ACL Reconstruction without meniscal repair

Patellar Tendon or Hamstring

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Phase I: Weeks 0-4:

Range of Motion:

Goals:
0º-90º at 10 days
0º-125º at 4-6 wks
Control effusion
Monitor Knee Extension ROM throughout this stage.
Begin **immediate intervention** program if **any lack of knee extension past week 1**.
(See attached solutions page)

Exercises: A/AA/PROM, stationary bicycle/Nu-Step, quad sets, heel slides, prone hangs, heel sags, patellar mobilizations and scar tissue mobilizations,

patient needs to avoid prolonged standing or sitting (as in class or the office) with involved knee flexed or prolonged standing with weight shifted to uninvolved LE

Effusion:

Ice, elevation, electrical stimulation, ankle pumps
Joint effusion can impact firing of the quadriceps.

Strength:

Goal: Quad activation SLR without quad lag
Exercises: Quad sets, SLR x 4, calf raises, assisted squats, leg press (double leg progress to single leg), leg curls, 4 way hip T-band, single leg balance, weight shifting, mini lunges, step ups, step downs, lateral T-band walk, core exercises, Long arc quad with no resistance, rocker or tilt board with both legs with upper extremity support

Electrical stimulation for quad activation as needed
Parameters:
2 large electrodes placed over distal VMO and Proximal VL
Medium frequency NMES at 2500 Hz (Russian)
75 burst frequency
10sec on, 50 sec off
2 sec ramp times for 10-15 minutes,
Intensity to full tetanic contraction

Brace:

- Remove to sleep and shower at 2 weeks
- Remove brace for rehab or as directed by physician
- Unlock to AROM available once there is no or minimal quad lag with SLR
- D/C brace when ROM and strength goals met (SLB 30sec, controlled 4-6 inch anterior step up)

Driving: Surgery to **Right** knee: Begin driving when adequate quad control and when brace is D/C'd or unlocked. Study indicates delayed reaction time with drivers for 6 weeks (Nguyen, Knee Surg, Sports Trauma, Arthrosc 2000). Young drivers are cautioned against driving for 6 weeks.

Surgery to **Left** knee: Begin driving when patient is on little to no pain medication and car is an automatic

Gait:

Goals:
FWB, no assistive device, and to normalize gait which includes full knee extension at initial contact and terminal stance, with 10-15 ^{0} knee flexion after initial contact.
Watch for tendency of patient to keep knee locked in mild flexion (peg legged) during gait.

WBAT with crutches up to 10 days, brace unlocked when SLR with no or minimal quad lag D/C crutches when no or minimal quad lag with SLR and pain free single leg balance is achieved. May need to continue with one or two crutches to aid in normalizing gait, until patient is able to do on own.

Reminders:

- *Avoid rotation*
- *watch for patellar tendonitis symptoms*
- *Notify Physician if ROM loss is severe*

Red Flags:

Cellulitis, drainage 2° possible infection, calf pain could indicate DVT (Call doctor ASAP)

Pink Flags:

Lacks more than 5° of knee extension by week 3, lack of quadriceps firing, knee flexion <90° at 2 weeks post op, unsure of HMP, not weight bearing on leg when using crutches (email doctor if concerns and how it will be handled)

Phase II: Weeks 4-8:

Range of Motion:

Goals: Flexion within 5º of uninvolved side by 8-10 weeks, knee extension symmetrical to uninvolved side
Exercises: Flexion, extension and patellar mobilizations, general LE flexibility

Strength:

Goals: Single leg squat and/or 6 inch medial step down with good pelvic/hip/quads control

Exercises to add: Stairmaster @ week 4, elliptical @ week 6, knee extension with low resistance (90-30º), progressive single leg balance activities including changes in surface, single leg squats, LE reaches, anterior and lateral lunges, single leg tilt or rocker board, roller board with both legs

Reminders:

- *Make exercises functional while protecting the ACL graft*
- *Avoid patellofemoral pain or patellar/hamstring tendonitis symptoms*
- *Avoid rotation*
- *HFHS Staff can refer to ACL manual or intranet for exercise ideas*

Phase III: Weeks 8-12

Range of Motion:

Goals: Full pain-free ROM, no effusion

Strength:

Goals: Transverse plane activities slowly, controlled single leg balance in all planes, Single leg squat ROM ≥80% of uninvolved side,.

Exercises to add: *Begin transverse plane activities slowly*. Rotational lunges, lunges with upper body rotations, rotational step downs, rotational step ups, transverse plane balance exercises, perturbation training, and roller board single leg.

Reminders:

- *Good pelvic, hip, quadriceps control with all exercises*
- *Advance exercises when appropriate to patient's required level of function*
- *Avoid patellofemoral pain or patellar/hamstring tendonitis symptoms*
- *HFHS Staff can refer to ACL manual and intranet for exercise ideas*

At 12 weeks:

Progress to independent strengthening program with monthly rechecks if good ROM and muscle control.

In the non-athletic population more visits may not be necessary if all functional goals are met.

Phase IV: 3-6 Months

Strength:

Goals: Good pelvic, hip, quad control with progressive multi-planar sport specific activities, begin plyometric exercises (supervised) if criteria are met (start with low intensity and progress to medium and high intensity), begin agility and early sport-specific activities. Return to sports at 6+ months when **cleared by physician**.

Exercises to add: Agility exercises (speed and agility exercise ideas can be found in HFHS ACL manual and intranet), plyometric exercises- 2 feet first than progress to 1 foot (jumping/hopping progression ideas can be found in HFHS ACL manual and intranet), sport-specific training

Return to jog, pre-jump and agility criteria:

- full knee extension
- no joint effusion
- normal gait
- 2 legged squat with symmetry
- good single limb control all planes
- adequate strength to perform run without a limp and without pain
- good control with early functional tests (i.e. 6-8 inch medial steps downs and/or single leg squat at 80% of uninvolved leg)

Pre-Jump & early agility activities:

Calf jumps at edge of table, jumping on leg press, skipping, shuffle, carioca, jumping rope, back pedal, ice skaters to single leg balance

Running Programs: Beginning a running program and return to sport running program can be found in the HFHS ACL manual and intranet site.

Return to plyometric program criteria:

- Full knee extension
- Good single limb control in all planes (watch for knee valgus and femoral internal rotation and hip adduction)
- No pain or effusion
- Normal gait
- Good control with early functional tests

Plyometric Guidelines:

- Maximum 3 days per week
- Limit foot contacts to 100 in early sessions
- Form is crucial
- Begin with double leg take offs and landings
- Progress to single leg take offs with double leg landings
- Progress to single leg take offs with single leg landings
- Begin with jumps in place, progress to all other planes

Reminders:

- *Good pelvic, hip, quadriceps control with all exercises*
- *Advance exercises when appropriate to patient's required level of function*
- *Good take off and landing techniques*
- *Avoid patellofemoral pain or patellar/hamstring tendonitis symptoms*
- *HFHS Staff can refer to ACL manual for exercise ideas*

Discharge Criteria

- *Pass appropriate functional tests within 85% (Functional Assessment Tests ideas can be found in HFHS ACL manual)*
- *Independent with written progressive HMP*

ACL PROBLEM/SOLUTION LIST

LACKS EXTENSION-bent knee gait, decreased quad firing
-electrical stimulation for muscle re-education and/or reduce knee effusion
-quads sets with or without overpressure
-extension mobilization
-patellar mobilizations and scar tissue mobilizations
-prone hangs with or without weight
-heel sags with or without weight
-Straight leg raises with quads sets each repetition
-dynasplint
-active/active assistive/passive ROM
-gait training
-patients needs to avoid prolonged standing with knee flexed and weight on uninvolved
-anterior step up with opposite hip flexion (train knee to flex upon loading and then drive from flexion to extension)
-weight shifts, step ups and step downs (load through knee and not hips)
-TKE with T-band
-walk backwards on treadmill or stairmaster
-proper fit of brace

SWELLING-stiffness, decreased quad firing
-ice
-elevation
-electrical stimulation (IFC or pre-mod 0-10 Hz) with or without ice
-ankle pumps
-retro-grade massage
-stocking
-normalize gait

LACKS FLEXION-impacts gait, decreased function
-bike
-nustep
-patellar and scar tissue mobilizations
-active/active assistive/passive ROM supine and prone
-heel slides
-wall slides
-chair slides
-knee to chest
-4 point rock back (late phase)
-gait training

QUAD ACTIVATION-slows healing time, poor strength
-quads sets
-electrical stimulation for muscle re-education
-closed kinetic chain exercises/functional exercises
-make functional exercises easier to avoid compensations and bad movement patterns
-TKE with t-band
-watch for gluts/hamstring compensation with exercises

ACL Protocol

***See full protocol for more information.**
***Exercises not limited to this list as long as following overall protocol and Doctors guidelines.**
***Progression should be based on movement patterns and pain and not by weeks.**

Exercise	Weeks 0-4	Weeks 4-8	Weeks 8-12	Weeks 12-24
A/AA/Passive ROM	X	X	X	X
Stationary Bike/Nustep	X	X	X	X
Quad sets	X	X	X	X
Heel slides	X	X	X	X
Prone hangs/heel sags	X	X	X	X
Patellar mobs/scar mobs	X	X	X	X
SLR flex, ext, add, abd	X	X	X	X
Heel raises and toe raises	X	X	X	X
Assisted squats	X	X	X	X
Leg press double leg	X	X	X	X
Leg curls	X	X	X	X
4 way hip Thera-band	X	X	X	X
Single leg balance	X	X	X	X
Weight shifting	X	X	X	X
Step ups	week 2-4	X	X	X
Step downs	week 2-4	X	X	X
Lateral thera-band walk	week 2-4	X	X	X
Core exercises	X	X	X	X
Long arc quads w/ no resistance	X	X	X	X

Exercises should be done pain free and without compensation or altered movement patterns.

Single leg leg press	X	X	X
Single leg squats	X	X	X
Stairmaster	X	X	X
Lower extremity reaches	X	X	X
Knee extension 90-30 degrees	X	X	X
SLB with surface changes	X	X	X
Rocker board or tilt board with 2 legs	X	X	X
Full lunges ant and lat	week 6-8	X	X
Elliptical	at 6 weeks	X	X
Rotational lunges		X	X
Lunges with upper body rotations		X	X
Rotational step up and step downs		X	X
Transverse plane balance exercises		X	X
Pertubation training		X	X
Rocker board or tilt board with 1 leg		X	X
Roller board with 2 legs		X	X
Jogging, Back pedal			X
Shuffle, Carioka, Skipping			X
Butt kickers, High knees			X
Calf jumps at edge of table			X
Jumping on leg press			X
Jumping rope			X
Stationary bounds to single leg balance			X
Agility progression			X
Plyometric progression			X

Advance exercises when appropriate to patients required level of function.

ACL Protocol

Return to plyometric program criteria: full knee extension, good single limb control in all planes (watch for knee valgus, femoral int rot and hip add), no pain or effusion, normal gait, good control with early functional tests.

Plyometric guidelines: Form is crucial, maximum 3 days per week, limit foot contacts to 100 in early sessions, begin with jumps in place, progress to all other planes, begin with double leg take offs and landings, progress to single leg take offs with double leg landings, progress to single leg take offs and landings.

Jumping/Hopping Progression

Jumping in place (vertical)
Jumping front/back and side/side
Jump and land is squat position
Jumping diagonals
Jumping 4 square (figure 8 pattern)
Clock/Star jumps
Jump off 1 foot, land with 2 feet
Split squat jumps (lunge jumps)
Bounding/Ice skater front/back
Bounding/Ice skater side/side
Restart jumps (2 forward, 1 back, etc)
Tuck jumps
Jump for height & jump for distance
Rotational jumps (45, 90, 135, 180)
Zig Zag jumps
Jumping onto plyo boxes
Jumping off plyo boxes
Hopping in place (vertical)
Hopping front/back and side/side
Hopping diagonals
Hopping 4 square (figure 8 pattern)
Hopping Clock/Star jumps
Hopping for height
Hopping for distance
Zig Zag hops
Rotational hops (45, 90, 135, 180)
Restart hops (2 forward, 1 back, etc)

Dot Drills *start w/ 2 feet, then 1 foot

Figure 8 (hour glass)
"X" jumps (2-1-2)
Box jumps (4 corners)

Cone Drills

5-10-5 (pro agility drill)
Box drill (run/shuffle/carioka/backpedal)
Shuttle runs
Figure 8's
"W" drill, "Z" drill, "X" drill
T-runs
Hour glass
Zig Zags (cutting)
Triangle drill

Speed and Agility Exercise Ideas

Firefeet with T-band at ankles
Shuffle drill (forward, backward, side/side)
Cutting (Zig-Zags)
Lateral shuffle with overhead pass to partner
Mirror drills/Shadow drills
Back pedal to sprint, Sprint to backpedal
Line drills (suicides)
Quick steps on box
Backpedal and cut on command
Bounding (anterior and lateral)
Speed changes ie sprint/jog/sprint
Chase drill (start 2sec behind 1st person)
Resistance to sprint
Sit to sprint, Stomach to sprint, Bound to sprint
Parachute or bungee cord pulls
Hurdle drills
LEFT drill (run fwd, backpedal, shuffle, shuffle, carioka, carioka, run fwd)

Force Absorption progression

Drop squat - forward and 90 degrees
Drop lunge - forward and 90 degrees
Fall and stop (w/ small perturbation) forward & side
Hop and stop - forward over obstacle w/ arm drive
Unanticipated Landing - side (w/ shoulder bump)
Line hops - side, forward, 45 degrees w/ cut

Ladder Drills *jumping 2 feet, hopping 1 foot

1 foot in each box running
2 feet in each box running
in/in/out/out (forward and lateral)
hopscotch
cutting
carioka
side to side (high knee)
lateral bounding with opposite hand touch
restart jumps
jump turns
jumping in and out
hopping into each square