

## AUTOLOGOUS CHONDROCYTE IMPLANTATION Femoral Condyle Rehabilitation Guidelines

### PHASE I - PROTECTION PHASE (WEEKS 0-6)

- |                        |   |
|------------------------|---|
| Goals:                 | <ul style="list-style-type: none"> <li>- Protect healing tissue from load and shear forces</li> <li>- Decrease pain and effusion</li> <li>- Restoration of full passive knee extension</li> <li>- Gradually improve knee flexion</li> <li>- Regain quadriceps control</li> </ul>  |
| Brace:                 | <ul style="list-style-type: none"> <li>- Locked at 0° during weight-bearing activities</li> <li>- Sleep in locked brace for 2-4 weeks</li> </ul>  |
| Weight-Bearing:        | <ul style="list-style-type: none"> <li>- Non weight-bearing for 1-2 weeks, may begin toe-touch weightbearing immediately per physician</li> <li>- Toe touch weight-bearing (approx. 20-30 lbs.) weeks 2-3</li> <li>- Partial weight-bearing (approx. ¼ body weight) at week 4-5</li> </ul>  |
| Range of Motion:       | <ul style="list-style-type: none"> <li>- Immediate motion exercise</li> <li>- Full passive knee extension immediately</li> <li>- Initiate CPM day 1 for total of 8-12 hours/day (0-40°) for 2-3 weeks</li> <li>- Progress CPM ROM as tolerated 5-10° per day</li> <li>- May continue CPM for total of 6-8 hours per day for up to 6 weeks</li> <li>- Patellar mobilization (4-6 times per day)</li> <li>- Motion exercises throughout the day</li> <li>- Passive knee flexion ROM 2-3 times daily</li> <li>- Knee flexion ROM goal is 90° by 1-2 weeks</li> <li>- Knee flexion ROM goal is 105° by 3-4 weeks and 120° by week 5-6</li> <li>- Stretch hamstrings and calf</li> </ul> |
| Strengthening Program: | <ul style="list-style-type: none"> <li>- Ankle pump using rubber tubing</li> <li>- Quad setting</li> <li>- Multi-angle isometrics (co-contractions Q/H)</li> <li>- Active knee extension 90-40° (no resistance)</li> </ul>  |



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- Straight leg raises (4 directions)
  - Stationary bicycle when ROM allows
  - Biofeedback and electrical muscle stimulation, as needed
  - Isometric leg press at week 4 (multi-angle)
  - May begin use of pool for gait training and exercises 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°
  - 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 brace at week 6
  - Consider unloading knee brace
- Weight-Bearing:
- Progress weight-bearing as tolerated
  - ½ body weight with crutches at 6 weeks
  - Progress to full weight-bearing at 8-9 weeks
  - Discontinue crutches at 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 (PRE's), 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

- Stairmaster
- Swimming
- Nordic-Trak/Elliptical

Functional Activities: - As patient improves, increase walking (distance, cadence, incline, etc.)

Maintenance Program: - Initiate at week 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
- No 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 3-4x/week

- Progress resistance as tolerated
- Emphasis on entire lower extremity strength & flexibility
- Progress agility and balance drills
- Impact loading program should be specialized to the patient's demands
- Progress sport programs depending on patient variables



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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, rollerblading, 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 are allowed at 12-18 months.