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ACL Reconstruction: Protected Protocol

	WEIGHT BEARING	BRACE	ROM	EXERCISES	PROGRESSION GOALS
PHASE I - Acute 0-6 weeks	• 0-2 Weeks: - TTWB with brace locked and crutches • 2-4 Weeks: - PWB with brace locked and crutches • 4+ Weeks: - FWB with symmetrical gait - Unlock brace when adequate quad control - Wean off crutches as gait normalizes	• 0-1 Week: - Brace locked 0° extension • 1-2 Weeks: - Unlock brace 0° to 60° • 2-4 Weeks: - Unlock brace 0° to 90° • 4-6 Weeks: - Brace unlocked to full if good quad control and full extension • 6+ Weeks: - D/C crutches when gait is normal - D/C brace for home ambulation - Continue brace for community ambulation until MD approval to D/C	• 0-1 Week: - Full extension and progress flexion to 60˚ • 1-4 Weeks: - Maintain full extension and progress to 90˚ • 4+ Weeks: - Gradually progress flexion to 120˚ **STRESS EARLY EXTENSION** (avoid hyperextension > 10°)	• Quad sets, straight leg raises, hip abduction • 2+ weeks - TKEs, calf raises, pre-gait • 4+ weeks - Static balance - Mini squats - Stationary biking: must be >110˚ knee flexion • Other recommended exercises: - <u>Extension exercises</u>: Gastroc and hamstring stretches, prone hangs, manual overpressure - <u>Flexion exercises</u>: heel slides, wall slides - 4 way patellar mobs - E stim and biofeedback - Balance and proprioception exercises - Gait training	**Full symmetrical gait without limp or assistance:** • VAS ≤ 5 (worst) & IKDC ≥ 30 • Knee extension PROM ≥ 0° • Knee Flexion PROM ≥ 90° • ≥ 30 SLR without quad lag • BESS (SL-FIRM) ≤ 5 • MD or PT APPROVAL

- Monitor for pain and swelling. Modify as necessary.
- Encourage home exercises program daily
- Encourage ice 4x a day for 20 minutes while swelling is present
- For any questions or concerns please contact Dr. Tauberg's office

	WEIGHT BEARING	BRACE	ROM	EXERCISES	PROGRESSION GOALS
PHASE II - Strength **6-12 weeks**	• As tolerated	• Discontinued at 6 weeks if no extension lag	• 6+ Weeks: - Maintain full extension - Progress to full flexion	• Continue with Phase I • Strengthening - Loaded flexion >90˚ is PROHIBITED - Leg press, step ups, step downs, RDLs, lunges, Bulgarian squats, wall sits - Squat progression: bodyweight → single leg - Advance hip abduction & glute strength: band walks, lateral lunge, reverse lunge, bridges, hip thrusters - Core exercises: planks, side planks, v-ups, Russian twist, superman - Balance training: foam pad, balance board, BOSU • Conditioning - Initiate dynamic warm-up: Frankenstein kicks, leg swings, knee hugs, heel sweeps, heel/toe walks, oil rigs, lateral lunge, hip rotation, inch worm, speed squats - Stationary bike, elliptical, & rowing machine - Swimming: progress kicking gradually and pain-free, no flip turns	•
PHASE III – Initiate Jogging and Double Leg Plyometrics **12-20 weeks**	• Full	• Functional bracing dependent on patient activity and doctor recommendation	• 12+ Weeks: - Maintain symmetry & pain-free with overpressure	• Strengthening - Leg press, step ups, step downs, RDLs, lunges, Bulgarian squats, wall sits - Squat progression: bodyweight → single leg - Advance hip abduction & glut strength: band walks, lateral lunge, reverse lunge, bridges, hip thrusters - Core exercises: planks, side planks, v-ups, Russian twist, superman - Balance training: foam pad, balance board, BOSU	**Criteria For Jogging & Double Leg Jump Rope** • VAS ≤ 3 (worst) & IKDC ≥ 60 • Within 2˚ normal knee extension & 120˚ knee flexion • Heel height difference ≤ 1cm • Quad and hamstring strength ≥ 60% normal • Overhead squat (FMS) ≥2 • Less than 4cm deficit on single-leg squat (anterior reach)

	WEIGHT BEARING	BRACE	ROM	EXERCISES	PROGRESSION GOALS
				• Conditioning - Dynamic warmup & integrate sport specific warmup - Stationary bike, elliptical, swimming, & rowing machine - 12+ Weeks: treadmill walk/jog progressions. Begin with 30"-1' W/J intervals, advance jog time by 1 min each week - 16+ Weeks: Double leg jump rope and shuttle jumps	• Single leg squats (Vail Test) ≥ 1 minute • MD approval - If meet "goal progression" criteria, begin straight line jog to run progression at **16 weeks** for allograft
PHASE IV – Strength, Agility, Plyometrics 20-24 weeks	• Full	• Functional bracing dependent on patient activity and doctor recommendation	• 20+ weeks: promote and maintain symmetry	• Strengthening - Gym strengthening: squats, deadlifts, initiate Olympic lifting - SL strengthening: SL squats, sit to stands, ball slams, step ups/downs - Dynamic core exercises: mountain climbers, planks, pikes, Pallof press - Integrate interval strength circuits & work/rest timed intervals • Conditioning - Dynamic warmup & sport specific warmup - Stationary bike, elliptical, swimming, & rowing machine - Advance to track workouts: jog straights and walk curves • Plyometrics & Agility - Ladder drills, footwork agility drills, cone drills - Double leg plyos: jump rope, line jumps, cone jumps, depth jumps, box jumps - Single leg landings: alternating, line jumps, hops - High intensity predictable patterned movements, incorporate sport specific drills	**Criteria for Plyometrics & Agility:** • VAS ≤ 2 (Worst) & IKDC ≥ 70 • Tampa Kinesiophobia Scale < 20 • Heel Height Difference ≤ 1 cm • Quad & HS symmetry ≥ 80% normal; ≥ 50% H/Q ratio for females • Y Balance deficits < 4 cm (each direction) • Landing error scoring system ≤ 5 • At least 3 minutes of single-leg squats (resisted) • Jogging >15 minutes on treadmill • MD or PT APPROVAL - Allografts delay plyometrics to **24 weeks**

	WEIGHT BEARING	BRACE	ROM	EXERCISES	PROGRESSION GOALS
PHASE V – Advanced strength, agility, and plyometrics (24-28 weeks)	• Full	• Functional bracing dependent on patient activity and doctor recommendation	• 24+ weeks – maintain symmetry and pain free overpressure	• Strengthening - Gym strengthening: squats, deadlifts, initiate Olympic lifting - Interval strength circuits & work/rest timed intervals - Dynamic eccentric loading: double & single leg - Dynamic core: rotational and anti-rotational drills - Isokinetic training protocols: being with 300˚/sec, progress to 180˚/sec • Conditioning - Dynamic warmup - Biking, jogging, swimming, & rowing - Track workouts: advance to linear speed and sprinting drills • Plyometrics & Agility (2-3 days/week) - Tuck jumps, squat jumps, bounding, SL hop, SL triple hop, SL cross over hop - Change of direction drills: begin with <90˚, progress to 90˚ and greater - Introduce unpredictable agility movements - Non-contact sports specific drills	**Criteria for Advanced Agility & SL Plyometrics:** • VAS ≤ 2 (Worst) & IKDC ≥ 80 • Quad & Hamstring strength ≥ 80% normal; ≥ 50% H/Q ratio for females • At least 3 minutes of single leg squats (resisted) • Jogging >15 minutes on track or paved surface • MD APPROVAL
PHASE VI – Return to Play 28+ weeks	• Full	• Functional bracing dependent on patient activity and doctor recommendation	• Full	• Strengthening - Gym strengthening: squats, deadlifts, initiate Olympic lifting - Interval strength circuits & work/rest timed intervals - Dynamic strength and core exercises - Complex movement patterns - Isokinetic protocols: 300˚, 180˚, 60˚/sec • Conditioning - Biking, jogging, swimming, & rowing • Plyometrics & Agility (2-3 days/week) - Max effort DL and SL jumps → progress with rotation	**Return to Play Criteria:** • VAS ≤ 2 (Worst) & IKDC ≥ 80 • >75/100 on ACL-RSI survey • Quad & Hamstring strength ≥ 90% normal; ≥ 60% H/Q ratio for females • 90% normal on single-leg hop tests • 95% normal figure of 8, 5-10-5 pro-agility, & SL vertical jump • Complete sports metrics • MD APPROVAL

	WEIGHT BEARING	BRACE	ROM	EXERCISES	PROGRESSION GOALS
				- Lateral & rotational agility drills - Unpredictable cutting agility - Non-contact drills → contact drills with MD approval - Return to practice → contact practice → scrimmage → interval play → full play	

- Do NOT change bandages unless instructed by physician
- Monitor for pain and swelling. Modify as necessary.
- Encourage home exercises program daily
- Encourage ice 4x a day for 20 minutes while swelling is present.
- If hamstring graft, no hamstring stretching x 4 weeks, no hamstring strengthening x 6 weeks
- For any questions or concerns please contact Dr. Tauberg's office

Additional Instructions / Suggestions

1. Surgical pre-cautions: Do not change bandages unless instructed by physician. If you suspect a DVT, contact Dr. Tauberg's office immediately or refer to ED immediately. If patient has reactive effusion that does not improve with rest, ice, and compression, contact Dr. Tauberg's office.

2. Begin stretching extension ROM on day one. Achieve full extension ROM by week 2. If not achieved by end of week 4, notify the physician's office.

3. Address quad activation early and focus on isolation of quadriceps activation. Use surface EMG, NMES, and tactile cueing to isolate quadriceps. Be aware of co-contracting from hamstrings and ensure proper form. Do not progress to standing activities if patient is unable to achieve isolated quad set in long seated position. Goal is to achieve heel lift with a quad set. *Dosing quad sets: 10 minutes of 10 second squeeze/10 second rest, x5 times a day.

4. Straight leg raises: Ensure quadriceps is activated and is maintaining contraction throughout the SLR range to eliminate extensor lag. Aim for a calf tap and elimination of extensor lag by week 3. Calf tap: the calf taps/skims the table while the heel stays elevated as the leg descends to starting position. Continue doing SLR until 10# ankle weight is achieved.

5. Do not force **flexion ROM** but encourage steady progression. Patellar mobility is imperative. Use gentle soft tissue techniques for areas such as anterior interval/fat pad, quadriceps, hamstrings, and scar management. If 90° of flexion is not achieved by week 4, notify physician's office.

6. Start double leg (DL) mini squats and leg press from 0° to 60° initially, then progress to 90° as tolerated. Single leg (SL) activities may be initiated at week 4 with SL leg press and step-ups, then advancing to SL activities as tolerated. Loaded leg extensions are prohibited.
*Squat progressions example: DL leg press, DL mini squats, DL chair squats, DL body weight squats, SL leg press, SL step ups, Static lunge split squat, SL step downs, SL squats, SL split squat with elevated back leg, walking lunges, SL sit to stands, SL slide outs.

7. Pre-run/pre-jump program includes tempo-based activities with focus on the deceleration phase such as DL speed squats, DL drop squats, DL "bounce bounce squat", then progress to alternating SL drop squats. Also, intermittently increase the tempo of regular strengthening exercises to align with the timing requirements of jogging and jumping.

8. Walk/Jog program: MD approval required. Begin on treadmill with 2- 3 days per week. Begin with 1:1 or 2:1 walk to jog ratios, (i.e. 1 min walk to 1 min jog or 2 min walk to 1 min jog). Then progress each week by 1 min jog until 12-15 min of jogging is achieved.

9. Plyometric program: MD approval required. Begin with small DL jumps, jump rope, and small depth jump landings& box jumps. Progress box height as skill is mastered. Ensure equal weighted DL take-off and landing before progressing to SL plyometrics. Initiate SL plyometrics
with alternating L and R landings in place and then advance to SL hops. Begin a sports metric based plyometric program when released by surgeon.

10. Isokinetic protocol: After 16 weeks and with MD approval, may begin training and testing with 300°/sec and progress to 180°/sec. Do not proceed if patient has history of anterior knee pain.

11. Return to Play Progression: a graded re-exposure is essential. Return to non-contact practice, return to contact practice, return to scrimmage, return to interval play, return to full time play