Anterior Cruciate Ligament (ACL) Reconstruction

Accelerated, Goal Oriented Rehabilitation Program for Athletes

George L. Caldwell, Jr., M.D.

Introduction

The following goal-oriented approach to ACL rehabilitation is designed to facilitate early return to sports. The emphasis is upon rapid progress without compromising ligamentous stability. The patient must progress in a stepwise fashion after achieving a determined set of goals rather than progression simply based on a calendar date.

Background

This handout includes some comments, suggestions, as well as preferred techniques. The abbreviated format is used once one is familiar with the details of the program. Please learn the program and contact the surgeon if there are difficulties. The "Foundation" of the program is based on three concepts:

1) Full Extension - This is defined as extension that equals the hyperextension on the opposite side. This must be achieved early to allow the ACL graft to "mold" into the notch and prevent ligament or notch hypertrophy that would prevent full extension at a later date. Full extension is vital to the long term success of reconstruction. It is a prerequisite for return of quad strength and return to full activities. It prevents excessive forces about the patello-femoral joint, normalizes gait, and minimizes quad atrophy.

The preferred method of measurement is by the heel lift technique (the patient is supine, one hand of the examiner presses the knee flat against the bed while the opposite lifts the heel off the bed as far as possible to determine hyperextension.

2) Closed Chain exercises - Co-contraction allows functional strengthening while minimizing graft stress.

3) Limited, yet Intensive Therapy visits - The patient education is vital this approach, beginning with the pre-operative visit. The therapist outlines the structure of the program and sets goals. The emphasis on this program is avoidance of complications! Patients who do well in the first two weeks tend to avoid them

Pre-operative

The focus is preparation of the patient and the knee for surgery. The therapist must devote a large amount of time to mental preparation and education of the patient and family. Home exercises begin post-op day #1 and this responsibility of the patient, no one else!

Pre-operatively, the importance of range of motion cannot be overemphasized. The timing of surgery is chosen to minimize complications. The patient should understand that immediate, acute reconstruction can lead to stiffness and contracture. Acute knee injury does not require immediate surgery. Thus, surgery is generally delayed several weeks after the acute injury to permit improved range of motion, decreased swelling, and improved strength. Adjustments should be made to the work/school schedule to permit at least one week
off.

The therapist must teach the patient and a responsible family member the initial set of exercises to be performed during the first week postoperatively. Overall the patient should remain relatively sedentary during the first seven days post-op and not plan to attend work or school. Exercises are to be performed for 10 minutes every hour while awake. The ankle should be elevated on two pillows for elevation (heel props). Active extension by the patient and assisted passive extension by a family member or with a 2.5 lb. soft weight is to be performed. Also calf pumps and straight leg raises (quad contractions) are emphasized.

Crutches are continued preoperatively for patients with locked meniscus tears. Patients without a meniscus tear use crutches until they have restored, normal heel/toe gait

**GOALS**

- Decreased swelling/effusion - Expect it to approach minimal level preoperatively.
- Increased Range of motion - Full hyperextension is vital to an excellent outcome.
- Strength - Closed kinetic chain exercises should permit return of strength.
- Normalized gait - Uses crutches until they obtain full extension and ambulate without a limp.
- Education checklist complete

**POSTOPERATIVE**

**PHASE I** (1 - 6 days post op)

The early post-operative period is the "critical start". The surgery is done as an outpatient procedure. The patient is actively excercising, not simply sitting passively while receiving modalities during visits.

Extension exercises are emphasized! They are performed 10 minutes each hour of the day. These include placing the heel on a bolster (or pillow) and achieving full hyperextension (heel props). A soft 2.5 lb. ankle weight may be placed across the knee to promote extension. The patient is instructed not to place a pillow under the knee. Although this may seem comfortable, it promotes development of a flexion contracture. **We wish to obtain hyperextension equal to the opposite knee!** Towel extension exercises and prone hangs are also taught. Flexion exercises done from the edge of the bed three times daily.

Ambulation is permitted with crutches and the brace locked in full extension. The brace will be worn and locked for ambulation until discontinued by the surgeon. The patient may weight-bear as tolerated (unless otherwise noted by the surgeon). The patient is to wear the brace at night post-operatively (patients without a brace often sleep with their legs flexed, thus contributing to a flexion contracture every morning).

Quad sets, straight leg raises and heel slides (supine) and wall slides are instituted. Active flexion is permitted, while extension is passive.

The wound is inspected at each visit and the surgeon called for any questions.

**GOALS**

- Full Hyperextension - equal the opposite side.
- Flexion - approximating 90 degrees
- Straight leg raises - without a noticeable extensor lag.
PHASE II  (7-14 days)

The patient should have full and equal hyperextension at this phase. Full extension is critical to the long-term success of the surgery. If necessary, the therapist should loan the patient 2.5 to 5 lbs of soft weights for prone extensions or for placement over the knee while performing heel props. If the patient is non-compliant or unable to achieve full hyperextension an extension board (device with a heel elevation and velcro straps to exert an extension force while supine) may be provided for short term home use. Another option is weighted hangs. The patient lies supine on a couch. They palce the operative leg on a chair with the toes pointing upward. They drape the straps of a bookbag over the knee and load it with increasing weight to achieve passive hyper-extension.

Flexion is promoted with heel slides, wall slides, and assisted flexion while sitting on the edge of a table. Heel slides (with assist of a towel for leverage) usually begin after 90 degrees of flexion has been gained.

Weight bearing as tolerated is permitted with the brace locked in extension and crutches. When quad control has returned sufficiently enough to perform straight leg raises without a lag, gait training may begin without the brace or crutches while at therapy. The patient may perform this gait training at home in front of a full length mirror.

The strengthening may begin when the patient has regained full extension and has a normal gait.

Closed chain exercises may include bilateral knee bends, calf raises, and some stair-master on manual control.

**GOALS**

- Full terminal hyperextension
- At least 90 degrees of flexion
- Normal gait without assist devices

PHASE III  (3 to 5 weeks)

Range of motion is continued. Again, full and equal terminal hyperextension should have been achieved. If not, some of the previously mentioned modes of treatment will be employed. Terminal flexion is achieved.

The physician may then decide to discontinue the brace and crutches together when gait is normalized and leg control is sufficient. This is generally at three to four weeks post-op. Typically, the brace is not "unlocked" for a period of time (most patients in this situation usually ambulate about in a bent-knee gait, which is unsightly and detrimental).

The patient may begin weight room activities as soon as they have sufficient leg control to perform a unilateral knee bend without difficulty. **Exercises** include: leg press, calf raises and 1/4 squats in the squat rack. The exercise bike should be begun with the seat elevated and the gradually lowered to increase flexion. After flexion is improved (>120 degrees), the exercise speed may be increased for strengthening workouts.

**GOALS**

- Full range of motion
- Discontinue brace and crutches when gait is normal
- Weight room and fast speed strengthening begun
PHASE IV  (5 weeks -> onward)

Patient should have full range of motion and a noticeable return of quadriceps tone. Exercises include: leg press, hip sled, safety squat, squat rack, and stair master.

Isokinetic evaluation (optional) may be performed if necessary to determine current strength. This is done with a 20 degree extension block and anti-shear device at 180 degrees per second. Isometric leg press may be performed to quantify strength.

Return to controlled agility training and sport specific activity is based upon full range of motion, patients subjective rating, isokinetic and isometric rating. Patients may typically begin running on a straight course as early at eight weeks postoperatively as long as prior goals have been met and strength is at least to approximately 70 percent. Agility training and limited sports specific training as tolerated help the patient to regain fast strength speed as well as restore confidence in their knee condition. Proprioceptive function training and running are increased as tolerated. Bicycle training is continued.

**GOALS**

- At least 70% strength
- Proprioceptive / agility specific program
- Agility and sport specific training
- Complete a sport specific functional program
- Return to full activity

Optional

a) objective tests of stability: KT-1000 assessment (generally not utilized)  
b) Clinical tests: single leg hop (as compared to opposite)