Dynamic Chiropractic

MUSCULOSKELETAL PAIN

Update on the Extensor Mechanism of the Knee

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Anterior knee pain is a common complaint, particularly in athletes. The pain usually involves structures dealing with the patellofemoral joint (PFJ). Some of the more important structures to be concerned with are the retinacula; capsule; tendons; cartilage; subchondral bone; synovial plicae; and infrapatellar fat pad.[1] Regarding our evaluation of the surrounding PFJ soft tissues, treatment of the surrounding retinacula, muscles and tendons can make a huge difference in helping our patients. This article will present information to aid us in our approach to anterior knee pain.

The *rectus femoris, vastus intermedius, vastus medialis* and *vastus lateralis* are connected to the quadriceps tendon, which connects to the patella. Type IVa free nerve endings (FNE) detect crude touch, pressure, heat and cold, and transmit information on pain and inflammation. They constitute the articular nociceptive system.[1]

The quadriceps tendon has the highest density of FNE in the knee, followed by the retinacula and patellar tendon. Increased density in these particular tissues is explained by the fact that they "control acceleration, deceleration, and rotation of the knee joint, and therefore need a high proprioceptive capability for coordinating these conditions. It also indicates their importance in balancing the patella during the gliding mechanism."[1]

The patellar tendon is the distal extension of the tendon of the quadriceps femoris, extending from the inferior pole of the patella to the tibial tuberosity. The patella tendon is more often involved in overuse trauma, and is 25 percent to 30 percent thinner than the quadriceps tendon.[2] Quadriceps tendinopathy does not occur as often as patellar tendinopathy, since the quadriceps tendon has superior strength, mechanical advantage and better vascularity. In adolescent athletes, pain at the proximal patella is more often an avulsion injury of the apophysis than tendinopathy of the quadriceps.

Panni[2] states that the extensor mechanism has two important functions: an accelerating function using concentric contraction, as in jumping or kicking a ball; and a decelerating function, using eccentric contraction, such as landing after jumping or running down stairs. The decelerating function can load the patellar tendon beyond its inherent tensile strength.

According to McConnell,[3] patellofemoral pain is most likely caused by either tension or compression of the soft-tissue structures. Lateral patellar pain may be caused by shortening of the lateral retinaculum, possibly associated with a tilted patella (open on the medial side). Inferior patellar pain may be caused by irritation of the infrapatellar fat pad; medial pain by recurring laterally subluxing patella (hypermobility) resulting from overstretching of the medial retinaculum; superior pain by the quadriceps tendon insertion area; and retropatellar pain by *chondromalacia patellae*, with pain originating on the richly innervated underlying subchondral bone, since hyaline cartilage is completely free of nerve fibers.[4] Frequently, the only sign in patellar tendinosis is pain at the inferior pole of the patella. This pain can be elicited by tipping the superior pole and pressing into the inferior pole space. Patella grinding tests often will reveal the chondromalacia patellae.

It is important to check particular muscles for shortening that may adversely affect patella tracking, such as the tensor fasciae latae, hamstrings, gastrocnemius, rectus femoris, and especially the lateral retinaculum. A shortened *tensor fasciae latae* and its extension into the iliotibial band, along with a tightened lateral retinaculum, whose deep fibers originate at the iliotibial band (ITB), will result in lateral tracking of the patella. At 20-degree knee flexion, the ITB is at its shortest; therefore, in checking patella tracking, the patella will tend toward the lateral side at 20 degrees. This action occurs naturally during normal gait; during gait at less than 20 degrees, the ITB lies anterior to the lateral femoral epicondyle, and assists in knee extension. At greater than 30 degrees, the ITB lies posterior to the lateral femoral epicondyle. A tight ITB pulls laterally on a tight lateral retinaculum, pulling the patella laterally over 30 degrees of knee flexion.

With the patient supine and the knee flexed 20 to 30 degrees, an examiner will note that the patella does not shift from lateral to medial as well as in the opposite knee. This type of finding requires a release of the lateral retinaculum, and probably the ITB, up to the tensor fasciae latae, and possibly the gluteus medius. Soft tissue methods, including friction massage, fascial release and instrument-assisted mobilization, will free the area. Home stretching of the lateral knee and thigh should be taught to the patient.

Quadriceps tendinopathy creates pain at the proximal pole of the patella, and a resistance test for this area of pain may appear if the examiner resists knee extension with the knee in maximum flexion. In older patients with quadriceps tendinopathy, there may be degenerative changes, such as calcification in the tendon or spur formation at the superior pole.[2] Soft tissue methods directed at the superior pole insertion and related areas, such as the quadriceps femoris and hamstrings, will make a difference. An interesting statement by Panni,[2] describing surgery for this problem, notes it should include "debridement of degenerative, diseased tissue and promotion of healing by stimulating a vascular response, either by linear tenotomy or needling." Stimulating a vascular response is one of the main theories as to why instrument-assisted soft tissue mobilization is successful.

References

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