Differential Diagnosis of Lumbar Spine Injuries in Athletes

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Any patient who presents with low back pain demonstrates an impressive array of signs and symptoms which, for health care providers, leads to a challenging course of rehabilitation. Athletes, like the population at large, frequently experience lower back pain from a variety of causes.

While lumbar spine injuries are not limited to any particular sport or event, team physicians, athletic trainers, and physical therapists have reported a high incidence of lumbar muscle strains among athletes, especially those in contact and collision sports. Because of the self-limiting nature of lumbar spine injuries, it is likely that many go unreported or untreated, in effect masking the actual number of injuries.

Lumbar spine pain is the most common injury reported among professional golfers and male gymnasts (Sward et al., 1990). Overuse injuries related to hyperextension have frequently been reported with gymnastics, volleyball, and rowing (Harvey et al., 1991). Among college athletes, 80% of lumbar spine injuries reportedly occur during practice and most of them are classified as acute (Keene et al., 1989).

Early identification of the source of lumbar spine pain is essential to a rapid intervention, rehabilitation, and return to sports. Given the complexity of spinal anatomy and biomechanics, it is understandable why pinpointing the cause of lumbar spine pain presents a real challenge for athletic trainers, physical therapists, and team physicians.

Anatomical Considerations

Anatomically, the lumbar spine is at greater risk for injury than the thoracic spine and sacrum. The vertebrae of the thoracic spine are coupled with the ribs, providing protection and stabilization to the visceral organs. The sacrum, just inferior to the lumbar vertebrae, also has inherent protection through the fused ilium, ischium, and pubis, forming the pelvis.

The vertebrae of the lumbar spine are less protected and are dependent on the spinal ligaments, deep and superficial spinal muscles, and lumbosacral fascia for external support. These structures normally provide adequate protection to the large lumbar vertebrae. In athletics, however, forces transmitted...
through the trunk and lower extremities can often be excessive, leading to mechanical failure of soft tissues and bony structures.

Ligamentous and joint capsule connective tissues offer support and allow for controlled joint movements, but are vulnerable to both macro- and microtrauma when the spine is forced beyond its allowable anatomical or physiological range of motion.

As with other capsular joints, the facet joints of the lumbar spine have been found to play an important role in providing both proprioceptive feedback and reflexive muscular trunk control. Pathology involving the facet joints may further diminish this important auxiliary function, making it more difficult for the athlete to regain the full dynamic trunk control that is essential for most athletic endeavors.

The reported high incidence of muscular contusions and strains in the lumbar spine among athletes seems to indicate its susceptibility to injury as a result of external forces. Once injured, the muscles are no longer efficient in their role as auxiliary stabilizers, leaving the vertebral segments susceptible to shear, torsional, tensile, and compressive forces.

The intervertebral discs of the lumbar vertebrae are composed of a fibrous ring or annular cartilage material that surrounds an inner mucoid substance, referred to as the nucleus pulposus. The discs offer additional stability to the spine by acting as shock absorbers and resisting torsional forces.

Susceptible to injury from compression, torsional, and shear forces, the annulus may become inefficient at containing the inner nuclear material. If subjected to an increase in internal disc pressure from external force, the weakened annulus may begin to bulge and even rupture, extruding the inner nuclear material. Subsequent inflammation of the surrounding neural structures sets off a host of acute pain, producing biochemical reactions that may eventually lead to referred pain to the extremities and prolonged pain and dysfunction.

Classification of Low Back Pain in Athletes

A variety of classification schemes for low back pain have been developed and are presently undergoing review and revision. While none of the current classification schemes proposed are specific to athletes, we can broadly classify low back pain within the scope of the commonly known lumbar spine pathologies. Classification in this manner will enable us to more easily arrive at a differential diagnosis of lumbar spine pain based on involved anatomical structures.

Excluding serious spinal injury, it has been reported by Nachemson (1988) that the correct diagnosis in acute low back pain is initially arrived at only 2% of the time. Lumbar spine pain presents a unique problem to the clinician, since it is often the case that two patients with the same diagnosis have somewhat different presentations in terms of signs and symptoms. Additionally, separate anatomical structures may be responsible for similar signs and symptoms in two individuals.

More often than not, and especially in the case of a traumatic injury, more than one anatomical structure is responsible for the production of pain. Given these limitations, at best we can build a framework of a broad classification from which to work when attempting to determine our best course of treatment for the athlete with a lumbar spine injury (Table 1).

History

The importance of obtaining a detailed and accurate history of the athlete with low back pain cannot be overstated. Knowledge of the biomechanics required of the athlete's sport and, when applicable, his or her position on the team, is helpful in understanding the mechanism of injury.

In general, sports such as football that require compression or weight loading of the spine are responsible for compressive type forces. Sports that require excessive motion, such as gymnastics, place high tensile stresses on the spinal ligaments. Torque, rotation, and shear forces are produced by motions used in golf and throwing sports (Hosea & Gatt, 1996). All athletes in contact sports can be subjected to direct blows, resulting in strains, sprain, contusions, or fractures.

In giving a history, the athlete is asked to describe the specific events that precipitated the pain, past and present severity, nature of the pain, and factors that aggrivate or ease the condition. Especially important is the presence and location of radiating pain symptoms.

Any sensory changes, lower extremity weakness, loss of speed, timing, or proprioception may indicate the involvement of neural structures. Pain with coughing, sneezing, or straining while using the toilet may also indicate the involvement of an intervertebral disc.