



ANTERIOR CRUCIATE LIGAMENT REHAB PROTOCOL

Nevada Physical Therapy

Phase 1

Weeks 0-2

Precautions/Common Pitfalls (0-4 weeks):

- ◆ Excessive Weight-Bearing
- ◆ Pushing through pain during mobility and stability progressions
- ◆ Rapid progression of exercise volume and intensity
- ◆ Persistent lack of passive knee extension

Mobility/Range of Motion:

- ◆ Heel Slides
- ◆ Assisted Knee Flexion EOT
- ◆ Strap Calf Stretch
- ◆ Heel Prop Knee Extension

Therapeutic Exercise:

- ◆ Quad Isometrics
- ◆ Straight Leg Bridge
- ◆ TA Pullovers w/ quad set
- ◆ Mini Crunches w/ quad set
- ◆ Ankle Pumps
- ◆ Standing SLR w/ quad set
- ◆ Hip ABD w/ quad set (on UNINV)
- ◆ Prone Hip Extensions w/ Ball Rollout

CRUTCH DISCHARGE CRITERIA

- ◆ Symmetrical Passive Knee Extension
- ◆ Normalized quad contraction with quad setting, ie. "Heel Pop" with quad set.
- ◆ Able to perform a straight leg raise without an extensor lag
- ◆ Able to demonstrate normal heel-to-toe mechanics in strike phase of gait without knee flexion "break"
- ◆ Minimal to no increase in swelling with mobility work and early phase strength training.

Phase 1b

Weeks 3-5

Mobility/Range of Motion (including above)

- ◆ Wall Slides
- ◆ Bike Rockbacks
- ◆ Seated Hamstring Stretch
- ◆ Prone Quad Stretch

Therapeutic Exercise (including above)

- ◆ Weight Shifts/Wobble Board
- ◆ Long Arc Quads/Knee Extensions
- ◆ ECC 1L Leg Press
- ◆ Mini Squats
- ◆ Hip Hinge/RDLs
- ◆ Split Squat (INV in front)
- ◆ 1L Leg Press
- ◆ Low Step Up

Phase 1 Progression Criteria:

- ◆ Equal, normal knee extension compared to non-surgical side
- ◆ 110 degrees of flexion by PO Day 21
- ◆ Post-operative trauma resolution (decreased swelling week over week)
- ◆ Ambulate independently without AD with normal knee mechanics

Phase 2a

Weeks 6-10

Mobility/Range of Motion

- ◆ Heel Slides
- ◆ Wall Slides
- ◆ Strap Calf Stretch
- ◆ Heel Prop Extension
- ◆ Prone Knee Hang
- ◆ Strap HS Stretch
- ◆ Prone Quad Stretch

Common Pitfalls

- ◆ Pain with daily activity
- ◆ Persistent swelling
- ◆ Subjective complaint of active knee hyperextension moments
- ◆ Rapid progression of exercise volume and intensity
- ◆ Decreasing mobility emphasis too soon

Phase 2 Progression Criteria:

- ◆ Demonstrate ability to reproduce program outside of clinic, consistently and as prescribed.
- ◆ Normalized passive range of motion in all planes (extension/flexion)
- ◆ 50% Limb Symmetry or greater with hip ABD, Knee Extension testing
- ◆ Able to complete training session with less than 2 pt increase in pain



ANTERIOR CRUCIATE LIGAMENT REHAB PROTOCOL

Nevada Physical Therapy

Phase 2

Weeks 5-8

Therapeutic Exercise

- ◆ Lateral Agility/Monster Walks
- ◆ 2 Step Drill
- ◆ Wall Squats
- ◆ KB Front Squats to Box
- ◆ KB RDLs
- ◆ BB RDLs
- ◆ KB Bridge
- ◆ Barbell Bridge
- ◆ Lunges (INV in front)
- ◆ Lateral Step Down
- ◆ Low Step Up
- ◆ 1L RDLs
- ◆ 1L Hip Thruster
- ◆ Hip Thrusters
- ◆ 2L ABD Bridge
- ◆ ECC 1L Squat
- ◆ 1L Leg Press
- ◆ Calf Raises
- ◆ 1L Calf Raises
- ◆ ECC 1L Calf Raise
- ◆ Soleus Bridge
- ◆ Banded HS Curls
- ◆ Machine HS Curls
- ◆ 90-60 deg Knee Extensions
- ◆ 1L Knee Extension (Partials)
- ◆ Knee Ext ISOM
- ◆ 1L Knee Extensions
- ◆ Bent Knee Side Plank
- ◆ TA OH Pullovers
- ◆ Partial Crunch w/ QS
- ◆ Front Plank w/ LE Lift
- ◆ Front Planks
- ◆ Modified Side Plank
- ◆ Pallof Press

General Milestones

- ◇ Normalize Knee EXT PROM: Equal to UNINV limb by 2 weeks
- ◇ Knee FLEX PROM: 90 deg by 2 weeks
- ◇ Knee FLEX PROM: 105-110 deg by 3-4 weeks
- ◇ Knee FLEX PROM: 120 deg by week 5
- ◇ Crutch Discharge Criteria Met by 4-5 weeks
- ◇ Normalize Quad Contraction: "Heel Pop" by 4 weeks
- ◇ Normalize Quad Contraction: SLR with no extensor lag by 4 weeks
- ◇ Peripatellar Swelling: Resolution of post-op trauma by 4 weeks (<+1 edema)
- ◇ Knee PROM >90% flexion, normal symmetrical extension by 8 weeks/End of Phase

Phase 3a

Weeks 9-14

Common Pitfalls

- ◆ Initiating Return to Run protocol prior to skill work
- ◆ Introducing skill work prior to meeting strength milestones
- ◆ Failure to use autoregulation/subjective measurements of intensity or similar anchoring
- ◆ Progressing intensity too quickly
- ◆ Failure to manage swelling or harvest site pain
- ◆ Reducing mobility focus too soon

Therapeutic Exercise (including above)

- ◆ Trap bar Deadlifts
- ◆ Elevated Deadlifts
- ◆ Barbell Back Squats (earlier if well tolerated)
- ◆ KB Step Up
- ◆ Cossack Lunge
- ◆ Bilateral Split Squats
- ◆ ECC Hamstring Sliders
- ◆ Glute Med Side Plank
- ◆ Side Plank Progressions

Phase 3 Progression Criteria:

- ◆ No Subjective Complaints of Instability or Buckling
- ◆ 3 mm or less PA laxity compared to UNINV side
- ◆ Minimal to No Joint Effusion
- ◆ >70% Limb Symmetry Knee Extension Isometric Testing
- ◆ >70% Limb Symmetry with Side Plank Hip ABD Testing
- ◆ >70% Limb Symmetry with Single Leg Squat Testing

Mobility/Range of Motion:

- ◆ Wall Slides
- ◆ Prone Knee Hangs
- ◆ Strap Calf Stretch
- ◆ Standing Quad Stretch
- ◆ ADD/ITB/Quad Foam Roll
- ◆ Piriformis/FABER as tolerated
- ◆ Standing ITB Stretch
- ◆ Standing ADD Stretch



ANTERIOR CRUCIATE LIGAMENT REHAB PROTOCOL

Nevada Physical Therapy

Phase 3b

Weeks 15-16

SAMPLE SKILL BLOCK 1

| Level 1 | Level 2 |
|-----------------------------|----------------------------|
| Pogos | 1L Lateral Tape Hops |
| Snap Downs | DBL Wall Switches |
| Ball Slams | Bulgarian Split Squat Hops |
| Wall Marches | Decel Lunges |
| Single Wall Switches | Lean Starts |
| Bulgarian Split Squat Tempo | |

General Milestones

- ◇ Normalize Quad Strength: 50% LSI with isometric testing by 12 weeks
- ◇ Normalize Quad Strength: > .4 ft lb/lb BW by 12 weeks
- ◇ Normalize Hip Strength: 50% LSI with isometric testing by 12 weeks
- ◇ Psychological Readiness: ACL-RSI >40 pts by 12 weeks

Phase 4

Weeks 16-20

Common Pitfalls

- ◆ Failure to manage tendon/harvest site pain
- ◆ Excessive closed chain rotation/pivoting
- ◆ Progressing skill development too quickly

Mobility/Range of Motion:

- ◆ Couch Stretch
- ◆ Standing Quad Stretch
- ◆ ADD/ITB/Quad Foam Roll
- ◆ Piriformis/FABER as tolerated
- ◆ Standing ITB Stretch

Therapeutic Exercise (including above)

- ◆ Deadlifts
- ◆ Reverse Nordics
- ◆ Copenhagen Variations
- ◆ Olympic Lifts
- ◆ Kettlebell Swings
- ◆ Barbell Rollouts
- ◆ Isokinetic/Power Knee Extensions
- ◆ Anterior Step Downs
- ◆ Rack Taps/Pistol Squats

Phase 4 Progression Criteria:

- ◆ Successful Completion of Return to Running Protocol
- ◆ QUAD Torque >.7 ft lb/lb BW or 2.0 N m/kg BW
- ◆ HAM Torque >.4 ft lb/lb BW or 1.0 N m/kg BW
- ◆ IKDC >70%
- ◆ >70% Limb Symmetry Lateral Step Down testing (20% BW load, 12 in box)
- ◆ No increase in pain or swelling with current programming.

General Milestones

- ◇ Knee Stability: 3 mm or less PA Laxity by 16 weeks
- ◇ Normalize Quad Strength: 70% LSI isometric testing by 16 weeks
- ◇ Normalize Quad Strength: >.5 ft lb/lb BW Knee EXT TTBW by 16 weeks
- ◇ Normalize Hip Strength: >70% LSI with Side Plank ABD Testing by 16 weeks
- ◇ Normalize Hip/Knee Strength: 70% LSI with SL Squat to 70 deg knee flexion by 16 weeks
- ◇ Normalize Hip/Knee Strength: <8 cm Ant. Y-Balance Test by 16 weeks



ANTERIOR CRUCIATE LIGAMENT REHAB PROTOCOL

Nevada Physical Therapy

Phase 5

Weeks 25-36

Common Pitfalls

- ◆ Failure to measure and program for hip and plantarflexion strength
- ◆ Random skill/plyo selection
- ◆ Decreasing strength emphasis too early
- ◆ Programming change of direction work prior to meeting strength criteria

Therapeutic Exercise (including above)

- ◆ No restrictions on lifting

General Milestones

Phase 5 Progression Criteria:

- ◆ QUAD Torque $>.8$ ft lb/lb BW or 2.4 N m/kg BW
- ◆ HAM Torque $>.5$ ft lb/lb BW or 1.5 N m/kg BW
- ◆ $>80\%$ LSI with Quad Power Testing (Isokinetic or RFD)
- ◆ Hip ABD Torque $>.6$ ft lb/lb BW, Hip ADD Torque $>.7$ ft lb/lb BW
- ◆ Plantarflexion Isometric Testing > 1.3 x BW and $>90\%$ LSI
- ◆ IKDC $>80\%$, ACL-RSI >65 pts
- ◆ $>85\%$ Limb Symmetry Lateral Step Down testing (20% BW load, 12 in box)
- ◆ $>85\%$ Limb Symmetry Side Plank Testing (AMRAP)
- ◆ Anterior Y-Balance <6 cm Deficit
- ◆ Successful completion of Force Plate Battery

- ◇ Normalize Quad Strength: $>.8$ ft lb/lb BW Knee EXT TTBW by 6-7 months
- ◇ Normalize Quad Strength: Peak Power $>80\%$ LSI by 6-7 months
- ◇ Normalize HS Strength: $>.5$ ft lb/lb BW Knee FLEX TTBW by 6-7 months
- ◇ Normalize Hip/Knee Strength: <6 cm Ant. Y-Balance Test by 6-7 months
- ◇ Normalize Hip/Knee Strength: $>85\%$ LSI with Lateral Step Down Test by 6-7 months
- ◇ Normalize Hip Strength: $>85\%$ LSI with Side Plank Hip ABD Testing by 6-7 months
- ◇ Subjective Reporting: IKDC $>80\%$ by 6-7 months
- ◇ Psychological Readiness: >65 pts ACL-RSI by 6-7 months

SAMPLE SKILL BLOCK 2

| Level 1 | Level 2 |
|-------------------------|----------------------|
| 2L Drop Landing | Skater Hops |
| Skater Hop ACCEL | Lateral Shuffle |
| Skater Hop DECEL | Lunge Switches |
| A Skips | Countermovement Jump |
| 1L Drop Landing | Lateral Bench Overs |
| Bench Lateral Step Down | Sled Sprints |

SAMPLE SKILL BLOCK 3

| Level 1 | Level 2 |
|---------------------------|------------------------------|
| 1L Assisted Vertical Jump | Reactive 1L Box Jump |
| 2L to 2L Lateral Box Jump | 2-1-2 Lateral Box Jump |
| FWD Sprint to DECEL | 1L Vertical Jump |
| W Sprints | 1L to 2L Horizontal Broad |
| 5-0-5 (Frontal Plane) | FWD Sprint to Backpedal to |
| FWD Sprint to Backpedal | Sprint to Backpedal and Turn |
| Box Jumps | Sprint to 45 deg Cut |



ANTERIOR CRUCIATE LIGAMENT REHAB PROTOCOL

Nevada Physical Therapy

Phase 6

Month 7-RTS

Common Pitfalls

- ◆ Failure to measure power/RFD
- ◆ Continuing to progress workload in the presence of knee or secondary symptoms
- ◆ Inadequate skill emphasis
- ◆ Arbitrary skill progressions
- ◆ Failure to meet RTS criteria prior to being cleared for contact

SAMPLE SKILL BLOCK 4

| Level 1 | | Level 2 |
|---------------------------|---------------------|---------------------------|
| Sprint to Lateral Shuffle | 1L Broad Jump | Endurance Skill Block |
| VAIL Lateral Agility | 5-10-5 | Unanticipated Skill Block |
| DVJ to Sprint | 5-0-5 COD (15 yard) | Sport Specific Block |

RETURN TO SPORT BATTERY

| | |
|---|--|
| Functional Outcome Reporting | >90% IKDC, >72 pts ACL-RSI |
| A-P Knee Laxity | <4 mm cut-off, goal is <3 mm |
| Isometric Quad Strength | >1.0 ft lb/lb BW and >90% LSI |
| Isometric Ham Strength | >.6 ft lb/lb BW and 90% LSI |
| Ham:Quad Isometric Ratio | >.6 once quad isometric goal met |
| Isokinetic Quad Strength | >90% LSI @ .25 m/s (Voltra I) |
| Isometric Hip ABD/ADD Strength | >.6 ft lb/lb BW ABD; >.7 ft lb/lb BW ADD |
| Isometric Plantarflexion Strength | >1.3x BW cutoff, goal >1.5x BW |
| Nordic Hamstring Curl | >70 deg break angle |
| 1L Squat Test (10% BW to 70 deg knee flexion, max reps in 30 sec) | >90% LSI |
| Side Plank Hip ABD (max reps to failure) | >90% LSI |
| Anterior Y-Balance | <4cm deficit side to side |
| Lateral Step Down Test (12 in box, 20% BW, max reps in 30 sec) | >90% LSI |
| Countermovement Jump | <ul style="list-style-type: none"> ◆ <10% concentric impulse asymmetry ◆ >90% BW unweighting with eccentric/braking phase ◆ > 1.2m/s eccentric velocity ◆ Reactive Sport Index (RSI) >.4 m/s |
| 1L Vertical Jump Test | <ul style="list-style-type: none"> ◆ <10% vertical jump height asymmetry ◆ <10% RSI asymmetry |
| Hop Test | No obvious lateralization with concentric impulse or landing force; goal > 4 "crossovers" with 10 rep test |
| 5-0-5 COD | <10% asymmetry with COD time (entry to exit) |
| Vail Lateral Agility | 4 out 5 or higher score for each 20 second block |
| Appropriate Workload Established | Athlete has established roughly 70% workload of total in-season demands without restriction |
| All RTS Criteria Met | Pass/Fail based on meeting goals above |