

CARTICEL® (autologous cultured chondrocytes) IMPLANTATION Femoral Condyle Rehabilitation Guidelines

(Intended for small lesions (<5cm²) with no concomitant procedure;
See "Rehabilitation Guideline Variations" section for others)

PHASE I - PROTECTION PHASE (WEEKS 0-6)

Goals:

Protect healing tissue from load and shear forces	
Decrease pain and effusion	Restore full passive knee extension
Gradually improve knee flexion	Regain quadriceps control

Brace:

Locked at 0° during weight-bearing activities
Sleep in locked brace for 2-4 weeks

Weight-Bearing:

Non-weight-bearing for 1-2 weeks, may begin toe-touch weight bearing immediately per physician instructions
Toe touch weight-bearing (approx. 20-30 lbs) weeks 2-3
Partial weight-bearing (approx. 1/4 body weight) at weeks 4-5

Range of Motion:

Motion exercise 6-8 hours post-operative
Full passive knee extension immediately
Initiate Continuous Passive Motion (CPM) day 1 for total of 8-12 hours/day (0°-40°) for 2-3 weeks
Progress CPM Range of Motion (ROM) as tolerated 5°-10° per day
May continue CPM for total of 6-8 hours per day for up to 6 weeks
Patellar mobilization (4-6 times per day)
Motion exercises throughout the day
Passive knee flexion ROM 2-3 times daily
Knee flexion ROM goal is 90° by 1-2 weeks
Knee flexion ROM goal is 105° by 3-4 weeks and 120° by week 5-6
Stretch hamstrings and calf

Strengthening Program:

Ankle pump using rubber tubing
Quad setting
Multi-angle isometrics (co-contractions Q/H)
Active knee extension 90°-40° (no resistance)
Straight leg raises (4 directions)
Stationary bicycle when ROM allows
Biofeedback and electrical muscle stimulation, as needed
Isometric leg press by week 4 (multi-angle)
May begin use of pool for gait training and exercises by week 4

Functional Activities:

Gradual return to daily activities	If symptoms occur, reduce activities to
Extended standing should be avoided	reduce pain and inflammation

Swelling Control:

Ice, elevation, compression, and edema modalities as needed
to decrease swelling

Criteria to Progress To Phase II:

Full passive knee extension	Knee flexion to 120°
Minimal pain and swelling	Voluntary quadriceps activity

PHASE II - TRANSITION PHASE (WEEKS 6-12)

Goals:

Gradually increase ROM
Gradually improve quadriceps strength/endurance
Gradual increase in functional activities

Brace:

Discontinue post-operative brace by week 6
Consider unloading knee brace

Weight-Bearing:

Progress weight-bearing as tolerated
Progress to full weight-bearing by 8-9 weeks
Discontinue crutches by 8-9 weeks

Range of Motion:

Gradual increase in ROM
Maintain full passive knee extension
Progress knee flexion to 125°-135°
Continue patellar mobilization and soft tissue mobilization, as needed
Continue stretching program

Strengthening Exercises:

Initiate weight shifts week 6
Initiate mini-squats 0°-45°
Closed kinetic chain exercises (leg press)
Toe-calf raises
Open kinetic chain knee extension progress 1 lb/week
Stationary bicycle, low resistance (gradually increase time)
Treadmill walking program
Balance and proprioception drills
Initiate front and lateral step-ups
Continue use of biofeedback and electrical muscle stimulation, as needed
Continue use of pool for gait training and exercise

Functional Activities:

As pain and swelling (symptoms) diminish, the patient may gradually increase functional activities
Gradually increase standing and walking

Criteria to Progress To Phase III:

Full range of motion
Acceptable strength level

- Hamstrings within 10%-20% of contralateral leg
- Quadriceps within 20%-30% of contralateral leg

Balance testing within 30% of contralateral leg
Able to walk 1-2 miles or bike for 30 minutes

PHASE III: MATURATION PHASE (WEEKS 12-26)

Goals:

Improve muscular strength and endurance
Increase functional activities

Range of Motion:

Patient should exhibit 125°-135° flexion

Exercise Program:

Leg press (0°-90°)
Bilateral squats (0°-60°)
Unilateral step-ups progressing from 2" to 8"
Forward lunges
Walking program
Open kinetic chain knee extension (0°-90°)
Bicycle
Stair machine
Swimming
Ski machine/Elliptical trainer

Functional Activities:

As patient improves, increase walking (distance, cadence, incline, etc.)

Maintenance Program:

Initiate by weeks 16-20
Bicycle – low resistance, increase time
Progressive walking program
Pool exercises for entire lower extremity
Straight leg raises
Leg press
Wall squats
Hip abduction / adduction
Front lunges
Step-ups
Stretch quadriceps, hamstrings, calf

Criteria to Progress to Phase IV:

Full non-painful ROM
Strength within 80%-90% of contralateral extremity
Balance and/or stability within 75% of contralateral extremity
Rehabilitation of functional activities causes no or minimal pain, inflammation or swelling.

PHASE IV - FUNCTIONAL ACTIVITIES PHASE (WEEKS 26-52)

Goals:

Gradual return to full unrestricted functional activities

Exercises:

Continue maintenance program progression 3-4 times/week
Progress resistance as tolerated
Emphasis on entire lower extremity strength and flexibility
Progress agility and balance drills
Impact loading program should be specialized to the patient's demands
Progress sport programs depending on patient variables

Functional Activities:

Patient may return to various sport activities as progression in rehabilitation and cartilage healing allows. Generally, low-impact sports such as swimming, skating, in-line skating, and cycling are permitted at about 6 months. Higher impact sports such as jogging, running, and aerobics may be performed at 8-9 months for small lesions or 9-12 months for larger lesions. High impact sports such as tennis, basketball, football, and baseball may be allowed at 12-18 months.