

Theodore B. Shybut, MD FAANA FAAOS
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Knee, Shoulder, Elbow Arthroscopy &
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ACL Repair with Internal Brace Protocol

Tips for Successful Recovery

1. **Surgical pre-cautions:** Do not change bandages unless instructed by physician. Wear compression hoses on operative limb until crutches are discharged. If you suspect a DVT, contact Dr. Shybut's office immediately at 661-290-5473 or refer to ED immediately. If patient has reactive effusion that does not improve with rest, ice, and compression, contact Dr. Shybut'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 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 by week 2 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 end of week 1, 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.

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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 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, (ie. 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 sportmetric 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.

12. **Prevention of future ACL injury** requires ongoing dedication to correcting functional movement deficits identified during rehabilitation. **FIFA 11+** is an injury prevention program that has demonstrated efficacy. Dr. Shybut recommends athletes, therapists, and trainers utilize this program and incorporate the exercises into their ongoing conditioning.

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PHASE 1 - ACUTE (0-6 Weeks)

PHASE GOALS: PROTECT REPAIR, RESTORE AMBULATION & ADL STATUS
RANGE OF MOTION * NO MENISCUS/CARTILAGE PROCEDURES

0-1 Week – Full extension and progress flexion to 30°

1-4 Weeks – Maintain full extension and gradually progress to 90 flexion

4+ weeks - gradually progress to full flexion

Patellar mobs, calf/hamstring stretching, heel prop, prone hangs

WEIGHT BEARING

0-1 Weeks -- TTWB

1-4 weeks - WBAT w brace, crutches

4+ Weeks – FWB with symmetrical gait

BRACE & CRUTCH USE

0-2 Weeks – Brace locked in 0° extension

2-4 Weeks – Unlock brace 0° to 60°

4-6 Weeks – Brace unlocked to 90 if good quad control and full extension

4+ Weeks -- D/C crutches when gait is normal

4+ Weeks – D/C brace for home ambulation; continue for community ambulation until MD approval to D/C

STRENGTHENING

Quad sets, straight leg raises, hip abduction

Pre-gait, TKEs, calf raises, static balance, mini squats, chair squats, leg press, step ups, static lunge, HS curls, hip machine, bridges

Stationary biking: must be > 110° knee flexion

CRITERIA FOR FULL AMBULATION

> 0° KNEE EXTENSION & 90° KNEE FLEXION

> 30 STRAIGHT LEG RAISES WITHOUT LAG

MINIMAL EFFUSION/PAIN, & SYMMETRICAL GAIT WITHOUT A LIMP

MD OR PT APPROVAL

PHASE 2 – STRENGTH & JOGGING (6-12 Weeks)

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PHASE GOALS: IMPROVE STRENGTH & INITIATE JOGGING PROGRAM
RANGE OF MOTION

6+ Weeks – Symmetrical & pain free with overpressure

STRENGTHENING

Leg press, step ups, step downs, Romanian Deadlifts, lunges, Bulgarian squats, wall sits

Squat progression: bodyweight squats → single leg squats

Advance hip abduction & glut strength: band walks, lateral lunge, reverse lunge

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 (knee flexion must be beyond 110), elliptical, & rowing machine

Swimming: progress kicking gradually and pain-free, no flip turns, no frog/whip kick

CRITERIA FOR JOGGING : >8 WEEKS

- PAIN LESS THAN 3 / 10 (WORST)
- WITHIN 2° NORMAL KNEE EXTENSION & 120° KNEE FLEXION
- QUADRICEPS & HAMSTRING STRENGTH > 60% NORMAL
- LESS THAN 4cm DEFICIT ON SINGLE-LEG SQUAT (ANTERIOR REACH)
- AT LEAST 1 MINUTE OF SINGLE LEG SQUATS
- MD APPROVAL

PHASE 3 – STRENGTH, AGILITY, & PLYOMETRIC (12-24 Weeks)
PHASE GOALS: INTRODUCE DYNAMIC MOVEMENTS AND DL PLYOMETRICS
RANGE OF MOTION

12+ Weeks – Maintain symmetry & pain-free with overpressure

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, pale off press

Integrate interval strength circuits & work/rest timed intervals

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CONDITIONING

Dynamic warm-up & integrate sport specific warm up

Biking, elliptical, swimming, & rowing

Treadmill walk/jog progressions: begin with 30"-1' W/J intervals, advance jog time by 1 min each week

Advance to track workouts: jog straights & walk curves

PLYOMETRICS & AGILITY:

Ladder drills, footwork agility drills, cone drills

Double leg plyos: jump rope, line jumps, cone jumps, depth jumps, box jumps

High intensity predictable patterned movements, incorporate sport specific drills

**CRITERIA FOR PLYOMETRICS AND AGILITY : DL > 16 WEEKS, SL > 20 WEEKS
PAIN LESS THAN 2 / 10 (WORST)**

- **QUAD & HAM STRENGTH > 80% NORMAL; > 50% H/Q RATIO FOR FEMALES**
- **AT LEAST 3 MINUTES OF SINGLE LEG SQUATS (RESISTED)**
- **JOGGING >15 MINUTES ON TREADMILL**
- **< 5 ON LANDING ERROR SCORING SYSTEM (LESS)**
- **MD OR PT APPROVAL**

PHASE 4 – STRENGTH, AGILITY, POWER, & PLYOMETRICS (24+ Weeks)

**PHASE GOALS: INITIATE POWER MOVEMENTS & SINGLE LEG PLYOMETRICS
RANGE OF MOTION**

24+ Weeks – Maintain symmetry & pain free overpressure

STRENGTHENING

Gym strengthening: squats, deadlifts, 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: begin with 300°/sec, progress to 180°/sec

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CONDITIONING

Dynamic warm-up

Biking, elliptical, jogging, swimming & rowing

Track workouts: advance to linear speed drills 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

- **PAIN LESS THAN 2 / 10 (WORST)**
- **QUAD & HAM 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 OR PT APPROVAL**

PHASE 5 - RETURN TO PLAY (24+ Weeks)

PHASE GOALS: SPORTS SPECIFIC MOVEMENTS & RETURN TO PRACTICE STRENGTHENING

Gym strengthening: squats, deadlifts, and olympic lifting

Interval strength circuits & work/rest timed intervals

Dynamic strength and core exercises

Complex movement patterns

Isokinetic protocols: 300°, 180°, and 60°/sec

CONDITIONING

Jogging, biking, swimming, rowing, & interval sprint workouts

PLYOMETRICS & AGILITY (2-3 DAYS/WEEK)

Max effort DL and SL jumps → progress with rotation

Lateral & rotational agility drills

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Unpredictable cutting agility



Non contract drills → contact drills with MD approval

Return to practice → return to contact practice → return to scrimmage → return to interval play → return to full play

CRITERIA FOR RETURN TO PLAY

- **PAIN LESS THAN 2 / 10 (WORST)**
- **> 75/100 ON ACL-RSI SURVEY**
- **QUAD & HAM 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**
- **MD APPROVAL**