
<table>
<thead>
<tr>
<th>Phases and Criteria to Enter</th>
<th>Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criteria to enter phase 1 of Early Stage Rehab 0-2 weeks</strong></td>
<td>▪ Protect the Graft</td>
</tr>
<tr>
<td>▪ Administer Tampa Kinesiophobia Scale</td>
<td>▪ Swelling Management</td>
</tr>
<tr>
<td>▪ Administer The ALC-RSI at beginning of phase</td>
<td>▪ <a href="#">Restore knee ROM and prevent stiffness</a></td>
</tr>
<tr>
<td>▪ Physician Clearance</td>
<td>▪ <a href="#">Normalize gait</a></td>
</tr>
<tr>
<td>▪ No red flags</td>
<td>▪ Achieve and maintain quad activation</td>
</tr>
<tr>
<td>▪ <strong>Criteria to Discharge Brace</strong></td>
<td>▪ <a href="#">Restore patella mobility</a></td>
</tr>
<tr>
<td>▪ Full active knee extension</td>
<td>▪ Minimize arthogenic muscle inhibition</td>
</tr>
<tr>
<td>▪ Able to maintain SLR for 10 repetitions without extensor lag</td>
<td>▪ Patient education to manage expectations</td>
</tr>
<tr>
<td>▪ Good quad control in stance</td>
<td>▪ <a href="#">Swelling Management</a></td>
</tr>
<tr>
<td>▪ Discontinue brace after first post-op visit pending above criteria have been met</td>
<td>▪ <a href="#">Swelling Management</a></td>
</tr>
</tbody>
</table>

Healers. Innovators. Teachers.
### Criteria to enter Phase 2 of Early Stage Rehab 2-4 weeks
- Progressive decrease in Swelling
- AROM 0-90 degrees
- WBAT with crutches if needed for optimal gait
- Quad contraction with superior patella glide and full active extension
- Able to perform SLR without lag
- May need one crutch to promote normal mechanics

### Criteria to enter Phase 2 of Early Stage Rehab 2-4 weeks
- Protect the graft
- Swelling Management
- Maintain full extension
- Restore full flexion
- Normalize gait
- Minimize arthogenic muscle inhibition
- **NMES suggested parameters**: 10-15 secs on: 30-50 secs off
- Utilize Blood Flow Restriction training (BFR):
  - **Recommended Criteria and Parameters for BFR**: Minimum 2 weeks post op, no red flags, can complete in conjunction with NMES (SLR, 90-45 degree extension). Utilize with low intensity CKC loading start with body weight, no greater than 30% 1RM. Literature suggests initial set of 30, then 3 sets of 15-30 repetitions. 30 second rest period. Aim for 75-90 reps directed at the quadriceps. Reps may be lower 40-50 if sets are taken to failure. Sets to failure are to be taken for muscle groups distal to cuff application. Should be used as a complementary treatment, continue until strength is equal between LE’s. Encouraged to be carried into future stages as a supplement to treatment.
- Patient education to manage expectations
- Balance and proprioception

### Criteria to enter phase 1 of Mid Stage Rehab 4-10 weeks (strengthening/neuromuscular control)
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- No wave produced on a stroke test\(^1\)
- At least 120 degrees knee flexion\(^2\)
- Symmetrical knee extension\(^3\)

### Criteria to enter phase 1 of Mid Stage Rehab 4-10 weeks (strengthening/neuromuscular control)
- Low to moderate load OKC exercises 45-90 degrees, CKC exercise 12-20 RM, muscle endurance, hypertrophy through metabolic stimuli supplement with BFR and NMES
- Hamstring methods are dependent upon graft type, introduce hip dominant movements with greater loads, knee dominant with lighter loads
- Incorporate rotational control
- Closed chain strengthening on 12-20 RM
- Full quadriceps activation - no quadriceps sag on a single leg raise through 10 repetitions[^4]
- Normal symmetrical independent gait pattern[^4]
- Quadriceps strength 60% or greater than contralateral side (isometric test at 60 degrees of knee flexion)[^5]

<table>
<thead>
<tr>
<th>Optimize motor patterning of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Squat <a href="https://www.youtube.com/watch?v=LJ4VnlgwGkG8">https://www.youtube.com/watch?v=LJ4VnlgwGkG8</a></td>
</tr>
<tr>
<td>- Split Squat <a href="https://www.youtube.com/watch?v=Du4-I2q3N8Q">https://www.youtube.com/watch?v=Du4-I2q3N8Q</a></td>
</tr>
<tr>
<td>- 2 LE Hinge <a href="https://www.youtube.com/watch?v=CCxNlb1u_pLi">https://www.youtube.com/watch?v=CCxNlb1u_pLi</a></td>
</tr>
<tr>
<td>- 1 LE Hinge <a href="https://www.youtube.com/watch?v=I8qH9g7gQdM">https://www.youtube.com/watch?v=I8qH9g7gQdM</a></td>
</tr>
<tr>
<td>- Lunge <a href="https://www.youtube.com/watch?v=izVPg6ot6TA">https://www.youtube.com/watch?v=izVPg6ot6TA</a></td>
</tr>
<tr>
<td>- Step up <a href="https://www.youtube.com/watch?v=izVPg6ot6TA">https://www.youtube.com/watch?v=izVPg6ot6TA</a></td>
</tr>
<tr>
<td>- Carry <a href="https://www.youtube.com/watch?v=wpKbXaex1s&amp;t=38s">https://www.youtube.com/watch?v=wpKbXaex1s&amp;t=38s</a></td>
</tr>
</tbody>
</table>

- Bed based progressive to weight bearing to weighted plantar flexion activities
- Non WB and WB muscle re-activation activities for gluteal muscles
- Low load core stabilization to re-activate local core muscles
- Short to long lever activities for adductor strengthening
- Restore hip flexor strength
- Utilize manual therapy and muscle release techniques as needed
- Continue with stretching for muscle flexibility
- Restore static and dynamic balance in stance
- Aerobic fitness activities focusing on continuous moderate intensity
- Incorporate upper body strengthening outside of PT on recovery days when appropriate, non-weight bearing upper body strengthening

### Criteria to enter Phase 2 of mid stage rehab 10-16 weeks
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase
- No pain and no effusion on a stroke test[^1]
- Full knee ROM[^2]
- Quadriceps bilateral comparison 75%[^5]

<table>
<thead>
<tr>
<th>Moderate load OKC and CKC exercises 50-90 degrees, 8-12 RM, muscle hypertrophy through mechanical stimuli supplement with BFR and NMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamstring strengthening in isometric, isotonic, and isokinetic knee and hip dominant exercises 8-12 RM</td>
</tr>
<tr>
<td>Progress anti-rotation control</td>
</tr>
<tr>
<td>closed chain strengthening on 8-12 RM</td>
</tr>
</tbody>
</table>
- Equal bilateral hamstring strength<sup>5</sup>
- Extensor flexor ratio of 70-75%<sup>5</sup>
- Limb symmetry index >70%<sup>5</sup>
- Subjective knee scoring (modified noyes system) 80 points or better<sup>5</sup>

**Criteria to begin jogging<sup>5</sup>**
- IKDC score of 90
- CKRS score of 10
- 30 step and holds without loss of balance outside of the sagittal plane
- 10 consecutive single leg squats 0-60 degrees without loss of balance outside of the sagittal plane
- > or equal to 70% 1RM leg press involved/non-involved
- Fast treadmill walking for 15 minutes with normal gait

**Criteria to begin low level agility drills<sup>5</sup>**
- IKDC score of 90
- CKRS score of 10
- 10 consecutive single leg squats 0-60 degrees without loss of balance outside of the sagittal plane while holding weight >75%
- > or equal to 80% 1RM leg press involved/non-involved
- Normal running pattern on a treadmill
- Greater than 85% LSI hop tests Involved/non involved
- Cross over hop
- Triple hop
- 6 meter hop for time
- Single hop for distance

- Optimize motor patterning of:
  - Squat [https://www.youtube.com/watch?v=L4VnlgwkG8](https://www.youtube.com/watch?v=L4VnlgwkG8)
  - Split Squat [https://www.youtube.com/watch?v=Du4-I2q3N8Q](https://www.youtube.com/watch?v=Du4-I2q3N8Q)
  - 2 LE Hinge [https://www.youtube.com/watch?v=CCxNb1u_pLi](https://www.youtube.com/watch?v=CCxNb1u_pLi)
  - 1 LE Hinge [https://www.youtube.com/watch?v=l8qH9g7fdqM](https://www.youtube.com/watch?v=l8qH9g7fdqM)
  - Lunge [https://www.youtube.com/watch?v=izVPg6ot6TA](https://www.youtube.com/watch?v=izVPg6ot6TA)
  - Step up [https://www.youtube.com/watch?v=izVPg6ot6TA](https://www.youtube.com/watch?v=izVPg6ot6TA)
  - Carry [https://www.youtube.com/watch?v=wpKBxAAex1s&t=38s](https://www.youtube.com/watch?v=wpKBxAAex1s&t=38s)

- Single leg plantar flexion activities with an emphasis on eccentric control
- **Mix of WB and non WB exercises gluteal muscles**
- **Progress core stabilization and Integrate into functional movements**
- Short to long lever activities for adductor strengthening
- Loaded hip flexor activities
- Shift away from manual therapy if appropriate to more self-sustaining strategies such as foam rolling and self-massage
- Continue with stretching for muscle flexibility, optimize mobility in hip, knee, and ankle for deceleration requirements
- Unilateral dynamic balance
- Bilateral to unilateral landing drills
- Aerobic fitness activities focusing on continuous moderate intensity and interval high intensity activities
- Incorporate upper body strengthening outside of PT on recovery days when appropriate, include weight bearing lifts
### Criteria to enter Phase 1 of late stage rehab 16-22 weeks

- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase
- No effusion produced on a stroke test
- Full knee ROM
- Limb symmetry index >80% for flexors and extensors
- Leg press strength at least 125% body mass for 8 reps or 1.5Xbody mass of predicted 1 rep max
- Single leg bridge test greater than 20 reps and within 5 reps of each side with no cramping of the hamstring or adductor
- Single leg calf raises greater than 20 reps within 5 repetitions versus other side
- Single leg balance eyes open 43 seconds, eyes closed 9 seconds (normative data 18-39 years old)
- Single leg squat test to at least 60 degrees of flexion for 10 reps with minimal trunk rotation, minimal pelvic motion, and no hip adduction or internal rotation
- 80% LSI on triple hop scoring
- **Good unilateral landing control and deceleration in frontal and sagittal plane** no dynamic knee valgus, minimal trunk lean, and no pelvic drop
- **Running assessment**
- **Qualitative**- good frontal plane alignment (minimal dynamic knee valgus, lateral trunk lean, pelvic drop) good sagittal plane loading (optimal triple flexion angles, no knee avoidance

### Guidance for progressing to Phase 2

- Continue to restore muscle strength
- **Restore deceleration and landing capabilities**, consult PT prior to beginning and progressing
- **Pre-planned linear situations at different velocities focusing on deceleration mechanics**, consult PT prior to beginning and progressing
- High load machine-based strengthening 5RM
- Moderate load functional activities 8-12RM (squat, hinge, lunge)
- **Bilateral plyometrics**, consult PT for appropriate progression
- **Core stabilization**
- Off-feet cardiovascular fitness
- **Quantitative**- sufficiently normalized running gait and ability to run for >10 minute for 5 miles per hour
- subjective knee scoring modified Noyes greater than or equal to 90 points or better
- **Criteria to Begin Jumping**
  - IKDC score of 90
  - CKRS score of 8
  - 10 consecutive single leg squats 0-60 degrees without loss of balance outside of the sagittal plane while holding weight >85%
  - > or equal to 85% 1 RM leg press involved/non-involved
  - Normal running pattern on a treadmill and no compensatory patterns on declaration agility drills
  - Greater than 85% LSI hop tests involved/non-involved
  - Cross over hop
  - Triple hop
  - 6 meter hop for time
  - Single hop for distance

<table>
<thead>
<tr>
<th>Criteria to enter Phase 2 of Late stage rehab 22-28 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Administer Tampa Kinesiophobia Scale upon entrance and exit of phase</td>
</tr>
<tr>
<td>• Administer The ALC-RSI at end of phase</td>
</tr>
<tr>
<td>• Same as above, begin multi directional coordination with explosive pre-planned sport specific drills(^5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria to begin Cutting(^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• IKDC score of 90</td>
</tr>
<tr>
<td>• CKRS score of 8</td>
</tr>
</tbody>
</table>

- Introduce multidirectional coordination
- Maximize strength
- Cultivate explosive strength and power
- Pre-planned multi directional situations at different velocities focusing on acceleration and deceleration, consult PT prior to beginning and progressing
- High speed linear based running
- High load machine based strengthening 5RM
- Moderate load functional activities 8-12RM (squat, hinge, lunge)
- 10 consecutive single leg squats 0-60 degrees without loss of balance outside of the sagittal plane while holding weight >90%
- > or equal to 90% 1 RM leg press involved/non-involved
- No genu valgus when loading into or landing from jumps and equal weight distribution when initiating and landing the jumps
- Greater than 90% LSI hop tests involved/non-involved
- Cross over hop
- Triple hop
- 6 meter hop for time
- Single hop for distance

**Criteria to enter Phase 3 of Late Stage Rehab 28-34 weeks**
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase
- No pain/swelling
- Symmetrical ROM
- Knee flexor and extensor Limb symmetry index >90 %
- Triple hop test >90% Limb Symmetry index >90% 15,16
- Single leg press >2x body mass 7
- Rate of force development Limb symmetry index >80% 12

**Criteria to enter stage 4 of Late Stage rehab 34-40 weeks**
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase

- Bilateral plyometrics, consult PT for appropriate progression
- Core stabilization
- Off-feet cardiovascular fitness

- Introduce re-active movement
- Speed and change of direction
- Maximize strength
- Cultivate explosive strength and power
- Pre-planned multi directional situations at different velocities focusing on acceleration and deceleration
- High speed pre planned multi directional running
- Lower body strength (6-8 RM) and power training (1-5 RM)
- Core stabilization
- Off-feet cardiovascular fitness

- Introduce sport specific movement and sport skill retraining
- Speed and change of direction with sport specific drills
- Sport specific skills program
- Cultivate explosive strength and power
- Satisfactory Progression through stage 3 on field activity with reactive multidirectional movement\textsuperscript{12}
- Optimal Physical conditioning\textsuperscript{12}
- Reactive situations at different velocities focusing on acceleration and deceleration
- High speed reactive multi directional running
- Lower body strength (6-8 RM) and power training (1-5 RM)
- Core stabilization
- Off-feet cardiovascular fitness

### Criteria to enter stage 5 of late stage rehab 40-46 weeks
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase
- Satisfactory progression though sport specific skill training and sport specific conditioning\textsuperscript{12}
- Sport simulation and game reconditioning
- Speed and change of direction with sport specific drills
- Sport specific skills program
- Cultivate explosive strength and power
- Reactive situations at different velocities focusing on acceleration and deceleration
- High speed reactive multi directional running
- Lower body strength (6-8 RM) and power training (1-5 RM)
- Core stabilization
- Off-feet cardiovascular fitness

### Criteria to Return to Sport 46-52 weeks\textsuperscript{5}
- Administer Tampa Kinesiophobia Scale upon entrance and exit of phase
- Administer The ALC-RSI at end of phase
- Physician, Physical Therapist, Athletic Trainer, Strength & Conditioning Coach and most importantly Athlete come to a mutual decision of clearance
- IKDC score of 90
- CKRS score of 8
- Achieves greater than or equal to 90% of all strength assessment
- Displays a normal running gait that does not increase pain
- Has practiced and displays no hesitation or compensatory strategies during change of direction activities in particular deceleration movements when activities are performed at 100% effort
- Has practiced and has displayed normal loading and no genu valgus as well as soft athletic landings from all jumps and hops
- 10 consecutive single leg squats 0-60 degrees without loss of balance outside of the sagittal plane while holding weight >85%
- Rate of force development Limb symmetry index >90%12
- Greater than 90% LSI hop tests involved/non-involved
- Cross over hop
- Triple hop
- 6 meter hop for time
- Single hop for distance

References - see intext citations