KNEE PATELLOFEMORAL PAIN NON-OPERATIVE GUIDELINES

The following non-operative patellofemoral (PF) guidelines were developed by HSS Rehabilitation and are categorized into four phases, dependent on patient presentation and symptom irritability. Classification and progression are both criteria-based and individualized, to be determined by the clinician’s evaluation and significant diagnostic findings. Phases and time frames are designed to give the clinician a general sense of progression. Identification of phase and progression is evaluation based, allowing the practitioner to deem what treatment is most appropriate. The clinician should balance appropriate interventions for the optimization of functional activities, while considering symptom irritability and the resolution of impairments. Additionally, progression through the phases and the maximum achievable phase should be in alignment with patient goals. Note that pathology and/or structural deficits may affect the patient’s ideal level of activity.
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Phase 1: Activity Modification

PRECAUTIONS

- Be mindful of yellow flags such as effusion and red flags such as multi-joint symptoms
- Avoid exercises and activities that are painful and/or exacerbate symptoms
- Significant gait deviations

ASSESSMENT

- Lower Extremity Functional Scale (LEFS)
- Kujala
- Numeric pain rating scale (NPRS)
- Rule out lumbar spine
- Effusion
- Standing posture
- Single leg stance (pain, time, quality)
- Gait and transfers
- Patella mobility/apprehension AROM/PROM
- Quadriceps contraction
- Strength - MMT (proximal, distal, knee as tolerated)
- Flexibility (1 and 2 joint muscles: hip flexors, hamstrings, quadriceps, gastrocnemius/soleus)
- Address shoe type and inserts, if applicable

TREATMENT RECOMMENDATIONS

- Patient education
  - Understanding PF loads
  - Improved neuromuscular control/muscle activation
  - Standing posture
  - Deficits identified and plan of care including goals
  - Activity modification to decrease or eliminate pain
  - Movement strategies (importance of hip strategy versus knee strategy)
  - Management of pain and effusion

- Modalities
  - Pain, swelling: e.g., ice, compression, TENS
  - Strength: Russian stimulation, biofeedback
  - Consider Blood Flow Restriction (BFR) for muscle activation/strengthening

- Lower extremity (LE) soft tissue and joint mobility
- Knee P/AA/AROM without increasing irritability
• Knee isometric strengthening as tolerated
• Core stabilization
• Proximal and distal strengthening
• Proximal and distal stretching as tolerated
• Cardiovascular exercise (see Appendix 1- Cardiovascular exercises)
• External supports, as needed (bracing or taping)
• Gait training with appropriate assistive device if needed

CRITERIA FOR ADVANCEMENT
• Active quadriceps contraction
• No gross effusion at knee
• No or minimal pain at rest
• Pain controlled with ambulation on level surfaces with appropriate assistive device
• If while following recommendations fails to demonstrate improvement in 4 visits or 2 weeks, refer to MD

EMPHASIZE
• Patient understanding of condition/PF loading
• Control pain and effusion/inflammation
• Pain-free exercise and activities
• Normalize gait with appropriate assistive device
• Active quadriceps contraction
KNEE PATELLOFEMORAL PAIN NON-OPERATIVE GUIDELINES

Phase 2: Addressing Impairments/Building Foundation of Strength

PRECAUTIONS

- Sign/symptom provocation: pain during or after activity, joint effusion, active inflammation, quadriceps shutdown
- Avoid activities that cause pain or inflammation

ASSESSMENT

- LEFS
- Kujala
- NPRS
- Rule out lumbar spine (if not previously done)
- Verify absence of effusion
- Standing posture
- Single leg stance
- Gait (see Appendix 2)
- Movement strategy (squat, forward step up/step down)
- PROM/Flexibility assessment
- Manual muscle tests (MMT)
- Patella mobility/apprehension
- Address shoe type and inserts, if applicable

TREATMENT RECOMMENDATIONS

- Patient education
  - Progress to performance of modified function (0/10 pain with ADLs and non PT specific exercise e.g. cardiovascular)
  - Reinforce compliance with updated HEP
  - Movement strategy
- Continued external supports (bracing, taping, shoe inserts)
- Address flexibility and ROM deficits
  - Massage therapy
  - Soft tissue mobilization
  - Foam rolling
  - Stretching
  - Joint mobilization, as needed (patella, ankle, hip)
• Neuromuscular control, bilateral progressing to single limb balance
• Proximal muscle activation and limb alignment in single limb (see Appendix 3)
• Knee control and distal alignment in single limb
• Hip strategy during functional movements
• Strengthening (see Appendix 3)
  o Core
  o Hip and gluteal
  o Quadriceps
  o Ankle and foot
• Cardiovascular training (see Appendix 2)

CRITERIA FOR ADVANCEMENT
• Pain free with modified activities and ADLs
• Able to stand on 1 leg with good alignment and control
• Able to demonstrate a hip strategy
• Able to perform pain free 6” step up
• Intermittent pain
• Normalized gait on level surfaces

EMPHASIZE
• Progress home exercise program
• Compliance with activity modification
• Effusion, inflammation and pain control
• Good neuromuscular control/alignment with single limb support
• Monitor onset of new pain/symptoms
• Continue work on soft tissue self-mobilization
KNEE PATELLOFEMORAL PAIN NON-OPERATIVE GUIDELINES

Phase 3: Restoration of Function

PRECAUTIONS
• Too much, too soon: monitor volume and load
• Avoid compensatory movement strategies
• Monitor movement strategies during fatigue situations
• Avoid inadequate rest and recovery
• Avoid inadequate strength to meet demands of activity level
• Ensure that underlying pathology is conducive to long term loading and will optimize joint preservation

ASSESSMENT
• Kujala
• NPRS
• Effusion
• Dynamic single leg alignment and control
• Gait in various conditions
• Movement strategy (squat, forward step up 6-8”/step down 6-8”, single leg squat)
• Effects of fatigue on movement patterns, quality and/or pain
• Functional strength: as for movement strategy above
• MMT
• PROM/Flexibility assessment
• Address ongoing efficacy of external supports (brace, shoe inserts, tape)

TREATMENT RECOMMENDATIONS
• Patient education
  o Functional progression
  o Adequate rest and recovery
• Functional strength
  o Squat progression
  o Eccentric progression
• Progression of body weight exercise
  o Double leg to single leg exercise
  o Deadlift to single leg deadlift
• Neuromuscular control
• Cardiovascular training via low/non-impact activities such as elliptical, bike etc.
• Hydrotherapy if available (see Appendices 2, 4 and 5- hydrotherapy)
• Evaluation based strengthening progression
  o Core
  o Gluteals
  o Quadriceps (closed chain in pain free arc)
• Flexibility/mobility

CRITERIA FOR DISCHARGE OR ADVANCEMENT TO PHASE 4 (IF RETURNING TO SPORT)
• Independent control of symptoms
• Pain free with modified activities and ADLs
• Able to demonstrate bilateral body weight squat with proper alignment and control
• Able to descend a 6-8” step with good control and alignment (depending upon patient’s height)
• Discharge to long term HEP and modified activity or progress to Phase 4 if patient wants to return to dynamic activities or sport

EMPHASIZE
• Progression of pain free PF loading
• Eccentric quadriceps control
• Quality with functional activities
KNEE PATELLOFEMORAL PAIN NON-OPERATIVE GUIDELINES

Phase 4: Return to Play/Dynamic Activities

PRECAUTIONS

- Too much, too soon: monitor volume and load
- Avoid compensatory movement strategies
- Monitor movement strategies during fatigue situations
- Avoid inadequate rest and recovery
- Avoid inadequate strength to meet demands of activity level
- Ensure that underlying pathology is conducive to long term loading and will optimize joint preservation

ASSESSMENT

- LEFS
- Kujala
- NPRS
- Effusion
- Dynamic single leg alignment and control
- Gait in various conditions
- Movement strategy (squat, forward step up 6-8”/step down 6-8”, single leg squat)
- Effects of fatigue on movement patterns, quality and/or pain
- Functional strength: as above
- MMT
- PROM/Flexibility assessment
- Address ongoing efficacy of external supports (brace, shoe inserts, tape)

TREATMENT RECOMMENDATIONS

- Increase volume and PF load to mimic load necessary for return to activity
- Introduce movement patterns specific to patient’s desired sport or activity
- Introduction of light agility work (see Appendix 5)
- Increase cardiovascular load to match that of desired activity
- Consider collaboration with ATC, performance coach/strength and conditioning coach, skills coach and or personal trainer for complex sports specific movements if available
CRITERIA FOR DISCHARGE

- Ensure that there is a plan in place for a graded return to full or modified activity based on patient’s maximal therapeutic activity (e.g. ATC, skills coach, CSCS)

EMPHASIZE

- Progression of pain free PF loading
- Eccentric quadriceps control
- Quality with functional activities
APPENDIX 1: PHASE 1

- Cardiovascular exercises
  - UBE
  - Airdyne® or stationary bike
  - Swimming (use of pool buoy and avoidance of breaststroke)

APPENDIX 2: COMMON GAIT DEVIATIONS

- Lack of knee control resulting in knee hyperextension during stance
- Femoral internal rotation, valgus and/or increased pronation during stance
- Femoral internal rotation during swing
- Medial heel whip during swing
- Increased pelvic rotation with decreased hip extension

APPENDIX 3: PHASE 2 TREATMENT RECOMMENDATIONS

- For proximal muscle activation in single limb
  - Weight shifting medial/lateral, anterior/posterior to single limb stance
  - Proprioceptive board/wobble board
  - Contralateral hip extension and/or abduction
  - Hip hiking
  - Retro walking on treadmill or over ground
  - Single leg isometric leg press with slight knee flexion at less than body weight

- Emphasize hip strategy for movement
  - Initiate and continue to drive movement with the hips, e.g. hip hinging, butt taps

- Core strengthening
  - Transverse abdominis activation in hook lying
  - Pallof press
  - Front planks
  - Side planks

- Gluteal strengthening
  - Bridge progression
  - Side lying hip abduction with ankle weight
  - Prone hip extension with ankle weight
  - Clamshell
• Closed chain quadriceps strengthening
  o Double limb to single limb leg press at less than bodyweight
• Progress body weight strengthening (start with double limb support). Consider continued use of BFR to address continued muscle activation or strength deficits.
  o Squat into chair
  o Romanian dead lifts
  o Band walks
  o Step ups
  o Step downs
• Ankle and foot
  o Heel raises
  o Intrinsic foot exercises
• Cardiovascular training
  o Increase volume before intensity (e.g. increase time before resistance)
  o Bicycle 80 RPM
  o Swimming, progress from pool buoy
  o Walking program
• Hydrotherapy
  o Address gait deviations (forward, retro ambulation)
  o Strengthening: sidesteps, standing leg lifts with ankle weights, double limb squats, step ups, standing hip/knee extension with noodle under foot, calf raises (if applicable utilizing laminar flow to provide resistance)
  o Balance: single limb stance activity with UE/LE movements
  o Core stability: noodle push downs, med ball trunk rotation
  o Flexibility: address patient flexibility needs

APPENDIX 4: PHASE 3 TREATMENT RECOMMENDATIONS
• Hydrotherapy
  o Progress step ups, step downs, prone hip kicking (flutter, hip abduction/adduction), single limb squats, lunges, progress intensity of single limb activity against laminar flow, initiate light aquajogging

APPENDIX 5: PHASE 4 TREATMENT RECOMMENDATIONS
• Light agility: ladder, jump rope, Alter G® if able at low intensity and low volume
• Hydrotherapy
  o Plyometrics: double and single leg jumps, jumping jacks, split stance hops, lateral push-offs, cariocas, sprinting to test patient tolerance for return to sports activity
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References


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