Dynamic Chiropractic

MUSCULOSKELETAL PAIN

Core Stability Relates to Distal Segments

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An important question to ask lower back patients is if they have ever injured one or both of their ankles. Distal segments such as the shoulder, knee and ankle relate to a weakened core or trunk and might be repeatedly injured until the core is stabilized. In reverse, injured distal segments can weaken the core. Numerous papers have been written about how the weakness of our trunk or core can adversely influence not only our spine, but also our distal joints. This article will present information from some of the many references on the subject.

Distal injuries affect proximal core structures. Bullock-Saxton and Janda found that after ankle injuries, even in ankles in which there were no longer pain patterns, control of movement became impaired due to delay in the activation of the gluteus maximus during hip extension.[1] Janda believed it was important to have early activation of the gluteus maximus to provide appropriate stability for the pelvis during gait. He noted that the gluteus maximus would exhibit marked hypoactivity, hypotonia and sometimes even atrophy, especially in low back patients.

Ankle inversion injuries cause increased changes in postural sway (measured as single-limb sway) and weakness in hip abductor muscle strength[2] compared to the non-injured control group, and these changes persisted up to two years after injury. Cornwall and Murrell[3] thought these changes were due to ankle joint laxity or to de-afferentation of the nerves that innervate the joint capsule and ligaments. Beckman and Buchanan[2] recommend avoiding premature hip muscle activation due to ankle hypermobility. It is necessary to improve ankle stability and hip muscle activation. They mention techniques such as "closed kinetic chain exercises that require concurrent isometric hip and ankle activation, progressing to exercises that require active ankle stability followed by reciprocal gluteus medius activation."

Core stability is defined in sports medicine as a foundation of trunk dynamic control that allows production, transfer and control of force and motion to distal segments of the kinetic chain.[4] All of the musculature of the trunk, including abdominal and back musculature, contributes to core stability, and the contributions of each muscle group continually change throughout an athlete's task.[5] Hodges and Richardson found trunk muscle activity occurring before lower extremity activity in order to stabilize the spine to act as a foundation for lower extremity motion.[6] Zazulak, et al.,[2] found that athletes with decreased neuromuscular control of the body's core were more subject to knee injuries. They specifically found increased trunk displacement during perturbation and isometric force release. The main displacement was excessive lateral motion in the coronal plane in injured athletes with knee ligament and ACL injuries versus the non-injured athlete. They stated that lateral angular displacement of the trunk would be the single best predictor of knee ligament injury. Excessive lateral sway is associated with knee valgus collapse and subsequent ligament injury. These patients would benefit from proprioceptive training in the coronal plane[7] besides strengthening of weakened core muscles.

Leetun, et al.,[8] stressed the findings of weak hip abductors and external rotators in predicting knee injury. This allows increased lower extremity internal rotation and adduction, creating lateral patellar tracking and lateral retropatellar contact pressure. Strengthening the hip abductors and external rotators helps prevent femoral internal rotation and adduction which is related to patellofemoral problems. Young female athletes with patellofemoral pain had significantly weaker hip adductors and external rotators compared to a healthy, age-matched control group.[9] The chief hip external rotator happens to be the gluteus maximus, which Janda1 found to be related to ankle injuries.

References

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