ALTER G® Anti-Gravity Treadmill®

REHABILITATION PROTOCOL

Anterior Cruciate Reconstruction

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GENERAL PRINCIPLES

This protocol for Anterior Cruciate Ligament Reconstruction (ACLR) 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, pain level, the specific surgeon's guidelines, physical examination, progress, and presence of any complications.

CLINICAL ASSUMPTIONS

1. Gait training/Neuromuscular re-education is an important part of ACLR at numerous phases during the rehab cycle:
   - Phase I restoring early normal gait and functional quad control
   - Phase II early single limb control
   - Phase III introduction of ballistic movement
2. Abnormal patterns of movement at any phase of rehab complicate and prolong recovery
3. Micro-motion in the bone tunnels prior to full graft incorporation can cause loosening of the repair and cause poor outcomes
4. Clinical benchmarks need to be reached prior to advancing each phase of rehab

PRECAUTIONS AND CONTRAINDICATIONS FOR ACLR

- No walking allowed if gait is abnormal- revert back to assistive devices or increased support from the AlterG
- Early recovery of full knee extension and quad control are critical to uncomplicated rehab
- Swelling must be controlled
- Do not force flexion range through pain
- No ballistic movement or running until graft incorporation is achieved- according to majority of work described by the American Academy of Orthopedic Surgeons- this is greater than 10 weeks
- Perform 10 single leg step-downs from an 8 inch step with proper form prior to introducing ballistic stress

PHASE I (IMMEDIATE)

Week 1 - Week 3

Goals:

- Full knee extension, equivalent to uninvolved limb unless greater than 5 degrees hyperextension. Active range of motion if beyond 5 degrees- no passive stretching
- Limit swelling- often caused by early weight bearing, prolonged dependency of limb or over activity. A great variability exists in weight bearing status immediately post operatively among surgeons and repair types, so the general rule: No walking allowed if gait is antalgic. No ace wraps while lying- this blocks normal lymph and venous flow.
- Normal gait at 3 weeks
- Flexion beyond 110 degrees- able to ride a stationary bike
- Quad tone- Straight leg raise with no lag and stand on extended knee with full quad contraction.

Treatment Options:

Modalities:

- Icing and compression is used liberally during Phase I. Icing often is round the clock for the first 4 days. Then icing is performed for a minimum of 20 minutes every 4 hours.

Manual Therapy:

- Passive Manual Mobilization included if range is limited

Therapeutic Exercise:

- Passive Extension Hang- heel propped on a foam roller. Amount of time dictated by the therapist based on range.
- Short Arc Quad Strengthening with roller under knee. Early intervention with NMES and vigorous quadriceps contraction has been proven helpful in the restoration of early muscle strength and improving normal gait.

Gait Training:

- Gait Training in the AlterG Anti-Gravity Treadmill once partial weight bearing is allowed. Increase the body weight support until normal gait and no pain is achieved. Critical events include full knee extension at Heel Contact, full extension in Mid-Stance, flexion to 65 degrees for normal swing. The AlterG Anti-Gravity Treadmill can be used to support as much as 55% of body weight and still achieve a normal gait. Progressively decreasing support over the first 3 weeks post-op reduces fear for the patient and achieves early functional restoration of motion and strength. patellofemoral lesions.

PHASE II (EARLY POST-OPERATIVE PHASE)

Week 3 - Week 6

Goals:

- Safe restoration of range of motion to near full- soft end feel in flexion and firm extension stop.
- Improve single limb stance tolerance to perform 10 squats to 30 degrees without pain

Treatment Options:

Modalities:

- Ice and compression as dictated by knee temperature and response to exercise.

Manual Therapy:

- Graded Mobilization of physiologic flexion/extension.

The Anti-Gravity Treadmill has been cleared by the FDA for rehabilitation following injury or surgery of the lower extremity. Some of the authors may have been financially compensated for this clinical protocol.

Therapeutic Exercise:

- General Therapeutic Exercise including aerobic conditioning on stationary bike, core and hip stabilization and calf strengthening. Generally 3-4 sets of 15-20 repetitions of safe exercise for each body part to be done daily. Include single leg squats until the 10 reps from the 8 inch step is achieved.
- Education and performance of proper biomechanics of squat, knee alignment, foot position. Progressive squatting with the goal of creating fatigue in the thigh without knee pain or swelling. If pain or swelling is a problem, initiate squatting, single limb stance and calf raises in the AlterG with graded support.

Gait Training:

- Utilize the AlterG Anti-Gravity Treadmill if needed during this phase for walks longer than 10 minutes to reduce the risk of swelling and pain.

PHASE III (INTERMEDIATE PHASE)
Week 6 - Week 12
Goals:

- Restore strength to normal. 10 step-downs with proper form from an 8 inch step.
- Full Range of motion

Treatment Options:

Modalities:

- Icing post heavy sessions is performed

Manual Therapy:

- Manual Therapy interventions should only be necessary to achieve the final few degrees of motion loss, to perform soft tissue mobilization and assist in restoring normal length to affected muscles.

Therapeutic Exercise:

- Strength Training is the primary focus during this phase. This is accomplished by making the thighs, glutes and calves sore at least 2-3 times per week by including safe therapeutic exercise with a minimum of 6 sets of between 8-12 repetitions. If 2 more reps beyond 12 can still be performed during this phase then the strength building will not be achieved. Aerobic, non-loading exercises can be performed on the non-heavy lifting days.

PHASE IV (ADVANCED PHASE)
Week 12+
Goals:

- Full return to sport as measured by comparative functional testing including single leg triple broad jump, vertical leap and shuttle run.
- Running at prior level of function

Treatment Options:

- Introduction of running using the AlterG Anti-Gravity Treadmill- see the chart below for transition instructions. For patients in which single limb strength progressed quickly and swelling was not a limiting factor, we introduce the AlterG Anti-Gravity Treadmill as a training modality at week 10 post op.
- Functional and sport specific strengthening activities are introduced. Increased vigor of single limb stress and ballistic loads are critical to a full recovery. Sport specific microcycles of training are considered during this phase allowing for adaptation over the next 8 weeks.

APPENDIX
Progressive Loading Table

Week	Program	Speed	Incline	Time	Frequency
1-2	Walking at 45% BW	2.0	0	5 minutes	2-5 days per week
2-3**	Walking at 50-65% BW	3.0-3.5	0-3% incline	15 minutes	2-5 days per week
3-4*	Walking at 65-80% BW	3.0-3.5	0-3% incline	15 minutes	2-5 days per week
5-6*	Walking at 80-90%	3.0-3.5	0-3% incline	15 minutes	2-5 days per week
7-9	Walking at 80-90%	3.0-3.5	0-5% incline	20-30 minutes	2-3 days per week
10-12	Running at 55-65% BW	5.0-7.5	0% incline	5-10min	2 days per week
12-16	Running at	No limit	0-5%	Up to 60 min	2 days per week

**If gait remains compromised or swelling is an issue.*
***AlterG can be used with the treadmill stopped to introduce squatting, single limb stance or calf raises if pain or strength are limiting factors by offering varied support as needed to reduce pain and improve function.*

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