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Rehabilitation Following ACL Reconstruction

The Biology of ACL Reconstruction

The process of ACL regeneration relies heavily on the biology of your knee. I take a tendon, either from an organ donor or from a different part of your body, then place it where I want a ligament to grow. Your body uses this tendon as a scaffolding to regenerate a new ACL. This process occurs in 3 phases. The first phase is characterized by necrosis or cell death. During the first 4 weeks after surgery, your body tears down all of the living cells in the graft, leaving only nonliving tissue as a blueprint for the final ligament. 4 weeks after surgery the second phase of the regeneration process starts. This second phase is called the proliferation phase and it continues through 12 weeks post surgery. This phase is characterized by the influx of your own body's cells into the remaining scaffolding. The scaffolding also undergoes changes that cause significant weakness in the graft. Six to eight weeks after surgery is typically thought of as the time when the new ligament is at its weakest and when the structure of the new graft needs the most protection. The final phase, the ligamentization phase, begins about 3 months after surgery. During this time, the graft is slowly and steadily getting stronger and becoming more like the original ACL. There is no clear end point when the new ligament will reach full strength; however, there is plenty of evidence suggesting that the graft will continue to mature for at least a year.

Phase I (Post-Op) WEEKS 1-2

- Goals
  - Diminish joint swelling
  - **RESTORE FULL PASSIVE KNEE EXTENSION**
  - Gradually achieve knee flexion to 120 degrees
  - Re-establish quadriceps control
  - Resume full weight bearing in brace
- Activity
  - Knee brace locked in extension
    - Wear while sleeping and when standing/walking
      - May open while sitting
    - May bear weight as tolerated in brace
    - Use crutches for balance for at least the first week
  - Swelling control
    - Ice (20 min on, 20 min off) as much as necessary
    - Elevation
  - Patella mobilization/massage
- Exercises
  - Ankle pumps/standing heel rises
  - Overpressure into full, passive knee extension
  - Active and Passive knee flexion
    - Range of motion exercise at least 4-6 times per day
    - Goal: 90 degrees by the end of one week
      - 120 degrees by first follow up visit

- Quadriceps/hamstring muscle activation
  - Straight leg raises in brace (flexion, extension, abduction, adduction)
  - Straight leg raises may start out of the brace if quad control is good
  - Heel slides
  - Gentle isometric hamstring contraction out of brace
- Criteria to progress
  - Quad control (ability to perform good quad set and leg raise without lag)
  - Full passive knee extension
  - Range of motion 0-90 degrees
  - Good patellar mobility
  - Minimal joint effusion
  - Independent ambulation in extension brace

Phase II (Early Rehab) **(Weeks 3 to 6)**

- Graft Development**:** The initial phase involves necrosis or cell death. During this period your body tears down all of the living cells in the graft, leaving only nonliving tissue as a blueprint for the final ligament.
- Goals
  - Establish a normal gait pattern
  - Maintain extension
  - Increase knee flexion
  - Diminish swelling and pain
  - Re-establish muscular control and activation
  - Restore proprioception/neuromuscular control
  - Normalize patellar mobility

- Activity
  - Knee brace may be unlocked to sit. May unlock to walk starting week 3 or 4 when quad control allows.
  - Keep brace locked when sleeping through week four
  - **START TO WEAN OUT OF BRACE WEEK FIVE**
    May bear weight as tolerated in brace
    - Range of motion stretching (4-6 times/ day)
    - Continue ice, compression, and elevation as necessary to limit swelling

- Exercises
  - Isometric quadriceps sets
  - Straight leg raises (active only)
  - Leg press with light weights (0-30 degrees)
  - Front step-ups (4-6"), progress to front step-downs and lateral step-overs
  - Hamstring curls against gravity (active only)
  - May progression to stationary Bicycle ON LOW RESISTANCE as range of motion permits
  - May start Proprioceptive/neuromuscular training with therapist
    - Weight shifts, double/single leg stance balance training
    - Joint repositioning exercises
  - Initiate Basic Core strengthening program

- Criteria to progress
  - Active Range of Motion 0-115 degrees
  - Good quadriceps control
  - Minimal to no joint effusion
  - No joint line or patellofemoral pain

Phase III (Progressive strengthening) **(Weeks 7 to 12)**

- Graft Development: This portion of the regeneration process is the proliferation phase and is characterized by the influx of your own body's cells into the remaining scaffolding. The scaffolding also undergoes changes that cause significant weakness in the graft. This is the point during rehab that the graft is the weakest and most susceptible to stretching or re-ruptures.
- Goals
  - Normal gait pattern
  - Restore full knee range of motion
  - Improve lower extremity strength
  - Enhance proprioception, balance and neuromuscular control
  - Improve muscular endurance
  - Restore limb confidence and function
- Activity
  - Wean off of brace by end of week 5
  - Ice, compression and elevation after exercise
- Exercises
  - Progressive isometric strengthening
  - Leg Press (0-30 degrees)
  - Hamstring curls
  - Hip Abduction/adduction, Flexion/extension (therabands)
  - Lateral step-overs and step-ups (6 inch maximum height)
  - Standing calf raises
  - Balance training
  - Continue proprioceptive training
  - Progressive pool walking
  - Progressive core strengthening
  - Treadmill walking
  - Stationary bike continues at low resistance through week 12
- Criteria to progress
  - Active Range of Motion 0-130+
  - No pain or effusion
  - Satisfactory clinical exam
  - Basic Quad and Hamstring Control

Phase IV (Advanced Activity) **(Weeks 12-16)**

- Graft Development: The final phase is the ligamentization phase which begins about 3 months after surgery. During this time, the graft is slowly and steadily getting stronger and becoming more like the original ACL.
- Progressions: Any progressions suggested within the protocol from week 12 through 16 will be started only if the athlete demonstrates the necessary strength and control in the operative leg to be fully safe and under control. These progressions may include:
  - Progression to aerobic stationary bike and then progression to elliptical
  - Jogging at week 14
  - No jump training is to start until after a sports brace is in place after week 16
  - No jump training is to be attempted unless the athlete is being instructed and monitored by rehabilitation professional.
  - Formal double squat with progression to single leg squat strength training will start after week 12

- Goals
  - Normalize lower extremity strength
  - Enhance muscular power and endurance
  - Improve neuromuscular control
  - Perform selected sport specific drills

- Exercises
  - May begin pool running
  - Gradual initiation of light sport program
    - Swimming(flutter kick), cycling(without clips), jogging (week 14-16)
  - Continue all strengthening drills
    - Leg press
    - Wall squats
    - Hip Abd/Adduction
    - Hip Flex/Ext
    - Hamstring curls
    - Standing toe calf
    - Seated toe calf
    - Step down
    - Lateral step ups
    - Lateral lunges
  - Neuromuscular training
    - Lateral step-overs cones
    - Lateral lunges
    - Tilt board drills
  - May begin throwing program

- Criteria to progress
  - Full Range of motion
  - Demonstrate stability with single legged exercises in sport brace
  - Satisfactory clinical exam

Phase V (Sport-specific Rehab) **(Week 20 Onward)**

- Goals
  - Gradual return to full unrestricted sports
    - Achieve maximal strength and endurance
    - Normalize neuromuscular control
    - Progress skill training

- Exercises
  - Continue strengthening exercises
  - Continue neuromuscular control drills
  - Continue plyometrics drills
  - Progress running and agility program
  - May begin interval hitting program
  - Progress sport specific training
    - Running/cutting/agility drills
    - Gradual return to sport drills

6 MONTH FOLLOW UP

- Clinical examination
- Return to sport testing
- Sport Specific Rehab

This protocol was updated in 2015