ALTER G® Anti-Gravity Treadmill®

REHABILITATION PROTOCOL

Microfracture Procedure

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GENERAL PRINCIPLES

This protocol for rehabilitation after knee microfracture surgery is designed to provide the rehabilitation professional with a general guideline for patient care with the AlterG Anti-Gravity Treadmill. As such, it should be stressed that this is only a protocol and should not be a substitute for professional clinical decision-making regarding a patient's progression. And it should be further noted that progression should be individualized based upon each patient's specific needs, surgical variables, pain level, the specific surgeon's guidelines, physical examination, progress, and presence of any complications.

PHASE I (EARLY PROTECTION PHASE)

Week 0 - Week 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
- Reduce edema & pain

Brace:

- No brace, may use elastic wrap to control swelling

Weight-bearing:

- Weightbearing status varies based on lesion location and size
- For medium to large femoral condyle lesions (>2.0 cm2): Non weightbearing for 2 weeks, begin toe touch weight-bearing (approx. 20-30 lbs.) week 3; progress to partial weight-bearing (approx. ¼ body weight) at week 4
- For small femoral condyle lesions (<2.0 cm2): Immediate toe-touch weightbearing (per physician) (approx. 20-30 lbs.) week 0-2; progress to 50% WB week 3, 75% WB week 4
- For patellofemoral lesions: Immediate toe-touch weightbearing of ~25% body weight with brace locked in full extension; progress to 50% WB at week 2 and 75% WB week 3 with brace locked in full extension, full weightbearing week 4

Gait Training:

- Ambulation on the AlterG Anti-Gravity Treadmill may begin as soon as the patient can begin 25% weight bearing.
- Gait training may be performed daily and begins at 2.0 MPH with no incline. Gait training begins at 5 minutes per day and may progress to up to 20 minutes during this phase
- As the patient progresses to 50% WB, they may begin to increase the speed of the treadmill to a comfortable level of ~3.0-3.5 MPH with no incline.
- As the patient progresses to 75% WB, they may begin to increase the speed of the treadmill to a comfortable level of ~3.5-4.0 MPH with no incline.
- Monitor pain levels and gait mechanics during AlterG Anti-Gravity Treadmill training; body weight support may be increased on the AlterG Anti-Gravity Treadmill to reduce pain and correct gait kinematics during training

Range of Motion:

- Immediate motion exercise day 1
- Full passive knee extension immediately
- Initiate CPM day 1 for total of 8-12 hours/day (0-60º; if patellofemoral lesion > 6.0 cm2, 0-40º)
- Progress CPM ROM as tolerated 5-10º 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
- Progress passive knee range of motion as tolerated, no restrictions
- Minimum range of motion goals 0-90° week 1, 0-105° week 2, 0-115° week 3, and 0-125° week 4
- Stretch hamstrings and calf

Strengthening Program:

- Ankle pump using rubber tubing
- Quad setting
- Multi-angle isometrics (co-contractions Q/H)
- Active knee extension 90-40º for femoral condyle lesions (no resistance), avoid for patellofemoral patients
- Straight leg raises (4 directions)
- Stationary bicycle when ROM allows – low resistance
- 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 stationary bike week 3-4, low resistance
- NO active knee extension exercises for patellofemoral lesions

Functional Activities:

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

Swelling Control:

- Ice, elevation, compression, and edema modalities as needed to decrease swelling

Criteria to Progress to Phase II:

- Full passive knee extension
- Knee flexion to 125°
- Minimal pain and swelling
- Voluntary quadriceps activity
- Normal gait mechanics on the AlterG Anti-Gravity Treadmill

PHASE II (TRANSITION PHASE)
Week 4 - Week 8
Goals:

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

Weight Bearing:

- Progress weight-bearing as tolerated
- For large femoral condyle lesions: 50% body weight with crutches at 6 weeks; 75% weightbearing week 7, progress to full weight-bearing at 8 weeks, discontinue crutches after full weight bearing

Gait Training:

- Gradually progress the speed and duration of gait training on the AlterG Anti-Gravity Treadmill
- May begin to advance the incline of the treadmill during this phase
- Continue to monitor the patient for pain relief and proper gait mechanics. Modify AlterG Anti-Gravity Treadmill body weight support in order to minimize pain and maintain normal gait mechanics.

Range of Motion:

- 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 closed kinetic chain 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 patello femoral lesions, week 8 for large femoral condyle lesions
- For femoral condyle lesions, progress open kinetic chain knee extension, 1 lb./week
- For patellofemoral lesion, may begin open kinetic chain knee extension without resistance in a range of motion 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

Functional Activities:

- As pain and swelling (symptoms) diminish, the patient may gradually increase functional activities

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

PHASE III (REMODELING PHASE)
Week 8 - Week 16
Goals:

- Improve muscular strength and endurance
- Increase functional activities

Range of Motion:

- Patient should exhibit at least 135° flexion

Exercise Program:

- Leg press (0-90°)
- Bilateral squats (0-60°)
- Unilateral step-ups progressing from 2" to 8"
- Forward lunges
- Progress open kinetic chain extension (0-90°), for patellofemoral lesions, may begin week 12, perform from 90-40° or avoid angle where lesion articulates – Progress 1 pound 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

Gait Training:

- Continue with walking maintenance program in the AlterG Anti-Gravity Treadmill
- May begin a partial WB jogging program on the AlterG Anti-Gravity Treadmill after satisfactory examination by operating surgeon
- Small lesions may begin jogging at 50% WB on the AlterG Anti-Gravity Treadmill week 8-10, progressing to 75% WB week 10-12
- Larger lesions may begin jogging at 50% WB on the AlterG Anti-Gravity Treadmill week 12-14, progressing to 75% WB week 14-16
- Monitor the patient for maintenance of normal mechanics during jogging. The body weight support can be increased or the treadmill speed can be decreased if the patient exhibits abnormal running mechanics. The therapist should correct gait abnormalities by observation and verbal cues.

Maintenance Program:

- Initiate at week 12-16
- 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
- No pain, inflammation, or swelling

PHASE IV (MATURATION PHASE)
Week 16 - Week 26

Goals:

- Gradual return to full unrestricted functional activities

Exercises:

- Continue maintenance program progression 3-4x/week
- Progress resistance as tolerated
- Emphasis on entire lower extremity strength & flexibility
- Progress agility and balance drills
- Impact loading program should be specialized to the patient's demands
- Progress sport programs depending on patient variables

Gait Training:

- Continue with maintenance program in the AlterG Anti-Gravity Treadmill
- May progress jogging from 75% WB to 100% WB on the AlterG Anti-Gravity Treadmill
- Small lesions may progress to 100% WB at 4 months, larger lesions at 5 months
- May continue to jog at partial WB for endurance training and swelling control.

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.