CASE REPORTS

A Novel Treatment Combination for Failed Back Surgery Syndrome, With a 41-Month Follow-Up: A Retrospective Case Report

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ABSTRACT

Objective: The purpose of this retrospective case report was to describe chiropractic management of a patient with failed back surgery syndrome.

Clinical Features: A 45-year-old woman presented 2 years after L4-L5 and L5-S1 fusion surgery with low back and sciatic pain. Her physical exam included a positive straight leg raise and diminished lower-extremity reflexes and muscle strength. The patient's magnetic resonance imaging showed right disc bulging and annular tearing at L2-L3 and L3-L4 disc bulging with foraminal impingement.

Intervention and Outcome: A total of 52 treatments were provided over 28 weeks consisting of multidirectional functional decompression (FD) unweighted gait training, core exercises while in FD, strengthening exercises on a vibration platform, and supine spinal FD with vibration and chiropractic spinal manipulative therapy. Over the course of treatment, the patient noted gradual improvement in function (Oswestry Disability Index) and pain (Numeric Rating Scale), with a reduction in pain medications. Follow-up of 41 months posttreatment revealed an Oswestry Disability Index score of 0 and Numeric Rating Scale score of 0, and the patient no longer was using any pain medication.

Conclusion: After a course of care, the patient in this study reported resolution of symptoms, decrease in pain medications, and improvement of function. (*J Chiropr Med* 2018;17:256-263)

Key Indexing Terms: *Low Back Pain; Failed Back Surgery Syndrome*

INTRODUCTION

Failed back surgery syndrome (FBSS) is a term used to describe persistent or recurrent back or radiating leg pain after anatomically successful spinal surgery.¹ Treatment of FBSS can be challenging for health care practitioners. Treatment options for FBSS include the following: (1) medications, (2) exercise or manipulation, (3) spinal cord

stimulation, (4) injection therapy, and (5) surgery.²⁻²³

Patients who had surgery between 1990 and 1993 reported a 19% cumulative incidence of reoperation during the subsequent 11 years. After fusion surgery, 62.5% of reoperations were associated with a diagnosis suggesting device complication or pseudarthrosis,² with the likelihood of reoperation after a lumbar spine operation being substantial.²⁻⁷ As a result of the poor outcomes of subsequent surgeries,²⁻⁷ surgery is not a recommended treatment⁶ for FBSS.^{6,8}

Pharmaceuticals and injection therapy appear to have limited efficacy on FBSS,⁹⁻¹⁵ and limited information exists on the benefits of exercise, manipulation, or physical therapy for the treatment of FBSS.¹⁶ Surgical implantation of a spinal cord stimulation device has been shown to be promising for the treatment of FBSS,^{17,18} but success rates are only at the 50% to 75% range.¹⁹ These statistics demonstrate a need for effective, noninvasive therapies for FBSS.

Some evidence suggests that lumbar traction may provide a stabilizing effect on intervertebral movements²⁰ and reduce pressure in the nucleus pulposus of herniated discs.²¹ Lumbar

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traction may improve lower back mobility²² while providing proper mechanical alignment essential for joint function.²³

The purpose of this retrospective case report is to describe a therapeutic approach that was used for a patient with FBSS. The treatment combined spinal functional decompression (FD) (traction) on a vibration table; seated mechanical FD (lumbar traction) with exercise; multidirectional treadmill gait training with FD; manipulation of the cervical, thoracic, and lumbar spine; and whole-body vibration.

Case Report

A 45-year-old African-American woman reported intermittent low back pain “off and on since age 17,” when she fell and fractured her coccyx. For this initial injury, the patient sought chiropractic spinal manipulative therapy (SMT), and then continued care for low back pain 6 to 8 times per year for 25 years, which was moderately effective until 2008.

At that time, the patient noted an increase in pain for unknown reasons, and the SMT was no longer effective. There had been no trauma or change to precipitate the worsening. The patient reported having received 3 epidural injections over the period of 4 months to treat bulging discs, without lasting relief. The patient reported starting a course of treatment with hydrocodone along with acetaminophen, while also receiving spinal manipulations 3 times per week for 3 months without relief of pain. The patient reported that in 2009 she presented to her orthopedic surgeon, and magnetic resonance imaging (MRI) of the lumbar spine was obtained. An MRI revealed disc herniations, and the patient then underwent spinal fusion surgery. The patient stated that symptoms were improved for 3 months after surgery. Shortly after her return to work, however, the back pain returned. She then began treatment with opioid pharmacotherapy and traditional physical therapy for 3 months at 3 times per week at Central DuPage Hospital in Winfield, Illinois.

The patient reported that medication and traditional physical therapy failed to reduce her pain meaningfully. The orthopedic surgeon suggested a second surgery, which the patient refused.

The patient reported constant pain that affected her ability to take part in leisure activities, made her physically dependent on others for help, and impaired her ability to perform activities of daily living or hold down a job. The patient reported she had contemplated suicide and was under the care of a psychologist. Table 1 provides a list of the medications at intake.

The patient’s Oswestry Disability Index (ODI) score was 50%, demonstrating severe disability. Her Numeric Rating Scale (NRS) was 8 of 10 (severe pain, classified as disabling); and she was unable to perform activities of daily living owing to pain in the low back, right and left gluteal areas, and right and left lower extremities. The exam revealed a well-nourished woman, height 182.25 cm, weight 77.27 kg, and body mass index 23.3 kg/m². She demonstrated a positive straight leg raise bilaterally, a positive Kemp’s test bilaterally, and a positive sitting root (Bechterew’s) test bilaterally. Muscle strength testing of the quadriceps, gluteal, hamstring, and psoas muscles were graded 4 of 5 bilaterally. Lower-extremity reflexes were 1 bilaterally, and lumbar ranges of motion generally were reduced (Table 2). An MRI of the lumbar spine performed March 18, 2011, concluded the following: L2-L3 disc bulge with posterocentral annular tearing; L3-L4 disc bulge with small right foraminal protrusion, which minimally displaced the right L3 dorsal root ganglion; L4-5 and L5-S1 discectomy and posterior fusion; and left L4 hemilaminotomy. The diagnoses of post-spinal surgery syndrome, disc herniation, and radiculopathy were made.

The patient was seen for 52 visits over 8 months and was generally compliant, attending 81% of her scheduled treatment sessions (Table 3). Each treatment session lasted 90 minutes and was modified to patient tolerance. Therapy

Table 1. General Clinical Characteristics Including ODI and NRS Scores Plus Medications

Characteristic	Intake	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24	Week 28	41-Month Follow-up Posttreatment
ODI raw score	25	22	21	19	15	22	6	4	0
ODI percentage	50	44	42	38	30	22	12	8	0
ODI change in points from baseline	0	3	4	6	10	14	19	21	25
ODI decrease % change in score from intake	0	6	8	12	20	28	38	42	50
NRS	8	8	7	6	5	3	2	1	0
Hydrocodone-acetaminophen 10/325	6/d	0	0	6/d	6/d	4/d	4/d	2/d	No medication
Fentanyl 50 mcg/hr Transd Patch	1/d	1/d	1/d	0	0	0	0	0	No medication
Pregabalin (300 mg/d)	1/d	1/d	1/d	1/d	1/d	1/d	1/d	1/d	No medication
Sertraline (50 mg)	1/d	1/d	1/d	1/d	1/d	1/d	1/d	1/d	No medication

NRS, Numeric Rating Scale; ODI, Oswestry Disability Index.

Table 2. Physician Medical Outcome Assessments of Patient at 8-Week Intervals

Medical Exam	Baseline	Week 8	Week 16	Week 24	End of Care
Quad ST	4 Bilateral	4 Bilateral	4 Bilateral	L5 R4	L5 R5
Glute ST	4 Bilateral	4 Bilateral	4 Bilateral	L5 R4	L5 R5
Hamstring ST	4 Bilateral	4 Bilateral	4 Bilateral	L5 R4	L5 R5
Psoas ST	4 Bilateral	4 Bilateral	4 Bilateral	L5 R4	L5 R5
Lumbar flexion	70	80	85	90	90
Lumbar extension	5	15	20	25	25
Right rotation	20	20	20	20	20
Left rotation	20	20	20	20	20
Right lateral flexion	20	22	24	32	34
Left lateral flexion	20	20	22	28	30
Straight leg raise	+ RT side	+ Bilateral	+ Bilateral	+ Bilateral	- Bilateral
Sitting root	+ Bilateral	+ Bilateral	- Bilateral	- Bilateral	- Bilateral
Sacroiliac compression	+ Bilateral	+ Bilateral	- Bilateral	- Bilateral	- Bilateral
Kemp test	+ Bilateral	+ Bilateral	- Bilateral	- Bilateral	- Bilateral
Patellar reflex	1 Bilateral	1 Bilateral	1 Bilateral	L2 R1	L2 R1
Achilles reflex	1 Bilateral	1 Bilateral	1 Bilateral	L2 R2	L2 R2
Hip flexion	70 Bilateral	70 Bilateral	80 Bilateral	80 Bilateral	90 Bilateral
Ankle dorsi flexion	10 Bilateral	15 Bilateral	20 Bilateral	30 Bilateral	30 Bilateral

was progressed each month after a patient reevaluation or assessment. The patient received all of the interventions listed in this section on each visitation for treatment.

starting speed of 0.7 mph and progressing to 1.4 mph, and backward (3 minutes) with a starting speed of 0.7 mph and progressing to 1.3 mph (Fig 1).

Multidirectional Treadmill Gait Training With Functional Decompression

Equipment included a treadmill, pneumatic FD station, and compressor, which allow the patient to rotate 360 degrees while walking under FD. Functional decompression was applied to make the exercise tolerable, starting with 40% and progressing to 80% of the patient's body weight by the 15th treatment as she was able to tolerate more FD. The patient walked forward (8 minutes) with a starting speed of 1.0 mph progressing to 1.6 mph laterally (2 minutes each side), with a

Seated Functional Decompression in Pneumatic Chair

While seated, FD was applied, starting with 40% and progressing to 60% of the patient's body weight by the 15th treatment as she was able to tolerate more FD. While under FD, the patient was able to perform core strengthening and stability exercises; scapular stabilization exercises; isolated back extensions; and exercises to improve strength and mobility in the cervical, upper thoracic, and abdominal regions for 3 minutes each. The patient was secured tightly

Table 3. Treatment Schedule and Compliance

Treatment History	Weeks: 0-12	Weeks: 13-24	Weeks: 25-28
Number of treatments	3/wk	2/wk	1/wk
Compliance	28/36 treatments	20/24 treatments	4/4 treatments
Compliance percentage (%)	72.2	83.3	100

Fig 1. *Multidirectional treadmill gait training with functional decompression.*

in the chair using Velcro straps around her waist and thighs to lock the pelvis in place (Fig 2). This restraint system isolated sagittal plane movements to the lumbar spine while preventing other muscle groups (eg, hamstrings, gluteus) from contributing to the exercises being performed on the FD chair.

In addition, the patient remained seated for 8 minutes while FD was applied, starting with 80% and progressing to 100% of the patient's body weight by the 15th treatment as she was able to tolerate more FD weight. No additional exercises were performed during this time (Fig 2).

Fig 2. *Seated functional decompression in pneumatic chair.*

Vibration Table With FD Plus Exercise

While lying supine on the vibration FD table (0.6-1.2 mm at 30 Hz), 4 lever arms were used to create directional FD to the patient's spine. The vibration platform ran for 180-second intervals with 30 seconds of rest. Functional decompression started with 30% and progressed to 50% of the patient's body weight by the 15th treatment as she was able to tolerate more FD. The axial FD was applied with emphasis on the patient's right side (Fig 3).

Vibration Platform Plus Exercise

While standing on a vibration platform, the patient performed functional strengthening and stability and balance exercises, including physioball wall squats, full body squats, clam shells, and lunges. Additional exercises also were prescribed to address the muscle strength and endurance deficits and improve core strength and flexibility for all major muscle groups.

Manual Chiropractic Adjustments

Chiropractic SMT was applied to improve mobility to all spinal levels according to palpation findings on that visit.

Outcome

After 52 treatments, the patient's ODI score was 8%, demonstrating minimal disability and improved overall function. Her NRS score was 1, indicating minimal pain (Table 1). In addition, improvements were seen with muscle strength, lumbar flexion and extension ranges of motion, and reflexes (Table 2), as well as a decrease in pharmaceuticals for pain management (Table 1). At 41 months posttreatment, the patient's ODI and NRS scores were 0, and she no longer was taking any pain or depression medications (Table 1). The

Fig 3. *Vibration table with functional decompression plus exercise.*

patient reported a return to regular intimacy with her husband and was able to partake in a normal social life. The patient no longer felt dependent on others, improving her relationships and re-establishing her role within her family. The patient easily was able to perform daily tasks and return to work without issue. The patient provided consent for publication of her case report and signed an informed consent form.

DISCUSSION

To our knowledge, this is the first time this combination of therapeutic approaches has been presented in the literature. It appeared that FD allowed this deconditioned patient to perform exercises that she otherwise may not have been able to perform. Functional decompression creates distraction to increase the intervertebral space, tensing of the posterior longitudinal vertebral ligament, and vacuum effect to draw the disc protrusion inward toward the defined intervertebral space.^{21,24-27} Functional decompression in combination with gait training and core stabilization exercises, functional exercises, vibration with exercise, and SMT decreased pain and improving function in this patient.

Back pain is more common among people who are not physically fit. Weak back and abdominal muscles may not properly support the spine.²⁸ The patient presented in this study was deconditioned when she first started treatment. Thus, a strategy was developed to focus on both her disc issues and lack of muscular strength and endurance. Increasing the strength and endurance of the core muscles was critical to alleviating and preventing lower back pain while providing stability to the trunk region.^{29,30}

The flexor and extensor muscles that stabilize the spine are often weak in individuals with lower back pain, as was the case with this patient. The back extensor muscles, especially the erector spinae group, provide posterior stability for the vertebral column.³¹ According to several studies, a relationship exists between decreased strength and endurance of these muscles and chronic low back pain because low back pain has been prevented by strengthening of these muscles.^{21,30} In

addition, poor back extensor muscle endurance is a predictor of low back pain occurrence³² and long-term chronic low back pain (CLBP)³³ and affects neuromuscular recruitment and control of the spine.^{25,26} Isolated core exercises while in FD allowed this patient to perform core and thoracic exercises while actively stabilizing the pelvis, thus helping her in the long term with improved muscular endurance and a successful return to activities of daily living.

Functional decompression as a treatment for CLBP has been suggested to accomplish the following: (1) increase the disc height,²⁶ (2) stretch the ligaments and muscles of the spine,²⁵ (3) create separation of the facets of the apophyseal joints,²⁴ and (4) improve synaptic plasticity on dopaminergic neurons and fibers in an animal model.³⁴ Functional decompression in this case also was applied to provide relief of pain while having the patient perform exercises designed to strengthen and stabilize the core while stabilizing the pelvis.

It has been suggested that exercising with the pelvis firmly stabilized forces the lumbar spine to move against resistance.³⁵ Exercises that do not require pelvic stabilization do not encourage meaningful exercise movements because the patient's natural tendency is to protect the lumbar area from participating in meaningful exercise movements. This results in failure to improve the patient's core strength and consequent CLBP.³⁵ Pelvic stabilization while performing abdominal and lumbopelvic musculature³⁶ exercises was accomplished in this patient by teaching the patient to draw in her navel approximately 30%,³⁷ and bracing^{38,39} while performing abdominal and lumbopelvic musculature exercises.

Multidirectional treadmill gait training with FD may have allowed this patient, who had limitations of weight-bearing resulting from her CLBP, to exercise pain-free. Walking on a treadmill has been reported to improve walking speed and symmetry of walking compared with walking on the ground.^{24,34,40} Thus, walking on a treadmill while in FD may lead to pain relief owing to functional gait improvement. In addition, sideways walking has been shown to improve balance and walking abilities and reduces asymmetrical weight bearing on the lower limbs, while placing the patient in a position of good posture.⁴¹

Vibration therapy has been shown to acutely increase muscle activation during exposure,^{42,43} resulting in post-activation potentiation⁴² and improvement of muscular performance.⁴² Zaidell et al⁴⁴ have suggested that the tonic vibration reflex is operative during vibration therapy because antagonist musculature is being vibrated simultaneously. Furthermore, Cholewicki et al⁴⁵ has reported that antagonistic trunk muscle coactivation is necessary to provide mechanical stability to the lumbar spine around a neutral posture, resulting in an increased response to an increase of axial load on the spine. Thus, agonist–antagonist muscle coactivation resulting from vibration therapy may have improved the patient’s motor control strategy to improve joint stability and movement accuracy. Further, vibration therapy plus functional decompression may improve lumbar extension strength and both static and dynamic balance, all of which are needed to maintain a neutral spine position. Both traction and vibration therapy have been associated with decreasing pain in patients with lower back pain. Recently, Wang et al⁴⁶ reported that traction applied to patients while lying on a table in combination with 12 Hz of vibration was effective in reducing muscle fatigue of the lumbar erector spinae.

Motion palpation and range-of-motion findings for this patient demonstrated decreased segmental mobility contributing to decreased lumbar range of motion. Cramer et al (2013) lists reasons for facet joint hypomobility as “inactivity; injury; or repetitive, asymmetric motions (eg, assembly line work)” resulting in “normal or increased movement of some of the [facet joints] while chronically loading others.”⁴⁷ Loaded joints become hypomobile, and fibrous adhesions develop in the hypomobile joints, further reducing normal motion.⁴⁷ Gapping of the facet joints, achieved through spinal manipulative therapy, breaks up intra-articular adhesions and increases the motion of the segment.⁴⁷ Spinal manipulative therapy assists in reestablishing normal range of motion, thereby reducing pain and improving functional capacity.⁴⁷ The SMT within the therapeutic protocol described in this study allowed the patient to achieve improved joint mobility by gapping the facet joints and breaking up joint adhesions. Promotion of normal range of motion, pursued especially in chiropractic therapy, along with the therapeutic approach used in this study may have promoted healing in the disc periphery by stimulating cells, boosting metabolite transport, and preventing further adhesions from forming while prompting pain relief.⁴⁸

Limitations

Because this is a single case report, no generalizations or conclusions can be reported about the results found. In addition, we cannot state specifically if one aspect of the treatment accounted for the outcomes achieved by this patient or if the combination or order of the treatment strategies produced these outcomes.

CONCLUSION

This case study describes the resolution of symptoms and improvement of function in a patient with FBSS using a multimodal approach, at the conclusion of treatment and at 41-month posttreatment follow-up.

FUNDING SOURCES AND CONFLICTS OF INTEREST

No funding sources or conflicts of interest were reported for this study.

CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): G.F.M.

Design (planned the methods to generate the results): G.F.M.
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Practical Applications

- This case study suggests that chronic low back pain as a result of failed back surgery syndrome can be managed.
- Exercises done with vibration therapy plus functional decompression combined with multidirectional unweighted treadmill gait training and functional decompression supine traction may be an effective intervention to restore function and quality of life.

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