PATELLO-FEMORAL SYNDROME/JUMPERS KNEE REHABILITATION PROTOCOL

Patello-femoral pain (PFP) is the most common knee disorder. It is particularly common among adolescent girls and active individuals. The patient commonly presents with anterior knee pain that worsens with stairs, prolonged sitting/flexion, and kneeling or squatting activities. Common complaints are pain when attempting to rise after sitting and watching a movie or after a long drive. The patient may also experience swelling after activities and may complain of a “popping” sensation with ambulation.

The patella functions to aid in knee extension by acting as a pulley system to increase the angle of the moment arm of the quad tendon. Normally, as the knee flexes from 25-130° and the patella moves along the trochlear groove, it tilts medially approximately 11° and laterally rotates 6-7°. If normal patellar motion is restricted or excessive, the patella can translate out of its groove and degeneration of the patellar facets can occur. This can lead to significant pain and dysfunction. Predisposing factors that can lead to alteration in normal patello-femoral movement can include the following: trauma, osteochondritis dissecans, malalignment, tightness of the hamstring, IT band or lateral retinacula, external tibial torsion, weakness or delayed firing of the VMO, and increased Q angle.

Various conservative measures can and should be taken when addressing PFP including exercise for stretching and strengthening, bracing, taping, and orthotics. All should be considered when evaluating the patient and issuing treatment. If exercise is prescribed, the primary focus should be on quad retraining and strengthening. Biofeedback and muscle stim are helpful tools to regain neuro-muscular quad control. VMO activity is critical due to its angle of insertion and resultant pull on the patella. Studies utilizing normalized EMG values have shown that no specific exercises can be utilized to preferentially recruit the VMO over other parts of the quad. Because of this, a generalized quad strengthening program is in order.

The therapist needs to be aware of the knee angles that increase joint reaction forces on the PF joint. For closed kinetic chain activities such as the leg press, maximum joint reaction forces occur when contact between the patello-femoral surfaces is the greatest (60-90°). On the other hand, maximum joint reaction forces during open kinetic chain activities such as knee extension occur when contact between patello-femoral surfaces is the least (30-0°). With increased knee flexion, there is a concomitant increase in contact area between the patella and femur. This is important because the increased contact area serves to disperse the forces on the PF joint. On the other hand, even though contact forces are less at smaller flexion angles, the contact area is also less. Because of this, patients with degeneration at the articular surface will probably experience pain with open kinetic chain knee extensions from 30-0°.

It is important to differentiate between PF instability and PF arthritis in order to give the proper exercise prescription. Patients with PF degeneration will have pain with deep knee flexion closed chain activities whereas patients with instability will typically have pain at end range extension. Both groups should perform exercises in a pain-free range but this range will differ based on the diagnoses. Patients with PF arthritis may only be able to tolerate closed chain activities from 0-45°. On the other hand, those with instability need to exercise in deeper ranges of flexion (>30°) where the femoral condyles help to stabilize the patella.

This rehabilitation protocol has been developed for the patient with general tenderness around the knee cap which may increase in intensity with daily and sporting activities. The symptoms will often decrease with rest and are frequently bilateral. Sporting activities, especially running, stairs, sitting with knees flexed for a long periods of time, and deep squatting activities may intensify the pain. Early intervention of strengthening and stretching is recommended to decrease pain and assist in returning to activity. The protocol is divided into phases. Each phase is adaptable based on the individual patient and special circumstances. Progress through the phases as pain, range of motion, swelling and strength allow.
The **overall goals** of the rehabilitation protocol are to:
- Control pain and swelling
- Regain normal knee range of motion
- Establish appropriate stretching and strengthening exercises
- Regain normal proprioception, balance, and coordination for daily activities
- Achieve the level of function based on the orthopedic and patient goals

Physical therapy is an important intervention to assist the patient in early rehabilitation in attaining a level of fitness to return to functional activity without pain. It is extremely important for the supervised rehabilitation to be supplemented by a home fitness program where the patient performs the given exercises at home or at a gym facility. Physical therapy for PF syndrome/jumper's knee varies in length on factors such as:
- Structure(s) involved: infrapatellar tendon, patellar cartilage plica, or patellar tracking
- Acute versus chronic condition
- Lower extremity flexibility
- Lower extremity biomechanics: pronated foot, leg lengths
- Performance or activity demands
- Muscular strength and endurance

**Return to activity** requires both time and clinical evaluation. To safely and most efficiently return to normal or high level functional activity, the patient requires adequate strength, flexibility, and endurance. Return to intense activities may increase the possibility of repeat injury or the potential of compounding the original injury. Symptoms such as pain, swelling, or instability should be closely monitored by the patient.

**PHASE ONE:**

**EXERCISE GOALS**

**RANGE OF MOTION**
- Full range of motion
- Hamstring/ITB/Gastroc/Soleus/Quad/Hip flexor stretches
- Patella mobs

**STRENGTH**
- Quad sets with biofeedback
- SLR in 4 planes
- Heel raise/Toe raise
- SAQ (30-0°)
- Leg press (0-45°)
- Hamstring curls
- TKE with theraband
- Bicycle with resistance with seat high

**BALANCE TRAINING**
- Single leg balance with plyotoss
- Sportscord balance/agility work
- Wobble board balance work
- ½ Foam roller balance work
- Minitramp balance work

**MODALITIES**
- E-stim/biofeedback as needed
- Ice 15-20 minutes
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REHABILITATION PROTOCOL (page three)

PHASE ONE: (cont’d)
GOALS OF PHASE ONE:
• Control pain and inflammation
• Independent in HEP
• Initiate muscular strength and endurance training without pain
• Educate patient on diagnosis
• Adequate quad/VMO contraction

PHASE TWO
EXERCISE GOALS
RANGE OF MOTION
Continue with all stretching exercises from phase one, concentrating on muscle group with greatest deficient
STRENGTH
SLR with ankle wt/tubing
SAQ with ankle wt
Knee extension (90-45°, 90-30°)-range of motion depending on pain
Leg press-single leg eccentric
Hamstring curl
Reverse lunge-not to migrate knee over toe
Mini-squat (0-30°)
Stool crawl
Straight leg dead lift
Multi-hip in 4 directions
Bicycle for endurance
EFX for strength and endurance
BALANCE TRAINING
Continue with all balance activities from phase one
Advance balance/neuromuscular by variance of surface
MODALITIES
Ice 15-20 minutes
GOALS OF PHASE TWO:
• Minimize pain with all exercise
• Enhance lower extremity strength and endurance
• Normalize dynamic balance, proprioception, and coordination
• Preparation for return to functional activities

PHASE THREE:
EXERCISE GOAL
RANGE OF MOTION
Continue with all stretching activity from previous phases
STRENGTH
Continue with all strengthening activity from previous phases increasing weight and repetition
Progressively increase resisted knee range of motion within a pain free arc
Continue with all eccentric quad/hamstring work
Bicycle for strength and endurance
EFX for strength and endurance
Advance all single leg activity within pain free range
PHASE THREE: (cont’d)
BALANCE TRAINING
Continue with advanced balance, proprioception, and coordination training
RUNNING PROGRAM
Initiate running on a minitramp, progressing to treadmill as tolerated
Initiate jump rope for impact/endurance activity
Backward running
AGILITY PROGRAM
Initiate agility drills-carioca, high knee drills, short sprints, figure 8’s
FUNCTIONAL PROGRAM
Initiate sports specific drills
Initiate functional drills
MODALITIES
Ice 15-20 minutes as needed for pain and/or swelling

GOALS OF PHASE THREE:
• Maximize lower extremity strength and endurance
• Maximize balance, proprioception, and coordination
• Minimize pain and swelling
• Return to functional activities
• Return to sports specific activities

Patello-femoral pain/syndrome is a common problem. With recognition of the problem and early intervention, this problem can be treated and allow for return to maximum performance and participation in sporting activities for a lifetime.