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MPFL Reconstruction Physical Therapy Protocol

The following rehabilitation guidelines and protocol are developed for patients who have undergone MPFL (medial patellofemoral ligament) reconstruction for patellar (kneecap) instability. Any patients who also underwent a bone realignment procedure will have a different protocol. 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 your 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. 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.)

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 create unnecessary stress on the reconstructed ligament, and poor hip adduction/IR strength or hyperpronation of the foot can result in lack of control of the knee.

Patellofemoral joint mechanics

Rehab of the extensor mechanism after patellar stabilization surgery requires understanding how anatomic variants (hip rotation, femoral version), poor lumbo-pelvic-hip control, and quadriceps control deficits can negatively affect the function of the patellofemoral joint. Specific care should be taken to avoid dynamic knee valgus and femoral internal rotation which can cause abnormal loads on the healing graft. Maintenance of neutral lower extremity alignment (anterior superior iliac spine over knee over 2nd toe) should be stressed throughout exercises and functional activities.

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.

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

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

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Phase I: Early Motion/Healing Phase

Goals	- Gain control of pain and diminish joint swelling - Restoration of patellar mobility (suprapatellar/infrapatellar fat pad) - Emphasis on regaining full passive extension as early as possible as well as gradual improvement of passive knee flexion - Increased quadriceps activation and reestablishing quad control - Normalized gait/Weight Shifting – restore independent ambulation
Brace/crutches	**Weightbearing** is <u>as tolerated</u>. However, for the first couple weeks, many patients have tenderness/pain that limits this ability, and so crutches are used and partial weight bearing is typical. Crutches <u>may be discontinued once</u> sufficient quad control is demonstrated. **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> until 20 *excellent* straight leg raises without any extension lag can be performed, at which point it can be discontinued. - Brace can be unlocked (range 0-90) when sitting or non-weightbearing starting post-op day 3 - Brace to be worn at night until released by MD (likely at first postop visit)
Suggested Exercises Suggested Exercises	**ROM** Patellar Mobilizations - Avoid lateral glides Extension ROM - Hamstring/gastroc stretching, etc. - Low load long duration stretching (heel prop) • Patient should be doing extension stretching multiple times daily starting as early as day of surgery Flexion ROM - 0-90 limited until post-op day 14, then progress as tolerated with maintenance of full extension - 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 **Strength** Quadriceps strength/control - NMES – only to be used in 0-10 deg knee flexion for first 2 weeks • To be used with all quad exercises if quad is not effectively or efficiently firing starting week 3 • 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 - Closed chain for quad exercises strongly preferred for first 6 weeks - Standing terminal knee extensions - Floor-based core and glutes work - Hamstring curls – avoid isotonic hamstrings if quad recruitment is poor 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

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	Note on blood flow restriction: 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.
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. Full knee active range of motion: > 0-120 with side to side knee extension difference ≤ 5° 2. Minimal complaints of pain and swelling in the surgical knee 3. Complete 3 sets of 20 repetitions of a straight leg raise with no extension lag 4. Perform single leg balance of the surgical limb on a solid surface for 1 minute (0-20 degrees of knee flexion allowed)

Phase II: Motion and Strengthening

Goals	- Improve single limb strength - Develop strength and stability in all planes of motion under various proprioceptive conditions while focusing on achieving proper trunk, knee, and ankle alignment. - Improve cardiovascular fitness and muscle endurance
Precautions	**Brace** will likely be discontinued provided sufficient quad control is present. Occasionally the patient is transitioned to a patellar stabilizing (tru-pull) style brace
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 – closed kinetic chain exercises** 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 **Balance/proprioception** – neuromuscular training (see note)
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)

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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.

Phase III: Introduction to Landing/Impact, Return to Running	
Goals	- Increase the intensity of training - Improve the strength foundation - Incorporate functional balance activities utilizing muscle strength, proprioception, and UE manipulation - Start progression of running program
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.) **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** (make sure running program is going well – if you can't run straight, cutting/pivoting isn't appropriate at this stage) 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 4x weekly home exercises

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Progression Criteria	Must meet **ALL** criteria prior to progressing into Phase 4: 1. Y-balance testing, single leg hop, single leg triple hop within 10% of uninjured leg 2. Display IKDC score of ≥ 60 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.

Note for Non-Competitive Athletes

For patients who have undergone MPFL reconstruction 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, 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 IV: Return to Sport

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. - Re-integrate into team activities
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 attached/online
Frequency & Duration	1-2x weekly formal PT, 2-4x weekly exercises with athletic trainer/coach/home
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.