

Introduction

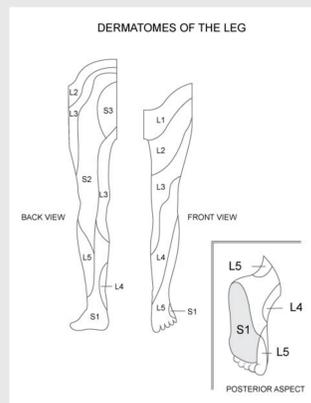
Along the spine, there are 23 intervertebral discs which are all made of 3 structures: the annulus fibrosis, the nucleus pulposus, and the endplates. There functions are to absorb shock and to protect the spinal column along with giving the spine stability during load bearing tasks. There are several risk factors that could predispose a patient to experience a lumbar disc herniation: hereditary history of disc herniations, dehydration, activities that involve repetitive flexion, etc. The following information will discuss the patient's mechanism of injury, initial treatment prior to surgery, rehabilitation protocol and reasons that make his injury significant to other lumbar disc herniations.

Purpose

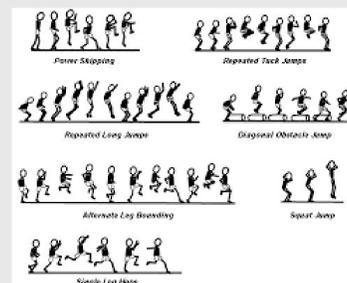
The purpose of this case report was to introduce an 18-year-old Division 1 football player and military cadet who experienced a L5-S1 disc herniation while participating a lifting workout. Even though he experienced a complete rupture, he vetoed surgical procedures to avoid an even lengthier recovery process. An overview of this unique case who experienced a mechanism of injury that is not common in his population nor in traumatic cases. This case will highlight the effective methods of non-conservative treatment towards treating this athlete and his return to football/military activity.

Structural/Mechanical Factors

For an intervertebral disc to herniate, the outer layer of the annulus fibrosis must lose its integrity for the fluid of the nucleus pulposus to protrude out of it. This fluid will eventually place an overwhelming amount of pressure on the spinal canal or lumbar nerve roots, depending on the herniation level. Disc herniations are often degenerative changes of the annulus fibrosis, which usually age-related. As an individual progress in age, the outer layer of intervertebral discs dries out and lose their strength to hold this fluid into place while performing daily activities. Also, with aging there is an increase in lumbar lordotic angle which then leads to an increase of vertebral disc stresses and pressure upon the lumbar spine. Other structural risk factors that could be accounted for towards this injury are body mass index and gender. The effects of the spine due to altered biomechanics placed on the spine can play a role on the lumbar spine to overloaded leading to disc degeneration.



Dermatome map of lower extremities, anterior and posterior view from levels of L2 through S2



Examples of plyometric exercises that were implemented into phase III of the athlete's rehabilitative process

Case Report

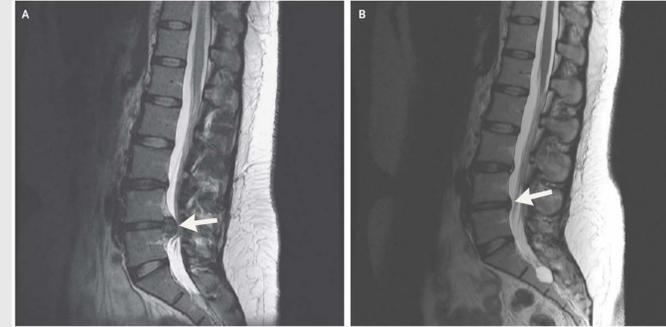
Patient: The patient is an 18-year-old Division 1 football and plater and military cadet that experienced an L5-S1 disc herniation during his senior year of high school and had a more severe herniation months after the original injury. The following information will discuss the patient's mechanism of injury, initial treatment prior to surgery, rehabilitation protocol and reasons that make his injury significant to other lumbar disc herniations.

Mechanism of Injury: Lumbar disc herniations occur between the vertebral levels of L1 to L5. Traumatic cases of lumbar disc herniations are usually rare as most cases are caused by existing degenerative changes to the intervertebral discs. "However, structural damage to the IVD due to flexion/ extension, lateral bending, and axial loading may lead to the annular fissuring and fragmentation of nuclear tissue, which can result in altered biomechanical properties of the IVD with the loss of its structural integrity" (Luchtmann and Firsching, 2016). The quarterback was participating in a workout in the weight room and suddenly felt a sharp pain in his lower back as he attempted to lift a heavy weight from the floor. The sudden movement from spinal flexion into extension while lifting the barbell resulted in the original injury. After participating in basic training and preseason practice, the injury initial injury had progressed to a worsened state.

Clinical Examination: After, being removed from the first day of preseason due to him experiencing sciatica and a sharp pain in his lower back. The head athletic trainer performed an extensive evaluation on him, and he tested positive in tests that were indicative of a possible lumbar disc herniation along with episodes of sciatica. The patient also chose not to disclosed his previous history of a disc herniation due to the concern of being ineligible for the military academy.

Radiographic Findings: The head athletic trainer was referred to the military hospital for to have MRI conducted for the suspected herniation. The MRI displayed more a severe lumbar herniation between levels of L5 and S1 than the original that was done a few months prior to the original injury.

Initial Management: When a patient is suspected on sustaining a lumbar spine injury, a neurological exam must be performed to assess an any possible damage to the lower quarter nerve roots. If a patient, experiences any deficits during this examination, x-rays should be ordered to determine the integrity of the bony aspects of the lumbar spine and the surrounding structures it could affect. If there is any damage found in the spinal cord or nerve roots and MRI can distinguish if this injury affected the intervertebral discs and if surgery is required or not. In the case of this athlete, it was observed that the nerve root of L5-S1 was blocked by the posteriorly avulsed nucleus propolsus. In the acute phase of rehabilitation also known as the inflammatory phase, the main goals of the patient should focus on minimizing the mechanical stresses that cause him pain by correct body positions and working within movements that do not cause them pain. The McKenzie Back Extension protocol was administered to this athlete due to the restrictions that was placed on him to avoid inflicting pain, aggravating his suture, or causing more damage to the affected vertebrae. Motions should be performed in the sagittal plane to have more control of symptoms in this phase. This plane focuses on utilizing muscles that affect the lumbar spine indirectly. "Early use of stabilization training exercises has demonstrated improvements in symptom management for the lumbar HLD patient" (Vangelder, L., Hoogenboom, B., & Vaughn, D. W., 2013). The athlete performed progressions of transverse abdominis exercises earlier on in his rehabilitative process. The initial function of the transverse abdominis is to stabilize the pelvis and lower back during movement. Teaching the importance of sitting posture and correct body mechanics: Patients should be cued through different exercises to avoid muscle stiffness and causing further injury to their spine. For example, athletes should be cued to keep their abdominal muscles tight by contracting to activate all the muscles necessary to put less pressure on their backs in different ranges.



MRI displaying lumbar disc herniation between the L4-L5 disc space

Rehabilitative Protocol and Results

The main program that implemented throughout the patient's rehabilitation protocol was the McKenzie Back Extension Protocol. The series of self-treatment techniques are utilized for patients who exhibit back pain .The patient went through the primary exercises of this protocol in order to track his range of motion and avoid inflicting further pain. The main goals of phase I were to reduce the athlete's pain, increase active trunk range of motion and lower extremity mobility within a two-week period. His pain were centralized followed by sciatica and would specifically come from movements involving spinal flexion such as picking up items. This finding of pain can be constructed back to his initial mechanism of injury, which was from lifting heavy weight from the ground. Therefore, the patient's MOI was treated in the opposite direction of pain pattern: extension. According to Lam et al. (2018), "MDT yielded statistically and clinically significant better improvements in pain intensity compared to manual therapy plus exercise". Other methods of treatment that were effective in treating the athlete in phase I were heat therapy and electrical stimulation prior to performing exercises. As the athlete progressed into phase II of the rehabilitation process, core strengthening, and spinal stability exercises were added into his treatment plan along with manual therapy. Hip flexor and hamstring stretches were specifically done to maintain and further increase flexibility of these musculature. Maintaining flexibility of these muscles is crucial for the allowance of normal pelvis and spinal range of motion A pool gait pattern was performed for 2 weeks during the patient's progress during phase II to ensure that he could maintain a pain-free walking pattern before progressing to closed-kinetic chain exercise on dry land. Gait training was performed in a pool for the athlete to relearn proper gait mechanics and reduce to gravitational pull on his lower extremities during these exercises. Doing this helped us progress him to different levels of maintaining his body as he was progressed to the Alter-G for walking and running intervals. During the last phase of the patient's rehab, the focus was placed on improving his neuromuscular control from proprioceptive exercises and increasing the workload on spinal extension-based strength and endurance exercises to assess the integrity of his lumbar spine.

Discussion and Summary

Disc herniations are most found in the lumbar spine. In many cases, herniations are chronic but there are instances where there are traumatic cases. The standard symptoms seen in these cases are low back pain, sciatica, numbness and tingling in lower extremity. There is quite a rare presentation of acute lumbar disc herniations occurring from weightlifting especially amongst the young adult population. A neurological exam should be performed if a patient is suspected of sustaining this injury and followed by an MRI scan to assess if any spinal nerves were affected. In conservative and non-conservative cases, patients should be symptom free within 3 to 4 months, but this could last longer depending on each case. Patients could exhibit any phase during their treatments depending on the exercise they are performing which could setback an initial return-to-play timeline. Joint mobilizations, manual therapy, along with multifidi and transverse abdominis activation have been proven to be effective interventions for implementation of pain modulating modalities. With the utilization of these current methods of treatment as well following appropriate return to play guidelines and protocol should ensure the successful rehabilitation process for patients experiencing lumbar disc herniations.

The patient is still ongoing is rehabilitation process with the athletic training staff at his respective military academy. This case is unique in the aspect that most disc herniations occur in older patients with a history of bone degenerative disorders. The patient also experienced a significant mechanism of injury to this injury that is not common to the young athletic population.

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