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Lumbar Disk Herniation and Degenerative Disk Disease in Athletes

Payam Moazzaz, MD, and Jeffrey C. Wang, MD

This work reviews the epidemiology, evaluation, treatment, and return-to-play guidelines for athletes with degenerative disk disease and herniated nucleus pulposus. Although most athletes with degenerative disk disease and herniated nucleus pulposus improve with conservative treatment, athletes with persistent symptoms may benefit from lumbar discectomy surgery. Lumbar interbody spinal fusion or disk-replacement surgery should only be considered after all other treatment options have been exhausted. Although some general consensus exists, return-to-play guidelines for the athlete with lumbar degenerative disk disease or disk herniation are not well-defined and require further investigation.

KEYWORDS disc herniation, athletes, herniated nucleus pulposus, degenerative disc disease

Low back pain is exceedingly common in the general population, with an estimated occurrence of 95% during the course of a lifetime in Americans.[1] Although athletes are generally in better physical condition and more flexible than the general population, they also place greater loads on the lumbar spine during sporting activities. With conflicting reports, it is not clear whether athletes are at greater risk for low-back pain.[2] Although the incidence of low back pain varies with the specific sporting activity, the estimated prevalence of low back pain is 30% in athletes.[3] Sports in which the athlete is subjected to repetitive flexion or explosive extension-type movements appear to have a greater prevalence, with up to 50% of football lineman reporting low back pain.[4] Wrestlers and elite gymnasts have also been shown to have a greater prevalence of low back pain than age-matched control patients.[2]

Low back pain is also a common cause for elite athletes to miss playing time. A history of previous pain is the greatest predictor of future back pain in the athletic population. For athletes who have had low back injury previously, the risk for a repeat episode of pain has been shown to be 3 to 6 times increased.[5] McCarroll et al[6] found that low back pain was responsible for loss of playing time in 30% (44) of 145 college football players. Thirty-eight percent of professional tennis players also reported low back pain as the reason for missing at least one tournament.[7]

Although studies vary, most investigators document a greater incidence of degenerative disk disease in athletes compared with nonathletes. Sward et al[8] demonstrated that disk degeneration was more common in athletes (75%) than nonathletes (31%). The incidence of degenerative disk changes does appear to vary greatly by sport. A study of 40 ballet and flamenco dancers found a lower incidence of degenerative changes seen on magnetic resonance imaging (MRI) compared with nonathletic control patients.[9] Alyas et al[10] studied the MRI findings of 33 asymptomatic elite adolescent tennis players with an average age of 17.3 years. Abnormalities were frequent (84.8% of patients) and occurred almost exclusively at the L4/5 and L5/S1 levels. Elite Olympic athletes have also been shown to have a greater prevalence and greater degree of lumbar disk degeneration than the normal population. MRI findings demonstrated progressively decreased disk signal from cephalad to caudad, with L5-S1 being the most commonly affected level (in 35% of the athletes). Disk bulges were detected in 58% (18) of the 31 participants.[11]

Evaluation

The evaluation of the athlete with low back pain should begin with a careful history and physical examination. A thorough evaluation should be performed to rule out any red flag symptoms suggestive of more serious pathology, such as fever, weight loss, morning stiffness, or history of cancer or

Department of Orthopaedic Surgery, UCLA David Geffen School of Medicine, Los Angeles, CA.
Address reprint requests to Jeffrey C. Wang, MD, Department of Orthopaedic Surgery, Santa Monica-UCLA Medical Center and Orthopaedic Hospital, 1250 16th Street, 7th Tower, #745, Santa Monica, CA 90404. E-mail: jwang@mednet.ucla.edu

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trauma. The athlete with low back pain should also be asked about any changes in bladder or bowel function or diminished perineal sensation to help exclude the possibility of cauda equina syndrome. In addition to degenerative disk disease and herniation, the differential diagnosis for the athlete with low back pain includes intrapelvic or gynecologic conditions (eg, ovarian cyst), renal disease, neoplasm, spondylolysis, sacroiliac joint dysfunction, sacral stress fracture, acute traumatic fracture, and discitis/osetomyelitis.[2]

On physical examination, range of motion may be decreased secondary to pain. On inspection, any postural abnormalities or deformity, such as scoliosis or kyphosis, should be noted. The paraspinal musculature may demonstrate tenderness or muscle spasm. The athlete presenting with pain that increases with forward flexion typically possesses a discogenic abnormality, whereas pain that increases in extension is more likely attributable to the posterior elements. A thorough neurologic examination, including sensory and motor function as well as reflexes, should be performed. The athlete with an acute disk herniation may demonstrate a neurologic deficit corresponding to the nerve root involved. Provocative maneuvers, such as the straight leg-raise examination, should also be performed by the patient.

Diagnostic imaging begins with standing plain radiographs. These films may only show disk space narrowing. Oblique views will help assess the pars interarticularis, whereas flexion and extension views may be used to assess dynamic instability. MRI is indicated when there is concern for pathology involving the disks and neural elements and may also help diagnose occult fractures, infection, or neoplastic disease. Bone scan may also be considered to rule out causes of increased metabolic activity, such as infection, neoplasm, fracture, or spondylolytic defects.

Treatment

Treatment of the athlete with acute or chronic low back pain secondary to degenerative disk disease is usually nonoperative and symptoms are generally self-limited. Most patients with acute back pain because of degenerative disk disease gain resolution of symptoms within weeks. Initially, patients should refrain from practice and competition. Treatment with anti-inflammatory medications may also help relieve symptoms. The use of lumbosacral corsets or braces for discogenic back pain is not conclusively supported in the literature and may lead to muscle wasting.[4] Micheli et al[12] found bracing to be beneficial in only 50% of adolescent athletes treated with a Boston brace for discogenic back pain.

After the initial acute period, physical therapy is beneficial to help with stretching exercises and isometric core-strengthening exercises. Cooke and Lutz detailed a 5-stage rehabilitation protocol for the treatment of discogenic lumbar pain in athletes. Stage I (early protected mobilization) consists of a brief period of rest followed by various therapeutic modalities, such as heat or ice therapy and nonsteroidal anti-inflammatory drugs. Once pain symptoms are controlled, the athlete is started on an early exercise program to restore lumbar and lower-extremity range of motion. Stage II (dynamic spinal stabilization) focuses on isometric cocontraction exercises of the abdominal and lumbar extensor muscles to stabilize the injured motion segment. Stage III focuses on strengthening of the lumbar muscles. The focus of this stage is on strength gains derived from improvements in neuromuscular firing as opposed to muscle fiber hypertrophy. In Stage IV, the athlete returns to sports activity with institution of plyometric exercises. Stage V includes a maintenance program with regular home and warm-up exercises.[13]

The clinician must be able to distinguish self-limited symptoms from persistent symptoms associated with identifiable anatomic pathology. In athletes with acute disk herniation, treatment with a period of rest and oral anti-inflammatory medications to decrease the degree of nerve root irritation are warranted. A corticosteroid dose pack to decrease swelling and reduce inflammation may also be beneficial. As symptoms improve, an exercise program with emphasis on core strengthening is generally advocated, as described previously.[4] In the patient with persistent radicular symptoms, an epidural injection or selective nerve root block may be considered.

In athletes with persistent symptoms despite nonoperative management, lumbar discectomy may be considered (Fig. 1). Although there have been no randomized controlled trials in which the authors examined the results of discectomy in athletes, previous investigators have demonstrated excellent results in return to play, decrease in levels of medication needed for pain control, and elimination of radiculopathy.[14]

Spinal fusion is generally a last resort for the athlete with discogenic pain and should be considered only after all other treatment options have failed. The necessary postoperative course after lumbar spinal fusion is generally not well-tolerated by athletes eager to return to competition. The results of fusion performed for discogenic pain are also less predictable than fusion performed for radicular symptoms. Interbody fusion techniques have become more popular when fusion is considered because it is believed that the pain generator is the disk itself in many of these patients. No reports are available examining the rates of return to sport after interbody spinal fusion in athletes. In the general population, good or excellent results have been reported in 80% to 100% of cases.[15-18]

Lumbar disk replacement surgery has also been considered as a treatment option for the young, active patient with lumbar discogenic pain. To our knowledge, there has been only one report on the results of lumbar disk-replacement surgery in athletes. Siepe et al[19] reported their results in 39 athletes with an average age of 39.8 years. The study reported successful return to sports in 94.9% of patients, with 84.6% of the patients being completely satisfied with the procedure. Despite these promising early results, there are serious concerns regarding possible implant migration, subsidence, and load-bearing capacity over time in athletes exerting increased load on the lumbar spine during sporting activities. Further work with larger patient cohorts and long-term follow-up is needed to further evaluate the utility of this treatment option in the athlete with refractory discogenic pain.