RETURN TO PLAY AFTER ACL RECONSTRUCTION

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Disclosures

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Goals

• Understand the basic biology of ACL graft healing.

• Understand the challenges faced in ACL rehabilitation.

• Learn commonly used criteria for allowing RTP after ACL reconstruction.
Anterior Cruciate Ligament (ACL)
ACL Injury

- Common injury in sports involving cutting, pivoting, and jumping
- Return to most sports not advised without reconstruction. Instability will cause further injury.
- >120,000 ACL reconstructions done each year in US
ACL Injury Mechanism

- Knee valgus
- Internal tibial rotation
- Shallow knee flexion
- Anterior tibial translation
ACL Reconstruction

- Removes the torn ACL and replaces it with a graft
  - Patellar tendon autograft
  - Hamstring tendon autograft
  - Quadriceps tendon autograft
  - Allograft (donor tissue)

- Graft must heal with appropriate tension in an anatomic position to restore mechanical stability to the knee.
Goals of ACL reconstruction rehabilitation

- Minimize pain and swelling
- Restore full (symmetric) range of motion
- Restore strength
- Restore agility, balance, proprioception, and neuromuscular control
- Train sport-specific movements

Do all the above while respecting biology and protecting the healing graft.
2 Main Sites of Healing

- Intra-tunnel Graft Incorporation
  - Graft must heal to the bone within tunnels in both the femur and the tibia.

- Intra-articular Graft Healing (Ligamentization)
  - Histology and biological, mechanical properties change from that of a tendon to that of a mature ligament.
Graft – Tunnel Healing

Bone plug
  • 6 weeks

Soft tissue (hamstring)
  • 3 months
Ligamentization

3 phases

1. Early Graft Healing Phase (~ weeks 0 – 4)
   Graft necrosis and hypocellularity
   Overall collagen structure is maintained

2. Proliferative Phase (~ weeks 4 – 12)
   Cellular repopulation
   Re-vascularization

3. Ligamentization Phase (12 wks – 12+ mos)
   Graft approaches normal ACL
Graft Strength

Graft Strength Over Time

Percent (%)

Months Post-Op

Normal ACL
ACL Graft
Secondary ACL Injury

• Literature cites rates between 3% and 49%
• 75% of secondary injuries occur with 2 years of surgery.
• Younger age and higher activity level carry a higher risk.
• Allograft ACL has a higher risk.
Neuromuscular Deficits

- Motion loss
- Quadriceps weakness
- Deficient hamstring activation
- Loss of proprioception from native ACL
- Net hip internal rotation moment
- Increased knee valgus motion
- Reduced postural stability
Psychological Deficits

- Poor confidence
- Pessimism
- Poor motivation
- Poor social supports
- Stress
Factors Used for Return to Play

- Time from surgery
- Thigh circumference
- Knee ROM and effusion
- Dynamic Function (single leg hop tests)
- Neuromuscular Function (drop jump tests)
- Stability on exam
- Validated questionnaire results
- Sports-specific testing
Single Leg Hop Test

Goal is $\geq 85\%$ of uninvolved limb for each test
**Vertical Drop Test**

**Procedure**
- Subject stand on 31 cm box with feet 35 cm apart
- Drop down off box and immediately perform maximum vertical jump, raising both arms
- Land on both legs
- Perform 3 trials

**Assessment Criteria**
- Do both feet hit the ground at the same time on initial contact: **yes or no**
- Pronation of the feet on initial contact: **yes or no**
- Evidence of medial knee motion during initial contact: **yes or no**
- Evidence of medial knee motion during the final landing: **yes or no**
Single Leg Squat

**Procedure**
- Stand on 1 leg and perform single leg squat
- Hands out to side or on hips
- 10 reps
- 45-60° of knee flexion

**Assessment Criteria**
- Pronation or supination of the foot: *yes or no*
- Knee valgus: *yes or no*
- Hip internal rotation: *yes or no*
- Extension or flexion of the trunk: *yes or no*
- Able to maintain balance (falling or touching a surface with opposite foot or hand): *yes or no*
- Able to perform the entire set of 10 reps: *yes or no*
How Do We Decide?
RTP Pearls after ACL Reconstruction

1. There is no one proven criterion or test that can be used to guide the decision on when it is safe to return to sport.

2. Some athletes may be ready at 6 months. Others may never be ready.

3. The decision should be tailored to the individual, combining objective assessments of their recovery with their tolerance for risk of re-injury.
My Ideal Criteria for RTP after ACL

- No functional complaints
- Knee stable to Lachman and pivot-shift exam
- ≥ 6 months from surgery
- Confidence when running, jumping, and cutting at full speed.
- ≥ 85% contralateral strength (isokinetic testing)
- ≥ 85% contralateral on hop tests
- Minimal valgus or hip IR with drop test and single-leg squat
- Sport-specific training without pain or swelling
Practical Issues

• PT rarely extends beyond 3 months.

• Don’t have the time to perform hop tests or isokinetic strength in the clinic.

• Pressures to play in a certain time frame sometimes come in to play.

• Patients have varying tolerance for risk.
What I Do

• Stable on exam
• No effusion
• Pt feels ready, confident on knee
• Timing: 9 months when possible, 6 months in special cases. 12 months for very high risk (revisions, very young, allograft).
• Single leg squats without marked knee valgus or hip IR
Take Home Points

1. There is no one universally agreed-upon criterion for determining return to play.

2. Healing is only half the battle. Addressing neuromuscular deficits is equally important.

3. A cookie-cutter approach won’t work. Decisions on RTP should be individualized.
Thank you