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Case Study

Failed back surgery syndrome successfully ameliorated with Chiropractic Biophysics® structural rehabilitation improving pain, disability as well as sagittal and coronal balance: a Chiropractic Biophysics® case report with a 6 year follow-up

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Abstract. [Purpose] To present the case of the amelioration of chronic pain and disability in a patient suffering from failed back surgery syndrome. [Participant and Methods] A 27-year-old male with chronic low back pain was treated with a Coflex® intra-spinous instrument, however, it was removed shortly after due to poor outcome including worsening pain and disability. Radiographic assessment revealed significant posterior translation of the thorax complicated by significant loss of the normal lumbar lordosis and a left lateral translated thoracic cage posture. Chiropractic Biophysics® technique was applied over a 5.5-month period leading to structural spine improvements as well as improved pain, Oswestry disability index (ODI) and quality of life (QOL). [Results] There was a 21 mm reduction in posterior thoracic translation, a 6.2° improvement in lumbar lordosis and a 16 mm reduction in lateral thoracic translation corresponding with improved ODI and QOL scores. A 6 year follow-up showed successful outcome despite some degenerative changes in the spine at the prior surgical level. [Conclusion] This case adds to the growing literature showing the efficacy of non-surgical spinal rehabilitative methods in improving outcomes in patients with spinal deformity and associated disabilities. This case also demonstrates necessity of the continued criterion standard of spinal radiography for biomechanical assessment.
Key Words: Low back pain, Adult spinal deformity, Failed back surgery syndrome

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INTRODUCTION

Low back pain (LBP) is a major contributor to the global burden of disease (GBD) and is a significant source of disability and reduced health-related quality of life (QOL) measures[1–3)]. Pain and loss of function leads many patients to seek treatment for these conditions including surgical and non-surgical. In guiding patients through the clinical trajectory with chronic back pains, proper diagnostic procedures, objective outcome measures, and current knowledge of alternate treatment options are necessary for providers seeking the ultimate goal of pain relief. Unfortunately, often certain procedures chosen with the patient's best interest at heart, do not lead to improved symptoms (motivating the patient to seek care in the first place) but in certain circumstances cause the condition and symptoms to either stagnate or indeed worsen.

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Surgical interventions can sometimes lead to failed back surgery syndrome (FBSS)[4, 5]. Many non-surgical and surgical treatment options are available to providers and treatment approaches to FBSS vary significantly from no intervention to multiple revision surgical interventions designed to stabilize the abnormal loading and prevent further deterioration and dysfunction[6–8]. FBSS has been thoroughly discussed in the medical literature[4–8]. This condition is defined by the International Association for the Study of Pain as “lumbar spinal pain of unknown origin either persisting despite surgical intervention or appearing after surgical intervention for spinal pain originally in the same topographical location”[5]. This condition may be the result of inadequate or poor pre-surgical diagnostics, concomitant conditions such as obesity, diabetes, mental health issues, and osteoporosis which all can contribute to FBSS. FBSS is not widely studied and reports of successful non-surgical treatment of FBSS are extremely rare in the medical literature[9].

Adult Spinal Deformity (ASD) is a significant cause of pain and disability and is a significant contributor to the GBD[10]. ASD includes the deformities of scoliosis >20°, sagittal vertical axis >5 cm, pelvic tilt >25° or thoracic kyphosis >60°[10, 11] as well there exists multiple studies relating ASD to syndromes related to failed interventions such as iatrogenic spine surgery complications, trauma and mental health conditions[12]. ASD and other spinal deformities cause altered loads on sensitive tissues. These abnormal loads lead to changes in the tissues that increase degeneration, worsen spine instabilities and increase pain, disabilities and disease and ultimately worsen the burden on global healthcare[12]. The reduction of these abnormal loads has been the study of numerous surgical and non-surgical treatment approaches[13]. ASD is most common in individuals greater than 60 years; thus, ASD diagnosed in younger patients increases the necessity for rapid treatment to reduce the untoward trajectory associated with the evolution of ASD.

Chiropractic Biophysics® (CBP®) is a non-surgical treatment approach for reducing sagittal and coronal abnormal spinal alignment. There is preliminary evidence in the form of randomized trials and case reports that the CBP treatment approach can improve some categories of ASD, including: thoracic hyper-kyphosis[14], loss or reversal of the lumbar lordosis[15, 16], and certain types of scoliotic deformities[17]. The purpose of this report is to present the improvement of deformity in a patient with FBSS and a type of early onset ASD associated with loss of the lumbar lordosis, reduced pelvic tilt, and mild lumbar scoliosis with trunk side translation. The important addition of CBP spinal traction illustrates the patient-specific treatment approach based upon precise radiographic analysis and the prescription of a home spinal orthosis as important aspects of this successful case with long-term follow-up.

PARTICIPANT AND METHODS

At a spine care facility in Gillette, WY, a 27 year old presented in July of 2017 with the chief complaint of LBP rated as a 6–7/10 (0=no pain; 10=worse pain ever). The patient reported suffering with altered sensation in the form of numbness and tingling and increased sensitivity on the left lateral portion of the thigh. The patient reports that when he was 22 years old he sought treatment for his low back pain with a surgeon. He had a history of failed back surgery in 2012 where they placed a Coflex® intra-spinous instrument between the spinous processes of either L3/4 or L4/5 to open up the space between the vertebrae. He worsened with the implant, so they removed it in 2013, and he had significant back pain since. He was unable to remember the exact segment and the records were not available due to the surgeon being incarcerated. He reported his pain worse with sitting.

Examination revealed the patient had restricted range of motion (ROM) for lumbar flexion, but all directions were within normal limits (WNL). Reflexes were normal with the exception of a 1+ deep tendon reflex on the right patellar reflex. Muscle strength was normal as was sensory testing. The patient scored a 24% on the Oswestry low back pain disability questionnaire (ODI) and scored poorly on the indices of mental health (68 vs. 100), bodily pain (58 vs. 100) and energy/fatigue (45 vs. 100) on the short-form 36 (SF-36) quality of life questionnaire (QOL) (Fig. 1).

Standing radiography was taken and assessed with the PostureRay EMR (PostureCo., Trinity FL, USA) which used the Harrison posterior tangent method to mensurate lateral spinal curves and the modified Risser–Ferguson method for the anterior-posterior (AP) views[18–21]. On the lateral view (Fig. 2), the patient demonstrated having a severely hypolordotic lumbar spine (−16.1° vs. 40° normal[22, 23]), posterior thoracic translation (−88.7 mm vs. 0 mm normal[22]), and a decreased sacral base angle (23.1° vs. 40° normal[10]). Also noted was a retrolisthesis of L4 of −5mm and L5 of −7.5 mm. On the AP view (Fig. 3), the patient had a 29.5 mm left thoracic translation (side shift), a 1.9° lumbodorsal angle (LDA; vs. normal=0°),

	Health Perception	Physical Functioning	Physical	Emotional	Social Functioning	Mental Health	Bodily Pain	Energy Fatigue
Initial 08/07/2017	87/100	95/100	100/100	100/100	100/100	68/100	58/100	45/100
Interim 02/01/2018	100/100	100/100	100/100	100/100	100/100	76/100	90/100	65/100
Current 07/19/2023	97/100	95/100	100/100	100/100	100/100	88/100	90/100	80/100
Current Change	-3	-5	0	0	0	12	0	15
Overall Change	10	0	0	0	0	20	32	35

Fig. 1. SF-36. Scores of 100 are ideal.

and an 82.2° (vs. 90° normal) skewed angle versus a right angle between the vertical lower lumbar spine and the sacral base (LSA: lumbosacral angle).

CBP technique[24–26] was chosen for treatment to improve the lumbar lordosis and other radiographic parameters[27]. Full-spine, spinal manipulative therapy (SMT) was given to mobilize the spinal joints. Spinal traction consisted of the patient in the supine position with the pelvis on the bench but the upper back was elevated with a block of 5 inches (Fig. 4). The femurs were strapped down to the bench to allow the pelvis to flex forward rotating at the hip axis. In this position, a padded strap was placed under the mid-lumbar spine (L3) and was attached to a spreader bar which was mounted by rope to a pulley system. The strap pulled in a direction posterior-to-anterior and slightly inferior towards the patients feet and was tightened to tolerance for a period of up to 20 minutes per session. The patient also performed mirror image® exercises on a power plate for 8–10 minutes (Fig. 5). These exercises included right thoracic translation shifts, posterior pelvic and anterior thoracic cage translations with a block at T12, as well as thorax extensions over the power plate with the edge of the power plate at T12 were all performed. All exercises were performed for approximately 3-minutes and each repetition was held for 5-seconds. A total of 36 visits of CBP care was performed between August 8, 2017 and January 31, 2018.

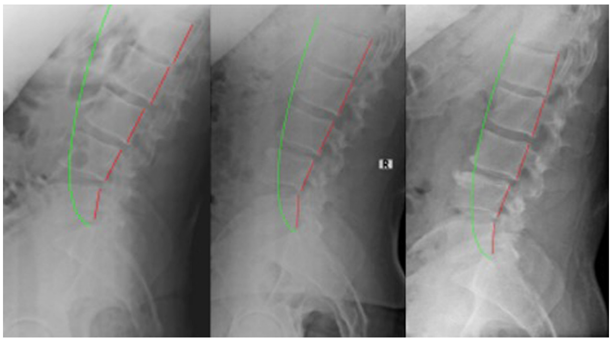

Fig. 2. Lateral lumbar spine.
Left: Pre-treatment; Middle: Post-treatment; Right: 6 year follow-up. Green line represents an ideal lumbar curve; red line highlights the patient posterior vertebral body margins.

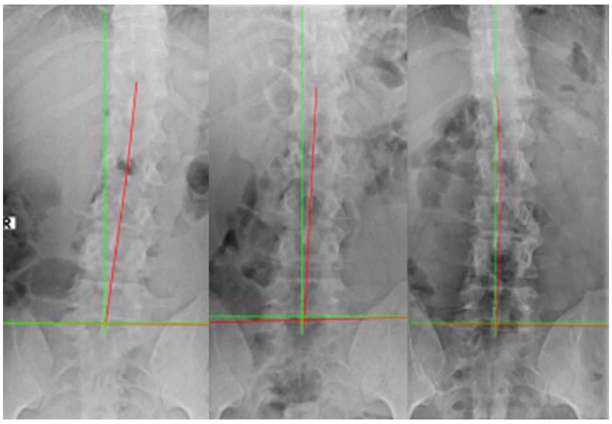

Fig. 3. Anterior-posterior lumbar spine.
Left: Pre-treatment; Middle: Post-treatment; Right: 6 year follow-up. Green line represents vertical; red line indicates best fit line drawn from estimated midpoints of vertebrae.

Fig. 4. Lumbar extension traction.
While the torso is elevated (mirror image), the lumbar spine is pulled into extension by a fulcrum strap pulling anteriorly and slightly inferiorly.

Fig. 5. Corrective exercises.
Left: Right thoracic translations. Middle: Back extensions with a block placed at the upper lower back. Right: Back extensions over the edge of a PowerPlate. All exercises were held for 5-seconds per repetition. All exercises were performed in-office; the middle exercise was performed at home.

A home care regimen was also instituted and consisted of a large lumbar Denneroll (Denneroll Industries International Pty Ltd, Wheeler Heights, NSW, Australia) being placed at T12 with a 3-inch block behind the back[28)]. The patient was given an exercise of 50–100 repetitions to block the mid back while standing to his back to the wall and to posteriorly shift his pelvis posteriorly to warm up prior to the home traction (Fig. 5). He was working up to 20 minutes of home care daily. The patient consented to the publication of his case and treatment results, including the X-rays.

RESULTS

A re-examination assessment after 5.5 months revealed the patient to report a 50% symptomatic improvement in LBP. At this time there was no improvement reported in the left outer thigh numbness. The ODI was scored as a 6% (vs. 24%) and the SF-36 was scored and showed improved scores for the indices of mental health (76 vs. 68), bodily pain (90 vs. 58) and energy/fatigue (65 vs. 45). A repeat X-ray showed structural improvement in the biomechanical alignment of both the sagittal and coronal planes. The lateral view showed increased lordosis (−22.3° vs. −16.1°), decreased posterior thoracic translation (67.8 mm vs. 88.7mm), and relatively the same SBA (24.6° vs. 23.1°). Importantly, the retrolitheses were also reduced; L4 was now −3.6 mm and L5 was now 2.6 mm. The AP view showed a decrease in left thoracic translation (13.4 mm vs. 29.5mm), a 0.9° LDA, and an 84.5° LSA.

A follow-up assessment (7/19/23) 6 years after first initiating care showed the maintenance of wellness. The patient reported the LBP as 70% improved and that at this point in time there was no longer any left outer thigh numbness (i.e. 100% improved). The ODI was scored as 10% and the SF-36 QOL indices of mental health (88/100), bodily pain (90/100) and energy/fatigue (80/100) showed continued improvement. A lateral lumbar X-ray showed some regression of the lordosis (−13.6° vs. −22.3°), a further improvement of posterior translation of the thorax (−53.7 mm vs. −67.8mm), and relatively the same SBA (25.6° vs. 24.6°). The AP lumbar X-ray showed a further decrease (improvement) in the left thoracic translation (1.4 mm vs. 13.4mm), a 4.7° LDA, and an 89.2° LSA. Interestingly, at the level of L3-L4 there was proliferation of degenerative changes and the development of an L3 retrolisthesis of −5.4 mm (Fig. 2); this is likely the segment of surgical intervention and a consequence of hardware removal.

DISCUSSION

This case documents the improvement in pain, disability and QOL as well as the long-term alleviation of altered sensation of numbness and tingling in the leg. These objective changes are coupled with the improvement in the structural alignment in the lumbar spine, including the reduction of the posterior translation of the thorax and improved lordosis as well as the improvement in lateral thoracic translation back towards the midline. The 6 year follow-up showed the maintenance of most spine alignment parameters as well as the continued wellness of the patient. Thus, the successful improvements both immediately following CBP treatment coupled with the long-term improvements presents promising treatment options for treating complicated FBSS patients with early onset of ASD.

This case demonstrates that surgical and non-surgical treatments should focus on improving the altered loads on pain sensitive tissues of the spine and surrounding structures by improving coronal and sagittal imbalance and reducing abnormal intervertebral segmental angles and segmental translations. Reducing these loads have been the focus of many recent studies on ASD and pre-treatment diagnostics show that the criterion standard of upright radiographs are crucial in determining the surgical and non-surgical approach to care[29–32)].

Iatrogenic complications of spine surgery have been discussed in the literature. Interspinous spacer (ISS) implant devices such as the Coflex™ device have generally shown a low level of complications, however, the devices have been implicated to fail in cases resulting in spinous process fracture, loosening of the device, and device breakage. Infection and dura-mater tearing have also been reported as a complication that could lead to failure. The device has been mostly used in cases of lumbar spinal stenosis with and without disc herniation, but the literature shows it has been implanted in patients with scoliosis, dynamic instability, degenerative disc disease (DDD) and others. Zhang et al.[33] recommend that the device not be used in patients with narrow interspinous space, intervertebral body coronal spondylosis, osteoporosis and sagittal spinal instability. Further, the authors report that the correct surgical revisions and salvages should include internal fixation with pedicle screws, not just the removal of the device (as was the case with our patient). Crawford et al. report that interspinous devices such as Coflex™ and others do not demonstrate a significant change in sagittal balance at 12-month follow-up[34].

The patient records for the exact level of implantation of the device were not available. The device has FDA approval for all segments from L1–L5. The device was removed when it did not alleviate the patients back pain and altered sensation of the outer left thigh. Given the severe sagittal imbalance with posterior translation of the upper lumbar spine (thorax), one could speculate that the patient may not have been a proper candidate for the ISS, and the device was simply removed when it did not alleviate the symptoms in spite of the recommendation in the literature for pedicle screw implantation[33, 34]. Though ASD classically only includes anterior sagittal balance or forward translation of the thoracic spine[10–12], we argue herein, that posterior translation displacements might be just as significant. Relatively few investigations have looked at the biomechanics, kinematics, and load scenarios for posterior thoracic translation postures, however, preliminary information exists on normal range of motion and muscle and disc loads for this postural position[35, 36]. Specifically, most normal individuals are closely vertically aligned in the sagittal plane with T1, T12 and S1 being within 25 mm of each other in horizontal offset[35, 36]. The average maximum ROM for T12–S1 posterior translation in healthy persons has been reported to be 75 mm normalized to the height of the average person[35], whereas the patient herein presented with an initial posterior translation of T12–S1 of 88.7 mm which is considerably further than typical ROM and thus, this would be classified as a severe postural displacement in neutral upright stance and would be associated with a dramatic increase in both muscle and disc loads leading to pain, disability, and degeneration[35, 36].

Non-surgical treatment studies of FBSS patients are rare in the medical literature. This condition generally has been shown to increase chronic pain and will lead to worsening of ASD and further worsen the Global Burden of Disease. Traditionally, it has been described that the treatment of FBSS should include follow-up radiography to determine if the patient has the surgery at the wrong disc level, the presence of poor surgical technique, adjacent segment degeneration, presence of lateral stenosis, pseudoarthrosis or other factors that may be the determinant factor for treatment. Treatment in the literature ranges from very conservative (NSAIDS and physical therapy) to more invasive procedures such as joint injections and radiofrequency ablation and revision surgery, including instrument salvage surgery.

The non-surgical treatment in this case was performed using the CBP protocol of care. Mirror image exercises were administered to reduce the posterior translation of the torso and improve neuromuscular strength, coordination and balance of the postural muscles of the torso and pelvis. Mirror image traction of the spine with the pelvis stabilized and the lumbar spine translated anteriorly with the emphasis placed on increasing the lumbar lordosis was utilized. SMT was used to improve the ROM and to temporary reduce pain over a total of 36 treatments over 5.5-months. Prior studies have shown that this protocol reduces pain both short-term and long-term and there is correlation to the magnitude of improvement in coronal and sagittal balance to better spine stability, improvements in QOL measures, decreased disability and thus, overall reduction in Global Burden of Disease[14–17, 26–28]. The 6 year, long-term follow-up of the patient demonstrated continued success of the treatment when coupled with home care using a simple orthotic device.

Radiography is crucial in the diagnosis of ASD, FBSS and myriad of other spine conditions. Simple, safe and extremely valuable upright x-ray diagnosis is the criterion standard for spine conditions and were necessary in this case. Discussions that they could potentially be harmful to this patient are unfounded and baseless and counter the current understanding of the inadequacy of the Linear-Non-Threshold (LNT) model of radiation exposure[30, 31], the fact that simply breathing causes more oxidative damage, and the fact that failure to find the postural and spinal abnormalities on x-ray would most likely have led to the patient to receive inadequate care, led to a worsening of his chronic pain and disability, worsening of his ASD and increased the burden on the healthcare system long-term. It can be said that the x-ray evaluation in this case was crucial and followed the appropriate guidelines for the diagnosis of proper treatment of FBSS patients.

Trager et al. determined that manual therapists are typically cautious when treating patients having a history of lumbar spine surgery[37]. The methods used in this case involved both SMT as well as spinal traction applied to the lumbar spine. The patient tolerated the treatment well and there were no reported adverse events. Chu and Trager found that of patients treated having previous spine surgery, those that are younger as well as having a higher baseline pain intensity respond more favorably to manual treatments[38]. The patient age of this case was 27, and the pain was rated as 6–7/10; thus, the initial patient profile paralleled that typically favorable to treatment[38] and this may have factored in to the positive outcomes reported here. It is also noteworthy, that although significant structural changes occurred in the re-alignment of the spine (in both the sagittal and coronal planes), improvement in other measures including the pain intensity, disability rating and QOL (SF-36) documented improvements in the overall functioning of the patient.

Surgical and non-surgical interventions directed at flat back syndrome should be directed to lessen pain and disability and, in turn, improve QOL and functional ability and lessen the burden of their condition on the healthcare environment[15]. Economical, repeatable, reliable and effective non-surgical treatments for patients such as those suffering from conditions associated with FBSS are rare in the literature and this case report further presents a growing body of evidence that CBP methods provide an opportunity to treat these complex conditions successfully and with potential positive long-term outcomes. This case provides growing evidence of the CBP protocols for the treatment of numerous spine and health conditions and demonstrates that patients may have a viable non-surgical treatment option for even severe and complicated cases such as this patient with FBSS.

A limitation to this case includes it being a single case. A future case series should be done to further the research agenda for CBP methods on these types of patients. A strength to the case includes the long-term (6 year) follow-up.

Conflict of interest

Dr. Miles O. Fortner (MOF) has no conflict of interest; Dr. Thomas Woodham (TJW) has no conflict of interest; Dr. Jason Haas is an instructor for CBP Seminars Inc.; Dr. Paul Oakley (PAO) is a paid consultant for CBP NonProfit; Dr. Deed Harrison (DEH) is the CEO of Chiropractic BioPhysics® (CBP®) and provides post-graduate education to health care providers/physicians. Spine rehabilitation devices are distributed through his company. DEH is the president of CBP NonProfit, Inc.—a spine research foundation.

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