



**AUTOLOGOUS CHONDROCYTE IMPLANTATION
Femoral Condyle Rehabilitation Guidelines**

PHASE I - PROTECTION PHASE (WEEKS 0-6)

- Goals:**
- Protect healing tissue from load and shear forces
 - Decrease pain and effusion
 - Restoration of 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 weightbearing immediately per physician
 - Toe touch weight-bearing (approx. 20-30 lbs.) weeks 2-3
 - Partial weight-bearing (approx. ¼ body weight) at week 4-5
- Range of Motion:**
- Immediate motion exercise
 - Full passive knee extension immediately
 - Initiate CPM day 1 for total of 8-12 hours/day (0-40°) for 2-3 weeks
 - Progress CPM 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 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

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.