

Principles of Surgery and Rehabilitation

This surgical technique is designed to implant a high strength graft (the patella tendon), to fix the graft securely to allow earlier rehabilitation, and to place the graft in such a way as to stabilize the knee but not compromise full range of motion. The ultimate goal of rehabilitation after surgery is to restore the patient to his or her pre-injury functional status. This requires:

- Normal stability of the knee
- Full range of motion of the knee
- Full muscle strength, endurance, quickness, and coordination in all muscle groups in the lower extremity
- Normal core strength and stability, ie, trunk, abdominal, and hip muscle groups.

The rehabilitation can be thought of as four phases:

Phase I From surgery to one week post-operative

- The main goals of Phase I are:
- Allow for wound healing
 - Achieve full extension
 - Achieve quadriceps control to allow for ambulation.

A. Protection

1. Use knee immobilizer when ambulating—it can take up to one week to regain enough quadriceps control to feel secure walking without the immobilizer.
2. Full weight-bearing is allowed and encouraged.
3. An elastic wrap may be worn on the knee or a compression stocking on the leg if desired to reduce swelling.
4. The cryocuff helps prevent knee swelling and can be used throughout the rehabilitation when swelling occurs after exercise.

B. Motion

1. Full extension is emphasized. Use a towel roll under the ankle and let the knee stretch out, or lie face down on a bed with the legs and knees over the side of the bed and let gravity stretch the knee out straight.
2. Work on active flexion by lying down and doing heel slides or sitting in a chair and using the good leg to help push the operated knee into increasing flexion.
3. Sometimes a home continuous passive motion (CPM) machine will be used for the first one to two weeks to help regain flexion.
4. Do exercises to mobilize the patella up, down, and side to side.
5. Ankle movement help with circulation and decrease leg swelling.

C. Muscles

1. Quadriceps tightening exercises only in full extension (no open-chain knee extension exercise at any time).
2. Quadriceps/hamstrings co-contractions in varying degrees of flexion, e.g. leg press or wall slides.
3. Hamstring stretching

Phase II One to 12 weeks post-operative

- The main goals of Phase II are:
- Maintain full extension
 - Regain full flexion
 - Muscle exercise for the entire lower extremity and core.
 - Protect the graft from stretch-out or failure (bone plug healing into bone tunnels takes at least six weeks; the graft itself revascularizes and is weakest from week six to week 12 after surgery).

A. Protection

1. Start straight-ahead jogging after six weeks when comfortable, but no twisting or cutting.

B. Motion

1. Continue extension stretching
2. Regain full flexion with full heel slides and squatting. Approximate target goals:
 - 90° by two weeks
 - 120° by five weeks
 - Full by 10 to 12 weeks

C. Muscles

1. Regain normal gait without protecting the knee
2. Closed kinetic chain quadriceps strengthening and endurance
 - Stair or elliptical machine
 - Cross-country ski machine
 - Bike
 - Leg press
 - Squats
 - Wall slide
3. Hamstring curls for strength and endurance
4. Core and hip strengthening
5. Calf raises
6. Joint proprioception and muscle coordination:
 - Slide board
 - BAPS board (wobble board)
 - Jump rope
 - Lunges
 - One-legged squats
 - Trampoline

Phase III *Three to six months post-operative*

The main goals of Phase III are:

- *Core strengthening*
- *Whole limb strengthening, endurance, quickness, and coordination*
- *Regain sport-specific skills*

A. Protection

The use of a functional brace (e.g. Lenox-Hill, CTi or the like) is controversial and will be discussed with each patient individually.

B. Motion

Work on motion as needed

C. Muscles—Emphasis on whole-limb, functional activities such as:

1. Running
2. Sport-specific skills
3. Plyometrics to regain muscle quickness
 - *Jump onto box, jump side to side, etc.*
4. Strengthening exercises should continue.

Phase IV *At six months post-operative*

- A. The main goal of Phase IV is to return to competitive sports participation. This is accomplished by a gradual increase in the duration and intensity of sports involvement.
- B. Many athletes can return to competitive participation by five to six months, sometimes it takes longer. Part of that depends on the demands of your particular sport.
- C. Even after return to competition, it takes some time before the athlete feels he or she has reached normal performance level. It is important to be patient and not get discouraged at not being 100% recovered.

For Meniscus Repair

1. We will allow the flexion to come back slower. We will not force the knee into full flexion until comfortable.



Anterior Cruciate Ligament Reconstruction Patella Tendon Autograft or Allograft



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