

Patellar Malalignment -- Part II

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In the previous article on patellofemoral (PF) problems I alluded to the idea that restoring normal balance to the patella was the main approach to conservative treatment of patellar function. Restoring normal balance to the patella mechanism automatically assumes that we must also take into account not only patellar position and motion but all of the peripheral possibilities that may affect PF mechanics.

Symptomatically, most patients with chronic PF problems complain of knee pain when squatting, climbing and descending stairs, getting up after sitting a while (movie sign), popping, giving way, crepitation, and possible mild parapatellar effusion.

Whether the diagnosis is loose bodies trapped in the PF joint, synovial plica impingement, patellar subluxation, patellar tendinitis, chondromalacia, lateral compression syndrome or patellar malalignment syndrome, to name a few, if the following functional examination and treatment is performed, a clinician should be able to markedly improve most of the PF conditions. The prime purpose of examination is to determine the source of the pain; and while tenderness to palpation may reveal a biomechanical stress, a functional examination is needed to reveal where treatment should be directed. The examination should comprise both a static and dynamic point of view.

A patient should be examined in a standing, sitting, and supine position to ascertain structural deviations.

Standing: Is the pelvis level or oblique? Pelvic obliquity and fixation may affect the hamstrings, quadriceps, and hip joint. An anterior pelvic tilt due to tight hip flexors may be associated with hyperextension of the knees and abnormal knee joint mechanics.¹ A posterior pelvic tilt due to hamstring tightness would create excessive stress on the quadriceps. Is there increased internal torsion of the femur (excessive anteversion) causing the patellae to be more medial ("squinting")? Formal retroversion causing laterally pointing patellae? Is there genu valgum (causing an increased Q angle and resulting in abnormal patellar tracking during knee flexion), genu varum (a cause of compensatory subtalar joint pronation), tibial rotation which should be increased internally with pronation and externally with supination, all of which affect PF mechanics? Unfortunately, there is not too much that can be done for structural deformities such as hip coxa valga or vera, femoral rotations or genu valgum and varum. Foot orthotics and stretching of associated tight muscles and strengthening of associated weak muscles might help to compensate. Finally, in the standing position we would check for foot and ankle alignment. Foot pronation is definitely related to PF problems.² Observing the standing patient from the side might reveal a genu recurvatum which may be associated with general ligamentous laxity or patella alta (high-riding patellae).

Sitting: Do the patellae point towards the ceiling (alta) instead of straight ahead, or do they appear to be displaced inferiorly (baja)? Patella alta means that the patella is not protected by the higher lateral femoral sulcus and may be more prone to lateral subluxation. Patella baja ad alta does not allow normal patella contact and is subject to poor stability and function. Patella tracking should be

observed as the patient flexes and extends the knee. Look for abrupt patellar deviation (covered in previous article) and popping. Abnormal patella tracking may refer to recurrent subluxation, chondromalacia, excessive lateral patella stress, plica syndrome or a chondral or osteochondral defect. Your treatment of these conditions will be based on the functional findings found during the examination. The vastus medialis obliquus (VMO), an extension of the vastus medialis which inserts into the patella, should be observed to see if it is dysplastic or atrophied. Atrophy will reveal a large superomedial patella dimple as the sitting patient extends the knee 45 degrees. The lower the VMO inserts on the medial patella the more stability it provides.

Supine: Structural or static evaluation in the supine position would include measurement of the Q angle. If the quadriceps angle is abnormal and is due to structural or functional abnormalities, such as genu valgus, VMO atrophy, etc., the angle is considered pertinent. An abnormal Q angle by itself is not necessarily diagnostic.³ One can observe the amount of effusion which obliterates the patella outline in an acute severe injury or a mild effusion in chronic patellar involvement. The patient's knee can be flexed about 30 degrees on the examiner's knee, and the examiner can displace the patella both medially and laterally to determine the degree of retinacular laxity, pain, and apprehension. Usually the patient will express pain, apprehension and excessive movement on medial to lateral stress if subluxation or dislocation is present. There is often tightness on lateral to medial patellar stress. Failure of the patella to displace medially more than one centimeter represents a tight lateral retinaculum which may require lateral to medial stretching as a treatment. In this supine position, orthopedic tests can be performed which help to localize the problem to the PF joint such as the patellar inhibition test. In this test, with the knee flexed five to ten degrees, the patient contracts the quadriceps while the examiner exerts fingertip pressure on the superior patellar pole. Keeping the knee flexed prevents pinching of the suprapatellar pouch which would cause a false positive.⁴ Crepitation and pain may occur while the patella is compressed during flexion between 30 and 60 degrees. If pain occurs, the examiner shifts the patellar medially to see whether the patient is relieved during grinding; this indicates tight lateral parapatellar tissue.³

The next phase of the PF examination relates to the dynamics of the lower extremity. Related muscles must be tested for tightness which may inhibit normal PF function. Hamstrings: (causes quadriceps to increase stress on PF joint during knee extensor) patient is supine with hip flexed 90 degrees and examiner attempts to straighten the leg; quadriceps: (tightness increases PF joint reaction forces) stretch while patient is prone to see how far the heel reaches to buttock; tensor fascia lata and iliotibial band: use Ober's test;³ gastrocnemius: (increases subtalar pronation) dorsiflex foot with knee extended; test for tight hip flexors by having supine patient with thigh extended and knee hanging off the end of the table. Patient then flexes opposite knee to chest to keep low back flat on the table. If the extended thigh lifts off the table the hip flexors are tight; if the thigh remains on the table and the knee extends, the the rectus femoris is shortened.

Muscle strength should also be tested since muscle imbalance may have an effect on PF joint mechanics. Beckman et al.¹ state that the medial hip rotators are often found stronger than the lateral hip rotators, resulting in increased femoral rotation and affect normal tracking of the PF articulation, especially when the knee is near extension.

A dynamic evaluation of the lower extremity could prove to be invaluable. Observing the patient descending stairs or performing single-leg squats might show increased genu valgus due to increased medial femoral rotation and adduction of the femur due to weak abductors and external rotators (posterior gluteus medius and piriformis). When the patient descends the stairs observe the flexing weightbearing knee to see if valgus occurs causing increased stress on the medial

retinaculum. The patient's gait should be observed with respect to femoral rotation, position of the patella and foot, and ankle pronation and supination.

Five functional tests leading to PF involvement are: a probable abnormal patellar tracking; patellar pain on resisted knee extension; pain on patellar inhibition test; retropatellar or popliteal fossa pain on knee-squat test; and pain or apprehension on medial to lateral, or lateral to medial displacement test.³

Joint play (assessory motion) of the patellar should be checked. Finally, based on the work of McConnell⁵ the position of the patella should be determined. Is the patella centered or is it closer to the lateral or medial condyle? Is the patella tilted medially, laterally, superiorly or inferiorly? Is the patellar inferior pole rotated internally or externally? In the treatment of PF conditions, it helps to tape the patella in its most neutral position to reduce PF pain and help prevent patellar malalignment during exercise.

The taping procedure and exercise protocol will be explained in the next article.

References

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