



**REHABILITATION
MANUAL**
CARTIGROW®



INTRODUCTION

- After an injury or surgery, a rehabilitation manual will help patient return to daily activities and enjoy a more active, healthy lifestyle. Following a well structured rehabilitation manual will also help patient return to sports and other recreational activities.
- This is a general rehabilitation manual that provides a wide range of exercises. For better understanding the exercises are divided into phases.
- To ensure that the manual is safe and effective for you, it should be performed under doctor's supervision.
- This manual should be continued for 4 to 6 weeks, unless otherwise specified by your doctor or physical therapist.
- After recovery, these exercises can be continued as a maintenance program for lifelong protection and health of hips and thighs.
- Performing these exercises 2 to 3 days a week will maintain strength and range of motion in hips and thighs.



GENERAL INFORMATION/ GUIDELINES.

RISK IN DOING TOO MUCH, TOO SOON

It feels good to feel good after surgery. But there is a risk in feeling so good that you push yourself to the next activity level before you're ready. Remember that regardless of how you may feel, healing from this surgery takes time. Too much activity too soon can damage the graft or cause it to fail.

Sport-specific activities can begin about 12 months after surgery. Most athletes do not return to their sport until about 16 months after surgery. And the knee joint won't be fully restored until about 18 months after surgery.



FOLLOWING THE PRICE PROTOCOL:

P



**Protection of
operated leg.**

R



**Rest for
recovery.**

I



**Ice/Cryotherapy/
Cryocuff**
Apply cryotherapy
as standard edema
control (20 minutes
with ice, at least
3 times per day).

C



**Compression
bandage.**

E



**Elevation of
foot using
pillows.**

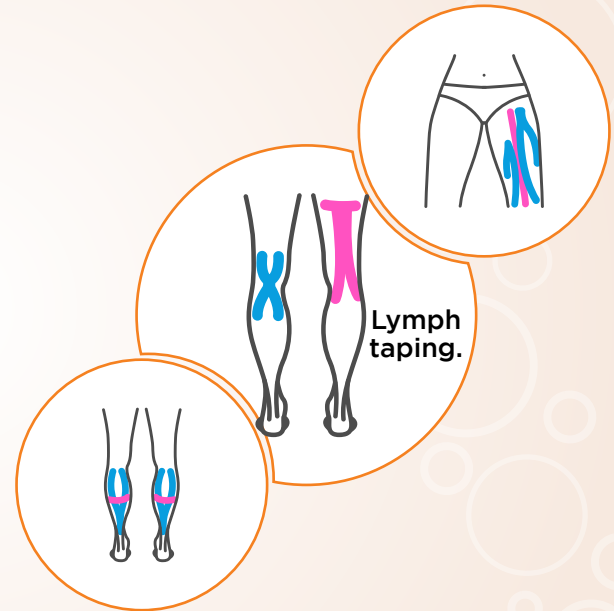


PROMOTING RESORPTION:

Active decongestion exercises. Manual lymph drainage
Lymph taping.

Passive movement exercises via CPM should be
commenced as soon as possible.

Continuous Passive Movement Start 48 -72 hours
post-surgery. For at least 6 weeks post op. Alternatively,
e.g., Bike Ergometer without resistance (60 mins/ day)



UNDERSTANDING WEIGHTBEARING

TYPES OF WEIGHT-BEARING RESTRICTIONS

Understanding the different weight-bearing restriction types, and how they are performed, can be confusing. So, what are weight-bearing restrictions, and how do you navigate from non-weight-bearing to full weight-bearing after injury or surgery?

Always check with your healthcare provider or physical therapist (PT) to understand your specific weight-bearing restrictions and how to maintain them properly. Studies have shown that compliance with these restrictions is low, and can have serious consequences.



• NON-WEIGHT-BEARING (NWB)

Non-weight-bearing means that no weight can be placed on the operated leg. This is the most restrictive of all weight-bearing limitations. Since you are not able to bear any weight on the leg, an assistive device, such as a walker or crutches, will be necessary for you to walk.

When walking with your walker or crutches, keep your affected knee bent and keep your toes off the floor. No weight means no weight; even the slightest bit of pressure on your leg can cause problems.



• TOE-TOUCH WEIGHT-BEARING (TTWB)

Toe-touch weight-bearing means that only the toes on your operated leg should contact the ground. **This is for balance only, however, and no significant amount of weight should be placed on your toes.**

As a result, an assistive device such as a walker or crutches will still be necessary for you to walk. Your toes are only used for slight balance and steadiness.

• PARTIAL WEIGHT-BEARING (PWB)

Partial weight-bearing allows you to place half of your weight on the operated extremity. Begin by using a scale to see how much pressure is on your affected leg when half of your weight is placed on it. Use your assistive device to stand with slight pressure on your leg.

Your physical therapist can help you with progressive partial weight-bearing. Sometimes your healthcare provider may give specifics when prescribing partial weight-bearing. They may prescribe

25% weight-bearing, 50% weight-bearing, or 75% weight-bearing.



• FULL WEIGHT-BEARING (FWB)

Full weight-bearing allows you to place all of your weight on the operated extremity. There are no restrictions in regard to the amount of weight placed on the leg,

It is important to strictly follow your weight-bearing restrictions after surgery or injury because otherwise you can disrupt healing and delay your recovery. These restrictions are meant to protect your body as it is healing.

PHASE I: PROTECTION AND ACTIVATION (WEEKS 0 – 6)

GOALS

- Maintain joint mobility and muscle tone.
- Protect healing tissue from load and shear forces
- Decrease pain and effusion.
- Gradually improve knee flexion
- Promoting resorption

REHABILITATION PLAN

Weight bearing	Range of motion	Activities
Non-weight bearing.	Using CPM, flexion starts after 48- 72 hours after surgery. Start with settings of 0- 20°	Gradual return to daily activities.
Use crutches for ambulation or the walking aid prescribed by your MS/PT.	Increase Flexion by 5 -7° on alternate days.	1. If symptoms like pain etc. occur, reduce activities to reduce pain and inflammation. 2. Extended standing should be avoided.

ACUTE (INPATIENT DAYS 0-4)

Cryotherapy, Kendall foot pumps and compression stockings are used for swelling, pain control and prevention of Deep Vein Thrombosis. Multi-directional patellar mobilization should begin immediately after surgery by your physiotherapist.

BRACE:

Locked at 0° during weight bearing (WB) activities.

- Must be worn all times.
- Sleep in locked brace for 2-4 weeks.
- Take Off for CPM only.



EXERCISES:

KENDALL FOOT PUMPS:

Promote blood flow and joint mobility.

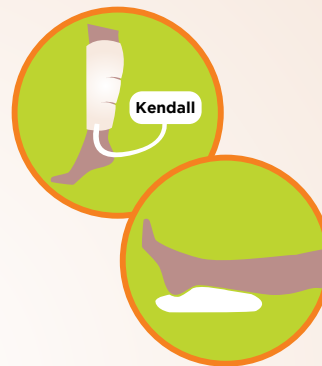
HEEL PROP STRETCH:

Elevate your leg by placing a cushion underneath your lower leg or heel as shown. While the leg is elevated, you may also bend your ankle, so your foot moves up and down or in circles. Do this 4-8 times per day for 15-20 minutes. You may also sleep with your leg elevated.

STRAIGHT LEG RAISES (SLR) : FLEXION

Squeeze thigh muscles tightly, then lift leg off the surface as shown in the picture. Raise and lower your leg slowly. Repeat 15-30 times

- SLR with foot upright.
- SLR with foot turned outward.
- SLR with foot turned inward.
- 2 Sets of each variation.



STATIC QUADS:

Squeeze thigh muscles tightly, as if pressing the back of your knee into the surface you are lying on. Hold contraction for 10 seconds, repeat 30 times.

STRAIGHT LEG RAISE: ABDUCTION

Squeeze thigh muscles tightly, then lift leg off the surface as shown in the picture. Raise and lower your leg slowly. Repeat 15-30 times

STRAIGHT LEG RAISE: EXTENSION

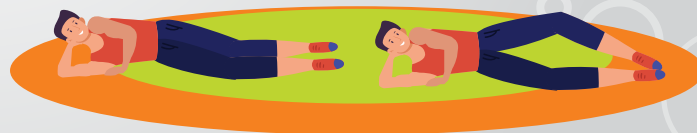
Squeeze thigh muscles tightly, then lift leg off the surface as shown in the picture. Raise and lower your leg slowly. Repeat 15-30 times.

GLUTEAL SETS:

Lie on your back with your knees bent in a 10 to 15-degree angle. Squeeze your buttock muscles together. Hold for five seconds. Relax. Repeat 15- 20 times.



CLAMSHELL EXERCISE:



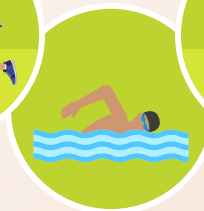
Core activation exercises and progression

ELECTRICAL MUSCLE STIMULATION:

Can be given by your physiotherapist, for improving sensorimotor function

DURING WEEKS 4 - 6

- If 90-degree flexion has been achieved, stationery cycle can be started with low – no resistance.
- Swimming (Optional) Once all wounds are healed and stitches removed
- Straight leg kicks, NO breast strokes, side strokes up to 6 months.



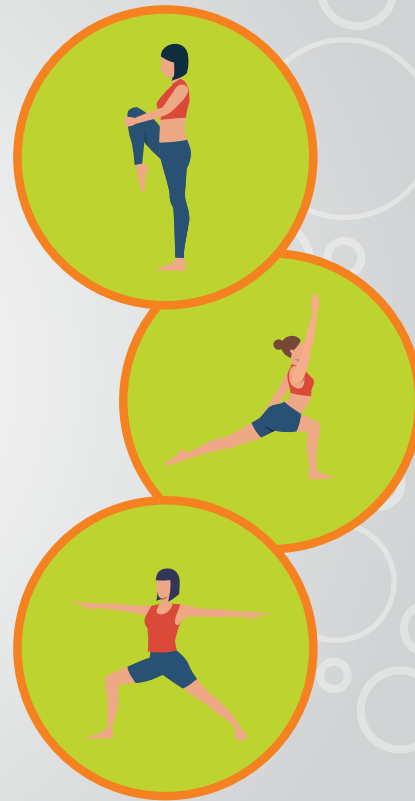
CONTRAINDICATIONS

1. Excessive load bearing (>20% of patient body weight) especially in combination with knee flexion
2. Ambulation without crutches and a protective knee brace
3. Generation of shear forces within the knee
4. Active knee extension (especially against resistance).

Strengthening / Stretching – Only quad sets and SLR's for quad strengthening frequently throughout the day to keep quad engaged. EMS for quad is good. Hamstring stretching. Calf stretching with a towel can be done.

CRITERIA FOR ADVANCEMENT WILL BE GIVEN BY YOUR MEDICAL HEALTH PROVIDER FOR EACH PHASE.

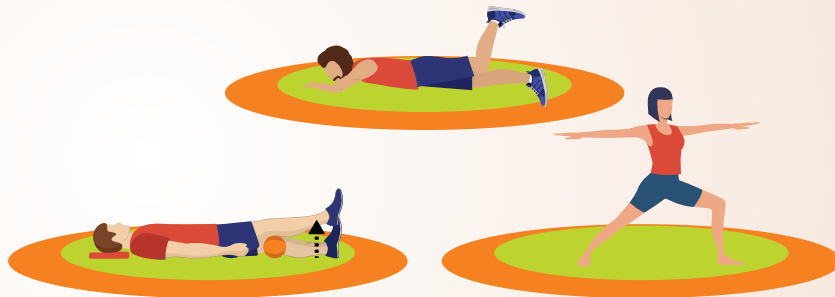
- Criteria for progression to next phase.
- Minimal pain and swelling, able to perform daily joint circulation exercises
- Surgical incisions healed
- Full passive knee extension and voluntary quadriceps activity
- Active, pain-free knee flexion of 90°



PHASE II (6- 12 WEEKS POST-OPERATIVE)

GOALS

- Painfree knee flexion of 90 degrees by 4 weeks after implantation.
- Pain free and full Passive knee extension.
- Reduced post-operative pain and edema.
- Ability to generate an active, isometric quadriceps contraction.
- Proficiency with home exercise program.



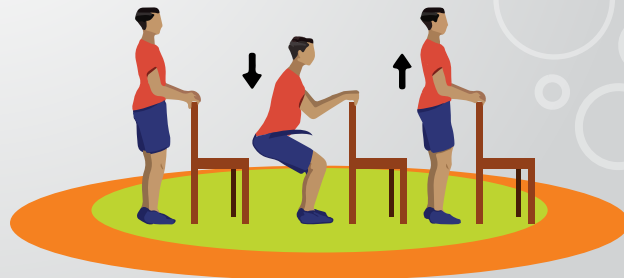
WEIGHTBEARING: TOE TOUCH WB

Exercise:

- Leg press (CKC): 60-0-degree Arc
- Initiate Mini squats /weight shifts
- Retrograde treadmill ambulation.
- Toe Calf raise.
- Initiate forward and lateral step ups
- SLRs with progressive resistance.
- Co ordination training under relaxation or partial load for improving gait pattern.
- Lower extremity Flexibility exercises
- Crutches can be discontinued at **8-9** weeks.
- Confirm with your PT/MS before doing so.

Criteria for progression to next phase

- Minimal pain and swelling.
- Full passive knee extension and voluntary quadriceps activity
- Active, pain-free knee flexion of $>110^\circ$
- Able to walk 1-2 miles or stationary bicycle/rowing
- (Light resistance) for 30 minutes within homeostasis
- Earliest time for progression to next phase: 10 weeks postoperatively



PHASE III (12-18) WEEKS POST- OPERATIVE)

GOALS

- Pain free knee flexion of 110-120 degrees by 6 weeks after implantation.
- Proficiency in performing home exercises including a straight leg raise.

Exercise:

- Progress squat program
- Initiate step-down program
- Advanced proprioception training (Perturbation)
- Agility exercises (Sports cord)
- Elliptical trainer
- Hamstring curls
- Stairmaster



Increased pain, swelling and clicking are signs that the patient may be progressing too quickly. Activity level should be modified if this occurs, and the MD should be notified.

PHASE IV (Weeks 18 AND BEYOND)

GOALS

- Normal gait pattern without pain, walking aids or knee brace.
- Ability to negotiate stairs and mild gradients.
- A return to work depending on demands of job.
- Proficiency in performing full WB activities.

Exercise:

- Return to Sports Activities
- Progression of all exercises from Phase 3.
- Plyometrics, agility drills etc.
- Tai chi for physical perception.
- Exercising on tilt board on both legs, trampoline, large platform.
- Therapy rocks with:
Eyes open, Looking away, Eyes closed.
- Stretching and independent stretching for shortened muscles.



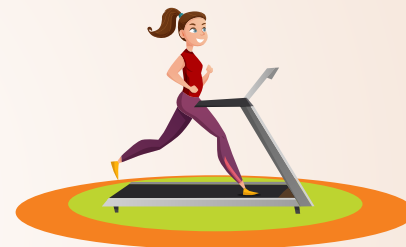
PHASE V: MONTHS 6-12 (SPORTS SPECIFIC)

GOALS

- Ability to tolerate walking distances of more than 5-10 km.
- Ability to return to pre-operative low impact recreational activities.
- Ability to effectively negotiate uneven ground, including soft sand.

Exercise:

- Jogging first on treadmill.
- Start 1 minute jog / 1 minute walk and advance very slowly watching for any swelling. Continue ice modalities.
- Jump rope.
- Stretching individual muscles:
- IT Band stretch
- Quad stretch
- Hamstring stretch
- Advanced personalized workout routines for strengthening.





This image shows a blank sheet of white paper with horizontal blue or grey ruling lines. On the right side, there is a vertical column of overlapping circles of various sizes, some solid and some outlined, creating a decorative border. The paper appears to be a standard notebook page.

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