Epidural Steroid Injection for Lumbar Disc Herniation in NFL Athletes

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ABSTRACT

KRYCH, A. J., D. RICHMAN, M. DRAKOS, L. WEISS, R. BARNES, F. CAMMISA, and R. F. WARREN. Epidural Steroid Injection for Lumbar Disc Herniation in NFL Athletes. *Med. Sci. Sports Exerc.*, Vol. 44, No. 2, pp. 193–198, 2012. **Purpose**: To our knowledge, there is no published information on the efficacy of epidural steroid injections for the treatment of lumbar disc herniation in an athletic population. The purpose of this study was to evaluate the efficacy of epidural corticosteroid injection for treatment of lumbar disc herniation in a group of National Football League (NFL) players. **Methods**: We retrospectively reviewed the records of all NFL players who underwent an epidural steroid injection at our institution for incapacitating pain secondary to an acute lumbar disc herniation (confirmed on magnetic resonance imaging) from 2003 to 2010. Our primary outcome was success of the injection, defined as return to play. The secondary outcome of the study was to evaluate risk factors for failure of this treatment approach. **Results**: Seventeen players had a total of 37 injections for 27 distinct lumbar disc herniation episodes from 2003 to 2010. The success rate of returning an athlete to play for a given episode of disc herniation was 89% (24 of 27 episodes) with an average loss of 2.8 practices (range = 0–12) and 0.6 games (range = 0–2) after the injection. Four players required a repeat injection for the same episode. Three of these four players ultimately failed conservative management and required surgical intervention. Risk factors for failing injection therapy included sequestration of the disc herniation on magnetic resonance imaging (P = 0.01) and weakness on physical examination (P = 0.002). There were no complications reported. **Conclusions**: In this highly selective group of professional athletes, our results suggest that epidural steroid injections are a safe and effective therapeutic option in the treatment of symptomatic lumbar disc herniation.
Key Words: FOOTBALL, RETURN TO PLAY, NUCLEUS PULPOSUS, PROFESSIONAL ATHLETES

Back injuries, specifically lumbar disc herniations, are very common in contact sports such as football (12). Repetitive hyperextension, axial loading/jumping, twisting, and direct contact are all risk factors for lower back injury (13). Management can be challenging in high-demand athletes, particularly when the goal of treatment is early return to play. Return to play after conservative treatment of athletes with symptomatic lumbar disc herniation has been reported to be 79% at an average of 4.7 months (19). Similarly, surgical treatment studies of lumbar disc herniation report return to play for elite college athletes and professional football players at 74%–90% but do not specify a time frame (17,34). On average, a period of at least 3 months is recommended before return to play after discectomy (13). With either of these two treatment options comes months of lost playing time, at a great cost to the athlete and organization, not only in dollars but in rehabilitation and missed game time.

Currently, there is minimal literature supporting the use of epidural steroid injections in professional athletes (26). A general criticism about epidural steroid injections is the lack of improvement in pain and function (18). Because professional athletes have a high level of baseline functionality, they provide an ideal population to assess the usefulness of this modality. The purpose of this retrospective study was to demonstrate the efficacy of epidural steroid injections in returning athletes to play after lumbar disc herniation and also to identify risk factors for failure of this treatment approach.

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Submitted for publication April 2011.
Accepted for publication July 2011.

0195-9131/12/4402-0193/0
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DOI: 10.1249/MSS.0b013e31822d7599

METHODS

This is a retrospective review of the cases from one professional American football team between the years 2003 and 2010. The study was performed after institutional review board approval, and all athletes consented to be included in the present study. Our inclusion criteria included members who sustained a back injury confirmed to be a herniated nucleus pulposus by magnetic resonance imaging (MRI) and were physically unable to return to play as determined by the training staff and the player himself. Each of the players sustained the injury during either a game or practice. If a player needed a repeat injection during the study for a different episode (defined as a distinct anatomic level of disc herniation), he was still included in the study. For example, a player who had a disc herniation at the right L4–5 level and a second herniation the following season at the left L5–S1 level would be included in the study and defined as two distinct episodes. Players who were unable to return to play or ultimately needed surgery to address the disc were not excluded from the study. Players who had preexisting herniated disc conditions or those who had concomitant pathologies such as malalignment, lumbar instability, and prior back surgery were excluded from this study. Athletes with lumbar stenosis or spondylolysis were not excluded because these findings are relatively common in this population (15,17).

After injury, the patients were evaluated by one of the team physicians. Examination findings often included limited forward flexion with associated corkscrew of the trunk away from the side of the disc herniation. Neurological findings, including weakness, were uncommon. Evaluation included anteroposterior, lateral, oblique, and L5–S1 spot lateral radiographs. Initial management included rest, ice, and removal from play and provocative activities. A lumbosacral MRI was obtained at our institution within 1 wk, and the diagnosis of herniated nucleus pulposus was then confirmed. MRI scans were reviewed for anatomic level of the disc herniation, characterization of the disc herniation, and the presence of same-level or adjacent-level spondylolysis. A disc protrusion was defined as a bulging displaced nucleus pulposus that has not extended beyond the limits of the annular membrane, a disc extrusion was defined as the nucleus pulposus extending beyond the annular membrane but still in continuity with the parent disc, and disc sequestration was defined as a disc fragment separated from the parent disc (31). The patient was then referred to a pain management specialist with expertise in administering epidural lumbar spinal injections.

Verbal and written consent was obtained from each player before administration of the injection. The injection cocktail—its drugs and dosage—was determined by the administering physician. The injection consisted of a steroid, 80–160 mg of triamcinolone, and an anesthetic, either lidocaine or bupivacaine. The technique was either transforaminal (81%) or interlaminar (19%), on the basis of the administering physician's discretion. After injection, all players had no contact sports for 48 h.

Once the injection was completed, our primary outcome measure was return-to-play status. This was defined as the ability of the player to participate in a professional football game as deemed by the coaches, player, and trainer. Time to return to play was measured from the time of injury to return-to-play activity. Complications such as infection, skin irritation, paresthesias, and worsening of preinjection symptoms were all recorded. Time lost because of injury was measured in games missed (games are played on a weekly basis in the National Football League (NFL)).

Statistical analysis was performed using the SAS software (version 9; SAS Institute, Inc., Cary, NC). To assess potential risk factors, including location of pain on presentation, anatomic level of disc herniation, MRI disc morphology, presence of spondylolysis, and injection technique, P values were calculated using a logistic regression model. A chi-square test was used to calculate whether neurologic deficit was a factor in return to play. P values < 0.05 were considered statistically significant.

RESULTS

Seventeen players had a total of 37 injections for 27 distinct lumbar disc herniation episodes from 2003 to 2010. The average male athlete age was 25 yr (range = 22–32 yr). Six of the players were offensive linemen, four were defensive linemen, two were wide receivers, two were defensive secondary, one was a running back, one was a linebacker, and one was a quarterback. MRI scans reviewed showed that 15 of the disc herniation episodes occurred at the L4–5 level, 11 occurred at the L5–S1 level, and 1 occurred at the L3–4 level. Disc herniations were defined as protrusions in 23 episodes, extrusions in two episodes, and sequestrations in two episodes.

The average time from injury to injection was 4 d (range = 0–14 d). Thirty of the injections were performed using a transforaminal approach (81%), and seven of the injections were performed using an interlaminar approach (19%). The success rate of returning a player to the field for a given episode of disc herniation was 89% (24 of 27 episodes) with an average loss of 2.8 practices (range = 0–12) and 0.6 games (range = 0–2) after the injection. After 27 of the 37 injections, the player was able to return to play without missing any games. After successful return to play, the thirteen players played an average of 2.8 seasons in the NFL (range = 1–6). Ten players are still actively playing in the NFL as of the end of the 2010 season.

Four players required multiple injections for the same episode. Three of these four players ultimately failed conservative management and required surgical intervention. The first player presented with severe leg pain and weakness with an MRI demonstrating a large right disc sequestered fragment causing impingement of the right S1 nerve root (Fig. 1). He was managed with four injections during

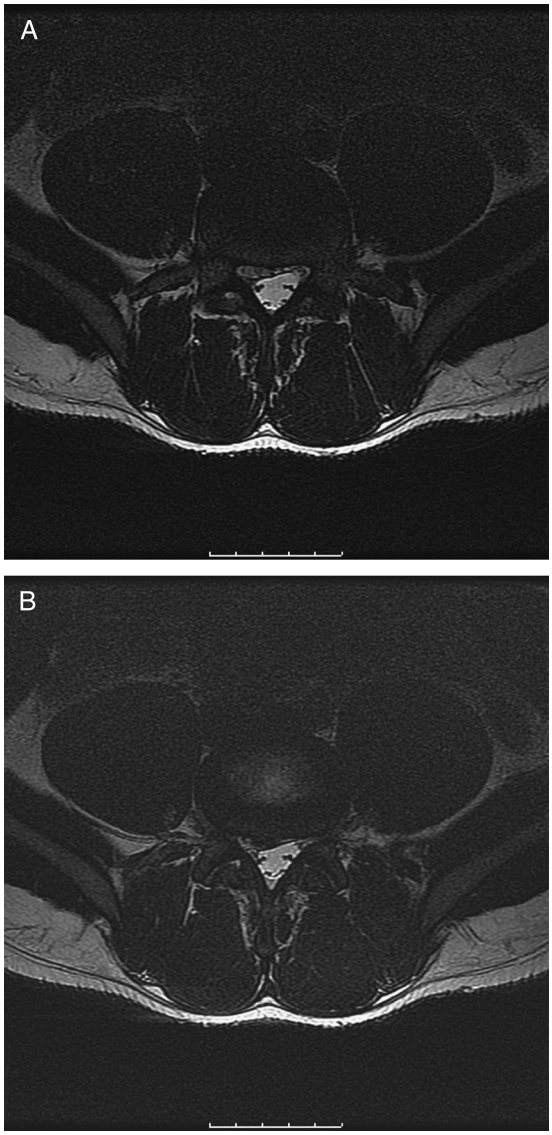

FIGURE 1—Two consecutive axial images, (A) cranial and (B) caudal, demonstrating a small posterior right paracentral disc protrusion compressing the right axillary sleeve of the nerve root and, immediately caudad to the space, a large sequestered disc fragment, located in the anterior epidural space to the right of midline.

the season, did not return to play, and ultimately required a right-sided microdiscectomy at L5–S1 after the season for persistent pain and weakness. He was able to return to play the next season and has played a total of three seasons since surgery. The second player presented with severe low back pain and no leg symptoms or weakness. The MRI demonstrated degenerative disc disease at L4–5, with a left-sided protrusion mildly displacing the left L5 nerve root. Despite three injections, he continued to have pain, was unable to return to play, and was placed on injured reserve. He retired from football because of persistent back pain and ultimately underwent an artificial disc replacement at another institution because of underlying degenerative disc disease. The third player who did not return to play presented with right extensor hallucis longus weakness and numbness on the dorsum of his foot from a large sequestered disc fragment, compressing the right L5 nerve root. He initially had a right transforaminal injection, which alleviated his pain, but had continued weakness. A second injection was performed, but his examination did not improve. Therefore, he underwent a right L4–5 microdiscectomy for persistent leg weakness and was placed on injured reserve. He is currently in rehabilitation and expected to return to play.

Risk factors for failing injection therapy included sequestration of the disc herniation on MRI ($P = 0.01$) and weakness on physical examination ($P = 0.002$; Table 1). Presenting symptoms, anatomic level of the disc herniation, presence of spondylolysis, and injection technique did not adversely affect return to play. There were no complications reported. No players returning to play had any residual weakness or sensation deficit.

DISCUSSION

In professional athletes with high functional demands, our results suggest that epidural steroid injections are effective in treating symptomatic lumbar disc herniations. The injections seem to be safe and well tolerated. When measuring success by return to active play after receiving an epidural steroid injection, our study shows an 89% success rate. This treatment modality provides a safe alternative to surgery or, at the very least, provides relief until surgery can be done in the off-season.

In the general population, back and leg pain secondary to disc herniation is estimated to affect 10 million in the United States alone (16). The majority of episodes of acute lumbar pain resolve with conservative treatment (e.g., physical

TABLE 1. Risk factors for failure of epidural injection.

		No. of Episodes	RTP after Injection	Significance
Symptoms				$P = 0.96$
	Low back pain	9	8 (89%)	
	Leg pain	0	NA	
	Both	17	15 (88%)	
Neurologic deficit				$P = 0.002$
	Yes	2	0 (0%)	
	No	25	24 (96%)	
Anatomic level				$P = 0.47$
	L3–4	1	1 (100%)	
	L4–5	15	13 (87%)	
	L5–S1	11	10 (91%)	
MRI disc findings				$P = 0.01$
	Protrusion	23	22 (96%)	
	Extrusion	2	2 (100%)	
	Sequestration	2	0 (0%)	
Spondylolysis				$P = 0.19$
	Same level	5	5 (100%)	
	Adjacent level	2	2 (100%)	
Injection technique				
	Transforaminal	20[a]	16 (80%)	$P = 0.55$
	Interlaminar	7[a]	7 (100%)	

[a] First injection for a given episode.
NA, not applicable; RTP, return to play.

therapy, medications, and activity modifications), 60%–70% within 6 wk and 80%–90% within 12 wk (5). Therefore, in contrast to this study of professional athletes where MRIs were obtained within 1 wk of injury, usually, the general population can initially be managed without advanced imaging with the acute presentation of lumbar disc herniation. Recent MRI studies have shown that reduction in size of disc herniations correlates with clinical improvement after conservative treatment in two of three patients (14,22). But for those patients who do not respond to conservative treatment, surgical discectomy or epidural injection has been used to treat the pain associated with disc herniation. Although surgical discectomy generally has excellent results, it can be associated with neurological, cardiovascular, and infection complications (28,29,33,37).

Epidural injections avoid surgery, but systematic reviews of the literature have produced conflicting results. The incidence and cost of treating of chronic lumbar back pain are increasing rapidly. Koes et al. (21) reviewed 12 randomized trials in 1995. Six reported favorable outcomes, whereas six did not support the efficacy of lumbar epidural steroid injections. Several studies do support the short-term efficacy of epidural steroid injections (7,9), including several systematic reviews (1,2,10,27,32). Recently, two studies reported that epidural injections containing local anesthetic and a steroid demonstrated better and faster efficacy than local anesthetic and saline alone (24,30). In a 2007 report by the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology, it was concluded that epidural steroid injections may ameliorate radicular leg pain between 2 and 6 wk after the injection, compared with control treatment (6). They concluded that long-term use, however, demonstrated no benefits beyond 3 months. Other investigators have found long-term efficacy of epidural steroid injections. Lutz et al. (23) reported greater than 75% long-term success (average period of 80 wk) with fluoroscopic transforaminal lumbar epidural steroid injection, although this was not a randomized study. Manchikanti et al. (24) concluded in 2010 that epidural steroid injection afforded long-term relief by patient selection and judicious use of repeat injections. Buttermann (8) compared epidural steroid injections with discectomy and found these to be less effective in reducing pain, leg weakness, and Oswestry disability scores. However, for nearly half of the patients receiving epidural steroid injections, these were effective for a period of up to 3 yr.

The contrasting results outlined above may be attributed to methodological and technical differences between all the studies such as heterogeneous subject populations, diagnosis and pathologies, technique of epidural injections (caudal, interlaminar, transforaminal), and use of fluoroscopic guidance. The transforaminal approach was shown to provide more effective pain relief over the other two approaches (3). Although pain scores were not measured in the current study, there was no difference in return to play between transforaminal versus interlaminar injection techniques. Epidural injections performed without the aid of fluoroscopy are termed "blind" injections and have been reported to miss the intended target area 30%–40% of the time (36).

Concerning athletes, the use of epidural steroid injections in professional sports is generally acknowledged, but few reports exist in the medical literature regarding their efficacy (26). Outcomes may differ for elite professional players compared with the general population because of the demands of their sport. In a study that investigated back injuries among collegiate athletes, gymnasts and football players suffered the most back injuries (20). Previous reports have estimated that approximately 30% of college football players miss games as a result of lumbar spine problems (11,25). Elite competitive football players are at a greater risk of disc herniation and degenerative disc disease due to repetitive flexion, extension, and torsional lumbar movement with an increasing axial load (15,17) and lifting heavy weights.

Conservative versus surgical management for a herniated disc in the athlete remains controversial in the literature (34). It tends to be very patient-specific and depends on the treating surgeon's recommendations (35). Similar to the players treated in our study, the decision to perform an injection depended on the treating spine surgeon's judgment, based on such factors as when in the season the injury occurred, the player's anatomic distribution of symptoms, and the player's physical examination, focusing on any leg weakness. A recent performance-based outcome study after lumbar discectomy in professional American football players found that 78% of players treated surgically returned to play in at least one NFL game (17). A short-term outcome study of conservative management in athletes from a variety of sports other than football reported a similar 79% return to play at an average of almost 5 months (19). Our study compares favorably, with 89% in the current series returning to play. A recent systematic review of the literature comparing conservative versus surgical management in athletes with lumbar disc herniation found satisfactory return to play using either conservative or surgical treatments (18). We recommend an individualized approach to each athlete, based on his symptoms, physical examination, and imaging findings.

Risk factors in our series for failed injection management included weakness on physical examination and sequestration of the herniated disc on MRI. In contrast, a previous study of 71 athletes treated nonoperatively did not find either of these factors to correlate with return-to-play status (17). In that series, the only factor influencing the ability of athletes to return to their original sporting activities was the severity of symptoms before the start of their treatment. However, in that study, only 79% of athletes returned to sport at an average of almost 5 months. A prospective and longitudinal study assessing the relationship of clinical outcomes to morphologic changes on MRI found that sequestered disc herniations had an 85% successful clinical outcome versus 67% for extruded disc herniations, but this difference was not statistically significant (4). However,

there was also a higher rate of resorption of the disc materials on follow-up MRI scans for the sequestered discs at an average of 4.3 months later. In both of the above studies, return to activities was significantly longer than in the present series. It is possible that the two players in our series with sequestered disc fragments that were treated with surgery could have improved with prolonged conservative treatment because they both underwent surgery at 2 months from initial injury. The timing of the end of the season and anticipated rehabilitation for return to play for the next season affected the decision to perform surgery in these high-demand professional athletes. In addition, it is also possible that the cortisone injection used in our series may dampen the inflammatory process needed for ultimate resorption of the disc fragment.

There are several limitations to our study. First, the primary end point in this study is return to play. No long-term follow-up with physical examination or repeat MRI was performed. A recent study reports that players treated surgically for lumbar disc herniation played in more games after treatment than those treated nonoperatively (17). Second, we did not rate the patients' pain. Athletes generally have a high pain tolerance and are able to regain enough functionality to return to play. It may be difficult to directly correlate the athletes' pain to that of nonathletic patients. Third, there was no control group, and one could argue that players may have returned to play without injection. However, on the basis of a previous study of conservative management without injection, an average time of almost 5 months for return to play was required (19). Finally, our study did not monitor other treatment modalities done in conjunction with the epidural steroid injections (i.e., use of nonsteroidal anti-inflammatory drugs, physical therapy, etc.). We believe that physical therapy is a critical component of conservative treatment. A future prospective study would yield more objective results if it includes these data points.

It is important to remember that the results of the current study include only professional football players who received an epidural injection at an average of 4 d from injury. These results should not be applied as a treatment algorithm to the general population because 80%–90% of acute lumbar pain episodes resolve with physical therapy, medications, and activity modifications within 12 wk (5).

CONCLUSIONS

In this highly selective group of professional athletes, our results suggest that epidural steroid injections are an effective therapeutic option in the treatment of symptomatic lumbar disc herniation. In our experience, these seem to be safe and well tolerated with minimal adverse effects.

This study did not receive financial support.
The authors report no conflicts of interest.
The results of the present study do not constitute endorsement by the American College of Sports Medicine.

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