



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



Rehabilitation Protocol for ACL Reconstruction

Concomitant Procedures Performed:

- Medial Meniscus Repair
 - Root/Radial pattern
- Lateral Meniscus Repair
 - Root/Radial pattern
- Partial Medial Meniscectomy
- Partial Lateral Meniscectomy
- Lateral Extra-articular Tenodesis (LET)
- Other _____

ACL Graft Choice:

- Bone-patellar tendon-bone (BTB) autograft
- Quad tendon autograft
- Hamstring autograft
- Allograft

Specific Case Complexity and Limitations:

- Primary Procedure
- Revision Procedure

Comments: _____

Pace of Protocol:

- ROUTINE
- AGGRESSIVE

Comments: _____

Special Considerations

Meniscus repair:

- ROM: 0-90 degrees for 6 weeks.
 - Progress to full at 6 weeks, but no loading knee beyond 90 degrees for 12 weeks
- Weight-bearing status: Partial weight-bearing (~50 lbs) for 4 weeks then gradually progress to WBAT
- Brace: locked in extension when ambulating for 6 weeks

Meniscus root/radial repair:

- ROM: 0-90 degrees for 6 weeks.
 - Progress to full at 6 weeks, but no loading knee beyond 90 degrees for 12 weeks
- Weight-bearing status: non-weight-bearing for 6 weeks
- Brace: locked in extension when ambulating for 6 weeks

Lateral Extra-articular Tenodesis: no additional restrictions

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

<p>Rehabilitation Goals</p>	<ul style="list-style-type: none"> ● Protect graft ● Reduce swelling, minimize pain ● Restore patellar mobility ● Restore full extension, gradually improve flexion ● Minimize arthrogenic muscle inhibition, re-establish quad control, regain full active extension ● Patient education <ul style="list-style-type: none"> ○ Keep your knee straight and elevated when sitting or laying down. Do not rest with a towel placed under the knee ○ Do not actively kick your knee out straight; support your surgical side when performing transfers (i.e. sitting to lying down) ○ Do not pivot on your surgical side
<p>Weight Bearing</p>	<p><i>Walking</i></p> <ul style="list-style-type: none"> ● Initially brace locked with crutches ● May start walking without crutches as long as there is no increased pain, effusion, and proper gait <ul style="list-style-type: none"> ○ Allograft and hamstring autograft continue partial weight bearing with crutches for 6 weeks unless otherwise instructed by MD ● May unlock brace once able to perform straight leg raise without lag ● May discontinue use of brace after 6 wks and once adequate quad control is achieved ● When climbing stairs, lead with the non-surgical side when going up the stairs, and lead with the crutches and surgical side when going down the stairs <p>*Meniscus repairs</p> <ul style="list-style-type: none"> ● See special considerations on first page
<p>Interventions</p>	<p><i>Swelling Management</i></p> <ul style="list-style-type: none"> ● Ice/cryotherapy ● Compression ● Elevation ● Retrograde massage ● Ankle pumps <p><i>Range of motion/Mobility</i></p> <ul style="list-style-type: none"> ● Patellar mobilizations: superior/inferior and medial/lateral <ul style="list-style-type: none"> ○ *Patellar mobilizations are heavily emphasized in the early post-operative phase following patella tendon autograft* ● Seated assisted knee flexion extension and heel slides with towel ● Low intensity, long duration extension stretches: prone hang, heel prop ● Standing gastroc stretch and soleus stretch ● Supine active hamstring stretch and supine passive hamstring stretch <p>*Meniscus repairs</p> <ul style="list-style-type: none"> ● Keep knee flexion to less than 90 degrees for 6 weeks <p><i>Strengthening</i></p> <ul style="list-style-type: none"> ● Calf raises ● Quad sets

	<ul style="list-style-type: none"> • NMES high intensity (2500 Hz, 75 bursts) supine knee extended 10 sec/50 sec, 10 contractions, 2x/wk during sessions—use of clinical stimulator during session, consider home units distributed immediate post op • Straight leg raise <ul style="list-style-type: none"> ○ *Do not perform straight leg raise if you have a knee extension lag* • Hip abduction • Multi-angle isometrics 90 and 60 deg knee extension
Criteria to Progress	<ul style="list-style-type: none"> • Knee extension ROM 0 deg • Quad contraction with superior patella glide and full active extension • Able to perform straight leg raise without lag

PHASE II: *Intermediate Post-Op (3-5 WEEKS AFTER SURGERY)*

Rehabilitation Goals	<ul style="list-style-type: none"> • Continue to protect graft • Maintain full extension • Restore full flexion • Normalize gait
Range of Motion	<ul style="list-style-type: none"> • Progress to full ROM (unless patient had concomitant meniscus repair, see page 1)
Brace	<ul style="list-style-type: none"> • May unlock brace once able to perform straight leg raise without lag • May discontinue use of brace after 6 wks and once adequate quad control is achieved
Interventions -Continue with Phase I interventions -Follow meniscus repair precautions if applicable (see page 1)	<i>Range of motion/Mobility</i> <ul style="list-style-type: none"> • Stationary bicycle (gentle ROM only if concomitant meniscus repair) • Gentle stretching all muscle groups: prone quad stretch, standing quad stretch, kneeling hip flexor stretch <i>Strengthening</i> <ul style="list-style-type: none"> • Standing hamstring curls • Step ups and step ups with march • Partial squat exercise • Ball squats, wall slides, mini squats from 0-60 deg • Lumbopelvic strengthening: bridge & unilateral bridge, sidelying hip external rotation-clamshell, bridges on physioball, bridge on physioball with roll-in, bridge on physioball alternating, hip hike <i>Balance/proprioception</i> <ul style="list-style-type: none"> • Single leg standing balance (knee slightly flexed) static progressed to dynamic and level progressed to unsteady surface • Lateral step-overs • Joint position re-training
Criteria to Progress	<ul style="list-style-type: none"> • An effusion may still be present but must be non reactive before phase progression • Flexion ROM within 10 deg contralateral side (or 90 degrees if patient had meniscus repair) • Extension ROM equal to contralateral side

PHASE III: Late Post-Op (6-8 WEEKS AFTER SURGERY)

<p>Rehabilitation Goals</p>	<ul style="list-style-type: none"> ● Continue to protect graft site ● Maintain full ROM ● Safely progress strengthening ● Promote proper movement patterns ● Avoid post exercise pain/swelling ● Avoid activities that produce pain at graft donor site
<p>Interventions -Continue with Phase I-II interventions -Follow meniscus repair precautions if applicable (see page 1)</p>	<p><i>Range of motion/Mobility</i></p> <ul style="list-style-type: none"> ● Rotational tibial mobilizations if limited ROM <p><i>Cardio</i></p> <ul style="list-style-type: none"> ● 8 weeks: Elliptical, stair climber, flutter kick swimming, pool jogging <p><i>Strengthening</i></p> <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ○ Hamstring autograft can begin resisted hamstring strengthening at 12 weeks ● Progress intensity (strength) and duration (endurance) of exercises <p>**The following exercises to focus on proper control with emphasis on good proximal stability</p> <ul style="list-style-type: none"> ● Squat to chair ● Lateral lunges ● Romanian deadlift ● Single leg progression: partial weight bearing single leg press, slide board lunges: retro and lateral, step ups and step ups with march, lateral step-ups, step downs, single leg squats, single leg wall slides ● Seated Leg Extension (avoid anterior knee pain): 90-45 degrees with resistance <p><i>Balance/proprioception</i></p> <ul style="list-style-type: none"> ● Progress single limb balance including perturbation training
<p>Criteria to Progress</p>	<ul style="list-style-type: none"> ● No effusion/swelling/pain after exercise ● Normal gait ● ROM equal to contralateral side ● Symmetrical joint position sense (<5-degree margin of error)

PHASE IV: Transitional (9-12 WEEKS AFTER SURGERY)

<p>Rehabilitation Goals</p>	<ul style="list-style-type: none"> ● Maintain full ROM ● Safely progress strengthening ● Promote proper movement patterns ● Avoid post exercise pain/swelling ● Avoid activities that produce pain at graft donor site
<p>Interventions -Continue with Phase II-III interventions -Follow meniscus</p>	<ul style="list-style-type: none"> ● Begin sub-max sport specific training in the sagittal plane ● Bilateral PWB plyometrics progressed to FWB plyometrics

<i>repair precautions if applicable (see page 1)</i>	
Criteria to Progress	<ul style="list-style-type: none"> ● No episodes of instability ● Maintain quad strength ● 10 repetitions single leg squat proper form through at least 60 deg knee flexion ● Drop vertical jump with good control ● KOOS-sports questionnaire >70% ● Functional Assessment <ul style="list-style-type: none"> ○ Quadriceps index >80%; HHD or isokinetic testing 60d/s ○ Hamstrings ≥80%; HHD or isokinetic testing 60 d/s ○ Glut med, glut max index ≥80% HHD

PHASE V: Early Return to Sport (3-5 MONTHS AFTER SURGERY)

Rehabilitation Goals	<ul style="list-style-type: none"> ● Safely progress strengthening ● Safely initiate sport specific training program ● Promote proper movement patterns ● Avoid post exercise pain/swelling ● Avoid activities that produce pain at graft donor site
Interventions <i>-Continue with Phase II-IV interventions</i>	<ul style="list-style-type: none"> ● Interval running program <ul style="list-style-type: none"> ○ Return to Running Program ● Progress to plyometric and agility program (with functional brace if prescribed)
Criteria to Progress	<ul style="list-style-type: none"> ● Clearance from MD and ALL milestone criteria below have been met ● Completion jog/run program without pain/effusion / swelling ● Functional Assessment <ul style="list-style-type: none"> ○ Quad/HS/glut index ≥90%; HHD mean or isokinetic testing @ 60d/s o Hamstring/Quad ratio ≥66% ○ Hop Testing ≥90% compared to contralateral side, demonstrating good landing mechanics

PHASE VI: Unrestricted Return to Sport (6+ MONTHS AFTER SURGERY)

Rehabilitation Goals	<ul style="list-style-type: none"> ● Continue strengthening and proprioceptive exercises ● Symmetrical performance with sport specific drills ● Safely progress to full sport
Brace	<ul style="list-style-type: none"> ● Functional brace for returning to pivoting/high intensity sport
Interventions <i>-Continue with Phase II-V interventions</i>	<ul style="list-style-type: none"> ● Multi-plane sport specific plyometrics program ● Multi-plane sport specific agility program ● Include hard cutting and pivoting depending on the individuals' goals (~7 mo) ● Non-contact practice→ Full practice→ Full play (~9 mo)

Criteria for Return to Sports	<ul style="list-style-type: none">● Functional Assessment<ul style="list-style-type: none">○ Quad/HS/glut index $\geq 95\%$; HHD mean or isokinetic testing @ 60d/s○ Hamstring/Quad ratio $\geq 66\%$○ Hop Testing $\geq 95\%$ compared to contra lateral side, demonstrating good landing mechanics● KOOS-sports questionnaire $>90\%$● International Knee Committee Subjective Knee Evaluation >93● ACL-RSI
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Protocol adapted from Mass General Sports Medicine Physical Therapy Rehabilitation Protocols. See <https://www.massgeneral.org/orthopaedics/sports-medicine/physical-therapy/sports-rehab-protocols>