BRADLEY W SMITH MD
Sports Medicine Orthopedic Surgeon
YOU DESERVE A COMEBACK STORY

**Bradley Smith, MD**
**5316 S. Woodrow St. #200**
**Murray, UT 84107**
Office: (801) 747-1020
Fax: (801) 747-1023
bradleysmithmd.com

UTAH ORTHOPAEDIC SPECIALISTS

# Rehabilitation Protocol: Quad/Patellar Tendon Repair and Patella Fracture ORIF

## PHASE I: *Immediate Post-Op* (0-2 WEEKS AFTER SURGERY)

| | |
|---|---|
| **Rehabilitation Goals** | • Protect repair<br>• Minimize postoperative pain<br>• Minimize postoperative edema<br>• Prevent complications from prolonged immobilization |
| **Precautions** | • Hinged knee brace should be locked in extension and worn at all times (ambulating, sleeping, standing, etc.)<br>• No active knee extension<br>• No passive knee flexion beyond 60 degrees - Do not push motion at this point |
| **Weight Bearing** | • Weight Bearing as tolerated with hinged knee brace locked in extension |
| **Interventions** | *Swelling Management*<br>• Ice/cryotherapy<br>• Compression<br>• Elevation<br>• Retrograde massage<br>• Ankle pumps<br><br>*Range of motion/Mobility*<br>• Gentle patellar mobilizations<br>• PROM<br>• Heel slides with towel<br>• Low intensity, long duration extension stretches: prone hang, heel prop<br>• Seated hamstring/calf stretch<br><br>*Strengthening*<br>• Calf raises<br>• Quad sets<br>• Glute set |
| **Criteria to Progress** | • 2 weeks post-op<br>• Knee extension to 0 deg |

## PHASE II: *Intermediate Post-Op* (2-6 WEEKS AFTER SURGERY)

| | |
|---|---|
| **Rehabilitation Goals** | • Continued minimization of post-operative pain/edema<br>• Progress knee flexion PROM<br>• Progress to full weight bearing status with use of locked brace |

| | |
|---|---|
| | • Initiate proximal/distal strengthening (hip, back, abdominals, ankle) |
| **Weight Bearing** | • Weight Bearing as tolerated with hinged knee brace locked in extension<br>• Should be full weight bearing by 6 weeks |
| **Precautions** | • Knee flexion PROM starts at 50 degrees week 2<br>  ○ Light overpressure only for PROM<br>• Progress 10 degrees/week until 90 degrees achieved<br>  ○ 60 degree maximum end of week 2<br>  ○ 70 degree maximum end of week 3<br>  ○ 80 degree maximum end of week 4<br>  ○ 90 degree maximum end of week 5<br>• Hinged brace locked in extension for standing/walking/sleeping<br>  ○ Brace worn at night until week 6 unless otherwise specified by surgeon<br>  ○ Can unlock for sitting/laying (brace angle can be unlocked to available PROM, but not to exceed PROM progression noted above)<br>• Assistive device for ambulation as needed |
| **Interventions**<br>*-Continue with Phase I interventions* | *Range of motion/Mobility*<br>• Patellofemoral Joint Mobilization<br>• Gradual flexion PROM with light overpressure per above<br>• Extension PROM with overpressure as needed<br>• Heel Slide<br>• Sitting knee flexion to above ROM<br>• Heel prop<br><br>*Cardio*<br>• Upper body ergometer<br><br>*Strengthening*<br>• Straight leg raise *without lag<br>• Side lying hip abduction and adduction, prone leg extension<br>• Standing hip abduction, adduction and extension<br>• Glute bridge with legs straight elevated on a chair<br>• Calf raise<br>• Core strengthening: Plank as able without discomfort in knee, TA brace progression<br><br>*Balance/proprioception*<br>• Standing weight shifts |
| **Criteria to Progress** | • Full passive knee extension PROM<br>• Passive knee flexion to 90 degrees<br>• FWB in brace with no pain<br>• Active knee extension to 0 degrees with quad set |

## PHASE III: *Late Post-Op* (6-15 WEEKS AFTER SURGERY)

| | |
|---|---|
| **Rehabilitation Goals** | • Wean assistive devices if any are still used<br>• Restore full A/PROM of knee flexion |

| | |
|---|---|
| | ● Begin stationary bike when able<br>● Initiate progressive quadriceps loading/resistance exercises<br>● Restore static single leg balance<br>● Continue to progress proximal/distal strengthening |
| **Weight Bearing** | ● Hinged brace unlocked for ambulation (0-60 degrees) provided patient demonstrates sufficient quad control during stance to prevent buckling<br>○ Use brace until week 8 unless otherwise specified by surgeon<br>○ Patient should demonstrate sufficient quad control, weight bearing tolerance and single limb stability prior to discharge of brace. |
| **Precautions** | ● No weight bearing with flexion >90 deg until after 8 weeks<br>● A/PROM should be cautioned not to progress faster than 10 degrees per week before 12 weeks post-op<br>● Avoid aggressive quad stretching<br>● No maximal voluntary contraction of the quadriceps until week 16 (No manual muscle test or handheld dynamometer testing) |
| **Interventions**<br>*-Continue with Phase I-II interventions* | *Range of motion/Mobility*<br>● Patellofemoral Joint Mobilization<br>● Flexion PROM with overpressure<br>● Heel Slide<br>● Sitting knee flexion<br><br>*Cardio*<br>● Upper body ergometer<br>● Stationary bicycle - Begin with partial rotations, minimal resistance and gradually progress time and resistance once full motion is achieved<br>● Elliptical - may begin once active knee flexion motion reaches at least 120 degrees, able to perform 10 straight leg raises without lag, and gait is normalized without assistive device<br><br>*Strengthening*<br>*Progress strength gradually as appropriate avoiding anterior knee pain, many of the below exercises will not begin until 8-10 weeks or later<br>● Gym equipment: leg press machine, seated hamstring curl machine and hamstring curl machine, hip abductor and adductor machine, hip extension machine, roman chair, seated calf machine<br>○ Progress intensity (strength) and duration (endurance) of exercises as appropriate<br>*The following exercises to focus on proper control with emphasis on good proximal stability<br>● Squat to chair<br>● Lateral lunges<br>● Romanian deadlift (single and double leg)<br>● Resisted triple extension in standing<br>● Single leg progression: partial weight bearing single leg press, step ups and step ups with march, slide board lunges: retro and lateral, lateral step-ups, single leg squats, single leg wall slides, lateral step down<br>○ Knee Extension machine at 16 weeks: If quad strength continues to be significantly limited, limiting further progression, may begin using knee extension machine as long as there is no anterior knee discomfort or pain |

| | |
|---|---|
| | • Proximal Strengthening: Double leg bridge, bridge with feet on physioball, single leg bridge, lateral band walk, standing clamshell/fire hydrant, hamstring walkout, TA brace with UE and LE progression<br><br>*Balance/proprioception*<br>• Progress single limb balance including perturbation training |
| **Criteria to Progress** | • Good recovery of quadriceps strength<br>  ○ Ability to perform 10 single leg squats to 60 degrees<br>  ○ Quad strength of at least 70% on handheld dynamometer: If following standard timeline, and timeline not delayed due to integrity of repair, can test quad strength at week 16<br>  ○ Or 100% quad set compared to contralateral side (measured by sphygmomanometer in mmHg)<br>• Knee flexion PROM to at least 120 degrees<br>• Single leg stance to 30 seconds on involved side with no significant compensatory pattern<br>• Symmetrical gait pattern without use of assistive device<br>• Symmetrical stair negotiation without reliance on UE |

## PHASE IV: *Transitional* (4-6 MONTHS AFTER SURGERY)

| | |
|---|---|
| **Rehabilitation Goals** | • Restore full ROM and muscle length of quadriceps<br>• Restore quadriceps strength (quad index preferred)<br>• Restore single leg dynamic balance/eccentric control (Y balance preferred)<br>• Initiate return to jog/run protocol as tolerated<br>• Restore proximal/distal strength to symmetry with contralateral side |
| **Precautions** | • Avoid pain more than delayed onset muscle soreness (DOMS) during or following exercise especially in the anterior knee/extensor mechanism |
| **Interventions**<br>*-Continue with Phase II-III interventions* | • Begin sub-max sport specific training in the sagittal plane<br>• Bilateral PWB plyometrics progressed to FWB plyometrics<br><br>*Progress to plyometric and agility program (with functional brace if prescribed)*<br><br>*Interval Running/Return to Running Program*<br>• Must have full ROM, resolved swelling, no pain with walking, at least 80% limb symmetry on handheld dynamometer, and ability to perform SL hop with good form prior to initiating jogging progression |
| **Criteria to Progress** | • Quad index of at least 90% (handheld dynamometry preferred, if not sphygmomanometer is acceptable, but consider referring to clinic with dynamometry available for testing)<br>  ○ Isokinetic dynamometry should be held until 6 months and reserved for cases where advanced return to sport/activity is needed<br>• Symmetrical strength measures in hamstrings and hip (dynamometry preferred)<br>• Y balance test within 90% of contralateral side<br>• Symmetry in gait while jogging |

## PHASE V: *Progressive Return to Sport* (6-8 MONTHS AFTER SURGERY)

| | |
|---|---|
| **Rehabilitation Goals** | • Progress running/sprinting program<br>• Improve multidirectional dynamic movements and control of acceleration/deceleration<br>• Improve power in plyometrics and landing mechanics<br>• Restore full quadriceps strength<br>• Return to sport/competition with minimal risk of re-injury |
| **Interventions**<br>*-Continue with Phase II-IV interventions* | • Add sport specific exercises based on patient's desired sport goals<br>  ○ If participating in a cutting/sprinting sport, increased focus on rapid acceleration/deceleration activities and change of direction drills gradually increasing demand and predictability of drill |
| **Criteria to Progress** | • Clearance from MD and ALL milestone criteria below have been met<br>• Quad index of at least 90% (measured by dynamometry, isokinetic preferred)<br>• Functional Assessment<br>  ○ Quad/HS/glut index ≥95%; HHD mean or isokinetic testing @ 60d/s<br>  ○ Hamstring/Quad ratio ≥66%<br>  ○ Hop Testing ≥95% compared to contralateral side, demonstrating good landing mechanics |

Protocol adapted from Mass General Sports Medicine Physical Therapy Rehabilitation Protocols. See https://www.massgeneral.org