South Shore Hospital

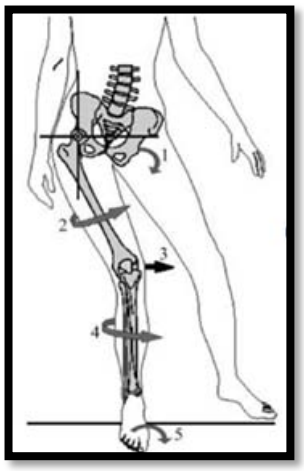
Orthopedic, Spine and Sports Therapy

Patellofemoral/Chondromalacia Protocol

Anatomy and Biomechanics

The knee is composed of two joints, the tibiofemoral and the patellofemoral. The patellofemoral joint is made up of the patella (knee cap) and the groove of cartilage on the femur in which it sits. The purpose of the patella and the patellofemoral joint is to allow for greater force development through the quadriceps muscle by creating a fulcrum mechanism as the knee is extended. This joint is subject to tremendous forces when the knee is repetitively loaded in flexion and extension during sports and physical activity.

Normally the knee cap slides up and down following the natural track of the groove in the middle of the femur. When the knee cap fails to slide up and down evenly in the groove this can create irritation of the cartilage on the underside of the knee cap. There are many potential reasons as to why the patella would not accurately track within its groove. One reason is the alignment of the bones of the leg and foot. Subtle abnormalities in alignment and boney structure can cause the patella to sit in a position in which it will create uneven pressure and wear within the groove.



Another potential cause of increased load on the joint is improper pull and tension from the connective tissue that surrounds the joint and the muscles that control the movement of the patella. Tight structures surrounding the patella can cause it to slide toward the outside of its groove when the quadriceps is contracted. These tight structures also cause the patella to be compressed into the groove as it slides up and down. Imbalance in strength between the four heads of the quadriceps and weakness throughout the muscles of the hip can also cause the patella to be improperly positioned during weight bearing activities.

When the cartilage on the under surface of the knee cap has been continually irritated for a long period of time it can begin to wear down and degenerate. This condition is known as chondromalacia of the patella. This degeneration may be responsible for the crunching and grinding noise heard in some patients when the knee is bent and straightened. When significant chondromalacia is present this may undermine the knee's ability to respond well to conservative treatments.

Treatment Options

The severity, and resulting pain and dysfunction, of patellofemoral syndrome and chondromalacia varies greatly in patients that are affected by it. In each case the physician and his or her staff evaluates the individual case and determines the best plan of care for the patient. A period of rest followed by activity modification may be enough to fix some cases. Use of anti-inflammatory medication and ice may also be recommended. Active patients may be recommended to wear a brace that supports the knee cap during activity. The physician and his or her staff may also ask the patient to undergo a course of physical therapy to address the underlying mechanical causes of patellofemoral joint stress. If conservative measures are unsuccessful in reducing pain and restoring function your physician may discuss the potential need for arthroscopic surgery in rare cases. **Recovery time from this injury is different in each case**. Your individual time table for return to activities will be discussed by your physician and or physical therapist.

Relative Rest

Regardless of the specific mechanism (alignment, weakness, etc) patellofemoral syndrome is always caused by the overloading of the patellofemoral joint. As the pain, inflammation and underlying cause of the patellofemoral syndrome are treated the physician and/or physical therapist will likely recommend that the patient refrain from participation in the activities that most provide stress to injured joint. This does not always mean that the patient must stop all exercise. There are often forms of exercise in which patellofemoral forces are reduced enough to allow for the patient to continue to exercise while recovering. The patient should consult with the physician and/or physical therapist to determine individualized exercise guidelines and restrictions.

Rehabilitation Philosophy

Physical therapy is often recommended for treatment of pain and dysfunction associated with patellofemoral syndrome and chondromalacia of the patella. The physical therapist will evaluate the patient's mobility, flexibility and strength with the purpose of determining the underlying cause of the abnormal stress on the patella. The patient will be counseled on which activities he or she can safely continue and which should be avoided. The physical therapist will teach the patient the proper exercises to reduce patellofemoral stress. In most cases this will include strengthening muscles about the hip and knee that are weak and stretching ones that are tight.

Rehabilitation

****The following is an outlined progression for rehab. Advancement from phase to phase as well as specific exercises performed should be based on each individual patient's case and sound clinical judgment by the rehab professional. ****

Phase 1 (Acute Phase)

Goals

Control Pain and Inflammation
Begin Pain Free Flexibility Exercises
Establish Quadriceps Activation
Establish Pain Free Knee ROM

Recommended Exercises

Range of Motion and Flexibility

- Cycle with Minimal Resistance (if pain free)
- Heel Slides (in pain free arc)
- Lower Extremity Stretching (based on individual assessment)
  - Rectus Femoris
  - IT Band
  - Hamstring
  - Hip Rotators
  - Gastroc

Strength

- Quad Sets (intensity and flexion angle guided by pain)

Guidelines

Perform range of motion exercises daily. Do 2-3 sets of 15-20 Reps. Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.

Phase 2 (Sub-acute Phase A)

Goals

Continued Protection of Injured Joint
Continue to Improve Flexibility
Begin to Strengthen Areas of Weakness/Instability

Recommended Exercises

Range of Motion and Flexibility

- Cycle (slow progression of resistance)
- Continue Flexibility From Phase 1

Strength

- Begin Open Chain Strengthening (based on strength assessment)
  - Knee Extension (SAQ, If painful use LAQ in painfree arc)
  - Straight Leg Raise
  - Hip Abduction
  - Hip Extensors
  - Hip External Rotators
  - Hamstring Curls

Guidelines

Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
Cardio program should be performed no more that 3-5 times a week for 20-35 minutes.
Perform strengthening exercises daily. Do 2-3 sets of 15-20 Reps.

Phase 3 (Sub-acute Phase B)

Goals

Continue to Avoid Exacerbation of Symptoms
Continue to Maximize Return of Strength and Flexibility
Establish Closed Chain Strength and Stability

Recommended Exercises

Range of Motion and Flexibility

- Continue Cycle
- Continue Lower Extremity Stretching from Phase 1 and 2

Cardio

- Cycle with Progressive Resistance
- Elliptical (if pain free)
- Swimming

Strengthening

- Continue Progression of Open Chain Program with Ankle Weights
- Can Add Gym Equipment (Leg Press, Ham Curl, Multi-Hip)
- Squats to 90^{o} (Stress Pain Free Range and Proper Frontal/Sagittal Plane Mechanics)
- Step Up Progressions (Forward Step Ups, Lateral Step Ups) *Forward Step Downs are not recommended due to increased patella femoral load*
- Pain Free Closed Chain Hip Strengthening

Guidelines

Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
Cardio program should be performed no more that 3-5 times a week for 20-45 minutes.
Perform strengthening exercises 3 times a week. Do 2-3 sets of 15-20 Reps.

Phase 4 (Return to Sport/Activity Phase)

Goals

Continue to Avoid Patella Femoral Overload
Progress with Single Leg Strengthening
Achieve Adequate Strength and Flexibility to Return to Activity

Recommended Exercises

Flexibility

Continue Daily Stretching

Cardio

Continue Cycle, Elliptical, Swimming

Return to Running Progression (outlined by Physician or Physical Therapist)

Strengthening

Continue SLR Program and Gym Equipment Progression

Continue Step-Up Progressions (lateral step-ups, cross over step-ups) *Forward Step Downs are not recommended due to increased patella femoral load*

Static Lunge

Lateral Lunge

Progressive Single Leg Strengthening (single leg squat, split squat, single leg dead lift)

Return to Sport

Work with Physician or Physical Therapist to Outline Progressive Return to Sport

Guidelines

Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
Cardio program should be progressed in preparation for return to sport.
Perform strengthening exercises 3 times a week. Do 2-3 sets of 15-20 Reps.

Phase	Emphasis	Recommended Exercises	Guidelines
Phase 1 Acute Phase	*Control Pain and Inflammation *Re-establish Normal ROM *Establish Quadriceps Activation *Begin Pain Free Flexibility Program	**ROM and Flexibility** Cycle (if pain free motion) Heel Slides (in pain free arc) Lower Extremity Stretching • Rectus Femoris • IT Band • Hamstring • Hip Rotators • Gastroc *based on individual assessment **Strength** Quad Sets *intensity and flexion angle guided by pain	*ROM Daily 2-3 sets of 15-20 Reps *Stretching Program Daily 2-3 Repetitions of 30 Seconds
Phase 2 Sub-acute Phase A	* Continued Protection of Injured Joint *Continue to Improve Flexibility *Begin to Strengthen Areas of Weakness/Instability	**ROM and Flexibility** Cycle (slow progression of resistance) Continue Flexibility From Phase 1 **Strength** Begin Open Chain Strengthening • Knee Extension (SAQ, If painful use LAQ in painfree arc) • Straight Leg Raise • Hip Abduction • Hip Extensors • Hip External Rotators • Hamstring Curls *based on individual assessment	* Stretching Program Daily 2-3 Repetitions of 30 Seconds *Cardio program should be performed no more that 3-5 times a week for 20-35 minutes. *Perform strengthening exercises daily 2-3 sets of 15-20 Reps
Phase 3 Sub-acute Phase B	* Continue to Avoid Exacerbation of Symptoms *Continue to Maximize Return of Strength and Flexibility *Establish Closed Chain Strength and Stability	**Flexibilty** Continue Lower Extremity Stretching from Phase 1 and 2 **Cardio** Cycle with Progressive Resistance Elliptical (if pain free) Swimming **Strengthening** Progress OKC Program with Ankle Weights Can Add Gym Equipment Squats to 90^{o} (Stress Pain Free Range) Step Up Progressions (Forward Step Ups, Lateral Step Ups) *Forward Step Downs are not recommended due to increased patella femoral load* Pain Free Closed Chain Hip Strengthening	* Stretching Program Daily 2-3 Repetitions of 30 Seconds *Continue to Stress Proper Gait * Cardio program should be performed no more that 3-5 times a week for 20-45 minutes. *Perform strengthening exercises 3 times a week 2-3 sets of 15-20 Reps.

Phase 4 Sport Specific Phase	* Continue to Avoid Patella Femoral Overload *Progress with Single Leg Strengthening *Achieve Adequate Strength and Flexibility to Return to Activity	**<u>Flexibility</u>** Continue Daily Stretching **<u>Cardio</u>** Cycle, Elliptical, Swimming Begin Return to Running Progression **<u>Strengthening</u>** Continue OKC Program Continue Gym Equipment Progression Continue Step-Up Progressions (lateral step-ups, cross over step-ups) *Forward Step Downs are not recommended due to increased patella femoral load* Static Lunge Lateral Lunge Progressive Single Leg Strengthening (single leg squat, split squat, single leg dead lift) **<u>Return to Sport</u>** Outlined by PT or MD	* Stretching Program Daily 2-3 Repetitions of 30 Seconds *Cardio program should be progressed in preparation for return to sport. *Perform strengthening exercises 3 times a week. Do 2-3 sets of 15-20 Reps

***Reviewed by Michael Geary, MD**