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A DIVISION OF ROCKFORD ORTHOPEDIC ASSOCIATES, LTD.

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# Autologous Chondrocyte Implantation (ACI) – Patellofemoral Joint & Anteromedialization (AMZ)

### 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 with the restrictions listed below
- 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:

- Touch down weight-bearing (25%) in full extension with crutches

#### 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
  - 45° by day 5
  - 60° by the end of week 1
  - 75° by week 3, 90° by week 4 • 115° by week 5
  - 125° by week 6
  - 125°-135° by week 8
- May continue use of CPM for total of 6-8 hours per day for 6 weeks

#### Strengthening Program:

- Ankle pump using rubber tubing
- Quad setting
- Straight leg raises (4 directions)
- Stationary bicycle when ROM allows with no resistance
- 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

**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 8 weeks

**Weight-Bearing:**

- Progress weight-bearing as tolerated
- Progress to full weight-bearing by 6-8 weeks
- Discontinue crutches by 6-8 weeks

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