**Autologous Chondrocyte Implantation (ACI)**

**PHASE I: PROTECTIVE PHASE (weeks 0-6)**

**GOALS:**
- Protect healing tissue from load and shear forces
- Restoration of full passive knee extension
- Gradual improvement of knee flexion
- Regaining quadriceps control

**BRACE:**
- Locked at 0° during weight-bearing activities
- Sleep in locked brace for 2-4 weeks

❖ **WEIGHT BEARING:**
  - Nonweight bearing for 2 weeks. Progress to toe touch weight bearing at 4 weeks.
  - Toe touch weight bearing at week 5.

❖ **Range of Motion:**
  - Immediate motion exercises
  - CPM after 4-12 hours (0-40°), 4-12 hours per day for 2-3 weeks
  - Progress CPM as tolerated 5-10° per day
  - Passive knee flexion ROM 2-3 X’s daily
  - Knee flexion ROM goal is 90° by 2 weeks
  - Knee flexion ROM goal is 105° by 4 weeks and 120° by 6 weeks
  - Stretch hamstrings, calf, and quadriceps
  - Patellar mobilization
 Stretching Program:
- Ankle pump using rubber tubing
- Multiangle isometrics (co-contraction quads and hamstrings)
- Active knee extension 90°-40° (no resistance)
- Straight leg raises (four directions)
- Stationary bike when ROM allows
- Isometric leg press at week 4 (multiangle)

 Functional Activities:
- Gradual return to daily activities
- If symptoms occur, pt should reduce activities to reduce pain and inflammation

PHASE II: TRANSITION PHASE (weeks 6-12)

GOALS:
Gradually increase ROM
Gradual improvement in quad strength and endurance
Gradual increase in functional activities

 Criteria to Progress to Phase II
1. Full passive knee extension
2. Knee flexion to 115° - 120°
3. Minimal pain and swelling

 Brace:
- Discontinue brace at 4-6 weeks

 Weight bearing:
- Progress weight bearing as tolerated
- Half of body weight with crutches at 6 weeks
- Progress to full weight bearing 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 120°-125°
- Continue stretching program

 Strengthening Exercises:
- Initiate mini squats 0-45°
- Toe-calf raises
- Stationary bike
- Treadmill walking program
- Balance and proprioception drills
- Initiate front and lateral step-ups
PHASE III: MATURATION PHASE (weeks 12-26)

- CRITERIA TO PROGRESS TO PHASE III
  1. Full range of motion
  2. Acceptable strength level
     a. Hamstring within 10% of contralateral leg
     b. Quadriceps within 10-20% of contralateral leg
  3. Able to walk 2 miles or bike for 30 minutes
  4. 50 lateral step-ups (8 inch height)

- RANGE OF MOTION:
  ➢ Pt should exhibit 125°-135°

- EXERCISE PROGRAM:
  ➢ Leg press (0°-60°)
  ➢ Bilateral squats (0°-60°)
  ➢ Forward lunges
  ➢ Walking program
  ➢ Bicycle
  ➢ StairMaster
  ➢ Swimming
  ➢ Nordic Track

PHASE IV: FUNCTIONAL ACTIVITIES PHASE (Weeks 26-52)

GOALS: Gradual return to full unrestricted functional activities.

- CRITERIA TO PROGRESS TO PHASE IV
  1. Full nonpainful ROM
  2. Strength within 90% of contralateral extremity
  3. No pain, inflammation, or swelling

- FUNCTIONAL ACTIVITIES:
  ➢ Patient may return to various sports activities as his/her progression in rehab allows.
  ➢ Generally, low impact sports such as 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, and baseball are allowed at 12 months.