



# MPFL Reconstruction Protocol Phase 1

Purpose		Precautions
Maximum Protection	<ul style="list-style-type: none"><li>• NWB w/ crutches for 6 weeks</li><li>• Protect fixation (medial aspect)</li><li>• Increase knee flexion ROM gradually by 10°-15° each week</li><li>• Patellar mobilization (superior, inferior, medial ONLY). NO lateral mobilization</li><li>• No closed chained exercises for 6 weeks</li></ul>	
Typical Time Frame		
0-6 Weeks		
Criteria to Pass		
<ul style="list-style-type: none"><li>• 0°-90° of knee AROM</li><li>• 30 consecutive SLR without lag</li></ul>		
Priority List & Suggested Exercises		
<ol style="list-style-type: none"><li><b>1. Knee Flexion ROM</b><ol style="list-style-type: none"><li>a. Seated knee bend off table, Physioball knee flexion (supine), Heel slides (seated and supine), Wall slides</li><li>b. Patella mobs (inferior glides) ** only if necessary</li></ol></li><li><b>2. Quad Activation (at least 10min of NMES between 1-2 exercises)</b><ol style="list-style-type: none"><li>a. Quad sets with NMES (towel roll, 10sec hold)</li><li>b. SLR with NMES (towel roll &gt; quad set &gt; into SLR &gt; reset)</li><li>c. Kicking into physio ball isometric holds (begin at 90° and progress to 60°) NMES if necessary</li></ol></li><li><b>3. Knee Extension ROM</b><ol style="list-style-type: none"><li>a. Low Load Long Duration: Extension prop, Foot on Ottoman (add weight or ice to all)</li><li>b. Manual Techniques: Passive extension overpressure (add quad set), Patella mobs (superior glides) ** only if necessary</li></ol></li><li><b>4. Lateral and Posterior Chain</b><ol style="list-style-type: none"><li>a. 4-way SLR with (NMES only for forward)</li><li>b. Clamshells</li><li>c. Standing hamstring curl (hamstring curl with surgical side)</li><li>d. Straight leg bridge on ball</li></ol></li></ol>		
Special Considerations		
<ul style="list-style-type: none"><li>• Manage pain with meds</li><li>• Swelling: compression, elevation, ice, retrograde massage</li><li>• NMES: Use with all quad exercises in this phase</li><li>• BFR: use as soon as patient able to get a good quad contraction</li><li>• Incision: inspect frequently to ensure healing and closing</li><li>• Consider aerobic conditioning for HEP throughout all phases to maintain aerobic capacity</li></ul>		

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# MPFL Reconstruction Protocol Phase 2

Purpose	Precautions
Protection	<ul style="list-style-type: none"> <li>• WBAT to full WB with no AD by 8 weeks</li> <li>• Continue patella mobs as needed but cautious with lateral glide</li> </ul>
Typical Time Frame	
6-9 Weeks	

Criteria to Pass
<ul style="list-style-type: none"> <li>• Knee ROM is restored to 80% of the uninvolved knee</li> <li>• SLS x 30sec without LOB</li> <li>• Normal gait pattern without AD and with full terminal knee extension</li> </ul>

Priority List & Suggested Exercises
<ol style="list-style-type: none"> <li><b>Knee Flexion ROM</b> <ol style="list-style-type: none"> <li>Continue Phase 1 exercises (adding sets and reps per discretion)</li> <li>Nu-step &amp; bike (½ revolutions progressing to full)</li> </ol> </li> <li><b>Quad Activation</b> <ol style="list-style-type: none"> <li>4-way SLR (NMES only for forward)</li> <li>TKEs with NMES progression</li> <li>Leg press into physioball with NMES</li> <li>SAQ with NMES progression</li> <li>LAQ with NMES</li> </ol> </li> <li><b>Gait Training</b> <ol style="list-style-type: none"> <li>SLS no UE support &gt; SL balance reaches</li> <li>Gait training without crutches (forward and retro) &gt; progress to sled (pulling and pushing)</li> <li>Low hurdle (reciprocal pattern) &gt; high hurdle (step to) &gt; high hurdle (reciprocal pattern)</li> <li>Calf Raises</li> </ol> </li> <li><b>Knee Extension ROM</b> <ol style="list-style-type: none"> <li>Continue Phase 1 exercises (adding sets and reps per discretion)</li> </ol> </li> </ol>

Special Considerations
<ul style="list-style-type: none"> <li>• Swelling: compression, elevation, ice, retrograde massage</li> <li>• NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ comparable ROM to uninvolved LE</li> <li>• BFR: use as soon as patient able to get a good quad contraction (start at 50% and progress to 80% per patient tolerance and use most of session)</li> <li>• Incision: Should be closed by 6 weeks</li> <li>• Programming: High volume for exercises 2-3 sets of 12-15 reps</li> </ul>

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# MPFL Reconstruction Protocol Phase 3

Purpose	Precautions
<b>Functional Restoration</b>	<ul style="list-style-type: none"> <li>• Avoid exercises that are painful and cause swelling</li> <li>• Don't initiate running</li> <li>• Still avoid aggressive PROM into knee flexion</li> </ul>
<b>Typical Time Frame</b>	
<b>7-11 Weeks</b>	

Criteria to Pass
<ul style="list-style-type: none"> <li>• Knee ROM is restored to 90% of the uninvolved knee in supine</li> <li>• Ascend/descend stairs reciprocal pattern without pain or UE assist</li> <li>• 5 steps ups (10" step)</li> <li>• 5 lateral step downs (8" step)</li> <li>• Squat symmetrically to 90°</li> <li>• Y balance reach 80% of uninvolved side without hip strategy</li> </ul>

Priority List & Suggested Exercises
<p><b>1. Knee Flexion ROM</b></p> <ul style="list-style-type: none"> <li>a. Continue Phase 2 exercises (adding sets and reps per discretion)</li> <li>b. Manual: Knee flexion with manual tibial internal rotation</li> <li>c. Mobility: Prone quad stretch, Knee Circles</li> <li>d. AAROM: Shuttle press, TRX squat</li> </ul> <p><b>2. Anterior Chain Strength</b></p> <ul style="list-style-type: none"> <li>a. Continue SAQ and/or LAQ with NMES and isometric knee extension at 60°</li> <li>b. Isotonic leg extension (ankle weight &gt; cable resistance)</li> <li>c. Wall sit progression</li> <li>d. Heavy banded TKEs/Shuttle Press TKEs</li> <li>e. SL Shuttle press</li> </ul> <p><b>3. Functional Strength</b></p> <ul style="list-style-type: none"> <li>a. Squat progression</li> <li>b. Step ups progression</li> <li>c. LSD progression</li> </ul> <p><b>4. Posterior Chain Strength</b></p> <ul style="list-style-type: none"> <li>a. Bridge progression</li> <li>b. Hamstring curls progression</li> <li>c. Quadruped hip extension over bench holds</li> <li>d. Double leg hip thruster holds</li> <li>e. SL RDL reaches</li> <li>f. Calf raise variations</li> </ul> <p><b>5. Lateral Chain Strength</b></p> <ul style="list-style-type: none"> <li>a. Clamshells &gt; Side lying abduction</li> <li>b. Stork stance holds</li> <li>c. Sidelying shuttle press</li> <li>d. Hip hike holds &gt; hip hike reps</li> </ul>

Special Considerations
<ul style="list-style-type: none"> <li>• BFR: Continue to use in the earlier part of PT session</li> <li>• NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ = ROM to uninvolved LE</li> <li>• Motor Control: If there is still a difference between AROM/PROM focus on end range strengthening and isometrics</li> <li>• Programming: <ul style="list-style-type: none"> <li>◦ High Volume Exercises 2-3 sets of 12-15 reps</li> <li>◦ 3:1:1 anterior chain to posterior chain to lateral chain strengthening ratio</li> <li>◦ Complete 1x25 reps on uninvolved leg for anterior chain exercises and same sets/reps for posterior and lateral chain</li> </ul> </li> </ul>

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# MPFL Reconstruction Protocol Phase 4

Purpose		Precautions
Progressive Overload	<ul style="list-style-type: none"> <li>• Avoid exercises that are painful and cause swelling</li> <li>• Don't initiate running</li> </ul>	
Typical Time Frame		
10-16 Weeks		
Criteria to Pass		
<ul style="list-style-type: none"> <li>• Knee ROM is restored to 95% of the uninvolved knee</li> <li>• Y balance reach 95% of uninvolved side without hip strategy in supine</li> <li>• 30 lateral step downs (8" step, back flat against wall) with no hip compensation</li> </ul>		<ul style="list-style-type: none"> <li>• 25 SL bridges on bench (knee bent at 20 degrees)</li> <li>• 25 SL calf raises (10% incline to 60bpm metronome)</li> <li>• 25 SL squats to box (20") with minimal trunk flexion</li> </ul>
Priority List & Suggested Exercises		
<b>1. Knee Flexion ROM</b> <ul style="list-style-type: none"> <li>a. Continue previous PROM &amp; AAROM exercises</li> <li>b. Tibial rotations</li> <li>c. Couch Stretch, Prone quad stretch</li> </ul>		<b>3. Functional Strength</b> <ul style="list-style-type: none"> <li>a. LSD progression</li> <li>b. Forward step down progression</li> <li>c. SL squat progression</li> </ul>
<b>2. Anterior Chain Strength</b> <ul style="list-style-type: none"> <li>a. DL machine extension holds at 0 Degrees &gt; SL holds</li> <li>b. DL extension &gt; SL extension</li> <li>c. Sled Pulls/Pushes</li> <li>d. Kickstand Squat at wall &gt; Goblet squat</li> <li>e. Eccentric Shuttle press (up with 2, down with 1)</li> </ul>		<b>4. Posterior Chain Strength</b> <ul style="list-style-type: none"> <li>a. Hip thruster progression</li> <li>b. RDL progression</li> <li>c. Hamstring curl progression</li> <li>d. Calf raise variations</li> </ul>
		<b>5. Lateral Chain Strength</b> <ul style="list-style-type: none"> <li>a. Lateral squat progression</li> <li>b. Stork stance banded reps</li> <li>c. Lateral band walks/skaters</li> <li>d. Side plank progression</li> </ul>
Special Considerations		
<ul style="list-style-type: none"> <li>• BFR: Continue to use in the earlier part of PT session</li> <li>• NMES: Use for at least 10 minutes until patient can perform unweighted SAQ and LAQ = ROM to uninvolved LE</li> <li>• Motor Control: If there is still a difference between AROM/PROM focus on end range strengthening and isometrics</li> <li>• Programming: <ul style="list-style-type: none"> <li>◦ 3 sets of 6-12 reps with anterior and functional exercises focusing on strength</li> <li>◦ 3:1:1 anterior chain to posterior chain to lateral chain strengthening ratio</li> <li>◦ Tempo: 4-1-2 w/ emphasis on eccentric control</li> <li>◦ Complete 1x25 reps on uninvolved leg for anterior chain exercises and same sets/reps for posterior and lateral chain</li> </ul> </li> </ul>		

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# MPFL Reconstruction Protocol Phase 5

Purpose	Precautions
Intro to Impact	<ul style="list-style-type: none"> <li>• Avoid exercises that are painful and cause swelling</li> <li>• Don't initiate running until patient has passed the criteria below for return to jogging</li> </ul>
Typical Time Frame	
14-20 Weeks	

## Criteria to Pass

### To Begin Jogging: (Use Strengthlevel.com)

- 12 reps at 70% of Novice Goblet Squats
- 12 reps at 70% of Novice Forward Lunges
- 12 reps at 70% of Novice DB RDLs
- <30% quad strength deficit for average force with Isometric testing at 60° knee flexion
- 15 SL hops in place w/ good load acceptance & landing in same spot

### To Move Onto Phase 6:

- ATHLETES: Run 1mi w/o limping
- GENERAL POP: Jog 5min w/o limping
- Sprint w/o compensation
- Land symmetrical <10% difference w/ 5 squat jumps on Force Plates
- Decel efficiently in the sagittal plane

## Priority List & Suggested Exercises

### 1. Anterior Chain Mobility

- Dip Bar Assisted Slant Board Squat > Slant Board Squat > Dip Bar Assisted exaggerated Split Squat on step > No step > No Dip Bar Assist

### 2. Anterior Chain Strength

- Split Squat Isometric Hold (Yoga Block Cue)
- DL machine extension holds at 0 Degrees > SL holds
- DL machine extension > SL machine extension
- Shuttle Press Variations

### 3. Functional Strength

- Loaded goblet squat progression
- Lunge progression
- Loaded step up variations
- Loaded LSD & Forward step downs

### 3. Agility/Impact

- Agility ladder (basic coordination)
- Mini hops > Jogging progression > hop & stop > UE assisted treadmill intervals
- Deceleration: snap down progression > cable decels > multiplanar hops > ladder decels > change of pace > stop & goes
- Jump progression

### 4. Posterior Chain Strength

- Hamstring curl progression
- Hip thruster progression
- Deadlift/RDL variations
- Nordic progression
- Calf raise variations

### 5. Lateral Chain Strength

- Lateral squat variations
- Copenhagens
- Anti-rotation and balance training

## Special Considerations

- Stretching: Continue quad stretching (prone quad and couch stretch)
- Quad Strength: Constant focus to improve quad strength and decrease quad deficit
- Isometric Testing: Quad strength testing at 60°
- Programming:
  - 2:1:1 anterior chain to posterior chain to impact exercises
  - Increase sets to 4 with reps 6-12 specifically for anterior and functional exercises
  - No > 2-3 sets of 3-5 reps for agility/impact exercises
  - Once patient has started to jog begin same sets/reps for all exercises on uninvolved LE



# MPFL Reconstruction Protocol Phase 6

Purpose	Precautions
Deceleration	<ul style="list-style-type: none"> <li>Don't initiate cutting until patient has passed the criteria below for return to cutting</li> </ul>
Typical Time Frame	
5-6 Months	

## Criteria to Pass

### To Begin Cutting: (Use Strengthlevel.com)

- 8 reps at 80% of Intermediate Goblet Squats
- 8 reps at 80% of Intermediate Forward Lunges
- 8 reps at 80% of Intermediate DB RDLs
- <20% quad strength deficit for average force with isometric testing at 90° knee flexion

### To Move Onto Phase 7:

- SL hop test >80% LSI with average of 3 trials
- <20% deficit for Deceleration RFD and Peak Force with landing w/ SL Countermovement Jump on Force Plates

## Priority List & Suggested Exercises

### 1. Agility/Impact

- Medicine ball drops
- Weighted hops > 3-way hurdle hop
- Hop over hurdle in sagittal plane > hurdle hop into lateral plane
- Hop over hurdle (lateral plane) > transition hops
- Lateral shuffles, reactive cutting, pro agility drill, T-test drill
- Cutting footwork drill > cone cutting > reactive cone cutting

### 2. Anterior Chain Strength

- Heavy SL machine extension
- Advanced Shuttle Press variations
- Leg Extensions on Excentric
- Squat Variations

### 3. Functional Strength

- Continue with Phase 5 exercises
- Add more load to functional movements
- Excentric: squat, split squat

### 4. Posterior Chain Strength

- Hamstring curl progression
- Hip thruster progression
- Deadlift/RDL variations
- Nordic progression
- KB swings
- Calf raise variations

### 5. Lateral Chain Strength

- Lateral step ups
- Lateral squat variations
- Excentric: lateral lunges
- Rotational deadlifts

## Special Considerations

- Icing & Stretching: At the end of session or at home; Continue prone quad & couch stretch)
- Programming:
  - No > 3-4 sets of 3-5 reps agility
  - 2:1 Power to Strength ratio
  - Undulated Loading Model: Example: Mon - Mod intensity; Wed - High intensity; Fri - High volume
  - Rest Days: At least 3 days off
  - Tempo: 0-0-0 Decelerate the load and transition to acceleration as fast as possible
  - Plyometrics should be done prior to strengthening in order to avoid fatigue
  - Once patient can tolerate advanced plyometrics for multiple sets/reps without pain and with good form you can begin supersetting strength with power
- Conditioning: Begin through cross training on elliptical, bike, rower, jogging



# MPFL Reconstruction Protocol Phase 7

Purpose		Precautions
Return to Sport		
Typical Time Frame		
6 Months +		
Criteria to Pass		
<ul style="list-style-type: none"><li>• SL hop test &gt;95% LSI with average of 3 trials</li><li>• Triple hop test &gt;95% LSI with average of 3 trials</li><li>• &lt;10% quad strength deficit for average force with isometric testing at 90° knee flexion</li></ul>		<ul style="list-style-type: none"><li>• Girth measurements of the quad within 1 cm of non-surgical limb</li><li>• Score of 48 or &gt; on the Injury-Psychological Readiness to Return to Sport (I-PRRS) Questionnaire</li></ul>
Priority List & Suggested Exercises		
<p><b>1. Agility/Impact</b></p> <ul style="list-style-type: none"><li>a. Continue with phase 6 agility/impact exercises until performing proficiently</li><li>b. Depth jump progression</li></ul> <p><b>2. Complex Training: Compound Exercise at 80% 1RM (4 reps) followed by a plyometric jump exercise that mimic the same motor pattern (3 reps); 3-6 sets</b></p> <ul style="list-style-type: none"><li>a. <b>Anterior Chain Complex Example:</b> Front Squats followed by Squat Jumps</li><li>b. <b>Posterior Chain Complex Example:</b> Barbell RDLs followed by KB Swings</li><li>c. <b>Lateral Chain Complex Example:</b> Lateral Lunges &gt; Skaters</li></ul>	<p><b>3. Contrast Training</b></p> <ul style="list-style-type: none"><li>a. Perform a maximal or near maximal lift (90-97% 1RM) followed by a drop set performed at 50-70% 1RM. Perform at maximal velocity.</li></ul> <p><b>4. French Contrast Training</b></p> <ul style="list-style-type: none"><li>a. 4 exercises performed in succession</li><li>b. Heavy compound exercise (80-90% 1RM) 1-4 reps</li><li>c. Plyometric jump 3 reps</li><li>d. Drop set or weighted jump (30% 1RM) 3 reps</li><li>e. Accelerated jump (usually band assisted) 2-3 reps</li></ul>	
Special Considerations		
<ul style="list-style-type: none"><li>• Icing: At the end of session or at home</li><li>• Prioritize Recovery: 2-3 days off/wk</li><li>• Training Scheme: Master complex training &gt; contrast training &gt; french contrast training</li><li>• Patients should have about 1 month of sport specific movements before beginning contact. Build confidence with stopping, cutting, training, game like movements/plays, etc.</li><li>• Contact should be progressed per therapist discretion during practice. Basketball Example: Contact Drills &gt; 3v3 &gt; 2v2 &gt; 1v1 &gt; 5v5</li><li>• Continue building isolated quad strength and explosive movements</li><li>• Ramp up conditioning specific to sport</li></ul>		

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