

Rehabilitation Following Osteochondral Autograft Transplantation (AKA OATS)

I. PHASE I – EARLY PROTECTION PHASE (Weeks 0-6)

Goals:

- Protection of healing tissue from load and shear forces
- Decrease pain and effusion
- Restoration of full passive knee extension
- Gradual improvement of knee flexion
- Regaining quadriceps control

Brace:

- Locked at 0° during weightbearing activities
- Sleep in locked brace for 2-4 weeks

Weightbearing:

- Weightbearing status varies based on lesion location and size
- For femoral condyle lesions: non weightbearing for 4 weeks, progress to toe touch weightbearing (approx. 20-30 lbs) after week 4 and partial weightbearing (approx. 25-50% body weight) at week 6
- For patellofemoral lesions: Immediate toe-touch weightbearing 25% body weight with brace locked in full extension. Progress to 50% weightbearing week 2-3 in brace and 75% week 4-5 in brace.

Range of Motion:

- Immediate motion exercise day 1
- Full passive knee extension immediately
- Initiate CPM day 1 for total of 8-12 hours/day (0-60°; if patellofemoral lesion > 6.0 cm², 0-40°)
- 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 at least 2-3 times daily
- Passive knee range of motion as tolerated
- For femoral condyle lesions, minimum knee flexion ROM goal is 90° by 1-2 weeks, 105° week 3, 115° week 4, and 120-125° by week 6



- For patellofemoral lesions, minimum knee flexion ROM goal is 90° by week 2-3, 105° by 3-4 weeks and 120° by week 6
- Stretch hamstrings and calf

Strengthening Program:

- Ankle pump using rubber tubing
- Quad setting
- Multi-angle isometrics (co-contractions Q/H)
- Straight leg raises (4 directions)
- Active knee extension 90-40° for femoral condyle lesions if not articulation week 4 (no resistance)
- Electrical muscle stimulation and/or biofeedback during quadriceps exercises
- Stationary bicycle when ROM allows- low resistance
- Isometric leg press at week 4 (multi-angle)
- May begin use of pool for gait training and exercises week 6
- Initiate weight shifting exercises with knee in extension week 3-4 for patellofemoral lesions
- NO active knee extension exercises for patellofemoral lesions
- NO closed kinetic chain exercises for femoral condyle lesions

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

II. **PHASE II – TRANSITION PHASE (Weeks 6-12)**

Goals:

- Gradually increase ROM and weightbearing to full
- 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

Brace:

- Discontinue brace at 6 weeks, consider unloading brace for femoral condyle lesions



Weightbearing:

- Progress weightbearing as tolerated
- For femoral condyle lesions: 75% body weight with crutches at 6-7 weeks, and progress to full weightbearing at 8-10 weeks, may need to delay full weightbearing up to 14 weeks if large lesion, discontinue crutches at 8-10 weeks
- For patellofemoral lesions, progress to full weightbearing and discharge crutches at 6-8 weeks

Range of Motion:

- Gradual increase in ROM
- Maintain full passive knee extension
- Progress knee flexion to 125-135° by week 8-10
- Continue patellar mobilization and soft tissue mobilization, as needed
- Continue stretching program

Strengthening Exercises:

- Initiate weight shifts week 6-8 for femoral condyle lesions
- Initiate mini-squats 0-45° week 6-8 for patellofemoral lesions
- Closed kinetic chain exercises (leg press) week 8-10 for femoral condyle lesions; mini-squats 0-45°, front lunges, step-ups, wall squats; may need to delay CKC up to 14 weeks if large lesions
- Leg press week 8-10 (0-90° for femoral condyle, 0-60° for patellofemoral, progressing to 0-90° as tolerated)
- Toe-calf raises week 10-12
- Progress active knee extension: begin resistance with femoral condyle lesions progressing 1 pound every 10-14 days; for patellofemoral lesions begin with 0-30° at week 12 and progress to deeper angles as tolerated
- Stationary bicycle (gradually increase time)
- Balance and proprioception drills
- Continue use of electrical stimulation and biofeedback 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 20% of contralateral leg
 - Quadriceps within 30% of contralateral leg
- Balance testing within 30% of contralateral leg
- Able to bike for 30 minutes



III. PHASE III: REMODELING PHASE (Weeks 12-26)

Goals:

- Improve muscular strength and endurance
- Increase functional activities

Range of Motion:

- Patient should exhibit 125-135° flexion – no restrictions

Exercise Program:

- Continue progressing exercises
- Leg press 0-90°
- Bilateral squats (0-60°)
- Unilateral step-ups progressing from 2" to 8"
- Forward lunges
- Begin walking program on treadmill
- Open kinetic chain knee extension (0-90°) as tolerated, do not progress to heavy resistance with patellofemoral lesions – must monitor symptoms of pain and crepitation
- Bicycle
- Stairmaster
- Swimming
- Nordic-Trak/elliptical

Functional Activities:

- As function improves, increase walking (distance, cadence, incline, etc.)

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, gastroc



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
- No pain, inflammation, or swelling

IV. **MATURATION PHASE (Weeks 26-52)**

Goals:

- Gradual return to full unrestricted functional activities

Exercises:

- Continue maintenance program progression 3-4x/233k
- Progress resistance as tolerated
- Emphasis on entire lower extremity strength and 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 skating, rollerblading, and cycling are permitted at about 6-8 months. Higher impact sports such as jogging, running, and aerobics may be performed at 8-10 months. High impact sports such as tennis, basketball, and baseball are allowed at 12-18 months.