

Carticel Implantation Femoral Condyle Lesion < 5 cm²

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 degrees 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. ¼ 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 degrees) for 2-3 weeks
- Progress CPM Range of Motion (ROM) as tolerated 5-10 degrees 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 degrees by 1-2 weeks
- Knee flexion ROM goal is 105 degrees by 3-4 weeks and 120 degrees 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 degrees (no resistance)
- Straight leg raises (4 directions)
- Stationary bicycle when ROM allows
- Biofeedback and electrical 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 reduce pain and inflammation
- Extended standing should be avoided

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 degrees
- 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 degrees
- Continue patellar mobilization and soft tissue mobilization, as needed
- Continue stretching program

Strengthening Exercises:

- Initiate weight shifts week 6
- Initiate mini-squats 0-45 degrees
- 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 degrees flexion

Exercise Program:

- Leg press (0 to 90 degrees)
- Bilateral squats (0 to 60 degrees)
- Unilateral step-ups progressing from 2" to 8"
- Forward lunges
- Walking program
- Open kinetic chain knee extension (0 to 90 degrees)
- 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 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.