

UT★ORTHO

A Part of UT Physicians

Dr. Walter Lowe

Osteochondral Transplant

Post-Operative Rehabilitation Protocol

Ironman Sports Medicine Institute

3rd Edition

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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. Lowe's office immediately at 713-486-6540 or refer to ED immediately. If patient has reactive effusion that does not improve with rest, ice, and compression, contact Dr. Lowe'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 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.

OCT Protocol

PHASE 1 - ACUTE (0-6 Weeks)

PHASE GOALS: PROTECT GRAFT, RESTORE AMBULATION & ADL STATUS

RANGE OF MOTION

- 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°

WEIGHT BEARING

- 0-2 Weeks – Toe Touch Weight Bearing
- 2-4 Weeks – Partial Weight Bearing
- 4+ Week – FWB with symmetrical gait

BRACE & CRUTCH USE

- 0-1 Week -- Brace locked in 0° extension, unless unlocked by MD
- 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 for community ambulation until MD approval to D/C

STRENGTHENING

- Quad sets, straight leg raises, hip abduction
- 4+ Weeks: Pre-gait, TKEs, calf raises, static balance, mini squats
- 4+ Weeks: Stationary biking: must be > 110° knee flexion

CRITERIA FOR FULL AMBULATION

- **≥ 0 DEG KNEE EXTENSION & 90 DEG KNEE FLEXION**
- **≥ 30 STRAIGHT LEG RAISES WITHOUT LAG**
- **MINIMAL EFFUSION/PAIN, & SYMMETRICAL GAIT WITHOUT A LIMP**
- **MD OR PT APPROVAL**

OCT Protocol

PHASE 2 – STRENGTH (6-16 Weeks)

PHASE GOALS: IMPROVE STRENGTH AND PROTECT THE GRAFT

RANGE OF MOTION

- 6+ Weeks – Maintain full extension and progress to full flexion

STRENGTHENING

- Leg press, step ups, step downs, RDLs, lunges, Bulgarian squats, wall sits
- Squat progression: bodyweight squats → single leg squats
- 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

CONDITIONING

- Stationary bike: encourage daily biking, may begin interval training if non-reactive
- 12+ Weeks: Elliptical
- 16+ Weeks: Rowing machine
- Swimming: Progress kicking gradually and pain-free, no flip turns

CRITERIA FOR PHASE 2

- **PAIN LESS THAN 3/10 (WORST)**
- **WITHIN 2 DEG NORMAL KNEE EXTENSION & 120 DEG KNEE FLEXION**
- **SYMMETRICAL BODY WEIGHT SQUAT**
- **MINIMAL EFFUSION, PAIN, & SYMMETRICAL GAIT WITHOUT A LIMP**

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PHASE 3 – INITIATE JOGGING AND DOUBLE LEG PLYOMETRICS

(16-24 Weeks)

PHASE GOALS: IMPROVE STRENGTH AND INITIATE JOGGING PROGRAM

RANGE OF MOTION

- 16+ 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, pale off press
- Integrate interval strength circuits & work/rest timed intervals

CONDITIONING

- Stationary bike, elliptical, swimming, & rowing machine
- 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
- 16+ Weeks – Alter-G treadmill walk/jog progressions: begin with 30"-1' W/J intervals, advance jog time as tolerated, no more than by 1 min each week
- 20+ Weeks – Treadmill walk/jog progressions: begin with 30"-1' W/J intervals, advance jog time as tolerated, no more than by 1 min each week
- 20+ Weeks – Double leg jump rope and shuttle jumps

CRITERIA FOR JOGGING AND DOUBLE LEG JUMP ROPE : >16 WEEKS

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

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PHASE 3 – STRENGTH, AGILITY, AND PLYOMETRIC (24-32 Weeks)

PHASE GOALS: INTRODUCE DYNAMIC MOVEMENTS

RANGE OF MOTION

- 24+ 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, pale off press
- Integrate interval strength circuits & work/rest timed intervals

CONDITIONING

- Dynamic warm-up
- Biking, elliptical, swimming & rowing
- Advance to track workouts: initially jog straights & walk curves, then progress linear speed

PLYOMETRICS & AGILITY:

- Ladder drills, footwork agility drills
- Double leg plyos: shuttle jumps, jump rope, line jumps, depth jumps, box jumps
- Single leg plyos: alternating SL, SL hops, SL bounding

CRITERIA FOR PLYOMETRICS AND AGILITY

- **PAIN LESS THAN 2 / 10 (WORST)**
- **QUAD & HAM STRENGTH \geq 80% NORMAL; \geq 50% H/Q RATIO FOR FEMALES**
- **AT LEAST 3 MINUTES OF SINGLE LEG SQUATS (RESISTED)**
- **JOGGING >15 MINUTES ON TREADMILL**
- **\leq 5 ON LANDING ERROR SCORING SYSTEM (LESS)**
- **MD OR PT APPROVAL**

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PHASE 4 – ADVANCED STRENGTH, AGILITY, AND PLYOMETRIC (32-36 Weeks)

PHASE GOALS: INTRODUCE POWER MOVEMENTS

RANGE OF MOTION

- 32+ Weeks - Promote and maintain symmetry

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

CONDITIONING

- Dynamic warm-up
- Biking, elliptical, jogging, swimming & rowing

PLYOMETRICS & AGILITY: DOUBLE & SINGLE LEG

- Tuck jumps, squat jumps, bounding, SL hop, SL triple hop, SL cross over hop
- Cone drills and change of direction drills: begin with < 90°, progress to 90° and greater
- High intensity predictable patterned movements

CRITERIA FOR ADVANCED AGILITY

- **PAIN LESS THAN 2 / 10 (WORST)**
- **QUAD & HAM STRENGTH \geq 80% NORMAL; \geq 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**

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PHASE 4 - RETURN TO PLAY (36+ Weeks)

PHASE GOALS: INITIATE SPORTS SPECIFIC MOVEMENTS & RETURN TO PLAY 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
- 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**