Dynamic Chiropractic

Rehab Strategies to Address the Neuromuscular Consequences of ACL Injury

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It's important for the practicing chiropractic clinician to understand the neuromuscular consequences experienced after an anterior cruciate ligament injury because these deficits play a crucial role in the patient's recovery. With an increase in the number of people experiencing traumatic ACL injuries and surgical repair, it is likely that you will be attending to the care of such individuals. Neuromuscular deficits, which basically means the right muscles are not doing the right thing at the right time due to neuroprotectively-driven motor inhibition, can occur whether the ACL traumas are slight strains or full surgical reconstructions. The list of complications that can occur following an ACL injury can include alterations in sensation, joint-position sense, muscle activation, muscle strength, the ability to maintain balance and deficits in overall movement efficiency. For the purpose of this article, let's focus on the neuromuscular consequences patients experience as a result of pain and injury.

Altered Patterns of Activation

Altered neuromuscular patterns of activation may be the limiting factor that explains why patients experience such rates of poor recovery following ACL trauma, and why you may find that your adjustments are not holding. De Andrade, et al., first referenced muscle inhibition attributable to knee joint trauma, now more commonly called arthrogenic muscle inhibition.[1-2] Arthrogenic muscle inhibition is identified as a reflexive decrease in motor neuron pool excitability of the supporting musculature that results due to insult to the knee.[3] Clinically, when you see a patient with ACL trauma, there is a very strong likelihood that they are experiencing neuromuscular deficits altering their ability to control and stabilize the knee appropriately.

Elastic therapeutic taping is an effective strategy for combating neuromuscular deficits in the knee due to ACL injury.

Following ACL reconstruction, the quadriceps are most commonly affected and strength deficits have been reported to occur throughout the first six to 12 months following surgery.[4-6] Current literature indicates that quadriceps strengthalterations can exceed 20 percent as long as six months post-surgical reconstruction. These deficits result in quadriceps avoidance gait patterns and a decreased ability to absorb shock during stance, which can lead to other joint aggravations and even be possible risk factors for chronic pain and arthritic degenerative changes.

Atrophy often accompanies ACL injuries and affects the force-producing capabilities of the muscles involved. If prolonged, quadriceps muscle atrophy will further exacerbate the patient's chances of a full recovery. Even normal gait and walking patterns have been altered in ACL-injured individuals.[7-8]

Functional Rehabilitation

Your goal in designing a functional rehabilitative program is to restore or normalize activation patterns of the thigh muscles, most commonly affected, therefore improving joint congruency, decreasing shear forces and restoring functional stabilization of the knee. In order to achieve this, a practitioner must include sensorimotor re-education in the treatment protocol. Without understanding the neuromuscular consequences of an injury such as an ACL trauma, the design of a successful rehabilitative program can become a major challenge.

As clinicians working with integrated human bodies, we must also keep in mind that no injury ever happens in isolation; therefore, we must also take into consideration any compensatory alterations in movement and muscular function that may have occurred in response to the body's attempt to overcome the injury sustained to the knee. Understanding these mechanisms will significantly improve your rehabilitation strategies and treatment outcomes.

The progressive rehabilitative strategy for ACL injuries should involve three specific rehabilitative goals: to reduce neuromuscular deficits; to reduce the onset of atrophy within the muscles; and to limit the development of compensatory patterns of movement. Normalization of muscular activation and the reduction of neuromuscular deficits must occur first if the other two goals are to be achieved.

Elastic Therapeutic Taping

Traditional programs of rehabilitation that focus on building strength first often fail, as they do not take into consideration the involuntary inability to activate the musculature properly due to the neuromuscular deficits present. This particular rehabilitative goal can be successfully facilitated with the application of elastic therapeutic tape. The application of the tape is utilized to combat the neuromuscular deficits experienced in part by disrupting the abnormal afferent input signaling alarms that something is wrong with the knee.

Trauma and nociception provoke a neurogenically-driven inhibitory process affecting muscle activation. The tactile stimulation of the tape creates a mechano-transductive effect, leading to sensory gating of the discomfort experienced by the patient. TENS also gives you the ability to activate sensory gating mechanisms, but is limited in its use and cannot compete with the prolonged uninterrupted use of the tape over multiple days (up to five). Other strategies include the use of ice, which can help decrease nerve conduction velocity and slow the discharge rate of joint mechanoreceptors. Some literature supports the use of ice as having the ability to facilitate muscular activation.[9] Therefore, ice may be more effective if used before exercise, particularly when the movements / exercises are not overly dynamic and challenging.

In terms of minimizing muscle atrophy, the use of eccentricmuscle loading has been shown to be very effective. Such exercises should follow a progressive gradual increase in level of difficulty in order to avoid any complications. The use of suspension system training aids can be very beneficial in controlling the loads to which the patient is subjected. Programs must be designed to stimulate the necessary neural and connective-tissue changes required to retard atrophy and restore the ability to generate and attenuate force. Although there is no definitive clinical research as to the exact amount of stimulus needed, it is my recommendation that rehabilitative programs need to be repetitious in nature and performed at least three times per week in order to see successful outcomes achieved.

With the increased prevalence of injuries leading to ACL damage, practitioners should be familiar with the neural complications that accompany osseo-ligamentous damage affecting myofascial structures. Long-term complications are often a direct result of unidentified neuromuscular factors that have gone initially unnoticed in the initial evaluation and rehabilitative strategies employed by practitioners.

Resources

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