ACLR AND MCL REPAIR
CLINICAL PRACTICE GUIDELINE

Progression is time and criterion-based, dependent on soft tissue healing, patient demographics, and clinician evaluation. Contact Ohio State Sports Medicine Physical Therapy at 614-293-2385 if questions arise.

Background

ACL Reconstruction and MCL Repair occurs after a contact or non-contact knee injury when the ACL and MCL are both fully torn, often with involvement of the medial meniscus. Surgery uses an allograft or autograft to reconstruct the torn ACL ligament arthroscopically. The MCL is repaired where it was torn, either distally near the insertion on the tibia, in the middle of the ligament, or proximally near the origin on the femur. Progression of range of motion after surgery depends on where the MCL was torn. Long-term outcomes should include full range of motion and return to prior level of function. Return to sport is expected to take between 8-12 months depending on comorbidities and nature of the sport.

Summary of Recommendations

Precautions	1. No testing of repaired or reconstructed ligaments (Lachman, Anterior Drawer, Valgus Stress) prior to 12 WEEKS 2. No isotonic resisted hamstring exercises for 8 weeks with hamstring autograft 3. Meniscus Repair: a. No weight-bearing (WB) therapeutic exercise >90º x 8 WEEKS b. No forced flexion beyond 90º x4 WEEKS
Weight Bearing Guidelines	1. NWB for 0-2 weeks with brace locked in extension 2. TTWB for weeks 2-4 with brace locked in extension 3. WBAT 4-6 weeks with brace locked in extension 4. WBAT at 6 weeks with brace unlocked, wean from brace
MCL Lesion Site Considerations	1. Distal: Cautious knee flexion ROM to allow healing and prevent long-term valgus laxity. a. Weeks 0-2: 0-30° b. Weeks 2-4: 0-60° c. Weeks 4-6: 0-90° d. Weeks 6+: flexion ROM as tolerated 2. Proximal or Mid-substance: Accelerated knee flexion ROM to prevent scar formation and loss of functional ROM.
Outcome Tools	Collect the Lower Extremity Functional Scale (LEFS) at each visit. Collect at least one of the following at initial evaluation, every month, and discharge. Be consistent with which outcome tool is collected each time. 1. IKDC 2. KOOS 3. ACL-RSI 4. Tegner
Strength Testing	1. Isometric testing any time after week 8- fixed at 90º 2. Isokinetic testing no earlier than 12 weeks

Criteria to Discharge Assistive Device	1. ROM: Full active knee extension; no pain on passive overpressure 2. Strength: Able to perform strong quad isometric with full tetany and superior patellar glide and able to perform 20 SLR without quad lag 3. Effusion: 1+ or less is preferred (2+ acceptable if all other criteria are met) 4. Weight Bearing: Demonstrates pain-free ambulation without visible gait deviation
Criteria to Discharge NMES	• <20% quadriceps deficit on isometric or isokinetic testing (can use HHD for isometric testing) **OR- If testing equipment is not available:** 1. 20 SLR without quad lag 2. Normal gait 3. 10 heel taps to 60 degrees with good quality 4. 10 rep max on LP and similar effort bilaterally 5. Inability to break quad MMT
Criteria to Initiate Running and Jumping	1. ROM: full, pain-free knee ROM, symmetrical with the uninvolved limb 2. Strength: Isokinetic testing 80% or greater for hamstring and quad at 60º/sec and 300º/sec 3. Effusion: 1+ or less 4. Weight Bearing: normalized gait and jogging mechanics 5. Neuromuscular Control: Pain-free hopping in place without dynamic knee valgus
Criteria for Return to Sport	1. ROM: full, pain-free knee ROM, symmetrical with the uninvolved limb 2. Strength: Isokinetic testing 90% or greater for hamstring and quad at 60º/sec and 300º/sec 3. Effusion: No reactive effusion ≥ 1+ with sport-specific activity 4. Weight Bearing: normalized gait and jogging mechanics 5. Neuromuscular control: appropriate mechanics and force attenuation strategies with high level agility, plyometrics, and high impact movements 6. Functional Hop Testing: LSI 90% or greater for all tests 7. Physician Clearance

RED/YELLOW FLAGS

Red flags are signs/symptoms that require immediate referral for re-evaluation. Yellow flags are signs/symptoms that require modification to plan of care.

Red Flags
 	
Require Immediate referral for re-evaluation
	• Signs of DVT→ *Refer directly to ED*
	  ○ Localized tenderness along the distribution of deep venous system
	  ○ Entire LE swelling
	  ○ Calf swelling >3cm compared to asymptomatic limb
	  ○ Pitting edema
	  ○ Collateral superficial veins
	• Lack of full knee extension by 4 weeks post-op →*Refer to surgeon for re-evaluation*
	• Mechanical block or clunk →*Refer to surgeon for re-evaluation*
	• Reported episode of instability →*Refer to surgeon for re-evaluation*

Yellow Flags *Require modifications to plan of care*	• Persistent reactive effusion or pain following therapy or ADLs ○ *Decrease intensity of rehab interventions, continue effusion management, educate patient regarding activity modifications until symptoms resolve*

Pre-Operative Phase (Initial Injury - Surgery)

Appointments	• If we have the opportunity to work with patients prior to surgery, be cautious with visit use pre-operatively to optimize post-operative care • Emphasize home program and patient education, with occasional check-ins to monitor progress and update program
Goals	1. Full active (AROM) and passive (PROM) knee extension 2. Knee flexion ROM to a minimum of 120° 3. Trace to zero effusion via Sweep Test (Appendix C) 4. No extension lag with SLR 5. Ideally: Quadriceps LSI ≥ 80% of uninvolved limb (handheld dynamometry, isometric, isokinetic) • Retain these values for post-operative comparison to minimize overestimation of strength
Patient Education	• Importance of pre-operative PT to optimize post-operative outcomes → especially regarding ROM and post-operative stiffness • Home program instruction between surgery and first post-operative appointment • Anticipated RTS timeline (9-12+ months) • DVT signs/symptoms for acute post-operative phase
Suggested Interventions	• Extension: bag hangs (Appendix A), prone hangs, heel prop towel stretch → Goal: 60 min total /day • Flexion: heel slides, wall slides → Goal: 300+ repetitions/day • Quad isometric • Prone TKE • SLR – flexion, abduction • Double leg squat – emphasis on equal loading • Gait correction

Early Post-Operative Phase (0 – 4 weeks)

Appointments	Post-operative evaluation should be performed 3-5 days following surgery. Follow-up PT appointments 1-2x per week, depending on progression towards goals.

Precautions	1. No testing of repaired or reconstructed ligaments (Lachman, Anterior Drawer, Valgus Stress) prior to 12 WEEKS
	2. Weight-bearing:
	  a. NWB for 0-2 weeks with brace locked in extension
	  b. TTWB for weeks 2-4 with brace locked in extension

Pain and Effusion	Goal is ≤ 2+ (using Modified Stroke Test, Appendix B) Cryotherapy and compression
ROM	<u>Extension:</u> Emphasis on achieving full knee extension immediately following surgery (Appendix A). If full extension is not achieved by 4 weeks, contact surgeon regarding ROM concerns. <u>Flexion:</u> • Flexion PROM/AAROM 0-30° for distal MCL lesion weeks 0-2 • Flexion PROM/AAROM 0-60° for distal MCL lesion weeks 2-4 • No forced flexion beyond 90º with meniscal repairs
Therapeutic Exercise	• Emphasis on quad activation without gluteal co-contraction • Restore patellar mobility • Symmetrical extension ROM (Appendix A) • Decrease effusion

Open Chain Knee Extension Progression	• Unresisted LAQ – week 1 (partial → full range) • Multi-angle isometrics at 90° and 60°– weeks 2-3 • LAQ with cuff weight – week 2-3 • Partial range knee extension machine (90° - 45°) – week 3
Suggested Interventions	• Extension PROM: bag hangs or prone hangs (Appendix A) • Flexion PROM/AAROM: heel slides or wall slides with slight varus position • Bike: Begin with ½ and progress to full revolutions with proximal MCL lesions only; keep knee in slight varus positions to avoid stretch of MCL repair • Patellar mobilization: superior, inferior, medial, lateral • Quad Isometrics; SLR 4-way with brace on until no extensor lag • TKE: prone weeks 0-2; standing TTWB weeks 3-4 • Non-involved single leg balance with involved leg multidirectional hip (Reverse Steamboats) • Begin Neuromuscular re-education using electrical stimulation (NMES) in long sitting with pads on proximal and distal quadriceps. Once 60º knee flexion is easily obtained, then perform NMES following instructions below.
Blood Flow Restriction Training *Appendix D*	• Blood Flow Restriction (BFR) training can be initiated as soon as sutures are removed • Ensure patient has no contraindications (Appendix F) and if patient has any listed precautions or are at risk for a DVT, clear with physician before initiating BFR • Use BFR twice weekly for up to 10 weeks; use for 2-3 exercises per session • Can be used with any exercise that is safe for patient to perform depending on time since surgery (ex. SLR 4-way, prone TKE). *BFR should never be performed during a plyometric exercise.* • Training Load: 20-40% 1 RM (Estimated, or use OMNI-RES, see Appendix F) • Limb Occlusion Pressure= 80% (see Appendix F if patient unable to tolerate) • 4 sets for each exercise with reps of 30-15-15-15 (75 total) with a 30 second rest break between sets, keeping cuff inflated the entire duration of each exercise. Deflate between exercises, or every 8 minutes.
NMES Parameters *Appendix B*	• NMES pads are placed on the proximal and distal quadriceps • Patient: Seated with the knee in at least 60º flexion, shank secured with strap and back support with thigh strap preferred. The ankle pad/belt should be two finger widths superior to the lateral malleoli • The patient is instructed to relax while the e-stim generates at least 50% of their max volitional contraction against a fixed resistance OR maximal tolerable amperage without knee joint pain • 10-20 seconds on/ 50 seconds off x 15 min
Criteria to Progress to Middle Phase of Rehab	ROM: ≥ 0-90 degrees. If full AROM knee extension is not achieved by 4 weeks, contact surgeon regarding ROM concerns. Strength: Quadriceps set with normal superior patellar translation, 20x SLR without extensor lag Effusion: 2+ or less with Modified stroke test

Middle Phase of Rehabilitation (4-12 weeks)

Appointments	• Goal to increase lower extremity strength and regain flexion ROM. 1-2 visits per week with emphasis on patient compliance with resistance and ROM training as part of HEP

Precautions	• Avoid dynamic knee valgus with all interventions, including warm-up and endurance activities
	• No isolated resisted hamstrings strengthening until 8 weeks with hamstring autograft
	• Weight-bearing:
	  • WBAT 4-6 weeks with brace locked in extension
	  • WBAT at 6 weeks with brace unlocked, wean from brace

Criteria to Discharge Assistive Device	• ROM: Full active knee extension; no pain on passive overpressure • Strength: Able to perform strong quad isometric with full tetany and superior patellar glide and able to perform 20 SLR without quad lag • Effusion: 1+ or less is preferred (2+ acceptable if all other criteria are met) • Weight Bearing: Demonstrates pain-free ambulation without visible gait deviation
Pain and Effusion	Cryotherapy/compression as needed for effusion Patellar taping to reduce PF symptoms if present

ROM	• Distal MCL lesion: Continue cautious knee flexion ROM to allow healing
	  ○ Weeks 4-6: ROM 0-90°
	  ○ Weeks 6+: flexion ROM as tolerated
	• Monitor and progress knee ROM, patellar mobility, and LE flexibility
	• Begin more aggressive techniques to achieve/maintain full knee extension (i.e. weighted bag hang) as needed
	• ROM progression from AAROM to AROM
	• Initiate bike for ROM and warm-up for distal MCL lesions, keeping knee in slight varus position

Open Chain Knee Extension Progression	• Progress multi-angle isometric to include 90°, 60° and 30° – week 4
	• Knee extension machine (full range) – week 4
	  ○ Monitor for anterior knee pain and modify as appropriate
	  ○ Progress via resistance, speed/type of contraction

Suggested Interventions and timelines	• At week 6, initiate and progress WB strengthening/stability with emphasis on proper LE mechanics avoiding knee valgus
	  ○ Lunges, shuttle, steamboats, side-stepping, leg press, step up/down
	• Progress gluteal and lumbopelvic strength and stability
	• Progress single leg balance and proprioceptive exercises
	• Endurance:
	  ○ Biking at week 6
	  ○ Treadmill walking, stepper, elliptical at week 8
	• Initiate PWB plyometrics on shuttle at 10 weeks (see criteria to begin full WB plyometrics)
	• NMES (see parameters in week 0-4)
	• BFR (continue as in early phase, adding appropriate exercises)

Criteria to Discharge NMES	• <20% quadriceps deficit on isometric or isokinetic testing (can use HHD for isometric testing) **OR- If testing equipment is not available:** 1. 20 SLR without quad lag 2. Normal gait 3. 10 heel taps to to 60 degrees with good quality 4. 10 rep max on LP and similar effort bilaterally 5. Inability to break quad MMT

Criteria to Progress to Late Phase of Rehab	1. ROM: Maintain full, pain free AROM including patellofemoral mobility 2. Effusion: 1+ or less 3. Strength: Isometric or isokinetic quadriceps and hamstrings strength >/= 80% 4. Weight Bearing: Able to tolerate therapeutic exercise program, including PWB plyometrics, without increased pain or >1+ effusion 5. Neuromuscular Control: Demonstrates proper lower extremity mechanics with all therapeutic exercises (bilaterally) 6. Outcome Tools: ≥7/10 on #10 IKDC Questionnaire

Late Phase of Rehabilitation (week 12 – RTS)

Appointments	Increased frequency from previous stage to 1-2x per week when appropriate to initiate plyometric training and return to running program.
Criteria to initiate Running and Jumping	1. ROM: full, pain-free knee ROM, symmetrical with the uninvolved limb 2. Strength: Isokinetic testing 80% or greater for hamstring and quad at 60º/sec and 300º/sec 3. Effusion: 1+ or less 4. Weight Bearing: normalized gait and jogging mechanics 5. Neuromuscular Control: Pain-free hopping in place
Pain and Effusion	Effusion may increase with increased activity, ensure ≤1+ and/or non-reactive effusion for progression of plyometrics
ROM	Full, symmetrical to contralateral limb, and pain-free with overpressure
Therapeutic Exercise	• Performance of the quadriceps, hamstrings and trunk dynamic stability • Muscle power generation and absorption via plyometrics • Sport- and position-specific activities • Begin agility exercises between 50-75% effort (utilize visual feedback to improve mechanics as needed) • Advance plyometrics: Bilateral to single leg, progress by altering surfaces, adding ball toss, 3D rotations, etc.
Suggested Interventions	Therapeutic Exercise/Neuromuscular Re-education • Squats, leg extension, leg curl, leg press, deadlifts, lunges (multi-direction), rotational trunk exercises on static and dynamic surfaces, resisted side steps, monster walks, PWB to FWB jumping • Single-leg squats on BOSU, Single-leg BOSU balance with manual perturbation to trunk or ball, single-leg BOSU Romanian deadlift Agility • Side shuffling, carioca, figure 8, zig-zags, resisted jogging (Sport Cord) in straight planes, backpedaling, ladder drills Plyometrics • Single-leg hop downs from increasing height (up to 12” box), Single-leg hop-holds, Double and single-leg hopping onto unstable surface, Double and single-leg jump-turns, Repeated tuck jumps
Criteria for Return to Sport	1. ROM: full, pain free knee ROM, symmetrical with the uninvolved limb 2. Strength: Isokinetic testing 90% or greater for hamstring and quad at 60º/sec and 300º/sec (Appendices C and D) 3. Effusion: No reactive effusion and ≤ 1+ with sport-specific activity 4. Weight Bearing: normalized gait and jogging mechanics 5. Neuromuscular control: appropriate mechanics and force attenuation strategies with high level agility, plyometrics, and high impact movements 6. Functional Hop Testing: LSI 90% or greater for all tests (Appendix E) 7. Physician Clearance

Appendix A: Bag Hang

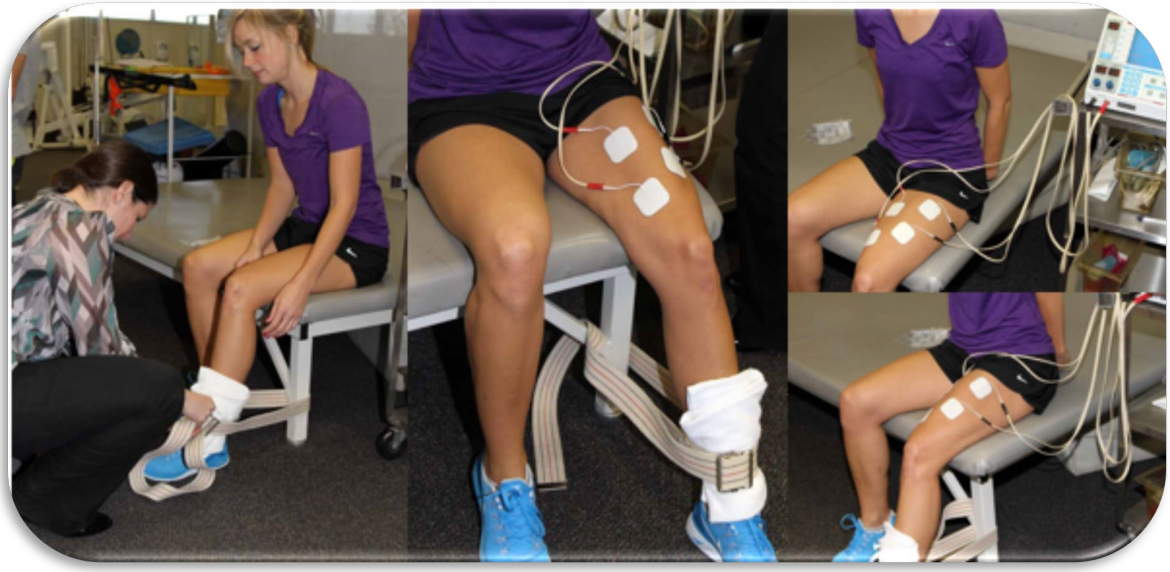
Emphasis on low load, long duration stretching

- *Goal: 60 minutes of bag hang time total per day.*
- *Ideally: 4x15 minutes (or greater) per day*

Appendix B: NMES Set Up

2 or 4 pad set-up is appropriate

- NMES pads are placed on the proximal and distal quadriceps
- Patient: Seated with the knee in at least 60º flexion, shank secured with strap and back support with thigh strap preferred. The ankle pad/belt should be two finger widths superior to the lateral malleoli
- The patient is instructed to relax while the e-stim generates at least 50% of their max volitional contraction against a fixed resistance OR maximal tolerable amperage without knee joint pain
- 10-20 seconds on/ 50 seconds off x 15 min



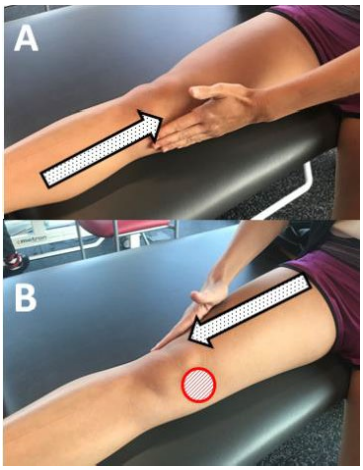
Appendix C: Stoke Test / Swelling Assessment

The Stroke Test

The stroke test is a great way to assess your swelling independently. The results of this assessment will help you decide what exercises are appropriate.

A. Using one hand, gently sweep the inside portion of your knee 2-3 times (pushing toward the hip joint).

B. On the outside portion of the knee, immediately sweep downward (toward the ankle). Watch the inside portion of the knee *(indicated by hashed circle in photo)* for a wave of fluid to appear during the downstroke.



Grading System

(Table adapted from Sturgill L et al, Journal of Orthopaedic & Sports Physical Therapy, 2009)

Test Result	Grade
No wave produced on downstroke	Zero
Small wave on inside aspect of knee with downstroke	Trace
Large bulge on inside aspect of knee with downstroke	1+
Swelling spontaneously returns to inside aspect of knee after upstroke (no downstroke necessary)	2+
So much fluid that it is not possible to move the swelling out of the inside aspect of the knee	3+

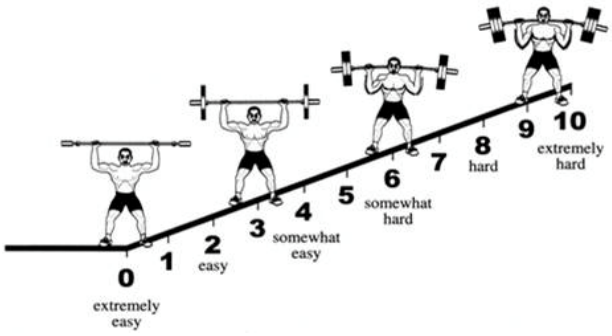
Indications for Activity

3+ or 2+	1+	Trace or Zero
Red Light	**Yellow Light**	**Green Light**
• No running, jumping or cutting or heavy lifting until swelling decreases to 1+ or less • Do not progress program until you speak with your therapist • Utilize swelling management strategies (ice, compression, elevation, NSAIDs)	• Proceed with caution • You may participate in running, jumping and normal lifting routine. • Check effusion before and after workouts • Utilize swelling management strategies (ice, compression, elevation, NSAIDs)	• May participate in running, jumping and normal lifting routine without restriction • Continue to monitor swelling after activity

Appendix D: Blood Flow Restriction Training

Precautions (must get permission from MD)	Contraindications
▪ Patients with poor circulatory systems (Indicators: shining or scaly skin, brittle dry nails, extremity hair loss, increased capillary filling time, and presence of varicose veins) ▪ Patients who are obese or with limb tissue that is loose ▪ Arterial claudification ▪ Abnormal clotting times ▪ Diabetes ▪ Sickle cell trait ▪ Tumor ▪ General infection ▪ Hypertension ▪ Cardiopulmonary conditions ▪ Renal compromise ▪ Clinically significant acid-base imbalance ▪ Atherosclerotic vessels ▪ Taking anti-hypertensive medications	▪ Venous thromboembolism ▪ Impaired circulation or peripheral vascular compromise ▪ Previous revascularization of the extremity ▪ Extremities with dialysis access ▪ Acidosis ▪ Sickle cell anemia ▪ Extremity infection ▪ Tumor distal to the tourniquet ▪ Medications/supplements known to ↑ clotting risk ▪ Open fracture ▪ Increased intracranial pressure ▪ Open soft tissue injuries ▪ Post-traumatic hand reconstructions ▪ Severe crushing injuries ▪ Severe hypertension ▪ Elbow surgery with excessive swelling ▪ Skin grafts in which all bleeding points distinguished ▪ Secondary or delayed procedures after immobilization ▪ Vascular grafting lymphectomies ▪ Cancer

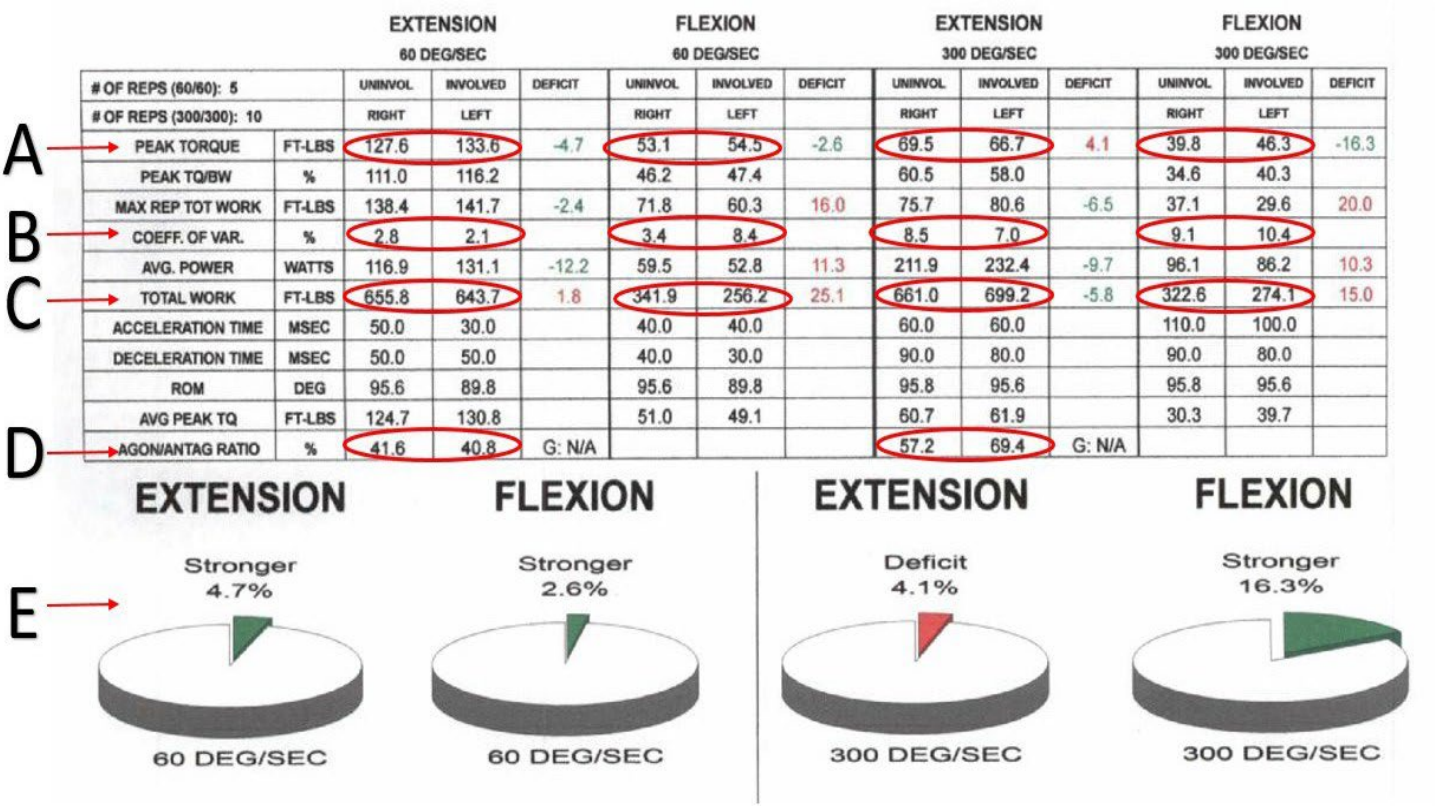
Training Intensity: 20-40% 1RM or use the Omnibus Resistance Exercise Scale (below). Patient chooses weight/resistance that corresponds to 2-3



Exercise Prescription:

- If Patient achieves:
  - 75 repetitions: continue with training, re-assess intensity within 1-3 sessions and change as strength improves
  - 60-74 repetitions: continue with training, but extend rest period between sets 3 and 4 to 45 seconds until 75 repetitions is completed
  - 45-59 repetitions: continue with training, but extend rest period between all sets to 45-60 seconds
  - <44 repetitions: reduce load by approximately 10% until repetitions are achieved
- If patient is forced to stop before 75 repetitions due to undue pain, soreness, or general uncomfortable feeling underneath the cuff→ reduce tourniquet pressure by 10mmHg at each training session until cuff tolerance is achieved. Ramp cuff pressure back up by 10 mmHg to target limb occlusion pressure if patient can tolerate.

Appendix E: Isokinetic Data Interpretation

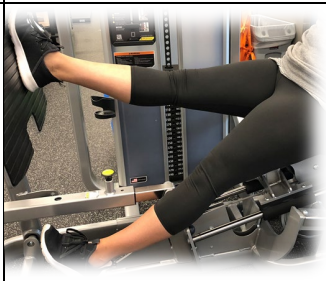


		EXTENSION 60 DEG/SEC			FLEXION 60 DEG/SEC			EXTENSION 300 DEG/SEC			FLEXION 300 DEG/SEC		
# OF REPS (60/60): 5		UNINVOL	INVOLVED	DEFICIT	UNINVOL	INVOLVED	DEFICIT	UNINVOL	INVOLVED	DEFICIT	UNINVOL	INVOLVED	DEFICIT
# OF REPS (300/300): 10		RIGHT	LEFT		RIGHT	LEFT		RIGHT	LEFT		RIGHT	LEFT	
A → PEAK TORQUE	FT-LBS	127.6	133.6	-4.7	53.1	54.5	-2.6	69.5	66.7	4.1	39.8	46.3	-16.3
PEAK TQ/BW	%	111.0	116.2		46.2	47.4		60.5	58.0		34.6	40.3	
MAX REP TOT WORK	FT-LBS	138.4	141.7	-2.4	71.8	60.3	16.0	75.7	80.6	-6.5	37.1	29.6	20.0
B → COEFF. OF VAR.	%	2.8	2.1		3.4	8.4		8.5	7.0		9.1	10.4	
AVG. POWER	WATTS	116.9	131.1	-12.2	59.5	52.8	11.3	211.9	232.4	-9.7	96.1	86.2	10.3
C → TOTAL WORK	FT-LBS	655.8	643.7	1.8	341.9	256.2	25.1	661.0	699.2	-5.8	322.6	274.1	15.0
ACCELERATION TIME	MSEC	50.0	30.0		40.0	40.0		60.0	60.0		110.0	100.0	
DECELERATION TIME	MSEC	50.0	50.0		40.0	30.0		90.0	80.0		90.0	80.0	
ROM	DEG	95.6	89.8		95.6	89.8		95.8	95.6		95.8	95.6	
AVG PEAK TQ	FT-LBS	124.7	130.8		51.0	49.1		60.7	61.9		30.3	39.7	
D → AGON/ANTAG RATIO	%	41.6	40.8	G: N/A				57.2	69.4	G: N/A			

		Definition	Clinical Impact	What to do
A	Peak Torque (ft-lbs)	Peak torque during repetitions	Symmetry criteria (see 'E'- this is the data represented in pie charts)	If <80%; continue unilateral, high resistance strength training
B	Coefficient of Variance (%)	Between repetition variability	Goal: < 15%	If >15%, consider retest
C	Total Work (ft-lbs)	Torque over all repetitions	Possible indicator of fatigue	If >10%; consider high volume training
D	Agonist/Antagonist Ratio (%)	Hamstring/Quadriceps Ratio	Goal: >60%	<60%; ensure 1:1 quadriceps:hamstring exercise ratio
E	Limb Symmetry Pie Charts	Strength relative to involved limb	Goal: <10% asymmetry (either direction- deficit OR stronger on involved limb)	If <80%, continue NMES in addition to strength training If <90%, continue unilateral > bilateral strength training emphasis

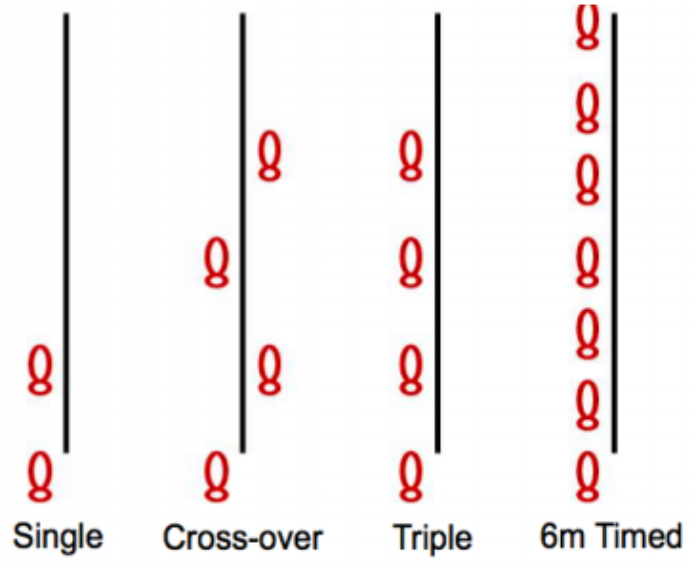
Appendix F: Isokinetic Testing and Appropriate Alternatives

Sinacore, J. A., Evans, A. M., Lynch, B. N., Joreitz, R. E., Irrgang, J. J., & Lynch, A. D. (2017). Diagnostic accuracy of handheld dynamometry and 1-repetition-maximum tests for identifying meaningful quadriceps strength asymmetries. *Journal of orthopaedic & sports physical therapy*, *47*(2), 97-107.

Isokinetic Dynamometry		• Considered the "gold standard" • 60°/sec for strength and power assessment • 300°/second for speed and endurance assessment
Hand Held Dynamometry with Static Fixation at 90°		• Appropriate alternative • Results may overestimate quadriceps strength symmetry: be cautious with data interpretation
SL 1RM Knee Extension Machine: 90°- 45°		• Appropriate alternative • Recommended to decrease stress on PF joint and limit strain on reconstructed ACL for up to 6 months • Results may overestimate quadriceps strength symmetry: be cautious with data interpretation
SL 1RM Leg Press		• Fair alternative • Results in significant overestimation of quadriceps strength symmetry due to compensation from other LE muscle groups
SL 1RM Knee Extension Machine: 90°- 0°		• Fair alternative • May be uncomfortable and/or inappropriate due to PF stress

Appendix G: Single Leg Hop Series

1) **Single hop for distance:** Have the subject line their heel up with the zero mark of the tape measure, wearing athletic shoes. The subject then hops as far as he/she can, landing on the same push off leg, for at least 3 seconds. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.
2) **Cross-over hop for distance:** The subject lines their heel up with the zero mark of the tape measure and hops 3 times on one foot, crossing fully over the center line each time. Each subject should hop as far forward as he/she can on each hop, but only the total distance hopped is recorded. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.
3) **Triple hop for distance:** The subject lines their heel up with the zero mark of the tape measure and hops 3 times on one foot. Each subject should hop as far forward as he/she can on each hop, but only the total distance hopped is recorded. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb distance/Uninvolved limb distance X 100%.
4) **Timed 6-meter hop:** The subject lines their heel up at the zero mark of the tape measure and hops, on cue with the tester, as fast as they can the length of the 6-meter tape. The arms are allowed to move freely during the testing. Allow him/her to perform 2 practice hops on each leg. Then, have the subject perform 2 testing trial, recording each distance from the starting point to the back of the heel. Average the distanced hopped for each limb. The Limb Symmetry Index: Involved limb time/Uninvolved limb time X 100%.



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Reviewer: Caroline Brunst, PT, DPT, SCS, OCS, AT
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