Rehab Practice Guidelines for: ACL Reconstruction

Assumptions: 1. Isolated ACL injury 2. Autograft (See specific graft types for precautions)

Primary surgery: ACL reconstruction
Secondary surgery (possible): See precautions section for modifications related to
Expected # of visits: 16-38

NMES Guideline:

1. Electrodes placed over proximal lateral quadriceps and distal medial quadriceps. (Modify distal electrode placement by not covering superior medial (VMO) arthroscopy portal until stitches removed and skin is healed)

2. Stimulation parameters: 2500Hz, 75 bursts, 2 sec. ramp, 12 sec. on, 50 sec. rest, intensity to max tolerable [at least 50% MVIC(see note at end)], 10 contractions per session. 3 sessions per week until quadriceps strength MVIC is 80% of uninvolved.

3. Stimulation performed isometrically at 60° (dependent on graft site)

Pre-operative Goals: Full knee extension range of motion (ROM), absent or minimal effusion, and no knee extension lag with straight leg raise (SLR)

<table>
<thead>
<tr>
<th>Immediate Post-operative (Week 1)</th>
<th>Treatment</th>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL VISITS 1-3</td>
<td>Wall slides, patellar mobilization, gait training, NMES(^2) (see guidelines) Bike for ROM Tx/HEP: supine wall slides, self patellar mobs 30-50X per day, QS, LAQ (90-45°), and SLR 3x10 (3X per day)</td>
<td>AROM/PROM = 0-90°, Active quadriceps contraction with superior patellar glide</td>
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</table>

<table>
<thead>
<tr>
<th>Early Post-operative (Week 2)</th>
<th>Treatment</th>
<th>Milestones</th>
</tr>
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<tbody>
<tr>
<td>TOTAL VISITS 4-6</td>
<td>Step ups in pain free range Portal/incision mobilization as needed (if skin is healed) Stairmaster, Wall squats/sits(^6) Progress to functional brace as swelling permits Prone hangs if lacking full extension(^7) PF mobilization in flexion(if flexion limited)</td>
<td>Flexion &gt;110° Walking without crutches Use of cycle/stair climber without difficulty Walking with full extension Reciprocal stair climbing KOS ADL &gt; 65%</td>
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<table>
<thead>
<tr>
<th>Intermediate Post-operative (Weeks 3-5)</th>
<th>Treatment</th>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL VISITS 7-15</td>
<td>Tibiofemoral mobilization with rotation if limited Progress bike and Stair master duration (10 minute minimum) Begin Balance and proprioceptive activities</td>
<td>Flexion to within 10° of uninvolved side Quad strength &gt; 60% uninvolved</td>
</tr>
</tbody>
</table>
### Late Post-operative (Weeks 6-8)

<table>
<thead>
<tr>
<th>TOTAL VISITS</th>
<th>Progress exercises in intensity and duration</th>
<th>Quad strength &gt;80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-25</td>
<td>Begin running progression**: on treadmill with functional brace (may vary with MD)*</td>
<td>Normal gait pattern</td>
</tr>
<tr>
<td></td>
<td>Transfer to fitness facility**</td>
<td>Full ROM (compared to uninvolved)</td>
</tr>
<tr>
<td></td>
<td>* (If all milestones are met)</td>
<td>Effusion &lt; or = trace</td>
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<td></td>
<td>**(see running progression below)</td>
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</tbody>
</table>

- Progress exercises in intensity and duration
- Begin running progression** on treadmill with functional brace (may vary with MD)*
- Transfer to fitness facility**
- * (If all milestones are met)
- **(see running progression below)

### Transitional (Weeks 9-12)

| TOTAL VISITS | Sports specific activities | Maintaining or gaining quadriceps strength (>80%)
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>25-38</td>
<td>Agility exercises</td>
<td>Hop tests &gt;85% (see attached)</td>
</tr>
<tr>
<td></td>
<td>Functional testing (see description below)</td>
<td>KOS Sports questionnaire &gt;70%</td>
</tr>
<tr>
<td></td>
<td><strong>Follow up Functional Testing:</strong></td>
<td>Maintaining gains in strength (&gt; or = 90% to 100%)</td>
</tr>
<tr>
<td></td>
<td>4 month, 5 month, 6 month, 1 year post-op.</td>
<td>Hop Test (&gt; or = 90% to 100%)</td>
</tr>
<tr>
<td></td>
<td>Recommending changes in rehab PRN.</td>
<td>KOS Sports (&gt; or = 80% to 100%)</td>
</tr>
<tr>
<td></td>
<td>Progression may include one-legged emphasis in gym, explosive types of activities (cutting, jumping, plyometrics)</td>
<td></td>
</tr>
</tbody>
</table>

**Follow up Functional Testing:**
- 4 month, 5 month, 6 month, 1 year post-op.
- Recommending changes in rehab PRN.
- Progression may include one-legged emphasis in gym, explosive types of activities (cutting, jumping, plyometrics)

### MVIC: Maximum Volitional Isometric Contraction

Patient is asked to volitionally extend the involved leg as hard as possible while knee is maintained isometrically at 60° knee flexion. Side to side comparison: (involved/uninvolved X 100 = % MVC)

### Precautions:

**Patellar tendon graft technique**
- Be aware of patellofemoral forces and possible irritation during PRE’s.
- Treat patellofemoral pain if it arises with modalities, possible patellar taping.
- Consider alteration of knee flexion angle to most comfortable between 45°-60° for MVIC and NMES treatments.

**Hamstring tendon graft technique**
- No resisted hamstring strengthening until week 12.

**Partial meniscectomy**
- No modifications required; progress per patient tolerance and protocol.

**Meniscal repair**
- No weight-bearing flexion beyond 45° for 4 weeks.
- Weight bearing in full extension OK.
- Consider alteration of knee flexion angle to most comfortable between 45°-60° for MVIC and NMES treatments.

**Concomitant Abrasion Chondroplasty**
- WBAT with Axillary crutches 3-5 days
- No modifications required, progress per patient tolerance and protocol

**Concomitant Microfracture**
- NWB-ing 2-4 weeks with Axillary crutches
- No weight bearing activities in treatment for 4 weeks
- *Consider location and size of lesion for exercise specific alterations*

**Chondral Repair (OATS, ACI, MACI)**
- Follow procedure specific protocol if done concomitantly

**Meniscal Transplantation**
- Follow procedure specific protocol if done concomitantly

**MCL injury**
- Restrict motion to sagittal plane until week 4-6 to allow healing of MCL.
- Perform PRE’s with tibia in internal rotation during early post-op period to decrease MCL stress.
- Consider brace for exercise and periods of activity if severe sprain and/or patient has pain.
- Non Repaired ROM restrictions: Gr 1 no ROM restrictions; Gr 2 0-90° week 1, 0-110° week 2; Gr 3: 0-30°
- PCL injury

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University of Delaware Rehab Practice Guidelines
Follow PCL rehabilitation guidelines. (Not ACL protocol)

**Posterolateral corner Repair**
- Minimize external rotation torques and varus stress 6-8 weeks
- Avoid hyper-extension
- No resisted Knee flexion 12 weeks

**ACL Revision**
- Delay progression of running, hop testing, agility drills, and return to sport by 4 weeks. Crutches and immobilizer will be used 2 weeks following surgery. Otherwise follow same milestones

**Running Progression:** (requires: trace or less effusion, 80% or > strength, understand soreness rules)

<table>
<thead>
<tr>
<th>Level</th>
<th>Treadmill</th>
<th>Track</th>
</tr>
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<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td>0.1 mile walk/0.1 mile Jog repeat 10 times</td>
<td>Jog straights/Walk Curves (2 miles)</td>
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<tr>
<td><strong>Level 2</strong></td>
<td>Alternate 0.1 mile walk/0.2 mile jog (2 miles)</td>
<td>Jog straights/Jog 1 curve every other lap (2 miles)</td>
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<tr>
<td><strong>Level 3</strong></td>
<td>Alternate 0.1 mile walk/0.3 mile jog (2 miles)</td>
<td>Jog straights/Jog 1 curve every lap (2 miles)</td>
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<tr>
<td><strong>Level 4</strong></td>
<td>Alternate 0.1 mile walk/0.4 mile jog (2 miles)</td>
<td>Jog 1½ lap/Walk curve (2 miles)</td>
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<tr>
<td><strong>Level 5</strong></td>
<td>Jog full 2 miles</td>
<td>Jog all laps (2 miles)</td>
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<tr>
<td><strong>Level 6</strong></td>
<td>Increase workout to 2½ miles</td>
<td>Increase workout to 2½ miles</td>
</tr>
<tr>
<td><strong>Level 7</strong></td>
<td>Increase workout to 3 miles</td>
<td>Increase workout to 3 miles</td>
</tr>
<tr>
<td><strong>Level 8</strong></td>
<td>Alternate between running/jogging every 0.25 miles</td>
<td>Increase speed on straights/jog curves</td>
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Progress to next level when patient is able to perform activity for 2 miles without increased effusion or pain. Perform no more than 4 times in one week and no more frequently than every other day. Do not progress more than 2 levels in a 7 day period.

**Functional Testing (Week12)**

**Testing:** Patient performs two practices on each leg for each hop sequence. Patient performs 2 timed or measured trials on each leg for each hop sequence. Measured trials are averaged and compared involved to uninvolved for single, triple, crossover hop. Compare uninvolved to involved for timed hop.

**Passing Criteria for Return to Sport:** Greater than or equal to 90% on: quadriceps MVIC, hop testing, KOS-ADLS score, and Global Rating of knee function score.

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References


