ACL Reconstruction

Components of an Integrated Rehabilitation Program

- Flexibility Training
- Cardiorespiratory Training
- Core Training
- Balance Training
- Plyometrics Training
- Speed, Agility, and Quickness Training
- Integrated, Multi-planar Resistance Training
- Sports-Specific Training

Phase I: Protection, Mobility, and Activation (Weeks 0-4)

Goals

1. Protect tissues
2. Decrease pain and inflammation
3. Increase ROM within restrictions per surgeon
4. Prevent muscular inhibition
5. Promote correct muscle firing patterns with emphasis on core activation

Specific Exercises

- POD #1
  - Gait and transfer training
  - Patellar and Tendon mobilization
  - Ankle pumps
  - Wall slides or Seated PROM
  - Isometrics
    - TA
    - Quads
  - SLR (flexion, abduction and extension) (no quad lag)
  - Calf stretch
  - Ice/compression

- POD #2
  - POD #1 exercises
  - Bridging
  - Front and side planks
  - Bike (if PROM greater than 110 degrees)

- POW #1-3
  - POD #1 & #2 exercises
  - Tissue Extensibility
    - Quadriceps stretch
  - AROM
    - Flexionator (if present)
    - Extensionator (if present)
  - Neuromuscular control
- Weight shifting

- POW #4
  - Continue with tissue extensibility and ROM exercises
  - Neuromuscular control
    - Single limb bridging
    - Hip extension over edge of bed
    - Perturbation training (high kneeling, half kneeling, UE movement)
  - Balance/Proprioception
    - Weight shifting (Anterior-Posterior and Medial-Lateral)

Criteria for Progression
1. Minimal palpable swelling
2. Full weight bearing
3. Range of motion ≥ 75% of uninvolved side
4. Minimal pain with ADLs and phase I exercises
5. Good patellar mobility

Muscle activation and firing patterns normal and without compensation with all phase I exercises

Phase II: Stability and Neuromuscular Control (Week 4-8)

Goals
1. Normalize gait pattern
2. Restore full ROM
3. Improve neuromuscular control, balance, and proprioception
4. Initiate functional exercise to improve movement patterns with emphasis on maintaining lumbopelvic and hip stability
5. Utilize SFMA

Stabilization Endurance

<table>
<thead>
<tr>
<th>Reps</th>
<th>Sets</th>
<th>Tempo</th>
<th>% Intensity</th>
<th>Rest Interval</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>1-3</td>
<td>1-3</td>
<td>30-60 sec hold</td>
<td>Mild to moderate stretch</td>
<td>N/A</td>
<td>5-7x/week</td>
</tr>
<tr>
<td>Core</td>
<td>12-20</td>
<td>1-3</td>
<td>Controlled</td>
<td>Mild</td>
<td>30-60 sec</td>
<td>5-7x/week</td>
</tr>
<tr>
<td>Balance</td>
<td>1-3</td>
<td>1-3</td>
<td>20-60 sec hold</td>
<td>Mild</td>
<td>30-60 sec</td>
<td>5-7x/week</td>
</tr>
<tr>
<td>Neuromuscular</td>
<td>12-20</td>
<td>1-3</td>
<td>Controlled</td>
<td>Mild</td>
<td>30-60 sec</td>
<td>5-7x/week</td>
</tr>
</tbody>
</table>

Specific Exercises
- Tissue Extensibility
  - Soft tissue mobilization
    - TFL/ITB
    - Quadriceps
    - Hip flexors
    - Piriformis
    - Calf
  - Stretching
    - Calf
    - Quadriceps (prone)
- PROM
- Wall slides or prone quad stretch
- Upright bike
- PROM

### Neuromuscular Control and Core

<table>
<thead>
<tr>
<th>Planes of Motion</th>
<th>Range of motion</th>
<th>Type of resistance</th>
<th>Body position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sagittal</td>
<td>Full</td>
<td>Cable</td>
<td>Supine</td>
</tr>
<tr>
<td>Frontal</td>
<td>Partial</td>
<td>Tubing</td>
<td>Prone</td>
</tr>
<tr>
<td>Transverse</td>
<td>End-range</td>
<td>Medicine ball</td>
<td>Sidelying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power ball</td>
<td>Kneeling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dumbbells</td>
<td>Half kneeling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kettlebells</td>
<td>Standing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single leg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Staggered-stance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Standing progression on unstable surface</td>
</tr>
</tbody>
</table>

### Neuromuscular Control and Core Training Exercise Selection

<table>
<thead>
<tr>
<th>Progression</th>
<th>Systematic</th>
<th>Proprioceptively Challenging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy → Hard</td>
<td>Stabilization</td>
<td>Stability ball</td>
</tr>
<tr>
<td>Simple → Complex</td>
<td>Strength</td>
<td>BOSU</td>
</tr>
<tr>
<td>Known → Unknown</td>
<td>Power</td>
<td>Reebok Core Board</td>
</tr>
<tr>
<td>Stable → Unstable</td>
<td></td>
<td>Half foam roll</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Airex pad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bodyblade</td>
</tr>
</tbody>
</table>

- Perturbation training (rhythmic stabilization in tall and ½ kneeling)
- Single limb dead lift (i.e. RDL’s)
- Double limb rotations → single leg rotations
- Chops/lifts (tall kneeling, ½ kneeling)
- Prone hip extension off edge of bed
- Planks
- Bridging progression
- Quadruped UE/LE lifts
- Shuttle exercises/leg press (limited weight)

### Balance

<table>
<thead>
<tr>
<th>Stabilization Continuum</th>
<th>Lower Body</th>
<th>Upper Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor</td>
<td>Two leg – stable</td>
<td>Two-arm</td>
</tr>
<tr>
<td>Half foam roll</td>
<td>Staggered-stance stable</td>
<td>Alternating arms</td>
</tr>
<tr>
<td>Airex pad</td>
<td>Single-leg stable</td>
<td>Single-arm</td>
</tr>
<tr>
<td>Wobble board</td>
<td>Two-leg unstable</td>
<td>Single-arm with trunk rotation</td>
</tr>
<tr>
<td>Dyna disc/BOSU</td>
<td>Staggered-stance unstable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Single-leg unstable</td>
<td></td>
</tr>
</tbody>
</table>
- Aerobic Conditioning
  - Biking
  - Swimming
  - Elliptical

Criteria for Progression
1. Pain-free and symmetrical gait pattern
2. Full ROM
3. No joint inflammation, muscle irritation, or pain
4. Normal muscle activation patterns and symmetry with multi-plane and multi-segmental movements
5. Single limb balance with good neuromuscular control for 1 minute
6. Hip strength: hip flexion >60% of uninvolved side; remaining planes >70% of uninvolved side
7. Quad strength: >70% of uninvolved side
8. LE Y-balance equal bilaterally
9. FMS ≥ 14

Phase III: Strengthening (Week 8-12)

Goals
1. Restore muscular strength and endurance
2. Optimize neuromuscular control, balance, and proprioception
3. Restore cardiovascular endurance

Specific Exercises
- Tissue Extensibility
  - Movement Prep/Dynamic warm-up (see movement prep/dynamic warm-up sheet)
  - Soft tissue and stretching as necessary
- Joint Mobility
  - Joint mobs (if needed)
- Neuromuscular Control
  - Chops/lifts (squat, split squat, single limb stances)
  - Bridging progression
  - Pilates exercises
  - Squats with resistance
  - Lunges with resistance
- Strengthening
  - Double knee bends with sport cord
  - Resisted squats
  - Leg press
  - Lunges (3 way)
  - Balance squats
  - Single leg squats (without resistance → with sport cord)
- Aerobic Conditioning
  - Running
  - Biking
  - Swimming
- Sports-Specific Training
  - Initial agility drills (lateral agility, diagonal agility)

Criteria Progression
1. Hip strength: hip flexion >70% of uninvolved side; remaining planes >80% of uninvolved side
2. Pass sport cord test
3. Demonstration of initial agility drills with proper body mechanics

**Phase IV: Return to Sport (Week 12-16)**

**Goals**
1. Restore power, speed, and agility
2. Return to play
3. Independent maintenance program

**Specific Exercises**
- Sports-specific training
  - Advanced agility
  - Plyometrics
  - Speed
  - Power

**Criteria for Progression**
1. Cleared by physician
2. Ability to perform sports-specific drills at full speed without pain
3. Completed sport training and conditioning without pain or compensation