

### **Anterior Cruciate Ligament Reconstruction Delayed Rehab**

This rehabilitation protocol has been designed for patients who have undergone an ACL reconstruction (HS graft/PT graft/Allograft) in addition to other surgical procedures or conditions that may delay the initial time frame of the rehabilitation process. The ACL protocol for Hamstring Tendon Grafts is the same as for the Bone Patellar Tendon Bone Grafts and Quad Tendon Grafts with exceptions noted in the protocol.

The following may be considered criteria for this protocol:

- Concomitant meniscal repair
- Concomitant ligament reconstruction
- Concomitant patellofemoral realignment procedure
- ACL revision reconstruction
- MRI evidence of severe bone bruising or articular cartilage damage
- Concomitant articular cartilage restoration surgery

The protocol is divided into phases according to postoperative weeks and each phase has anticipated goals for the individual patient to reach. The **overall goals** of the reconstruction and the rehabilitation are to:

- Control joint pain, swelling, hemarthrosis
- Regain normal knee range of motion
- Regain a normal gait pattern and neuromuscular stability for ambulation
- Regain normal lower extremity strength
- Regain normal proprioception, balance, and coordination for daily activities
- Achieve the level of function based on the orthopedic and patient goals

Physical therapy is to begin first or second day post-op. It is extremely important for the supervised rehabilitation to be supplemented by a home fitness program where the patient performs the given exercises at home or at a gym facility.

**Important abnormal post-op signs** to monitor:

- Unusual erythema and effusion of the involved lower limb with complaints of constant pain and a positive Homan's indicated DVT and physician should be contacted immediately
- Abnormal pain response, hypersensitivity

**Return to activity** requires both time and clinic evaluation. To safely and most efficiently return to normal or high level functional activity, the patient requires adequate strength, flexibility, and endurance. Isokinetic testing and functional evaluation are both methods of evaluating an athlete's readiness to return to sports activity. Criteria for "clearance" for return to sports is an area of evolving research in orthopedic sports medicine. Dr. Shybut recommends athletes undergo functional movement evaluation by an experienced sports physical therapist and/or athletic trainer. Specific exercises may be modified, substituted, or added where clinically appropriate at the discretion of an experienced sports physical therapist or athletic trainer who has expertise in sports surgery rehabilitation.

**Prevention of future ACL injury** requires ongoing dedication to correcting functional movement deficits identified during rehabilitation. There are several injury prevention programs that have demonstrated efficacy. Dr. Shybut recommends athletes, therapists, and trainers utilize these programs and incorporate them into their ongoing conditioning. Two such programs are FIFA 11+ (shown to reduce soccer injuries by 50%) and the PEP program. For more information see:

<http://f-marc.com/11plus/home/>

<http://smsmf.org/smsf-programs/pep-program>

### **Females have 3-8x higher incidence of ACL tears than males...why??**

It is a well-known fact that females suffer more ACL injuries than males in the same sport. This has been attributed to numerous factors including the following differences between males and females:

- Anatomy: females have a wider pelvis, increased flexibility, narrower femoral notch, increased genu valgum, and increased tibial torsion.
- Females often have weaker gluteal/core musculature leading to faulty mechanics when cutting and landing from a jump.
- Females have a decreased sense of proprioception – knowing where their body is in space leading to incorrect postural adjustments and increased risk for injury.
- Neuromuscular function: females have difficulty recruiting their hamstrings to provide co-contraction with the quads for dynamic stabilization – this can be seen when landing from jumps (females land with 3x less knee flexion than males) and during cutting maneuvers. Females have longer electromechanical delay compared to males. Females require more time to produce force levels compared to males. Females generally have increased recurvatum (hyperextension), which puts the hamstrings at a mechanical disadvantage to provide stability.
- Hormonal: Females' knees are more lax than males and this laxity increases 50% during the menstrual cycle.

Many of these factors can and should be addressed in therapy. Proprioception/balance training will improve body awareness and decreases incidence of ACL injury by 7 times. Strength training of the hips and core should begin immediately and progress through each phase of rehab increasing in intensity to prepare the athlete for improved muscle recruitment and optimal firing patterns during agility and plyometrics. In addition, sports specific training prior to returning to the desired sport is mandatory and has been shown to reduce the risk of injury by 88%.

**A NOTE ON ALLOGRAFTS:** Multiple studies have shown that tissue incorporation and graft maturation takes longer in allografts as compared to autograft tissue. As a general rule Dr. Shybut recommends delaying return to high level cutting/pivoting/agility activities until at least 9 months postoperatively, assuming appropriate rehabilitation has been done up to that point.

## **PHASE I: WEEK 1-4**

*Focus of this phase is protection of graft, symptom reduction, and quad activation*

### **ROM/FLEXIBILITY**

- **LIMIT FLEXION TO 90° PROM UNLESS OTHERWISE SPECIFIED**
- Seated heel slides (passive only)
- Patella mobilization
- Seated Gastroc stretch with towel/strap
- Seated/supine Hamstring stretch (avoid if HS graft)
- Prone hangs if lacking full extension

### **STRENGTH**

- Quad sets with Biofeedback (10x10sec hold every hour and perform B with upright posture)
- Straight leg raise: supine until can perform with NO extensor lag then progress to sitting and/or add ankle weights (only if can maintain full extension)
- Abduction/Adduction/Extension leg raises: maintain quad contraction

### **GAIT**

- Patient will be PWB or FWB (depending on procedure) **locked in extension in brace**. Instruct patient to contract quad during stance phase to improve VMO recruitment and stability.

### **MODALITIES**

- Ice 10-15 minutes
- ESTIM: NMES if cannot elicit quad contraction; TENS for pain
- Ultrasound to portals/incision once healed if needed

### **BRACE**

- Will be locked at 0°; therapist may unlock to 90 when quad tone/strength allows for full weight bearing without apprehension
- To be worn at all times except in therapy for 6 weeks or until N gait is achieved

HEP: Quad sets, SLR, Heel slides, HS/calf stretch, core strengthening, Ice 10-15 min

### **GOALS TO ADVANCE TO PHASE II**

1. Full Extension
2. Flexion to 90° (unless otherwise specified by MD)
3. Voluntary VMO/Quad activation
4. Reduce effusion and pain

## **PHASE II: WEEK 4-8**

*Focus of this phase is gradual increase in ROM and achieving N gait*

### **ROM/FLEXIBILITY**

- Continue Phase I exercises

- Heel slides to increase ROM
- Initiate gentle HS stretch if HSG at postop week 4

#### AEROBIC

- BIKE: Begin when can flex to 110° (do not adjust bike seat to increase/force motion at any time)

#### STRENGTH

- Continue Phase I exercises: increase Intensity as able
- Standing calf raises
- Total Gym/Shuttle/Leg press: double limb only
- Squat to chair: 90° max – can use TRX to assist
- Step ups
- Wall squats
- Side-lying clams with theraband resistance
- Core

#### GAIT

- Patient will progress to FWB depending on procedure
- Cone walking with crutches (out of brace)
- Gait will continue with B crutches in brace until N gait pattern is achieved
- Can move to single crutch as confidence increases and full extension during stance is achieved
- Postop brace is to be worn for 6 weeks or until notified by surgeon

#### BALANCE/PROPRIOCEPTION

- Weight shifts side to side
- Single limb stance with knee slightly flexed on stable surface
- Wobble board (double leg only) – balance and mini squats

#### MODALITIES

- Ice 10-15 min following treatment and at end of day
- Ultrasound to portals if needed

#### HEP

- Bike (increase time; Intensity as high as possible maintaining 60-80 RPM)
- Strengthening ex as able at home/gym INCLUDE CORE as able
- Ice as needed post exercise and/or when effusion is present

#### GOALS TO ADVANCE TO PHASE III

1. Minimal effusion present
2. ROM 0-125
3. Equal extension/hyperextension B
4. N gait

5. Improve strength
6. Single limb balance on stable surface

### **PHASE III: WEEK 8-16**

*Focus now shifts to building strength and improving proprioception*

#### **FLEXIBILITY**

- Continue previous stretches
- Slant board gastroc/soleus stretch
- Quad stretch: prone or standing
- Foam roller for ITB/quad

#### **AEROBIC**

- Bike: double and/or single leg; continue to progress time 45-60 min
- Elliptical
- AlterG: depending on procedure and strength, may initiate light jogging at reduced body weight

#### **BRACE**

- Pt will be measured for functional brace when ready to initiate jogging
- Brace to be worn with all lateral movements, jogging, agility, plyometrics, functional drills and with return to sport

#### **STRENGTH**

- Cont previous (D/C quad sets when patient demonstrates good VMO tone)
- Leg press/shuttle: single and double limb
- Step ups/downs (weight through heel to avoid PF compression)
- Lateral heel touches
- Multi-hip/Cable column Fl/Abd/Add/Ext
- Bridge progression: single limb, on swiss ball/slide board
- Lunges: in place, reverse, walking, lateral (week 8)
- Smith press squats
- Single leg squats
- Hamstring curls: seated or prone
- Sidestep and monster walk with TB
- Dead lifts: double progress to single limb
- Sled push/pull
- TRX SL squats
- Core strengthening: planks, total gym core trainer, supine strengthening

#### **BALANCE/PROPRIOCEPTION**

- Advance to unstable surfaces as able for SL stance: Airex, dynadisc, wobble board
- BOSU: both sides, double and single limb balance and squats
- Y balance

- C column 4 way on Airex/dynadisc
- Plyotoss
- Sports cord sidestep over cones
- Korebalance

#### MODALITIES

- Ice following activity 10-15 min
- US as needed

#### HEP

- Cycling/elliptical/rowing can be performed daily
- Strength exercises to be performed every other day at gym/home

#### GOALS TO ADVANCE TO PHASE IV

1. Full ROM by week 8 (0-135°)
2. Improve strength/endurance: perform SL squat with good mechanics
3. Improve balance/proprioception
4. Initiate lateral movements (week 10-12)

#### PHASE IV: WEEK 12-20

*Focus now on initiating functional activities such as jogging*

#### FLEXIBILITY

- Continue previous: HS, quad, calf stretches and dynamic warmup prior to jogging

DYNAMIC WARMUP (Week 10): prior to jogging, 10-20 yards of each of following:

- Walking straight leg kicks
- Walking arabesque
- Walking quad stretch
- Walking butt kicks
- Hip opening
- Hip closing
- Walking lunge with twist
- Side to side lunge
- A skips

#### AEROBIC

- Continue bike – single and double limb
- Treadmill/AlterG: Jogging Week 16-20 (perform dynamic warmup immed before)
  - Criteria: **able to perform SL squats with good mechanics** – no glut compensation
  - Jog progression
    - 1-2 min jog/1 min walk up to 10 min
    - Progress as symptoms allow 2 min jog/ 1 min walk to 20 min

- Increase interval time jogging by 1-2 min every other session as long as no increase in pain/effusion
    - Jogging should be on TM or soft surface such as track
  - AlterG: begin at BW% in which patient can jog with comfortable, N gait
- Swimming
- Golf (if released by MD)

#### STRENGTH

- Continue previous increasing intensity as able to build strength
- Progress sled push/pull speed/intensity
- Biodex flexion/extension at 180°/sec, and 300°/sec

#### BALANCE/PROPRIOCEPTION

- Continue previous adding perturbation or removing vision to increase difficulty level
- Y balance: goal is <4cm difference involved vs uninjured in anterior direction

#### FUNCTIONAL TRAINING

- Slide board
- Ladder drills
- Initiate shuffles, carioca, figure 8 at submax speeds
- Initiate Part 1 of FIFA11+ [http://www.f-marc.com/downloads/posters\\_generic/english.pdf](http://www.f-marc.com/downloads/posters_generic/english.pdf)

#### HEP

- Cycling/elliptical/rowing can be performed daily
- Strength exercises to be performed every other day at gym/home
- Jog program is every other day as long as no increase in effusion/pain
- Jogging should be completed prior to any strength training if completed on same day

#### GOALS TO ADVANCE TO PHASE V

- Initiate functional activities (week 16-20)
- 80% On single leg squat test side to side with good mechanics
- Confident with sub-max intensity side to side drills
- Patient subjective report of 75-80% recovered
- Less than 6cm difference in reach on Y balance when testing involved vs uninjured

#### PHASE V: WEEK 20 TO DISCHARGE

##### FLEXIBILITY/STRENGTH/BALANCE

- Continue previous

##### FUNCTIONAL TRAINING

- Continue previous advancing speed and intensity

- Initiate Sportsmetrics jump training
- Advance to all 3 parts and all phases of FIFA11+ [http://www.fimarc.com/downloads/posters\\_generic/english.pdf](http://www.fimarc.com/downloads/posters_generic/english.pdf)
- Advance sports specific training

#### **GOALS OF PHASE V**

- Unrestricted return to sport
- 85-90% on isokinetic testing
- <4cm side to side reach on Y balance
- Subjective reports of readiness to return to sport
- 90% on all strength and balance testing comparing involved to uninvolved
- Patient should be able to complete home maintenance core / agility program and understands importance of continuing maintenance program because he/she is at greater risk risk of re-injury or contralateral injury by virtue of having torn an ACL!