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Meniscus Repair (Radial, Root, Bucket) Physical Therapy Protocol

The following rehabilitation guidelines and protocol are developed for patients who have undergone an arthroscopic meniscus repair of a radial, root, bucket, or other complex tear of the medial and/or lateral meniscus. Repairs of these types of tears have significant differences in need for protection and force avoidance when compared to a more typical meniscus repair, and the protocol reflects this. Exercises should be gradually progressed based upon protocol recommendations and criteria, physician discretion, and the patient's ability to perform the exercises correctly and without an increase in pain. This protocol has many notes relating to our philosophy and rationale behind the rehabilitation after meniscus repair surgery, and we ask that you read them as you come across them as they may differ from your standard rehabilitation experience. We have avoided making many notes for specific time points in our protocol, as progression should be largely based on achievement of milestones rather than the passage of time. Some patients recover more slowly than others, and that is fine provided steady forward progress is happening. Patients are counseled that total rehab time is a minimum of 6 months depending upon the patient, sport, and athletic demands. This protocol is not designed to replace the judgment, communication, and experience of a skilled physical therapist. If at any point in the rehabilitation process there are concerns or questions that arise, please do not hesitate to contact us so that we can answer it to the best of our ability.

Key Considerations

Patient Education

It is important to take the time during initial evals, and then regularly throughout the course of rehabilitation, to discuss and review important considerations related to their injury. Remember that each patient will present with different post-surgical considerations, pain levels, goals, etc. Reviewing this information with the patient and what to expect throughout the rehabilitation is of paramount importance.

For the Physical Therapist

Arthrogenic Muscle Inhibition (AMI):

Arthrogenic muscle inhibition (AMI) is a common occurrence following knee surgery and limits the quadriceps ability to activate effectively. Clinicians can consider the use of neuromuscular electrical stimulation (NMES), cryotherapy, etc. to limit the effects of AMI and promote quadriceps activation.

Exercise Progressions/Loading:

All exercises should be performed with progression of loading variables as tolerated (increased repetitions, sets, weight, speed, etc.)

Hoop stress

The meniscus uses hoop stress to dissipate the loading of body weight through the knee. Deeper knee flexion angles will put more stress on the posterior horn of the meniscus, which can put undue strain on the repair if the posterior horn or meniscal body are involved. Radial and root tears involve disruption of the circumferential fibers of the meniscus which provide most of the ability of the meniscus to resist deformation due to hoop stress, and thus this repair must be strictly protected.

Maintenance of Strength in Uninvolved Limb

Start bilateral strength work (single leg exercises should be performed on the operative side AND uninjured side) by week 3-4 – it is critical to keep the uninvolved limb from becoming the involved limb

Movement Quality

It is important to evaluate the entire kinetic chain. The knee is controlled from above and below - poor hip/ankle mobility can force the knee joint to become extra mobile, which is unnecessary stress on the meniscus repair, and poor hip adduction/IR strength or hyperpronation of the foot can result in lack of control of the knee.

If at any time there are signs of infection (increased swelling, redness, drainage from the incisions, warmth, fever, chills or severe pain that is uncontrolled with the pain medication),), or signs of DVT (calf swelling or tenderness, calf redness) please contact us at the office: (817) 283-0967.

Physical therapy protocols, post-operative instructions, and other information can all be accessed at any time at *www.frantzorthopedics.com*

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Milestones and Required Clinical Visits in MD's Office

- 2 weeks – Incision check
- 6 weeks – Motion check
- 12 weeks – Strength check
- 5-6 months – Performance check

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Phase I: Early Motion/Healing – Protection Phase – first 6 weeks after surgery

Goals	- Gain control of pain and diminish joint swelling - Restoration of patellar mobility (suprapatellar/infrapatellar fat pad) - Emphasis on regaining knee extension to zero as early as possible as well as gradual improvement of passive knee flexion - Increased quadriceps activation and reestablishing quad control
Brace/crutches	**Strict NON WEIGHT BEARING with two crutches** (or walker if unable to balance well with crutches) for the first **6 WEEKS** after surgery. Knee scooters are NOT ACCEPTABLE, a wheelchair is the best option if non weight bearing status cannot be maintained with crutches/walker **Brace is to be worn at all times** except for showering/bathing, working with PT, or doing home exercises/stretches. - Brace can be unlocked (range 0-90) when sitting or non-weightbearing starting post-op day 3 - Brace to be worn at night locked at 0 until seen by MD (typically at 2 week postop visit) and then unlocked at night (0-90) for entire non weight bearing period - Brace can be locked at 20-30 degrees flexion to allow for improved foot clearance during swing through during crutching for the non weight bearing period, but should be unlocked or locked to 0 immediately following ambulation
Suggested Exercises	**ROM** Patellar Mobilizations - All 4 directions; anterior interval, suprapatellar pouch Extension ROM - Emphasize obtaining full extension as early as possible - Hamstring/gastroc stretching, etc. - Low load long duration stretching (heel prop/bag hang) • Patient should be doing extension stretching multiple times daily starting as early as day of surgery • Do not push into hyperextension Flexion ROM - Weeks 0-6 - 0-90 degrees only - Weeks >6 - ROM as tolerated - Heel/wall slides, etc. - Don't worry if flexion is tough to obtain in the earliest phase • We have to go slow early to go fast later in a painful/swollen ("reactive") knee

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	Strength - <u>Avoid any active resisted hamstrings or open chain flexion for 8 weeks</u> Quadriceps strength/control - Blood flow restriction (BFR) highly encouraged - NMES • To be used with all quadriceps exercises if quad is not effectively or efficiently firing • Utilize until able to perform 20 full range active terminal extensions - Short arc quad progression • Towel roll at heel → mid-gastroc → knee → decrease towel height to table - Straight leg raise – in brace until quad control allows for successful SLR with minimal lag - Long arc quad • Unresisted, 90-40 degrees • Use isometrics at varying angles to build tolerance
Frequency & Duration	2-3x weekly formal PT, 2-3x daily home exercises/ROM work
Progression Criteria	Must meet **ALL** criteria prior to progressing into phase 2: 1. Active knee range of motion 0-110 with side to side knee extension difference ≤ 5° 2. Minimal complaints of pain and swelling in the surgical knee 3. Complete 1 sets of 10 repetitions of a straight leg raise with no extension lag

Phase II: Early Motion and Strengthening – Begin week 6-7

Goals	- Protect repair of meniscus - Improve single limb strength (emphasis on eccentric strengthening and neuromuscular control). - Restore normal ambulation - Develop strength and stability in all planes of motion (sagittal, frontal, transverse planes) and under various proprioceptive conditions while focusing on achieving proper trunk, knee, and ankle alignment. - Increase external focus of control with feedback and instructions - Improve cardiovascular fitness and muscle endurance
Precautions	**Ok to <u>begin weight bearing as tolerated with two crutches</u> AND brace locked out straight.** **Brace** is to be <u>worn at all times</u> except for showering/bathing, working with PT, or doing home exercises/stretches. The brace is to be <u>locked out in full extension during ambulation</u> for minimum 2 weeks after weight bearing is initiated. Ok to discontinue crutches once 5 straight leg raises with no lag can be performed. After 6 weeks postop, the brace can be unlocked 0-90 for ambulation ONLY once 20 *excellent* straight leg raises without any extension lag can be performed. Brace can be unlocked (range 0-90) when sitting or non-weightbearing, and discontinued at night **Avoid any active resisted hamstrings or open chain flexion for 8 weeks, no deep squatting, no stooping, no tibial rotation/twisting exercises**

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Suggested Exercises	*Increase repetitions, weight, and visual manipulation of phase 1 exercises, plus:* **ROM** Continue to progress flexion with goal of symmetry to contralateral side **Strength - <u>Avoid any active resisted hamstrings or open chain flexion for 8 weeks</u>** Quadriceps strength/control - Long arc quad • Unresisted full ROM is allowed when non-painful • Use isometrics at varying angles to build tolerance - Standing terminal knee extensions - Limit any weight bearing exercises if persistent joint line pain – stick with table/open chain exercises until meniscal pain subsides Ok to begin <u>bicycle</u> once flexion is easy to 110-115 degrees, make sure seat is set to appropriate height to avoid unnecessarily deep knee flexion <u>Note on blood flow restriction</u>: BFR has excellent results in preventing atrophy and producing muscle hypertrophy but only once there is good voluntary contraction. BFR may be used once unlocked ambulation is achieved. **Balance/proprioception:** Weight shifts (body weight) sagittal/frontal planes - Progress to single leg balance, add visual restriction etc. Gait training drills Retro walking, cone step overs, etc. Squat movement pattern (keep flexion <90 degrees until week 8) - Lunge → lateral step down → single leg squat → resisted single leg squats - Use shuttle/leg press to help bridge gap between stages Hip hinge movement pattern - Double leg deadlift → single leg deadlift Bilateral lower extremity strength - Continue progression of all phase 1 exercises
Frequency & Duration	2-3x weekly formal PT, daily home exercises/stretching
Progression Criteria	Must meet **ALL** criteria prior to progressing into Phase 3: 1. Full knee active range of motion: no side to side active knee extension difference 2. Minimal complaints of pain and swelling in the surgical knee 3. Normalized gait 4. Single limb squat for 1 minute without resistance using Vail Sport Cord criteria (testing protocol online) 5. Quadriceps strength limb symmetry index (LSI) to 50% of non-surgical limb

Neuromuscular Based Training

We believe that heavy emphasis on proprioceptive exercises to include perturbation and reactive training beginning around 2 months postoperatively creates positive outcomes in regard to restoring neuromuscular pathways in the body. It may sound trite, but we are not treating a knee, we are treating a person who has a knee injury. The knee is a complex joint of bone, cartilage, ligaments, etc, but the neuroreceptors within these structures and their connections to their controlling muscle, as well as the processing centers and programming for knee joint movement in the brain are underappreciated and often under-rehabbed.

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Phase III: Introduction to Landing/Impact	
Goals	- Increase the intensity of training - Improve the strength foundation - Incorporate functional balance activities utilizing muscle strength, proprioception, and UE manipulation
Precautions	No twisting/cutting/pivoting motions for 4 months postoperatively regardless of meeting other criteria for progression Avoid squatting movements with greater than 110 degrees flexion until 4 months postoperatively
Suggested Exercises	*Increase repetitions, resistance, and speed of movement of earlier phases, plus:* **Landing Progression** Proper eccentric control must be taught before jumping/running can begin - 2-leg to 2-leg with hold → 2-leg to 1-leg with hold → 1-leg to 1-leg with hold - 2-leg to 2-leg repeated → 2-leg to 1-leg repeated → 1-leg to 1-leg repeated **Bodyweight Assisted Running** Alter-G and pool running can be a great adjunct in preparation to run, as it allows for introduction to impact without need for full resistance of gravity as the patient continues to become stronger. Patients will become more comfortable with running technique as well. **Reactive Exercises** Cognitive challenges applied during exercise/activity allow for attentional focus to be directed away from task at hand, similar to in sport. This is important for patients as they progress from a period of internal to external focus during activity. - Visual (stroboscopic glasses, etc.) - Cognitive (completing math problems, etc.) - Coordination (catching different colored items, touching different items, etc.)
Frequency & Duration	2x weekly formal PT with 4x weekly home exercises
Progression Criteria	Must meet **ALL** criteria prior to progressing into Phase 4: 1. Perform a single limb squat (knee flexion 90-30) with heavy resistance cord for one minute with good neuromuscular control, forward and backward jog as per Vail Sport Cord criteria (testing protocol online) 2. Display IKDC score of ≥ 55 3. Be able to perform 30 single leg calf jumps with minimal assistance for balance 4. Complete jump landing progression with good neuromuscular control

Return to Running

Our protocol for return to running is slow compared to the standard for our area as we believe that running prior to excellent strength and motor control can allow for maladaptive gait patterns and neuromuscular programming that can be very difficult to overcome once set in the brain. By pushing the return to full body weight running further back, we have found improved results with being able to run with a normal gait and no increase in anterior knee pain, which translates to a sense of enjoyment and success with running to the athlete, rather than apprehension or dread. This allows for more rapid progression of sport specific activities rather than languishing in the running phase for too long due to abnormal gait or increased knee pain.

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Phase IV: Return to Running	
Goals	- Start progression of running program - Transition to movements geared more towards speed, power, and function
Precautions	No twisting/cutting/pivoting motions for 4 months postoperatively regardless of meeting other criteria for progression Avoid squatting movements with greater than 110 degrees flexion until 4 months postoperatively
Suggested Exercises	*Increase repetitions, resistance, and speed of movement of earlier phases, plus:* **Continued Strengthening Program** Ensure that patient is continuing to progress in overall weight and intensity of resistance training during this phase **Interval Running Program** Utilize a program focused on progression of running volume while utilizing walking rest - Find example program online at www.parkerorthopedics.com → Patient Resources → Rehab Protocols → Return to Running **Multi-planar Movements** Introduction of horizontal and transverse plane movements, starting with static and progressing to dynamic in preparation of jumping in other planes - Static (lateral lunges in place, etc.) - Dynamic (lateral lunges, curtsy lunges, single leg balance with rotation, etc.) - Jumping (2-leg → 1-leg lateral/rotational bounding → hopping, etc.)
Frequency & Duration	2x weekly formal PT with 3-4x weekly home/gym based program
Progression Criteria	Must meet **ALL** criteria prior to progressing into Phase 5: 1. Able to run 30 minutes at comfortable pace without rest 2. Quadriceps strength LSI to 70% of non-surgical limb or 55% peak torque to BW ratio of surgical limb 3. Pass Vail Sport Cord Test: 40/54 (testing protocol online) 4. Able to achieve 70% LSI during hop testing (single leg hop, single leg triple hop) 5. Double leg broad jump > height

Note for Non-Competitive Athletes

For patients who have undergone meniscus repair but do not desire a return to competitive sport, their progression through this protocol will likely end here. Though they may be through with formal physical therapy at 3-4 months postoperatively, they must be counseled that their overall recovery will continue for many, many months, often beyond one year after surgery, and they must remain diligent and accountable with continuing their strengthening program or they will not achieve their full potential and best possible outcome

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Phase V: Return to cutting/pivoting/jumping

Goals	- Continue to increase the intensity of training. - Increase specificity of training – sport-specific. - Progress movements geared toward speed, power, and function based upon sport and position requirements. - Incorporate reactive functional balance activities that require athlete to react to changing environment of their particular sport.
Suggested Exercises	*Increase repetitions, resistance, and speed of movement of earlier phases and in multi-planar movements as athlete now reacts to changing demands of the environment, plus:* **Cutting/Pivoting** Movements should be in a graded manner, starting with activities that have lower cognitive load at lower speeds and progressing to more anticipatory activities at higher speeds - Introductory (planned 30º cut, planned forward to backward running, etc.) - Intermediate (planned 45º cut, reactive forward to backward running, etc.) - Advanced (reactive 90º cut, mirror drills with partner, etc.) **Power/Rate of Force Development (RFD)** Important to focus on increasing speed of exercises at this stage, as athlete is normalizing overall strength but will likely be lacking proper RFD for sport activities **Bridge Program** Connect athlete with qualified sports performance personnel 2 to 3 days per week to work on speed, agility, and functional performance within their respective sport **Sprinting Progression** Utilize a program focused on progression of sprinting volume and intensity - Find example program online at parkerorthopedics.com
Frequency & Duration	1-2x weekly formal PT, 2-4x weekly exercises with athletic trainer/coach/home
Progression Criteria	Must meet **ALL** criteria prior to progressing into Phase 6: 1. Pass Vail Sport Cord Test: 46/54 2. Achieve an IKDC ≥ 70 3. Y-Balance Test: anterior reach within 4 cm and composite score > 95% 4. Quadriceps/hamstring strength LSI to 90% of non-surgical limb ***AND*** quadriceps strength > 70% peak torque to BW ratio of surgical limb 5. Single leg hop: within 10% of uninvolved limb and > 70% of patient height 6. Single leg triple hop: within 10% of uninvolved limb 7. Double leg broad jump: > 100% of patient height

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Phase VI: Return to Sport

Goals	- Return to sport progression - Athlete to demonstrate improved functional and reactive strength during sport-specific demands - Athlete to begin re-integration to team and team activities
Surgeon's note to patient and physical therapist	When returning to sports, there are three distinct milestones or phases that define recovery from meniscus repair surgery. They are as follows: - Return to sport (partial practice → full practice) - Return to competitive play - Return to prior performance (prior injury level of competition/performance) Each requires several months of continued hard work and striving following achievement of the preceding step. Many athletes, when asked to look at their recovery years after they have returned to performance at a high level, will acknowledge that it was often a year or even two after surgery before they really felt they were the same athlete as they were before their injury. Only a small part of this stage of recovery is physical, often the neuromuscular pathways and psychological effects of an injury like a meniscus tear take far longer to overcome than quad strength.
Suggested Exercises	- Continue to address remaining deficits, focusing on power/RFD and quadriceps strength - Initiation of Interval Sport Program - Sport Specific skills to prepare for participation in practice
Frequency & Duration	As determined between physical therapist, athletic trainer, performance coaches/bridge program, and patient preference
Progression Criteria	- Must see MD for full clearance to return to competitive sports. Return to sport testing including strength and motion analysis will be performed prior to this visit. Our primary goal of return to sport testing is to prevent reinjury to the surgical knee AND injury to the other knee. In young athletes, the risk of another injury to their knee on return to sport can be as high as 30-40%. However, that injury rate after they have been documented as PASSING all return to sport criteria is 5%. Half of all new or re-injuries occur within the first ~70 practices and games, because people just aren't ready.

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