Dynamic Chiropractic

ORTHOTICS & ORTHOPEADICS

Knee Problems? Check the Feet

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In their examination of anterior cruciate ligament (ACL) injuries, McLean, et al., noted that "consideration of the entire lower extremity contributes to an understanding of injury mechanisms."[1] Excessive foot pronation has been found to be an underlying cause of some ligament injuries in the knees and is a contributing factor in many instances of knee pain. Both treatment and prevention of knee problems require the evaluation of the foot and ankle for pronation. Poor healing and recurrent knee injury can often be traced to biomechanical problems, including hyperpronation. In many cases, flexible, custom-made foot orthotics are needed in order to ensure a good recovery and to avoid future knee conditions.

Knee Biomechanics

The knee has a remarkable level of stability, despite the incongruent joint surfaces of the tibia and femur. These two contrasting joint surfaces articulate only with the help of the crescent-shaped menisci. Through their weight-distribution and shock-protection properties, the menisci help guide movements between the convex surfaces of the distal femur and the almost-flat superior surfaces of the tibial plateau.

A second knee joint involves articulation between the femur and patella. The integrity of this joint is dependent on the coordinated contraction of the quadriceps muscles and the proper positioning of the patella on the saddle-shaped femoral surface. Normal knee-joint movement includes pivot flexion and extension, with external tibial rotation on the femur during the last 10 to 20 degrees of extension.[2]

However, conditions that produce excessive rotation of the tibia relative to the femur make the knee susceptible to the development of several degenerative conditions. The ACL prevents excessive anterior glide displacement of the tibia on the femur, hyperextension and internal tibial rotation. A review of normal and abnormal biomechanics of the gait cycle reveals why ACL injuries are among the most common ligamentous injuries of the knee.[3]

The Foot/Knee Relationship

Pronation of the foot in the contact period helps to absorb shock and is normally accompanied by internal rotation of the tibia relative to the femur. Excessive pronation during gait will transmit damaging forces up the kinetic chain. It is the excess of these rotational forces that result in repetitive microtraumas. If this conversion of torque in response to pronation occurs beyond normal limits, the tibia can subluxate in internal rotation.

The most common cause of degenerative joint disease is the presence of abnormal biomechanical forces on a normal or healthy joint. The next most common situation is the application of normal forces on abnormal cartilage. Excessive pronation, which causes internal tibial fixation and stretches the ACL, creates the necessary ingredients for both of these processes to occur simultaneously.

In their study comparing measurable drop of the navicular due to pronation with the incidence of ACL injury, Beckett, et al., found the injured subjects had higher navicular drop scores.[4] In another study, Loudon, et al., measured postural faults as predictors for the occurrence of noncontact ACL injury. Seven postural positions were measured: pelvis, hip, sagittal knee, frontal knee, hamstring length, ankle pronation and navicular drop. Postural distortions, including knee hyperextension, excessive navicular drop and excessive pronation, were significant predictors for ACL injury.[5]

Remember that knee pain often precedes visual radiographic evidence of degeneration. The navicular drop test can be a good preventative screening tool.

Comprehensive Knee Care

Conservative care for nontraumatic knee pain and degeneration should include the following:

- adjustments to provide proper alignment and remove restricted motion (especially internal tibial rotation fixation);
- orthotic support to control excessive pronation and internal tibial rotation; and
- rehabilitative exercises to build the muscles and improve stability.

Custom-made, flexible orthotics support the bones and soft tissues of the feet in their proper position of function. By correcting pedal imbalances (which can cause excessive pronation and tibial torsion), orthotics help prevent overuse injuries and knee-joint degeneration. Research published in the *Journal of Manipulative and Physiological Therapeutics* showed that custom-made orthotics improve the structural alignment of the foot, thereby creating a more symmetrical foundation throughout the entire kinetic chain.[6] Further research has shown that custom-made, flexible orthotics decrease (normalize) the Q-angle and improve patellar tracking. This indicates an improved functional alignment of the knee and leg.[7]

Developing muscles helps to stabilize the knee joint and lower the incidence of serious injury.[8] Rehabilitative exercises, including strengthening and coordinating contraction of muscles involved in flexion, extension and rotation, will help enable the patient to perform a range of movements to build strength in muscle groups interacting with the knee.

References

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