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Post-Operative Rehabilitation Guidelines Following

Bridge-Enhanced ACL Repair (BEAR)

The following protocol is intended as a general guideline for physical therapist, athletic trainer, and patient after Bridge-Enhanced-ACL Repair of the knee. These guidelines are designed to facilitate the expedited and safe return to athletic or professional activity and is based on a review of the current scientific principles of knee rehabilitation. For the treating health care provider this protocol should not serve as a substitute for individualized clinical decision making during the patient's post-operative course following this procedure. It should rather take into consideration the individual's physical findings, progression, and possible post-operative limitations. If the therapist or patient requires assistance or encounters any postoperative complication they should consult with the surgeon.

This patient received the BEAR Implant as treatment for a torn ACL. This is not an ACL Reconstruction (ACLR). Please do not follow a rehabilitation protocol for ACLR for this patient. Instead, follow the specialized, BEAR Implant Rehabilitation Protocol in the pages that follow. For questions about the BEAR Implant rehabilitation protocol, please contact Dr. Mithoefer.

Weight Bearing Status:

- Partial Weight Bearing (up to 50% of body weight) x 4 to 6 weeks, brace locked in extension for weight bearing for 4 weeks.
- With clearance from PT and surgeon, patient may advance to WBAT with crutch wean at 4 to 6 weeks, only if the following criteria are met:
    1. able to walk with normal gait pattern
    2. no pain
    3. no extensor lag
    4. good quad control

- With clearance from PT and surgeon, patient may discontinue crutch when the following criteria are met:
    1. normal gait pattern
    2. ability to safely ascend/descend stairs without noteworthy pain or instability (reciprocal stair climbing)

Bracing Instructions:

- ACL hinged knee brace (TROM or equivalent) for weight bearing activities.
- Locked for ambulation at 0 degrees for the first 4 weeks after surgery
- Locked for sleep at 0 degrees for first 6 weeks post op
- May unlock for range of motion (ROM) when seated or at physical therapy (per degrees below)
- Can advance to unlock brace for PWB ambulation at week 4 if the patient is comfortable doing so, and if they demonstrate appropriate quadricep control

Brace Range:

- 0 to 2 Weeks 0 - 30°
- 2 to 4 Weeks 0 - 60°
- 4 to 6 Weeks 0 - 90°
- 6 to 14 Weeks Change to functional brace when Active Range of Motion (AROM) is 0 to ≥110°

General Recommendations:

- No scar massage until 6 weeks post-op
- No Passive Range of Motion (PROM) in flexion
- Driving: No driving until patient is off all narcotics; for patient with RIGHT leg procedure – no driving for 2 weeks and able to achieve 60° of flexion
- Jobs with physical labor- restrictions per operating surgeon and in the following PT protocol
- The only modality for muscular stimulation to be used is E-Stim

Rehabilitation Protocol Bridge-Enhanced ACL Restoration, with the BEAR® Implant

Phase 0: Pre-Operative Recommendations (Time frame: Prior to surgery and immediately after)

- Educate the patient on post-operative exercises and need for compliance
- Educate on ambulation with crutches and PWB
- Educate on wound care

Phase 1: Patient Home Program & 1-2 week visit with PT as needed (Time frame: Weeks 0 to 4)

The following should be taught pre-operatively and reviewed at the two-week post-op visit.

Crutch Use

- PWB with crutches and brace locked (beginning the day of surgery, 50% maximum weight bearing until 4 to6 weeks post operatively)

Bracing

- Hinged Knee Brace: Lock at 0 - 30 degrees for 0 to 2; lock at 60 degrees for 2 to 4 weeks, do not flex the knee past the specified degrees
- Locked at 0 degrees for ambulation and unlocked (set 0 - 30° or 0 - 60°) while seated for ROM exercises

Exercises

- Patellar mobilizations (begin within the first 2 weeks of surgery)

Begin the following exercises 2 weeks from the date of surgery:

- Teach Extension and Flexion exercises (Extension with ankle propped up, seated chair knee flexion using AROM to bend knee). Patient to do 2x/day (See teaching sheet)
- Double toe and heel raise 10x two times per day (See teaching sheet)
- Teach quad set/quad isometric contraction at 2-week post-op visit (See teaching sheet)

Cryotherapy

- Cold with compression/elevation (e.g., Cryo-cuff, Don Joy Iceman device or equivalent)
- First 24 hours or until acute inflammation is controlled: every hour for 15 minutes
- After acute inflammation is controlled: 3 times a day for 15 minutes
- Do not sleep with automated device running while on the knee
- Keep a layer of fabric, or ace wrap between skin and icing device at all times
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Phase 2: Early Post-Operative Physical Therapy Phase (Time frame: Weeks 4 to 7)

GOALS:

- Full knee extension
- Good quadriceps isometric contraction
- Minimize pain and swelling

Crutch Use

- PWB with crutches (beginning the day of surgery, 50% maximum weight bearing until 4 to 6 weeks post-operatively)
- With clearance from PT and surgeon, may advance to WBAT with crutch wean at 4 to 6 weeks only if meeting the following criteria: able to walk normally gait pattern, no pain, no extensor lag, and good quad control.

Bracing

- Hinged Knee Brace: Lock at 0 - 90 degrees for weeks 5 and 6; unlocked if good quad control has returned. Do not flex the knee past the specified degree

Range of Motion (starting in week 5)

- Extension: Low load, long duration (~5 minutes) stretching (e.g., heel prop, prone hang minimizing co-contraction and nociceptor response)
- Gentle patellar mobilization (medial/lateral mobilization initially followed by superior/inferior direction while monitoring reaction to effusion and ROM)
- No Passive Range of Motion

Muscle Activation/Strength (starting 4 weeks after surgery)

- Quadriceps sets emphasizing vastus lateralis and vastus medialis activation
- Straight Leg Raise (SLR) emphasizing no lag
- Electric Stimulation: Optional if unable to perform no lag SLR; Discontinue use when able to perform 20 no lag SLR

- Ankle pumps with TheraBand
- Heel raises (calf press)
- Start reciprocal stair training at 4 to 6 weeks in preparation for crutch D/C

Criteria for progression to Phase 3

- 6 weeks out from surgery

Early Post-Operative Phase (Time frame: Weeks 7 to 12)

GOALS

- Minimize pain and swelling
- Full knee extension ROM
- Good quadriceps control (> 20 no lag SLR)
- Normal gait pattern

Crutch Use

- WBAT; can continue crutch wean as appropriate
- Crutch D/C Criteria = Normal gait pattern; Ability to safely ascend/descend stairs without noteworthy pain or instability (reciprocal stair climbing)

Bracing

- T-Scope or Functional ACL Brace
- 0 - 110 degrees at week 7. Okay to change to functional ACL brace when AROM in flexion is 110 degrees or higher
- Should be in either a hinged knee brace or functional ACL brace for walking and any other weight bearing and closed chain activity (bike, elliptical, leg press, wall slides, mini squats, etc.)

Range of Motion

- Extension: Low load, long duration (~5 minutes) stretching (e.g., heel prop, prone hang minimizing co-contraction and nociceptor response)
- Flexion: Wall slides, heel slides, seated active-assisted knee flexion (no passive ROM), bike: rocking-for-range

Muscle Activities and Strengthening

- Quadriceps sets emphasizing vastus lateralis and vastus medialis activation
- SLR emphasizing no lag
- Electric Stimulation: Optional if unable to perform no lag SLR Discontinue use when able to perform 20 no lag SLR
- Double-leg wall slides or mini-squats without knee over foot
- Hamstring sets: Hamstring curls - do not flex knee more than is comfortable for patient
- Side-lying hip adduction/abduction; Prone Hip Extension
- Quadriceps/hamstring co-contraction supine
- Ankle pumps with TheraBand
- Heel raises (calf press)
- Reciprocal stair training
- Aqua jogging in pool okay starting at 8 weeks post op

Criteria for progression to Phase 4

- Minimum of 12 weeks from surgery
- No lag SLR
- Normal gait
- Crutch/Immobilizer D/C
- ROM: No greater that 5° active extension lag, 90° active flexion

Phase 4: Early Rehabilitation Phase (Time frame: Weeks 12 to 20)

GOALS

- Full ROM
- Improve muscle strength
- Progress neuromuscular retraining

Range of Motion

- Low load, long duration (assisted prn)
- Heel slides/wall slides
- Heel prop/prone hang (minimize co-contraction / nociceptor response)
- Bike (rocking-for-range → riding with high seat height until comfortable and then bringing seat height down as ROM improves)
- Flexibility stretching of all major muscle groups

Strengthening Quadriceps

- Quad sets (Mini squats/wall squats)
- Step-ups
- Leg press; Shuttle press without jumping action

Strengthening Hamstrings

- Hamstring curls
- Resistive back SLR with sports cord for hamstring (not quad)

Strengthening Other Musculature

- Hip adduction/abduction: side lying SLR or with equipment
- Standing heel raises progress from double to single leg support
- Seated calf press against resistance
- Multi-hip machine in all directions with proximal pad placement
- Swimming with flutter kicks only

Neuromuscular Training

- Wobble board, Rocker board, Single-leg stance with or without equipment (e.g., instrumented balance system), Slide board

Cardiopulmonary

- Bike, Elliptical trainer, Stairmaster, Flutter kicking in pool starting at week 12

- Transition to straight line running on treadmill or in a protected environment after clearance by operating surgeon (NO cutting or pivoting) can begin around 18 weeks (4.5 months) if PT feels patient is ready to progress. Otherwise, hold off on straight line running until Phase 5

Criteria for progression to Phase 5

- Full ROM
- Minimal effusion and pain
- Functional strength and control in daily activities
- Clearance for running, given by operating surgeon
- Minimum 20 weeks out from date of surgery

Phase 5: Strengthening & Control Phase (Time frame: Weeks 20 to 30)

GOALS

- Maintain full ROM
- Running without pain or swelling
- Hopping without pain, swelling, or giving way

Strengthening

- Squats
- Leg press
- Hamstring curl
- Step-ups/down
- Shuttle
- Sports cord
- Wall squats
- Progress to single leg squats

Agility Drills

- Double leg jumping progressing to hopping as tolerated

Neuromuscular Training

- Wobble board/rocker board/roller board
- Perturbation training, Instrumented testing systems, Varied surfaces

Cardiopulmonary

- Straight line running on treadmill or in protected environment after clearance by operating surgeon
- NO cutting or pivoting
- All other cardiopulmonary equipment

Criteria for progression to Phase 6

- Running without pain or swelling
- Neuromuscular and strength training exercises without difficulty
- Able to hold single leg balance for 10 seconds
- 50% hop height on operated leg (hop test in brace)

- Completion of functional hop testing and clearance by operating surgeon
- Minimum of 30 weeks out from date of surgery

Phase 6: Advanced Training Phase (Time frame: Weeks 30 to 36)

GOALS

- Running patterns (Figure-8, pivot drills, etc.) at 75% speed without difficulty
- Jumping without difficulty
- Hop tests at 75% contralateral values (Cincinnati hop tests: single-leg hop for distance, triple-hop for distance, crossover hop for distance, 6-meter timed hop)

Strengthening

- Squats
- Lunges
- Plyometrics

Agility Drills

- Shuffling
- Hopping
- Carioca
- Vertical jumps
- Running patterns at 50 to 75% speed
- Initial sports specific drill patterns at 50 to 75% effort

Neuromuscular Training

- Wobble board/rocker board/roller board
- Perturbation training, Instrumented testing systems, Varied surfaces

Cardiopulmonary

- Running
- Other cardiopulmonary exercises

Criteria for progression to Phase 7

- Maximum vertical jump without pain or instability
- 85% of contralateral on hop tests
- Run at 85% speed without difficulty
- IKDC Question # 10 (Global Rating of Knee Function) score of > 8
- Completion of functional hop testing showing 85% function and clearance by operating surgeon

Phase 7: Return-to-Sport Phase (Time frame: Weeks 36 to 52)

GOALS

- 85% contralateral strength
- 85% contralateral on hop tests
- Sport specific training without pain, swelling or difficulty

Strengthening

- Squats
- Lunges
- Plyometrics

Sports Specific Activities

- Interval training programs
- Running patterns in football
- Sprinting
- Change of direction
- Pivot and drive-in basketball
- Kicking in soccer
- Spiking in volleyball
- Skill / biomechanical analysis with coaches and sports medicine team

Return-To-Sports Evaluation Recommendations

- Balance test – single leg balance for 30 seconds without touchdown for each leg
- Single leg squat – get to 60 degrees of flexion, able to do without IR at the hip or valgus at the knee
- Hop tests (single leg hop for distance) to be 95% of contralateral side

Return-to-Sports Criteria

- No functional complaints
- Confidence when running, cutting, jumping at full speed
- 95% contralateral values on hop tests
- IKDC Question # 10 (Global Rating of Knee Function) of > 9
- Clearance by operating surgeon