

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

(Intended for small lesions (<5cm<sup>2</sup>) 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:**

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Improve muscular strength and endurance  
Increase functional activities

#### **Range of Motion:**

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Patient should exhibit 125°-135° flexion

#### **Exercise Program:**

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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:**

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

#### **Maintenance Program:**

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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:**

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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.

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## 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.