



Bath Hospital

# ACL RECONSTRUCTION PATELLA TENDON AND HAMSTRING AUTOGRAFTS

*Based on - Evidence-based rehabilitation following ACL reconstruction van Grinsven S. et al  
KSSTA (2010 18: 1128-1144*

## PRE SURGERY

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Patients may be seen by the physiotherapist before surgery. During these sessions the following should be considered:

- Information about the rehabilitation (discuss mutual expectations). Emphasize that knee rehabilitation is more than strength-training of the upper-leg muscles alone. The (neuromuscular) rehabilitation addresses the whole lower extremity, core stability and training of the kinetic chain.
- Decrease pain, swelling and inflammation.
- Achieve/maintain normal range of motion (ROM with a focus on good patellar mobility).
- Achieve/maintain normal gait pattern.
- Maintain muscle strength, prevent atrophy.
- Training of the first-days postoperative exercises (i.e. heel slides, straight-leg raising (SLR), static quadriceps, leg elevation with a pillow under the heel). Emphasize the importance of full extension.
- Practice alternate walking with crutches for the first days postoperatively.

## POST SURGERY

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### Phase 1 (week 1)

- Control of pain and swelling (i.e. through ice packs and exercises).
- Obtain ROM of  $0^{\circ}$ - $90^{\circ}$ , emphasizing achievement of full extension including patellar mobilisation in all directions, plus heel slides (leg elevation with a pillow under the heel if necessary).
- Regain muscle control static quadriceps, hamstrings and functional SLR.
- Improve gait pattern. If pain is tolerated, aim at walking without crutches from day 4. Sufficient neuromuscular control and a non-limping gait pattern are criteria for walking without crutches.

### Criteria to start with phase 2

- Pain in knee is equal to previous week or less.
- Minimal swelling (measurement with measuring tape).
- Full extension and  $90^{\circ}$  flexion are possible.
- Good patellar mobility compared with contralateral side.

- Sufficient quadriceps control to perform mini squats 0°-30° and SLR in multiple directions.
- Ability to walk independently with or without crutches.

### **Phase 2 (week 2 to week 9)**

- Apply ice packs in case of pain or swelling (if necessary after each exercise session).
- Work toward full ROM (maintain full extension, 120° flexion from week 2 and 130° flexion from week 5) and ensure good patellar mobility.
- Walking without crutches from day 4 to 10. Normalize gait pattern with walking exercises (jogging on treadmill from week 8).
- Isometric and isotonic strength training increasing in intensity (hamstring, gastrocnemius and soleus), avoid weights for hamstring until week 9.
- Gentle open chain quadriceps exercise from week 8.
- Quadriceps strengthening (squats): week 2-7 0-60°, after week 8 0-90°.
- Start neuromuscular training by slowly increasing from static stability to dynamic stability. Work toward confidence on the vestibular and somatosensory system for balance, with increasing surface instability and decreasing visual input.
- Start from week 3 with cycling on an ergometer.
- Start from week 4 with stepping on a stair-stepping machine.
- Start from week 6 swimming with straight leg kick (no breaststroke).
- Start from week 8 with outdoor cycling.

Caution: act promptly in cases of persisting pain, inflammation or limited ROM as there is a risk of developing arthrofibrosis (knee stiffness). If in doubt consult the orthopaedic surgeon.

### **Criteria to start with phase 3**

- Minimal pain and swelling (VAS-score pain, measurement of knee swelling with measuring tape).
- Full extension and at least 130° flexion possible.
- Normal gait pattern.
- Exercises from previous week are performed correctly.

### **Phase 3 (week 9 to week 16)**

- Obtain and maintain full ROM.
- Optimise muscle strength and endurance for quads, hamstrings, calf. Add increasing weights from week 9 both for open chain and closed chain exercises.
- Neuromuscular training with increasing emphasis on dynamic stability and plyometric exercises, slowly increasing duration and speed. Start with two-legged jumping and work slowly toward one-legged jumping. Normalise running with outdoor jogging from week 13.
- From week 12 can swim using breaststroke.

### **Criteria to start with phase 4**

- No pain or swelling in the knee (VAS-score pain, measuring knee swelling with measuring tape).
- Full flexion and extension of the knee (ROM-goniometer).
- Quadriceps and hamstring strength >75% compared to the contralateral side.
- Hop test >75% compared to the contralateral side. (Hop test: the distance covered over 3 consecutive hops.)
- Exercises from previous week are performed correctly.

### **Phase 4 (week 16 to week 22)**

- Maximising muscle endurance and strength.
- Maximising neuromuscular control with emphasis on jumping, agility training and sport-specific tasks. Variations in running, turning and cutting manoeuvres are allowed. Duration and speed to be increased and maximised.

### **Criteria for returning to sports**

- No pain or swelling (VAS-score pain, measuring knee swelling with measurement tape).
- Full flexion and extension of the knee is possible (ROM-goniometer).
- Quadriceps and hamstring strength >85% compared to the contralateral side. Hop test >85% compared to contralateral side (see above).
- Exercises of previous week are carried out properly, and the patient tolerates sport-specific activities and agility training with maximal duration and speed.