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CRYSTAL LAKE
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A DIVISION OF ROCKFORD ORTHOPEDIC ASSOCIATES, LTD.

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Autologous Chondrocyte Implantation (ACI) – Patellofemoral Joint

PHASE I - PROTECTION PHASE (WEEKS 0-6)

Goals:

- Protect healing tissue from load and shear forces
- Restore full passive knee extension
- Regain quadriceps control
- Decrease pain and effusion
- Gradually improve knee flexion
- Focus on scar tissue modalities and patellar mobilizations

Brace:

- Locked at 0° during ambulation and weight-bearing activities
- Sleep in locked straight brace for 4 weeks

Weight Bearing:

- Protected weightbearing with crutches with brace in extension 0-2 weeks
- Weightbearing as tolerated with brace locked in extension 2-6 weeks

Range of Motion

- Immediate motion exercise days 1-2
- Full passive knee extension immediately
- Initiate CPM on day 1 for total of 8-12 hours/day
 - 0-60° 0-2 weeks
 - Progress CPM ROM as tolerated 5°-10° per day
- May continue use of CPM for total of 6-8 hours per day for 6 weeks
- Knee flexion ROM goal is 90° by 2-3 weeks
- Knee flexion ROM goal is 105° by 3-4 weeks, and 120° by week 6
- Stretch hamstrings, calf

Strengthening Program:

- Ankle pump using rubber tubing
- Quad setting
- Toe-calf raises by week 2
- Straight leg raises (4 directions)
- Stationary bicycle when ROM allows
- Biofeedback and electrical muscle stimulation, as needed
- May begin pool therapy for gait training and exercise by week 4
- Patellar mobilization (4-6 times per day)
- Motion exercises throughout the day
- Passive knee flexion ROM 2-3 times daily

- Isometric leg press by week 4 (multi-angle)
- Initiate weight shifts by weeks 2-3

Functional Activities:

- Gradual return to daily activities. If symptoms occur, reduce activities to reduce pain and inflammation
- Extended standing should be avoided
- Use caution with stair climbing

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
- Gradually increase functional activities

Brace:

- Discontinue brace by 6 weeks

Weight-Bearing:

- Progress weight-bearing as tolerated

Range of Motion:

- Gradually increase ROM
- Maintain full passive knee extension
- Progress knee flexion to 120°-125° by week 8
- Continue patellar mobilization and soft tissue mobilization, as needed
- Continue stretching program

Strengthening Exercises:

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| <ul style="list-style-type: none"> • Closed kinetic chain exercises (leg press 0°-60°) by week 8 • Initiate mini-squats 0°-45° by week 8 • Toe-calf raises at week 6 • Open kinetic chain knee extension without resistance • Begin knee extension 0°-30° then progress to deeper angles | <ul style="list-style-type: none"> • Stationary bicycle (gradually increase time) • Stair machine by week 12 • Balance and proprioception drills • Initiate front and lateral step-ups by weeks 8-10 • Continue use of biofeedback and electrical muscle stimulation, as needed |
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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 20% of contralateral leg

- Quadriceps within 30% of contralateral leg
- Balance testing within 30% of contralateral leg
- Able to walk 1-2 miles or bike for 30 minutes

PHASE III: REMODELING PHASE (WEEKS 12-32)

Goals:

- Improve muscular strength and endurance
- Increase functional activities

Range of Motion:

- Patient should exhibit 125°-135° flexion

Exercise Program:

- Leg press (0°-60°; progress to 0°-90°)
- Bilateral squats (0°-60°)
- Unilateral step-ups progressing from 2" to 6"
- Forward lunges
- Walking program on treadmill
- Open kinetic chain knee extension (90°-40°) – progress 1 lb every 2 weeks beginning week 20 if no pain or crepitation – must monitor symptoms
- Bicycle
- Stair machine
- Swimming
- Ski machine/Elliptical trainer

Functional Activities:

- As patient improves, you may increase walking (distance, cadence, incline, etc.)
- Light running can be initiated toward end of phase based on physician evaluation

Maintenance Program:

- 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:

- Full non-painful ROM
- Strength within 80%-90% of contralateral extremity
- Balance and/or stability within 75%-80% of contralateral extremity
- Rehabilitation of functional activities causes no or minimal pain, inflammation or swelling.

PHASE IV - MATURATION PHASE (8-15 MONTHS)

Goals:

- Gradually 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 & flexibility
- Progress agility and balance drills

- Progress walking program as tolerated
- Impact loading program should be specialized to the patient's demands
- No jumping or plyometric exercise until 12 months
- 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. High 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 pivoting sports such as tennis, basketball, football, and baseball may be allowed at 12-18 months. Individual results may vary. Many patients are able to participate in sports with some limitations.