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Rehabilitation following microfracture chondroplasty

DISCLAIMER: The intent of this protocol is to provide therapists with guidelines for rehabilitation of patients that have undergone surgery with Dr. Avallone. It is from the protocol presented in **JOSPT 36 (10) 774-794** and is specific to his operative technique. **PTs are encouraged to read this article**. It is not intended to serve as a substitute for sound clinical decision making. Therapists should consult with Dr. Avallone if they require assistance in the progression of post-operative patients.

Phase 1. Proliferation phase (weeks 0-4)

Goals

- Protect healing tissue from load and shear forces
- Decrease pain and effusion
- Restoration of full passive knee extension
- Gradually restore knee flexion
- Regain quadriceps control

Brace

- Femoral condyle lesions: no brace but may use elastic wrap to control swelling
- Patellofemoral lesions: hinged brace locked in full extension

Weight-bearing (WB)

- WB status varies based on lesion location and size
- For medium to large femoral condyle lesions (>2.0 cm^2):
    - Weeks 0-2: Non-weight bearing
    - Week 3: progress to toe touch WB (approximately 9.1-13.6 kg)
    - Week 4: progress to partial WB (approximately 1/4 body weight)
- For small femoral condyle lesions (<2.0 cm^2):
    - Weeks 0-2: toe-touch WB (per physician) (approximately 9.1-13.6 kg)
    - Week 3: progress to 50% WB
    - Week 4: progress to 75% WB
- For patellofemoral lesions (in braced locked in full extension):
    - Week 1: toe-touch WB of approximately 25% body weight
    - Week 2: progress to 50% WB at week 2
    - Week 3: progress to 75% WB
    - Week 4: full WB

Range of motion (ROM)

- CPM
    - 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
    - D/C CPM when
- Initiate ROM exercises immediately
- Patellar mobilization (4-6 times per day)
- Motion exercises throughout the day
- Passive knee flexion ROM at least 2-3 times daily
- Progress passive knee ROM as tolerated, no restrictions
- Knee Flexion ROM goals (minimum): 0°-90° week 1, 0°-105° week 2, 0°-115° week 3, and 0°-125° week 4
- Knee Extension ROM goal: full passive knee extension immediately
- Stretch hamstrings and calf

Strengthening program

- CONTRAINDICATION: no active extension exercises for patellofemoral lesions
- Ankle pump using elastic tubing
- Quadriceps setting
- Multi-angle isometrics (co-contractions quadricepss/hamstrings)

- Active knee extension 90°-40° for femoral condyle lesions (no resistance), **avoid** for patellofemoral lesions
- Straight leg raises (4 directions)
- Electrical muscle stimulation and/or biofeedback during quadriceps exercises
- Initiate weight shifting exercises with knee in extension week 1-2 for patellofemoral lesions and small femoral condyle lesions, week 3 for larger femoral condyle lesions
- Leg press 0°-60° week 3 for small femoral condyle lesions and patellofemoral lesions, progress to 0°-90° week 4
- Toe calf raises week 4 for small femoral condyle and patellofemoral lesions
- May begin use of pool for gait training and exercises week 3-4 (when incision is fully healed)
- May begin stationary bike week 3-4, low resistance

Functional activities

- Gradual return to daily activities
- If symptoms occur, reduce activities to reduce pain and inflammation

Swelling control

- Ice, elevation, compression, and modalities as needed

Criteria to progress to Phase 2

- Full passive knee extension
- Knee flexion to 125°
- Minimal pain and swelling
- Voluntary quadriceps activity

Phase 2. Transition phase (weeks 4-8)

Goals

- Gradually improve quadriceps strength/endurance
- Gradual increase in functional activities

WB

- Progress WB as tolerated
- For large femoral condyle lesions: 1/2 body weight with crutches at 6 weeks; 75% WB week 7; progress to full WB at 8 weeks, discontinue crutches

ROM

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

Strengthening exercises

- Progress WB exercises
- Initiate leg press for large femoral condyle lesions week 6
- Mini-squats 0°-45° week 7
- Toe-calf raises week 8 for femoral condyle lesions
- Progress balance and proprioception drills
- Initiate front lunges, wall squats, front and lateral step-ups week 5 for small femoral condyle and patellofemoral lesions, week 8 for large femoral condyle lesions
- For femoral condyle lesions, progress non-WB knee extension, 0.45 kg/wk
- For patellofemoral lesion, may begin non-WB knee extension without resistance in a ROM that does not allow for articulation of the lesion
- Continue stationary bicycle, low resistance (gradually increase time)
- Continue use of electrical muscle stimulation and or biofeedback as needed
- Continue use of pool for gait training and exercise

Functional activities

- As pain and swelling diminish, the patient may gradually increase functional activities
- Gradually increase standing and walking

Criteria to progress to Phase 3

- Full ROM
- Acceptable strength level
- Hamstrings within 20% of contralateral extremity
- Quadriceps within 30% of contralateral extremity
- Balance testing within 30% of contralateral extremity
- Able to bike for 30 min

Phase 3. Remodeling phase (weeks 8-16)

Goals
- Improve muscular strength and endurance
- Increase functional activities

ROM
- Patient should exhibit 125°-135°+ flexion

Exercise program
- Leg press (0°-90°)
- Bilateral squats (0°-60°)
- Unilateral step-ups progressing from 5.1 to 20.3 cm
- Forward lunges
- Walking program week 10
- Progress non-WB extension (0°-90°); for patellofemoral lesions, may begin week 12, perform from 90°-40° or avoid angle where lesion articulates; progress 0.45 kg every 2 weeks, beginning week 20 if no pain or crepitation, must monitor symptoms
- Continue progressing balance and proprioception
- Bicycle
- Stairmaster
- Swimming
- Nordic-Trak/elliptical

Functional activities
- Increase walking (distance, cadence, incline, etc)

Maintenance program
- Initiate at weeks 12-16
- Bicycle: low resistance, increase time
- Progressive walking program
- Pool exercises for entire lower extremity
- Straight leg raises
- Leg press
- Wall squats
- Hip strengthening (abduction/adduction)
- Front lunges
- Step-ups
- Stretch quadriceps, hamstrings, calf

Criteria to progress to Phase 4
- 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

Phase 4. Maturation phase (weeks 16-26)

Goals
- Gradual return to full unrestricted functional activities

Exercises
- Continue maintenance program progression 3-4 times per wk
- Progress resistance as tolerated
- Emphasis on entire lower extremity strength and flexibility
- Progress agility and balance drills
- Impact loading program should be individualized to the patient's needs
- 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, rollerblading, and cycling, are permitted at about 2 months for small femoral condyle and patellofemoral lesions and at 3 months for large femoral condyle lesions. Higher-impact sports such as jogging, running, and aerobics may be performed at 4 months for small lesions or 5 months for larger lesions. High-impact sports, such as tennis, basketball, football and baseball, are allowed at 6-8 months