

Microscopic lumbar discectomy results for 60 cases in professional and Olympic athletes

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Received 25 March 2002; accepted 9 September 2002

Abstract

Background context: There is no documented information indicating time for return to play after lumbar discectomy in professional and Olympic athletes.

Purpose: To determine the rate of return to sport and the average time of recovery in elite athletes undergoing microscopic lumbar discectomy (MLD).

Study design: Between 1984 and 1998, the senior author performed 60 MLDs on 59 professional and Olympic athletes with lumbar herniated nucleus pulposus.

Patient sample: Sixty consecutive MLDs performed on professional and Olympic athletes were reviewed.

Outcome measures: The rate of return and the average time to return to sport were determined. Also, the distribution of pain and presence of neurologic deficits were recorded.

Methods: A retrospective review was performed.

Results: Follow-up indicated that all but 7 of the 60 cases had returned to their sport, including one who underwent a second MLD for a herniation at an adjacent level. The average time from surgery to return was 5.2 months for the entire group, with a range of 1 to 15 months.

Conclusion: MLD was effective in correcting the problems that forced the athletes to seek help, and the time to return often depends on factors other than their medical condition. Postoperatively, a complete trunk stabilization rehabilitation program was effective in returning these athletes to a high level of competition. © 2003 Elsevier Science Inc. All rights reserved.

Keywords: Spine; Athletes; Athletics; Surgery; Discectomy; Outcomes

Introduction

In the business of sports, an athlete with an injured back is a nonproductive competitor. To the professional athlete, back injuries frequently result in poor performance or an inability to perform, leading to a loss of income or, even worse, early retirement from the sport. For the injured Olympian, an injured back may mean a long delay in, or possibly the early conclusion to, a promising pursuit of athletic excellence.

Although surgery can frequently correct the athletic injury, there remain the issues of whether surgical correction is sufficient to allow the athlete to return to the rigors of the

sport and, if so, whether it will take weeks, months or years to make that return. The return-to-normal function issue has been little studied; the return-to-normal function issue in sports specifically has had even less attention.

Methods and materials

A total of 59 professional and Olympic athletes presenting with lumbar herniated nucleus pulposus requiring surgical intervention, including one patient who underwent a second microscopic lumbar discectomy (MLD) for a herniation at an adjacent level, were operated on with MLD by one of the authors (RGW III) between 1984 and 1998.

A retrospective review of all of the cases was carried out to determine the rate of return to work and the average time of recovery, as indicated by the length of time between surgery and return to competitive play in the patients' sports.

All 60 cases were diagnosed with lumbar herniated nucleus pulposus on magnetic resonance imaging. Herniated

FDA device/drug status: not applicable.

Nothing of value received from a commercial entity related to this research.

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discs occurred at the following levels: 1 at L2–L3, 2 at L3–L4, 24 at L4–L5 and 33 at L5–S1. All patients had stopped participating in their sport and were unable to return because of back and leg pain. All patients had leg pain during play. Microscopic lumbar discectomy was indicated when patients fulfilled three criteria: herniated disc documented by magnetic resonance imaging, inability to participate in their sport and failed conservative treatment of at least 6 weeks.

The microscopic lumbar discectomy used in these patients consisted of the patient being positioned on the Andrews table. Paraspinous needles locate the disc space on a lateral X-ray. The skin incision extends from the center of the disc space to 2 cm caudal. Careful dissection is carried out down to the tip of the spinous process, and a fascial incision is made just off the bulbous tip of the spinous process. A blade-type retractor is placed over the interlaminar area with the spike of the retractor medially, caudal to the spinous process, and the blade dorsal to the facet joint. At this point, the microscope is brought into the field.

For a caudal extruded fragment, the ligamentum flavum is detached from the cephalad edge of the caudal lamina. A small portion of the ligamentum flavum is resected, as is the cephalad edge of the caudal lamina. The ligament is then detached laterally, allowing entry into the epidural space. The nerve root is identified, the pedicle is identified, the axilla is identified, and the fragment is removed. The hole and the posterior annulus are identified and entered with the pituitary rongeur, removing any loose pieces. A short, blunt right-angled dissector is used to explore the floor of the canal for any loose pieces. When the herniation is cephalad to the disc space or is a high lumbar herniation, the interlaminar area is exposed. The high-speed drill is used to perform a laminotomy up to the cephalad insertion of the ligament. The ligament is then removed, the epidural space entered and the fragment removed. This is followed by the same intradiscal and intracanal work as above. When there is lateral recess stenosis, a significant portion of the medial aspect of the facet, as well as more of the lateral ligamentum flavum, may need to be removed in order to adequately decompress the nerve root. Removing only the portion of the facet medial to the medial wall of the pedicle preserves stability. Once proper decompression is completed, the fascia and skin are closed tightly.

Within a few weeks after surgery, every athlete underwent an intensive trunk stabilization program. Because these athletes were referred from professional and Olympic sports organizations all over the country, most of the athletes had to return to our facilities to learn the initial stages of trunk stabilization. Except for those team therapists and trainers with whom we had already worked, the training and therapy staff were taught the basics of trunk stabilization.

Rehabilitation consisted of neutral position trunk lumbar stabilization and strengthening. The average time for beginning the rehabilitation program was 3 weeks after surgery. Trunk stabilization, a program that centers on balance and coordination of proprioceptor-stimulated muscle function,

begins with establishing neutral position, gaining isometric control and strengthening the trunk. Participants move through an upper-body phase of the program that is based on building proper trunk isometric control strength and emphasizes chest-out posture correction. From there, they complete five levels of trunk-stabilizing exercises of increasing intensity.

A concurrent aerobic conditioning program was also begun for these athletes that required them to begin ambulating as soon as possible after their surgery. This segued into a vigorous walking program and, after Level 1 stabilization training was initiated, the aerobics regimen increased to 1 hour of intensive exercises daily. Nordic Track, stair climbing, water walking and running were among the means used for building aerobic capacity.

Once the athletes completed the fifth level of the graduated program, they began a series of sports-specific exercises. Here is where the rehabilitation program begins to merge its activities with those activities common to the participants' various and respective sports. Nonetheless, the rehabilitation regimen continued to center on developing the same balance and coordination that was emphasized in all other segments of the program. Various additional tools and techniques entered the picture at this point, from bungee cords to agility exercises, and team coaches and trainers familiar with the sport began their active involvement and interventions.

Upon completing their sports-specific exercises, as long as the following factors were in place, athletes were cleared to return to their sport to begin practicing and preparing for gradual reintroduction to active play:

1. The trunk stabilization program had been completed through Level 5.
2. Excellent aerobic condition had been achieved.
3. The athlete had returned to a satisfactory level of mastery of the skills necessary to perform in the sport.
4. The stretching and strengthening exercises specific to that sport could be performed.

Each of the cases was followed postoperatively, in detail, with the training staff of their team. Careful monitoring was carried out concerning the level of the stabilization program, that is, when did the patient begin lifting, when did the patient begin running, when did the patient begin throwing. The decision to return to sport was based on the athlete's ability to perform the rehabilitation program rather than the time lapsed postoperatively. The surgeon participated in the decision to return to the sport, along with the athlete and the training staff of the team. This decision was based on the athlete's performance of the rehabilitation program and the presence of residual symptoms. With significant residual symptoms, the patient was returned to the surgeon's office for reevaluation. If the patient was asymptomatic and able to perform the rehabilitation program, an office visit before returning to the sport was not mandatory. Each player was followed for at least 2 years after surgery.

Results

Average age of the patients at the time of surgery was 26.8 years (range, 19 to 37). All patients presented with low back and/or leg pain. Thirty-nine patients reported leg pain greater than back pain, 19 patients reported back pain greater than leg pain, and two patients reported equal back and leg pain. Subjects had experienced an average of 5.2 months of pain (range, 1 week to 48 months) before initial presentation. A total of 17 patients had a neurologic deficit. Neurologic deficits (motor and/or sensory) occurred at the following levels: one at L3, two at L4, two at L5, nine at S1, one at L4 and L5 and two at L5 and S1.

Of the 60 cases, 53 returned to active participation in their sport. The average time that elapsed between surgery and their return to the sport was 5.2 months (range, 1 to 15 months). The number of athletes returning to sport and the average time returning to sport for individual sports is listed in Table 1.

There was no significant difference in the return to sport based on leg versus back pain. Of the 39 patients with leg pain greater than back pain, 35 returned to sport at an average of 5.2 months. Of the 19 patients with back pain greater than leg pain, 17 returned to sport with an average of 5.3 months. Of the two patients with equal back and leg pain, one returned to sport in 4 months.

Of the 17 patients with neurologic deficits, 15 regained full function (Table 2). Two patients with preoperative motor weakness of the S1 nerve root did not recover strength post-operatively and were not able to return to their sport. There were no cases of iatrogenic nerve damage or dural tear.

Case 1

A 31-year-old professional offensive lineman football player presented with radicular pain in his left leg and occasionally in his right leg. He had a 4/5 extensor hallucis longus and anterior tibialis and extreme left leg L5 radiculopathy. He had prior laminectomies performed 8 years and 6 years before the visit. At presentation he had sustained a recurrent herniation and fractured facet causing foraminal

stenosis at L5–S1. He underwent a one-level discectomy at L5–S1 and decompression of the facet. He returned to play the next season, 6 months after surgery, with full recovery of motor strength (Fig. 1).

Case 2

A 26-year-old professional football quarterback presented with a history of having developed significant low back pain 2 months before admission. Magnetic resonance imaging revealed a mild herniated disc at L4–L5. After his symptoms resolved with trunk-strengthening exercises, the patient returned to play. Several weeks later, he sustained a massive herniation at L4–L5, causing severe radiating left leg pain, weakness in the leg and an L5 radiculopathy. He underwent MLD at L4–L5 and returned to full strength and activity 8 weeks after surgery (Fig. 2).

Discussion

Microscopic lumbar discectomy has been reported to be a successful procedure, with up to 90% recovery in some series [1,2]. Our return to full activity of 88% compared favorably with other studies [1,3–9]. That the majority of the athletes in this study returned to competition, after what would appear to be a short hiatus from their physically demanding occupation or avocation, might be ascribed to the relative youth of the patients and their probable high motivation to recover fully and get back to work.

A study by Wang et al. [10] showed similar results of lumbar discectomy in athletes. Of 10 college athletes who underwent single-level discectomy, 9 returned to varsity competition. They did not include the time to return to sport or level of disability at return to sport in this paper.

A study by Matsunaga et al. [11] showed only 27% of athletes undergoing simple disc excision had a complete return to sport without disability. Similarly, 27% of athletes undergoing percutaneous discectomy returned to full activity. However, 87% of athletes undergoing percutaneous discectomy and 54% undergoing simple disc excision did return to their sport in some fashion, most of them with disability. They reported a return to sport of 7.5 weeks for athletes undergoing percutaneous discectomy and 17 weeks for those undergoing simple discectomy. However, these numbers included a majority of athletes who returned despite disability.

Table 1
Return-to-sport rate and average time, by sport

Sport	Total surgeries (N)	Return to sport (N)	Return to sport (%)	Average time (months)
Ballet	1	1	100.0	2.0
Baseball	21	19	90.5	5.3
Basketball	7	7	100.0	8.0*
Football	20	15	75.0	4.0
Hockey	7	7	100.0	6.4
Olympians				
Ski	1	1	100.0	3.0
Swim	1	1	100.0	3.5
Water polo	2	2	100.0	3.0

*One athlete, 15 months; other six, 6.8 months.

Table 2
Neurologic deficits by level

Level	Preoperative	Postoperative
L3	1	0
L4	3	0
L5	4	0
S1	8	2
L5 and S1	1	0

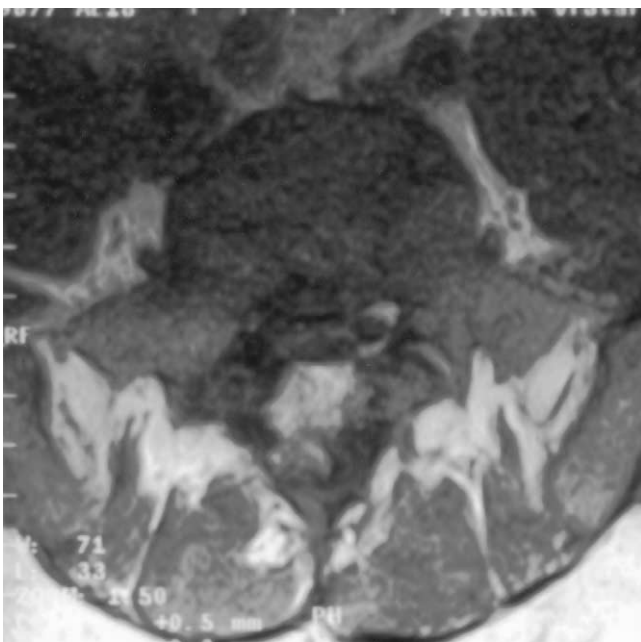
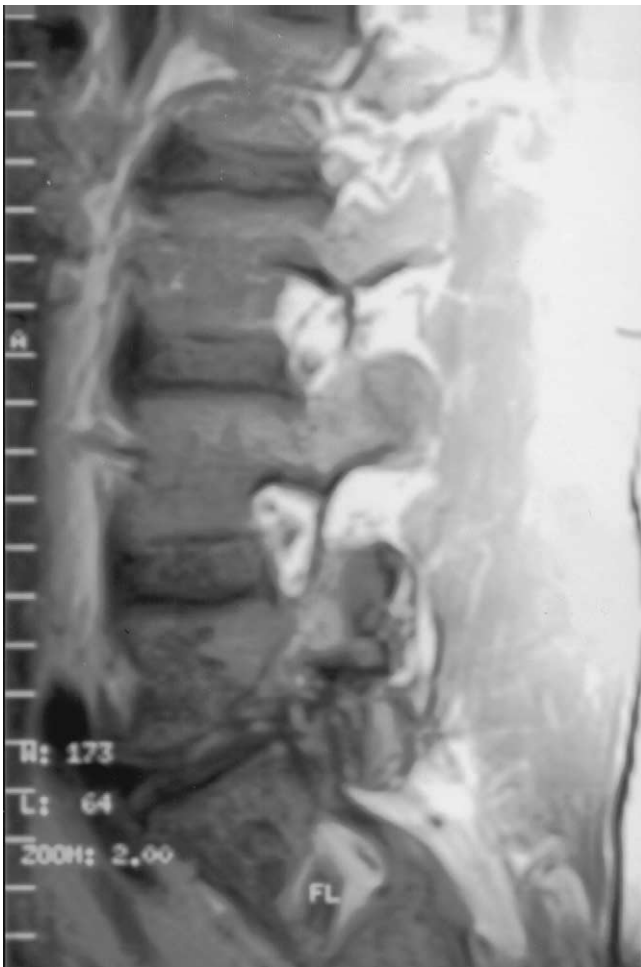


Fig. 1. (Top) Sagittal magnetic resonance imaging (MRI) of the L5–S1 disc herniation. (Bottom) Axial MRI of the L5–S1 disc herniation with fractured facet on the right. Notice compression of the right L5 nerve root.

Kambin et al. [12] reported 88.2% of patients undergoing arthroscopic microdiscectomy had a satisfactory result. However, within this group 19 of 149 patients had a good result, which was classified as occasional low back pain and return to modified occupation. Therefore, only 76.9% had an excellent result that included pain-free return to their preoperative occupation. All of our 88% patients with a satisfactory result returned to their preoperative professional or Olympic sport.

Yeung and Tsou [13] reported an 89.3% satisfactory result in patients undergoing posterolateral endoscopic excision for lumbar disc herniation. These results were based on a modified MacNab classification and did not specifically mention return to work.

It is interesting to contrast the 88% return-to-sport rate in our study with the return-to-work data reported in a recent survey of spine patients treated for lumbar disease and covered by a city compensation plan [14]. For the 118 patients in the prior study, as few as 8% of those who underwent L4 discectomies and no more than 36% of those who had L5 discectomies returned to work in the 2 to 13 years after their operations. Clearly, there would be differences between these two groups in the quality of surgery performed, the quality of their postoperative rehabilitation, their average age, state of health and so forth. Nevertheless, could the differences be so substantive as to produce such vast differences in outcomes? There must be other factors at work determining success of and recovery from spine surgery, at least one of them related to patient motivation. That athletes in general are highly motivated to return to the game is beyond conjecture.

The athletes' dedication to the rehabilitation program may have accounted for their timely return to sport. Studies have shown that participation in a trunk-strengthening program can improve results after lumbar discectomy [15,16]. If compression forces on the spine can be reduced, Morris et al. [17] said more than 30 years ago, patients with symptomatic herniated discs may be provided long-term reduction or alleviation of pain. They suggested that if trunk musculature can more efficiently support the spine, the force on the lumbosacral disc can be reduced by 30%. If the gluteal muscles, erector spinae, the abdominal oblique, the rectus abdominis and all the associated muscles of the trunk can fire together, then the spine can move in a coordinated, muscle-controlled manner [17]. Discrepancies in one muscle group may lead to overcompensation of another, hence the importance of all associated muscle groups being trained together to prevent injury. Movements executed from this neutral position should, theoretically, reduce or alleviate pain during movement and possibly prevent an injury from occurring. Although only limited research has been conducted on specific training regimens, evidence suggests that specific training of trunk muscles to react synergistically may increase strength and reduce stress on the spine [17–19].

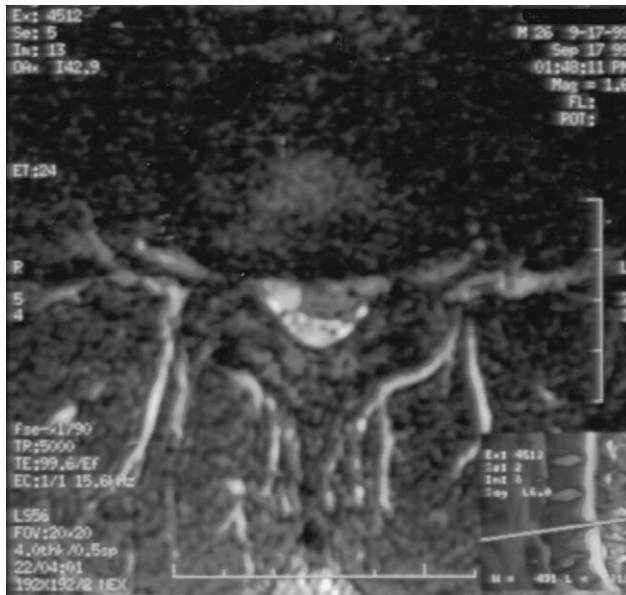


Fig. 2. (Left) Sagittal magnetic resonance imaging (MRI) of the massive L4–5 disc herniation. (Right) Axial MRI of the L4–L5 disc herniation with compression of the left L5 nerve root.

We think the postoperative rehabilitation program carried out with these athletes was a vital part of their safe return to their sport. It required not only the full participation of the athletes themselves but also the cooperative efforts of team trainers and team therapists skilled in trunk stabilization and rehabilitation of athletes. It was these therapists and trainers who monitored the rehabilitation program after the athletes left our facility.

For this outcome study, the primary measurement sought was simply whether athletic activities at the player's preinjury level were resumed. Being able to perform and having the opportunity to play on a team are two different things. A number of factors go into the decision to return to play, among them motivation to return, the temporal factor in seasonal sports and a coach or manager's decision on the matter.

As already noted, these results are confounded by a number of elements that could not be factored. Athletes with spinal problems commonly have surgery at a point so late in the season that the season ends just before they are ready to return. Their skill level usually returns sufficiently during the off-season so that they can return to active play on the first day of the following season. Nevertheless, their return to sport must be recorded as the day they return to active play. Were this not the case, it could be expected that the figure for average time of return to sport would be even lower.

Conclusion

Microscopic lumbar discectomy, when combined with an effective postoperative rehabilitation program, can be effective in returning athletes with lumbar herniated nucleus pulposus to their sport in a timely manner.

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