to involved LE in full extension in brace
- Multi-hip machine
- Standing calf raises

CARDIO

- UBE

MODALITIES

- Continue NMS as needed
- Continue to use ice following exercise

GOALS PHASE TWO

- ROM 0-90°
- Good quad control
- SLR with no quad lag
- Minimal effusion
- Good scar mobility

PHASE THREE: WEEKS 6-12

PRECAUTIONS

- Unlock brace to 90° when sitting with gait when quad control allows
- Initiate active leg extension but not loaded leg extensions
- Initiate closed chain strengthening 0-60° only
- Continue to slowly progress ROM as follows:
 - 0-110° by week 8
 - 0-130° by week 10

GAIT

- FWB
- Brace can progressively be unlocked to 30°, 45°, and 90° as quad control improves
- Cone walking - forward and lateral
- D/C brace and crutches when N gait

ROM/FLEXIBILITY

- Heel slides adhering to precautions above
- Hamstring stretch seated/supine
- Seated/standing calf stretch
- Thomas position hip flexor stretch
- Initiate light quad stretch at week 8 in prone

STRENGTH

- Continue previous adding leg weights to leg raises
- Seated active leg extensions
- Prone hamstring curls
- Shuttle/Total gym/leg press (0-60°) bilateral and unilateral- focus on weight distribution more on heel than toes to avoid overload on Patella tendon
- Step-ups
- Step-overs
- Wall slides/Mini-squats (0-60°)
- Swiss ball and foam roll hamstring exercises – supine bridge with knee flexion, bridge with HS curl
- RDLs progress to SL RDL

BALANCE

- SLB: stable progress to unstable; EO progress to EC
- Mini-Squat holds on wobble board using B Les
- SL RDL

CARDIO

- Initiate cycle when reach 110° of knee flexion
- Initiate EFX when adequate quad support
- Rowing

MANUAL

- Joint mobs and STM as needed

GOALS PHASE THREE

- N gait pattern
- Ascend/descend stairs with reciprocal pattern
- All ADLs pain free and with good mechanics
- No effusion/swelling

PHASE FOUR: WEEKS 12-24

ROM/FLEXIBILITY

- Continue previous working to get full flexion ROM
- Initiate dynamic warmup

STRENGTH

- Step-ups - forward and lateral; add dumbbells to increase I; focus on slow and controlled movement during the ascent and descent
- Squats - Smith press or standing
- Lunges -forward and reverse; add dumbbells or med ball
- T-band hip flexion
- Single leg squats

BALANCE

- Y balance test
- Plyoball - toss - even and uneven surface
- Squats on balance board/foam roll/airex
- Steamboats - 4 way; even and uneven surface
- Strength activities such as step-ups and lunges on airex

CARDIO

- Continue previous increasing I as able
- Initiate jogging in alterG
- Swimming

GOALS PHASE FOUR

- Ascend/descend stairs with reciprocal pattern
- All ADLs pain free and with good mechanics
- No effusion/swelling
- Less than 6cm difference in ant reach on Y balance test OR ability to balance with good stability on BOSU 60 sec
- Ability to perform SL squat to 45° with good mechanics

PHASE FIVE WEEKS 24+

- Exercises for strengthening should continue with focus on high intensity and low repetitions (6-10) for increased strength.
- Biodex may be implemented at high speeds (180°).
- Initiate lateral movements and sports cord: lunges, forward, backward, or side-step with sports cord, lat step-ups with sports cord, step over hurdles.
- Jog progression
 - 1-2 min jog/1 min walk up to 10 min
 - Progress as symptoms allow 2 min jog/ 1 min walk to 20 min
 - Increase interval time jogging by 1-2 min every other session as long as no increase in pain/effusion
 - Jogging should first be performed on a treadmill or track and harder surfaces such as asphalt or concrete should be avoided if possible.

- It is normal for the patient to have mild soreness but this should not persist beyond one day or the patient did too much.
- Jump rope and line jumps can be initiated when the patient is cleared to jog.
 - Goal: 3 sets of 1 min or 5 sets of 100 reps
 - Bilaterally progress to unilateral