



UNIVERSITY ORTHOPAEDIC CENTER, PA
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AUTOLOGOUS CHONDROCYTE IMPLANTATION Femoral Condyle Rehabilitation Program

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

Weight-Bearing:

- Non weight-bearing for 2 weeks
- Toe touch weight-bearing (approx. 20-30 lbs.) weeks 3-4
- Partial weight-bearing (approx. 1/4 body weight) at week 5

Range of Motion:

- Immediate motion exercise
- Full passive knee extension immediately
- Initiate CPM day 1 for 8-12 hours/day (0-40°) for 2-3 weeks
- Progress CPM ROM as tolerated 5-10° per day
- May continue CPM for 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 2 weeks
- Knee flexion ROM goal is 105° by 4 weeks and 120° by week 6
- Stretch hamstrings, calf, and quadriceps

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

PHASE II - TRANSITION PHASE (WEEKS 6-12)

- Goals:**
- Gradually increase ROM
 - Gradually improve quadriceps strength/endurance
 - Gradual increase in functional activities

**Criteria to Progress
To Phase II:**

- Full passive knee extension
- Knee flexion to 120°
- Minimal pain and swelling

Weight-Bearing:

- Progress weight-bearing as tolerated
- 1/2 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

- 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 (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

PHASE III - MATURATION PHASE (WEEKS 12-26)

- Goals:**
- Improve muscular strength and endurance
 - Increase functional activities

Criteria to Progress To Phase III:

- Full range of motion
- Acceptable strength level
 - Hamstrings within 10% of contralateral leg
 - Quadriceps within 10-20% of contralateral leg
- Balance testing within 30% of contralateral leg
- Able to walk 2 miles or bike for 30 minutes
- 50 lateral step-ups (8" height)

- 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.)
 - Light running can be initiated toward end of phase (week 24-26) based on physician decision

- Maintenance Program:**
- Initiate at week 16-20
 - Bicycle—low resistance
 - Progressive walking program
 - Pool exercises for entire lower extremity
 - Straight leg raises into flexion
 - Leg press
 - Wall squats
 - Hip abduction/adduction
 - Front lunges
 - Stretch quadriceps, hamstrings, calf

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

- Goals:**
- Gradual return to full unrestricted functional activities

**Criteria to Progress
To Phase IV:**

- Full non-painful ROM
- Strength within 90% of contralateral extremity
- Balance and/or stability within 75% of contralateral extremity
- No pain, inflammation, or swelling

Exercises:

- Continue maintenance program progression 3-4x/week
- Progressive 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 golf, 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. High impact sports such as tennis, basketball, football and baseball are allowed at 12 months.