Advanced Orthopedics and Sports Medicine
ACL-R delayed-Treatment Guideline

Indications

This rehabilitation protocol was developed for patients who have ACL reconstruction with one of the following

- Concomitant meniscal repair, complex or in vascular region
- Concomitant ligament reconstruction
- Concomitant patellofemoral realignment procedure
- Significant articular cartilage lesions
- Revision ACL reconstruction
- Marked physiological laxity

Phase I: Immediate Post-operative (IP) 0-2 weeks

Evaluate:

1. Pain
2. Hemarthrosis
3. Patellar mobility
4. ROM
5. Quadriceps contraction
6. Soft tissue tightness/flexibility.
7. Subjective functional scores (eg LEFS)

Goals:

1. Maintain integrity of the repair.
2. Diminish inflammation, swelling and pain of the knee.
3. Manage the graft donor site morbidity (pain and swelling)
4. Gradually increase PROM (restore full extension)
5. Re-establish quadriceps muscle control.
6. Wean patient off crutches and emphasize normal gait.

Precautions:

1. Watch for infection (constant throbbing pain, systemic signs), post op hemorrhage graft donor site, DVT,.
2. Watch for stiffness due to early arthrofibrosis or CRPS.
3. AROM hamstrings in 2 weeks and resisted only after 6 weeks for STG.

Treatment Summary:

1. Modalities include electrical stimulation for re-education of quadriceps contraction or electrical stimulation for pain relief (IFC, TENS) or edema control (HVPG). Ice and compression (elevation) for pain control should also be used as appropriate.
2. Mobs/MFR: Initiate patellar mobilization for normal patellar mobility, manual retrograde massage (efflurage) for swelling, soft tissue massage for muscle guarding and pain.
3. Range of motion exercises include but not limited to heel slides, heel props, wall slides, prone hangs, ankle pumps
   Goals for ROM *please see appendix for parameters based on graft type or concomitant injuries.
4. Stretching for flexibility of lower extremity musculature includes but not limited to the following musculature hamstrings, gastrocnemius, iliotibial band, quadriceps, hip flexors.
5. Strengthening exercises include but not limited to Quadricep sets, gluteus sets, hamstrings sets (delay for 4-6 weeks with STG), SLR flexion, active assisted knee extension (avoid 0-30 extension).
6. Gait training: Includes progressive weight bearing from WBAT to 25-50% WB and gait training with crutches. Brace locked at 0 for first week.

Criteria for progression:

1. If greater than 10% bilateral difference in swelling, ROM then rehab focused on specific parameter.

Phase II: Early Rehabilitative (ER)2-6 weeks

Evaluate:

1. Pain
2. Effusion
3. Patellar mobility
4. ROM

5. Quadriceps contraction
6. Soft tissue tightness/flexibility
7. Joint Arthrometer (day 28 if available)
8. Subjective functional scores (eg LEFS)

Goals:

1. Obtain a full unrestricted range of motion
2. Develop good muscle control and early proprioceptive skills
3. Progressive weight bearing and restore independent ambulation with normal gait
4. Reduce any persistent effusion
5. To return patient to normal function.

Precautions/possible complications

1. Stiffness (arthrofibrosis)
2. Recurrent hamstrings strain for STG, patello-femoral irritability for BPTB
3. Increased laxity of the graft and/or graft failure

Treatment Summary:

1. Physician/physical therapist will determine when to discontinue the crutches, and brace.
2. Modalities include electrical stimulation for re-education of quadriceps contraction or electrical stimulation for pain relief (IFC, TENS) or edema control (HVPG). Ice and compression (elevation) for pain control should also be used as appropriate.
3. Mobs/MFR: Includes but not limited to patellar mobilization for normal patellar mobility, manual retrograde massage (efflurage) for swelling, soft tissue massage for muscle guarding and pain. May initiate tibiofemoral joint glides to improve knee range of motion.
4. Range of motion exercises include but not limited to heel slides, wall slides, Prone hangs, ankle pumps. Goals for ROM *please see appendix for parameters based on graft type
5. Stretching: : same as previous phase.
6. Strengthening exercises include but not limited to multi-angle isometric Quadricep sets, gluteus sets, hamstrings sets (initiate at 4-6 for STG), SLR all planes (except extension for STG), active/resisted knee extension (90-30). Add resistance to Quadriceps exercise not greater than 10% body weight.
   Closed chain exercises (CKC) includes but not limited to heel raise, toe raise, wall sits, step ups forward/sideways. Initiate hamstring curls to 90, multihip and leg press exercises between weeks 4-6 (delay hamstring curls, hip extension to > 6 weeks if STG).
7. Balance training includes weight shifting, progression to single leg balance (upper extremity and lower extremity movement eg ball throws), balance board
8. Aerobic exercise can include leg bike (initially for ROM progressing to aerobic conditioning).
9. Gait training: Includes progressive weight bearing to 75-100% WB and gait training weaning off crutches by week 4. Cone/cup walking exercises for normalization of gait. Lateral step over cones by week 4.

Criteria for progression:

2. No increase in effusion with 20-30 minutes of biking or ambulating.
3. If greater than 10% bilateral difference in swelling, ROM then rehab focused on specific parameter.

Phase III: Progressive Strengthening (PS) 6-12 weeks

Evaluate:

1. Pain
2. Effusion
3. Patellar mobility
4. ROM
5. Muscle control/Manual muscle testing.
6. Gait
7. Soft tissue tightness/flexibility
9. Joint Arthrometer (8 weeks)
10. Subjective functional scores (eg LEFS)

Goals:

1. Restore full knee range of motion.
2. Continue to improve total leg strength
3. Improve endurance capacity of the muscles
4. Improve proprioceptive, balance and neuromuscular control
5. Improve limb confidence and function

Precautions/possible complications

1. Stiffness (arthrofibrosis).
2. Recurrent hamstrings strain for STG, patello-femoral irritability for BPTB.
3. Increased laxity of the graft and/or graft failure

Treatment Summary:

1. Modalities include electrical stimulation for re-education of quadriceps contraction with functional activities. Use electrical stimulation for pain relief (IFC, TENS) or edema control (HVPG) as needed. Ice and compression (elevation) for pain control should also be used as appropriate.
2. Mobs/MFR: Includes but not limited to tibiofemoral joint glides to normalize knee range of motion. Initiate perturbation training. Use patellar mobilization for normal patellar mobility, manual retrograde massage (efflurage) for swelling, soft tissue massage for muscle guarding and pain as appropriate.
3. Range of motion exercises: Goal WFL ROM by week 8.
4. Stretching: same as previous phase
5. Strengthening: Continue/progress strengthening exercises of phase II. Progress to resisted hamstring curls to 90, carpet drags, multihip and leg press exercises, step ups forwards/sideways and backwards, lunges, tubing walks. Advanced strengthening exercises can be added on unstable surfaces (eg squats on BOSU or balance board), lunges per patient tolerance. Emphasize single leg exercises to decrease compensation.
6. Balance training includes single leg balance, balance board, BOSU, reaction ball, star balance (introduce knee torque across the body reaching by week 8-9)
7. Aerobic exercise can include leg bike, water walking, swimming (kicking by week 9), elliptical
8. Gait training: Cone/cup walking exercises for normalization of gait.

Criteria for Progression:

1. Balance and proprioception should be within 10% of the uninvolved lower extremity.
2. Watch for PF joint chondrosis.

Phase IV: Advanced Activity (AA) 12 weeks to 5 months

Evaluate:

1. Pain
2. Effusion
3. ROM
4. Manual muscle testing.
5. Gait
6. Soft tissue tightness/flexibility
7. Joint Arthrometer
8. Functional tests , Isokinetic Testing.
9. Subjective functional scores (eg LEFS)

Goals:

1. Incorporate sports specific activity.
2. Introduce agility and reaction time into proprioceptive work
3. Increase total leg strength
4. Develop patient confidence.

Precautions/possible complications

1. Patello-femoral irritability

Treatment Summary:

1. Modalities Ice post exercises for pain/edema control.
2. Mobs/MFR: Includes but not limited to tibiofemoral joint glides to normalize knee range of motion. Advance perturbation training as tolerated.
3. Range of motion exercises: Goal is full knee range of motion
4. Stretching: same as previous phase.
5. Strengthening exercises: Continue/progress with strengthening of Phase III. Advanced strengthening exercises on unstable surfaces (eg squats on BOSU or balance board) per patient tolerance.
6. Balance training includes single leg balance, balance board, BOSU, reaction ball, star balance.
7. Gentle plyometric exercises on level surfaces double legged if < 20% deficits on isokinetic testing.
8. Aerobic exercise can include leg bike, water walking, swimming, walking, stair machine, ski machine.
9. Running program includes but not restricted to jogging straight line, backpedals, progression to quick starts and stops and increasing speed and distance. Running and agility drills only if < 30% deficit on isokinetic testing.
    a. Sprint-Front

b. Sprint Retro Run
c. Side Shuffles – Both Ways
d. Cariocas – Both Ways
e. Figure 8's – Both Ways
f. 45° Angle Cuts – Both Ways
g. 90% Angle Cuts – Both Way
h. Cross-Over Steps – Both Ways

Criteria for Progression:

1. Isokinetic values (at 180°) quadriceps bilateral comparison 75%, equal hamstrings bilaterally, quadriceps peak torque/body weight 65% at 180°/sec (males) 55% at 180° (females), hamstrings quadriceps ratio 66% to 75%, hop test (80-90% of uninvolved leg).

Phase V: Return to Sports > 5 mos

Evaluate:

1. Manual muscle testing.
2. Joint Arthrometer
10. Functional tests , Isokinetic Testing.
11. Subjective functional scores (eg LEFS)

Goals:

1. < 10-15% difference in Isokinetic testing
2. 85% of uninvolved lower extremity on functional tests (one legged distance hop, one-legged timed hop, % limb symmetry)
3. Proprioceptive test 100% of opposite side
4. Return to sports safely and with confidence

Treatment Summary:

1. Continue stretching exercises.
2. Continue strengthening exercises.
3. Continue neuromuscular control drills
4. Functional Training: Plyometric training (box hops), sports specific drills if < 15% deficits on isokinetic test.
5. Progress sports specific training: running/cutting/agility drills. Gradual return to sports drills.
6. Balance training: Progress/advanced exercises phase IV with single legged exercises.
7. Aerobic exercise can include leg bike, water walking, swimming, walking, stair machine, ski machine.

Criteria for return to Sports/Work (6-7 mos)

1. No pain or effusion with full ROM
2. Isokinetic strength: quadriceps bilateral comparison 80% or greater, hamstrings bilateral comparism of 110%, quadriceps torque/body weight ratio 55% or greater, hamstrings/quadriceps ratio 70% or greater
3. Functional tests 90% of uninvolved LE
4. Proprioceptive test 100% of contralateral side.
5. Begin following sports at discretion of surgeon and/or physical therapist:
    a. Running, mountain biking: 5-6 months
    b. Golf: 6 months.
    c. Soccer, football, tennins, skiing, snowboarding: 6-7 months

** PLEASE SEE ACL-R APPENDIX FOR TREATMENT PARAMETERS BASED ON GRAFT TYPE**