Anterior Cruciate Ligament (ACL) Rehabilitation

Dear

Enclosed you will find a copy of our Anterior Cruciate Ligament (ACL) Rehabilitation program and the data from our most recent follow-up study on patients who have undergone ACL surgery.

The semitendinosus (hamstring) graft is utilized because of its excellent strength and low harvest morbidity. The graft is precisely placed in the same location as the original ACL for optimal healing and mechanical function and for safer rehab. Significant injury to the meniscal cartilage is repaired if possible. This adds to the stability of the knee and diminishes the risk of osteoarthritis later.

Carefully staged rehab will achieve excellent results (see attached 5 year summary) while also emphasizing patient-initiated exercises. During the rehabilitation period, we expect that patients will return to 0-135° motion by 4 to 8 weeks. Closed kinetic chain activities and aerobic conditioning are emphasized with bracing to protect the ACL graft as it heals and matures.

Three basic precautions:
1. Focus on closed kinetic chain activities
2. Only fully extend, or “lock out” your knee with a slow, controlled quad recruitment, or controlled stretching: i.e. don’t “pop” your knee into full extension.
3. Avoid torsional/twisting/lateral stress during all rehab activity

Remember, cycling is super for rehab.

By following this plan, excellent results can be attained. Please contact us for further information at (435) 655-6600 or (801)743-4500.

Sincerely,

Drs. Rosenberg, Cooley and Lind

ACL Rehab Program
Bracing
1) Lock at 20° for 1-2 weeks depending on intraoperative findings (non weight-bearing and no ROM).
2) Shower without brace at one week.
3) Sleep without brace at four weeks.
4) Set extension on the brace at 10° for ambulation and ADLs (activities of daily living) during 1st month.
5) Set extension on the brace at 30° for rehab exercises during 1st month.
6) Flexion may be set to “open”. No flexion restrictions, typically.
7) Discontinue brace at five to six weeks with adequate quad strength.
8) Continue brace for rehab exercises if needed.
9) Remove brace for stationary biking.
10) May perform selected rehab exercises without brace under supervision of PT and in controlled setting.

ROM/Strengthening
1) Immediate isometric ham/quad co-contractions.
2) Passive ROM 0-135° (avoid hyperextension).
3) Safeguarded CKC (closed kinetic chain) exercises limiting extension to 30° in the rehab brace.
   Recommended:
   a) Squats
   b) Seated toe drags
   c) Toe raises
   d) Treadmill walking (inclines)
   e) Biking with toe clips
4) Incorporate single leg strengthening, balance, and proprioceptive exercises once good eccentric quad control is established.
5) Incorporate aquatic therapy where available once incision is well healed and sealed.

Goals
1) 0°-135° ROM by four to eight weeks.
2) Quad/ham strength 80-85% contralateral (opposite) limb by four months.
3) Sports brace with 20° extension stop at three months or once quad strength is sufficient.
4) Sports specific training at 5-6 months with sports brace.
5) Return to sport at six months in sports brace.
6) Run/jog program at 3-4 months upon physician approval.

Troubleshooting/Specific Needs
1) With meniscal repair:
   a) Lock brace at 20° for two weeks (increase weight-bearing at 2 weeks post-op).
   b) Set brace at 20°-90° for exercise.
2) With microfracture/mosaicplasty, see prescription for weight bearing timing.
3) Hyperlax patient:
   a) Set brace at 30°-100° for exercise.
   b) Avoid hyperextension with passive ROM.
4) Slow extension:
   a) Adjust brace setting to 10°-100° for exercise
   b) Patellar glides
   c) Extension sitting
   d) Prone extension
   e) Long striding gait
   f) Stretch gastroc/hams 5 times a day
   g) Remove brace for safe ADLs (optional)
   h) Remove brace for passive ROM exercises
   i) Soft tissue work to posterior musculature.
   j) Retro-treadmill walking
5) Slow flexion:
   a) Patellar glides/Scar Mobilization
   b) Wall slides
   c) Chair squats
   d) Kneeling squats
   e) Cycling
   f) Remove brace for passive ROM exercises

Range of Motion Exercises
**FLEXION:**

A) Wall Slides
Lie on your back with your hips flexed 90 degrees and your foot positioned on the wall. With gravity, slide your heel down the wall as far as possible (use a sock to decrease friction). Pressure from your other leg may be helpful.

B) Chair Squats
Sit in a chair with arm rests. With your foot firmly planted, slide your hips forward while controlling body weight with arms.

C) Kneeling Squats
While on hands and knees, lower hips backward toward feet. When you feel a stretch, hold as long as possible.

D) Cycling
You may use a bike to gain range of flexion. Position the seat at a height which allows you to pedal the bike without lifting off the seat. Progressively lower the bike seat to achieve greater knee flexion.

**EXTENSION:**

1) Extension Sitting
Sit on floor or table with legs straight. Prop up feet so that knee is hanging unsupported. Pull back on the foot with a strap while repetitively contracting your quadriceps (quad sets).

2) Prone Extension
Lie prone with your foot and ankle hanging off the edge of bed or top of a staircase. Relax and let gravity straighten the leg. To increase the stretch, place a light weight around your ankle. Continue activity for 5 to 10 minutes.

3) Long Striding Gait
Increase your walking distance and also increase the length of stride as much as possible. Use heel-toe walking.

4) Gastroc/Hamstrings Stretch
Stretch to the point of tension or mild pain. Use frequent repetitions and avoid brute force! Hold each stretch for 15-30 seconds. Do not bounce or jerk while stretching.

**Closed Kinetic Chain Exercises**
**Brace Setting 20°-100°**
Squats
Equal weight-bearing emphasized with knee flexion no greater than 90°. Do not progress in resistance or knee flexion if form forces weight shift to unaffected side.

Single leg squats are recommended with the use of pilates, or total gym.

Seated Toe Drags
While seated in a chair, extend leg, point toe, and press toe to the floor. Drag the toe along the floor as the knee is bending. Resistance increases as the toe is pressed more forcefully to the floor.

Toe Raises
With brace at 20° to control hyperextension, raise up on the ball of foot and slowly lower. Begin exercise off the floor and progress to a small step to allow greater range of motion as strength increases.

Treadmill Walking
With brace, start with 10 minutes and progress 5 minutes per week until 30 minutes is achieved. Proper form must be maintained in order to progress on the treadmill. Increase uphill grade 2° per week until a maximum of 10° is reached.

Biking with Toe Clip
When a symmetrical spin is achieved, progress in time from 15 minutes to 40 minutes at 5 minutes per week pace. Low load interval work can start at 6 weeks post-op with 20 seconds on and 40 seconds off. RPM is progressed from 70 to 100 during the work phase.

Quadrupled Semitendinosus ACL Reconstruction: 5 Year Results In Patients Without Meniscus Loss
Thomas D. Rosenberg, M.D., Kathleen T. Deffner, M.S., Vernon J. Cooley, M.D.

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**Background:** While non-surgical treatment of an ACL injury is sometimes recommended, such management often results in reinjury episodes that can injure the cartilage in the knee joint. Such damage can lead to osteoarthritis that may necessitate an eventual knee replacement. Replacement of the ACL using a quadrupled semitendinosus (hamstring tendon) graft restores stability to the knee and minimizes the likelihood of reinjury.

The quadrupled semitendinosus tendon has consistently been used for ACL reconstruction by the senior author (TDR) since 1990. This evaluation was undertaken to study the outcomes of ACL reconstruction in patients without meniscus loss at least 5 years after surgery.

**Methods:** A comprehensive follow-up examination was performed on twenty patients at an average of 5.7 years (range, 5 to 7 years) after surgery. None of these patients had undergone extraarticular reconstruction or meniscus removal. Suture repair was performed in nearly half of the patients whose meniscal tears were repairable. Meniscal excoriation to stimulate healing in small, stable meniscal tears was performed in half the patients. One manipulation, one manipulation and debridement, and a debridement and notchplasty were performed to regain range of motion. Average age was 31 years at the time of follow-up. 75% of the patients were male, and the remaining 25% were female. A comprehensive knee examination with KT-1000 arthrometry, x-rays, and isokinetic strength testing was performed.

**Results:** Anterior tibial translation was reduced from a pre-operative average of 6.3 mm (side-to-side difference) to an average of 0 mm (range, -2.5 to 2 mm) with the manual maximum pull. Lachman examination was negative in all but two patients. Radiographically, one of the patients experienced mild narrowing in the lateral compartment; no other joint space narrowing was noted. Tegner activity level was maintained at the level prior to injury in nearly half the patients. The remaining patients felt that their change in activity level was due to a lifestyle change and not due to the inability to perform the same activities as prior to injury. Isokinetic strength deficits were less than 10%.

**Discussion:** The above data demonstrate minimal morbidity, a low re-operation rate, and excellent clinical outcome. Because the stability of the knee persists beyond 5 years after ACL reconstruction, patients are able to maintain pre-injury activity levels without reinjury episodes. Compared to conservative treatment, in which instability, meniscal tears, and pain are common, these results are superior. In addition, neither deterioration of results nor the high reoperation rates seen with allograft reconstructions exist.