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Reduction of Lumbar Disc Herniation/Extrusion Verified by MRI Incorporating -Rx Extension Therapies: An ASPINE Systems® Case Report

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Abstract

[Purpose] To present the results of a patient with low back pain, MRI confirmed disc herniation/extrusion, who underwent -Rx extension therapies with ASPINE Systems®. [Case Presentation] A 28-year-old male suffered from low back pain due to lumbar disc herniation. MRI studies revealed a hypo-lordosis with confirmed lumbar disc herniation and extrusion at the L5-S1 level. Decrease in global and segmental lumbar range of motion suggested vertebral fixations; several orthopedic and neurological tests were positive. [Results] After 42 -Rx extension treatments over a period of 12 weeks there was a reduction of a lumbar disc herniation and extrusion verified with MRI and improvements in the patient's symptoms. [Conclusion] A patient with lumbar disc herniation/extrusion was successfully treated with ASPINE Systems® integrating spinal manipulation, strengthening spine muscles, and spinal multidimensional traction all in lumbar -Rx extension. Additional research is recommended in the treatment of lumbar disc herniation with extension therapies.

Keywords: Herniation • Extrusion • Extension therapies • APINE systems® • ASPINE spinal rehabilitation • Multidimensional traction

Introduction

Chronic low back pain (CLBP), pain lasting 3 months or more, is a major health problem, being one of the most common diseases since 60-80% of the population has experienced it or will experience it at some point. Amongst back pain ailments, lumbar disc herniation (LDH) is the most common [1]. A herniated disc is a condition affecting the spine in which the annulus fibrosus, the outer layer of the disc, is damaged enabling the nucleus pulposus, gel like substance located in the center, to herniate compressing the nerves causing pain [2]. The prognosis for chronic low back pain (CLBP) is unclear; as a study performed in 2009, surveyed 973 patients with CLBP, 47% had not recovered by 12 months [3].

Evidence suggests that extension therapy has favorable outcomes in patients with LDH. Extension type exercises are based extension movements of the lumbar spine [4]. McKenzie-type exercises has been shown to reduce the posterior movement of the disc's nucleus [5]. Postural divergence and sagittal plane (Z-axis) curves play an important role in the successful management of CLBP, due to the recovery of lumbar lordosis [6]. Application of segmental disc unloading force to restore lumbar lordosis with extension traction has shown successful results in patients with LDH [7,8].

The International Society of Biomechanics (ISB) suggests human kinematics to be quantified by means of an XYZ Cardan sequence of rotations and translations (**Supplementary figure 1**). Extension of the lumbar spine would be written as -Rx; the negative value indicates the direction of the lordosis [9].

Studies have shown that spinal manipulative therapy (SMT) can improve pain and functional disability of people suffering from LDH [10]. SMT is an effective and safe treatment for acute and chronic LDH. Gonstead Chiropractic Technique (GCT) locates vertebral fixations and restores its disc biomechanics using SMT in extension [11]. High velocity low amplitude (HVLA) manipulation engages a rapid use of force over a short duration, distance with the anatomical range of motion of a joint engaging the restrictive barrier to elicit the release of the fixation [12].

Case Presentation-On March 2, 2019, a 28-year-old male presented to the clinic with a chief complaint of frequent low back pain (LBP) which he described as, "sharp and aching" for one year, occurring daily, relieved with forward bending; but aggravated with coughing and sneezing. The patient rated his LBP at 8/10 on most days using the Visual Analogue Scale (VAS), 0=no pain; 10=worst pain ever. The patient's functional capabilities were rated as 20% via the Oswestry Chronic Low Back Pain Disability Questionnaire (ODI). The patient stated, *"I was an active guy, I used to play soccer with my friends at least twice a week. Now that I have this much back pain, I am unable to be as active as I was. My goal is to be able to be active and play soccer."*

Initial examination revealed pain and tenderness on palpation of the lumbar spine and pelvis. Lumbar range of motion (ROM) was limited in forward flexion about 70 degrees due to his hypertonic hamstrings, lumbar extension and left rotation about 20 degrees (visually estimated) due to pain in the lumbar region. Kemps test on the right reproduced his chief complaint of LBP. All other orthopedic tests were unremarkable. Toe walking was difficult to perform with his right leg, *stating, "I feel my right leg is weak and very sore when I try to walk on my toes."* Spinal segmental fixations were identified in the lumbar and pelvic region via spinal motion palpation. Digital posture evaluation revealed forward head shift (+TzH), anterior pelvis shift (+TzP) and a posterior pelvic tilt (-RxP) [13].

Lumbar MRI films (Figure 1) were brought to be assessed digitized using ASPINE Systems®. ASPINE Systems® refers to a standard protocol for spinal diagnostic procedures and noninvasive multidisciplinary

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rehabilitation treatments. The sagittal images were postural analyzed and calculated using the Harrison Posterior Tangent (HPT) [14]. Both sagittal and coronal views were clinically assessed for any congenital abnormalities and other spondyloarthropathies. The sagittal lumbar view revealed a hypo-lordosis of (18° vs. 40° normal) [15]. The MRI report revealed the following: *"Degenerative disc disease at the L5-S1 disc level. A large inferiorly extrusion right posterolateral L5-S1 disc herniation with compression of the right S1 nerve roots."*

Methodology

The patient consented to treatment targeting the correction of his lumbar hypo-lordosis and improvement of his LBP. The patient started treatment incorporating ASPINE Systems® utilizing the data collected and analyzed to create an individualized care plan with the purpose of correcting the abnormal postural distortions. See **supplementary file 2**. The multidisciplinary treatment approach to this case consisted of exercises to create a balance musculature in the spine, postural spinal traction, and spinal manipulations all in -Rx extension.

The patient was treated three times a week for 2 months with periodic re-examinations to document response of treatment and need for extended care. After the 24th visit frequency decreased to twice a week for 2 months for a total of 42 visits. The patient underwent non-weightbearing spinal multidimensional traction using a table and a spinal orthotic foam place at the L5-S1 disc region (Figure 2). The patient reported soreness initially in the low back; however, felt comfortable using the table after several minutes. Ice was applied for 5 minutes in the lumbar region after every traction session to avoid soreness or pain.

The rehabilitative routine initially included lying prone for 5 minutes, prone over the elbows for 5 minutes, followed with prone press-ups (3 sets of 10 repetitions), prone press-ups with over extension (10 sets of 30 seconds), creating more -Rx extension [9]. After the sixth visit the patient increased the prone press-ups to (3 sets of 20 repetitions) and prone press-ups with over extension (10 sets of 1 minute). He kept this routine until the 13th visit when his VAS was reported to be 4/10. His rehabilitative routine was modified to lying prone for 1 minute, prone on elbows for 1 minute, followed with prone press-ups with overpressure (3 sets of 1 minute) for the remainder of his care plan.

The second exercise called the "Birddog," where the patient is on all fours (knees bend) and lifts the right leg and left arm simultaneously followed by lifting the left leg and right arm [16]. The patient would hold the position for 5

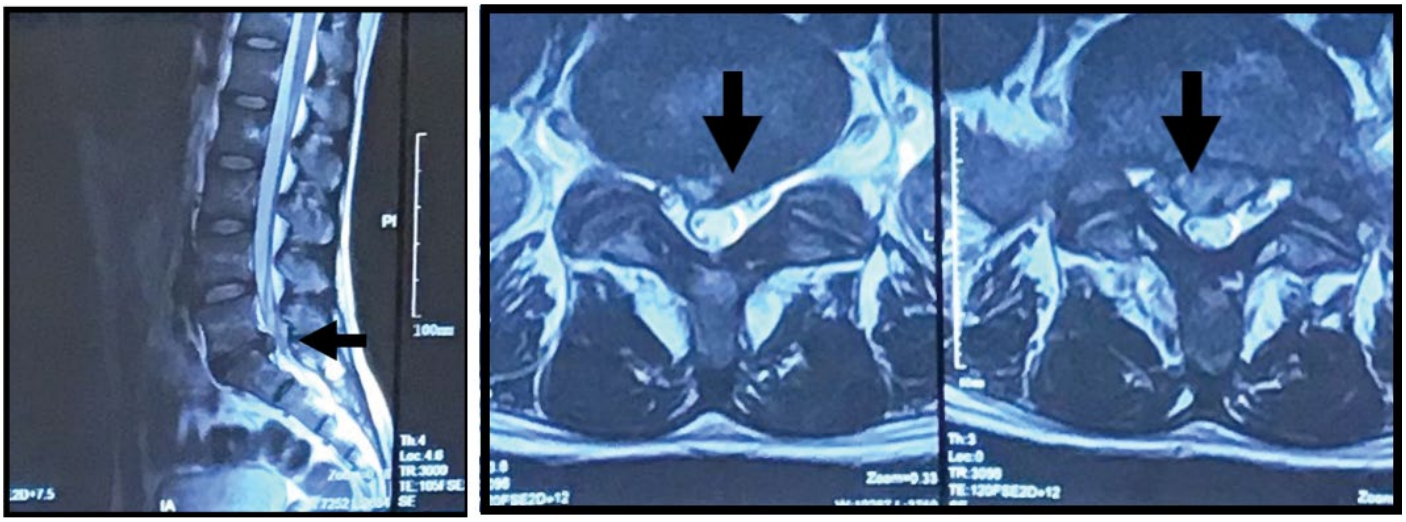

Figure 1. Sagittal MR image demonstrating an L5-S1 lumbar disc herniation/extrusion and a decreased lumbar lordosis of 18° vs 40° normal. Coronal MR image demonstrating an L5-S1 lumbar disc herniation/extrusion on a coronal slice. The large inferiorly extrusion right posterolateral L5-S1 disc herniation extending to the right resulting in compression of the S1 nerve roots.

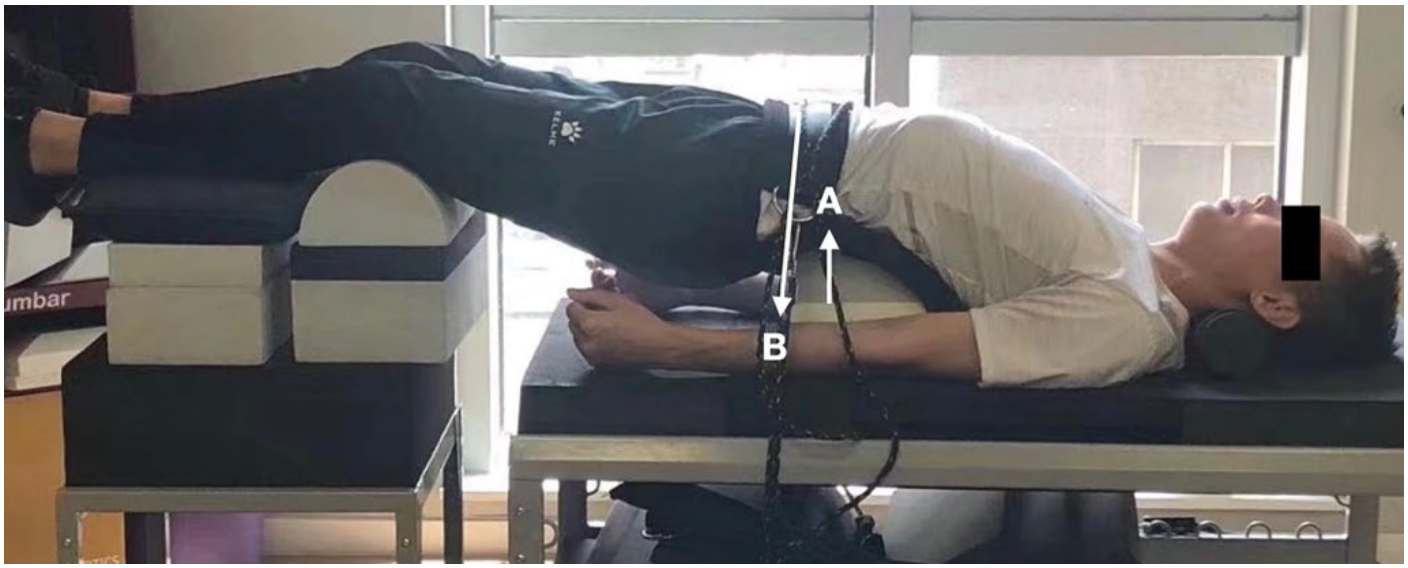

Figure 2. 3-D Denneroll System designed by Deed Harrison of Chiropractic Biophysics, provides non-weightbearing spinal multidimensional traction using a spinal orthotic foam pad placed at the L5-S1 disc region (A). The pelvic straps create tension downwards putting the lumbar spine in -Rx extension (B)

seconds bilaterally. He started with 15 repetitions with no rest period; After the 6th visit, his repetitions increased to 20. By the 13th visit he started performing the same movements on a yoga ball with 20 repetitions for the remainder of his care plan.

SMT utilizing GCT manipulations was performed on the 5th lumbar. SMT on the 5th lumbar was performed only if the spinal fixation met the criteria for a primary fixation which includes; decrease segmental range of motion in extension, edema visualized on the surface of the 5th lumbar, increase surface area temperature, and segmental extension malposition on radiographical analyses [17]. The visits in which the 5th lumbar did not meet the GCT criteria for correcting, general spinal stimulation was performed using a percussive instrument to provided proprioceptive stimulation to the rest of the spine.

Results

Re-exams were performed on the visits 13, 27, 40 and 42 Table 1. After the 40th visit a post care MRI was recommended to re-examine the LDH. After 42 visits of care, the patient brought his MRI films. He reported 0/10 VAS compared to 8/10 initially. His ODI was 5%. Lumbar lordosis increased by 7 ° to 25° compared to 18° initially, (Table 1). He reported 100% improvement in his condition with activity being normal, stating: *"I am able to play soccer with my friends now. I am very happy I am able to be active as I was before. The doctor who took my MRI asked me if I had done spinal surgery, because he could not see my previous herniation. I told him no; I had treatment with the people of ASPINE."* The MRI report indicated no evidence of lumbar herniation or extrusion; it stated: *"Lumbar physiological curve is maintained. Lumbar discs are intact with no evidence of disc herniation or extrusion."* (Figure 3).

Discussion

This case demonstrates the resolution of an L5-S1 lumbar disc herniation and extrusion after undergoing -Rx extension therapies. The disc herniation was resolved in 12-weeks of treatment verified by MRI, correlating with quality-of-life improvement. Studies on LDH have shown reduction in the herniation at a mean of 24 months following non-evasive treatments [17]. The treatment duration of this case was 12-weeks between positive and negative MRI findings which is shorter than the mean of 24 months.

Lumbar -Rx extension has been shown to reduce posterior migration of the nucleus pulposus [5]. Core stabilization exercises reduces symptoms of LDH due to the increase strength of the lumbar paraspinal musculature [16]. While there is more conclusive evidence supporting extension movements improve the functional capacity and pain intensity in patients with ALBP than in patients with CLBP [5,6]; this case seems to be the exception due to the application of multiple -Rx extension modalities such as exercises, traction, and SMT.

There is growing evidence that lumbar -Rx extension is a biomechanical approach beneficial for the treatment and management of LDH [19]. In this case there was increase of lumbar lordosis of 7° contributing to the evidence that increasing the lumbar lordosis enables for successful management of CLBP with LDH.

Table 1. Values of selected measures for the initial exam, visit 13, 27, 40 and 42 follow-up assessments

Test	Initial values	Visit 13	Visit 27	Visit 40	Visit 42
VAS	8/10	4/10	2/10	0/10	0/10
ODI	20%	14%	12%	10%	5%
PIR	N/A	50%	70%	80%	100%
ARA	18°	N/A	N/A	N/A	25°
MRI	Positive	N/A	N/A	N/A	Negative
Activity	None	Trying to play soccer	Able to play soccer with minimal discomfort	Normal	Normal

VAS: Visual Analogue Scale (0-no pain; 10-worst pain ever); ODI: Oswestry low back pain disability questionnaire; PIR; percentage improvement reported; ARA: absolute rotation angle (40°); MRI: magnetic resonance imaging; Activity: functional activity able to perform

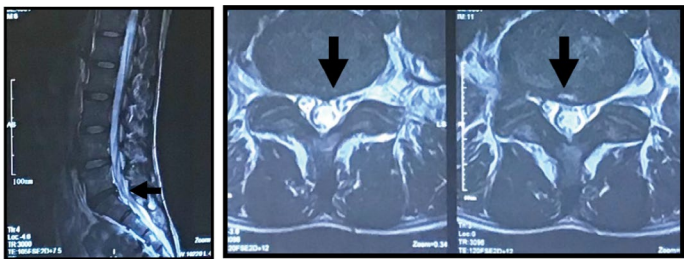

Figure 3. Sagittal MR image indicting no evidence of L5-S1 lumbar disc herniation/extrusion and a lumbar lordosis of 25 degrees vs 40 normal. Comparison Sagittal view of the lumbar MRI. Post treatment MRI indicating no evidence of lumbar disc herniation/extrusion. Comparison Coronal view of the lumbar MRI. Post treatment MRI indicating no evidence of lumbar disc herniation/extrusion.

Although pain reduction and functional improvements were clear at the conclusion of treatment, it is uncertain if time alone would have produced a similar outcome due to the natural history of LDH [20]. Nonetheless the patient had previously experienced months of back pain without any significant improvement; indicating that the improvements of the symptoms, function, and reduction of the LDH was attributed to the current course of treatment. The reduction of the LDH may be attributed to the lumbar extension while the patient received HVLA spinal manipulation. Further research is recommended to determine the effectiveness of SMT in extension and the reduction of LDH.

Standard ASPINE Systems® protocols utilize data collected by posture and radiographical software to create a care plan involving corrective exercises, multidimensional spinal traction, and SMT. It is not known which modality contributed the most to the reduction of the LDH. Regardless, it was the application of the -Rx extension specific therapies that led to following outcome. The limitations of this case are of a single case report being a sample size of one. A further limitation is that there is no long-term follow-up.

Conclusion

This case demonstrates a successful reduction of a lumbar disc herniation/extrusion treated with - Rx extension type therapies integrating corrective rehabilitative exercises, spinal multidimensional traction, and spinal manipulative therapy per ASPINE Systems®. Further research is recommended combining multidisciplinary extension therapies in the treatment of lumbar disc herniation.

Ethical Approval and Consent to participate

Hospital approved this case.

Consent for publication

Written consent was obtained from the participant. Proof of consent is available upon request.

Availability of data and materials

All data and materials are accessible if upon request.

Conflict of interests

Author Juan Jesus Villa is employed by Xuyang Doctor Group LTD. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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