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Radiographic, Pain, and Functional Outcomes in an Adult Post-Fusion Patient Using a Scoliosis Activity Suit: Comparative Results after 8 Months

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Abstract

There are few conservative treatment options for adult patients with idiopathic scoliosis who are status post-fusion surgery. These typically include pharmacologic pain management, epidural injections, and generalized CAM treatments such as massage and chiropractic manipulation in the non-fused areas of the spine. The purpose of this study was to compare the post-treatment results in an adult post-fusion patient who wore a scoliosis activity suit for 8 months. Pain was evaluated using a quadruple visual analog scale (QVAS), while function was measured using an SRS-22r questionnaire. After 8 months of wearing the scoliosis activity suit, her pain scores improved, here SRS-22r improved, and a significant correction in radiographic Cobb angle was observed. This case report is the first to document a Cobb angle change in an adult patient wearing a scoliosis activity suit who is status post-fusion. Given that pain and dysfunction are primary reasons for scoliosis treatment in the adult population, more studies need to address the disparity between available treatments for adult scoliosis and the incidence of adult scoliosis, especially in the post-menopausal population. Future prospective studies should consider evaluating treatment effects of this suit using intent-to-treat methodology.

Keywords

Chiropractic, Pain, Rehabilitation, Scoliosis, Spine

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1. Introduction

Scoliosis is a lateral curvature of the spine exceeding 10 degrees as measured by Cobb's angle, and is thought to occur in 2% - 3% of the adolescent population annually [1]. According to the National Scoliosis Foundation [2], 38,000 spinal fusion surgeries are performed each year for progressive idiopathic scoliosis. Although this has been the treatment of choice for decades, there have been recent reports calling the safety and necessity of scoliosis fusion surgery into question [3]. Unfortunately, many complications can occur years after the initial surgery [4]. In a study of patients who had Harrington rod surgery for adolescent idiopathic scoliosis, 40% of these patients were classified as legally disabled 16.7 years after the surgery [5]. Since spinal fusion surgery does not substantially improve pain levels, some authors recommend [6] more judicious use given the high rate of complications.

Given that post-fusion patients still experience pain after surgery [7], adult patients are seeking more opportunities for pain management. Recently, Morningstar *et al*. have published preliminary reports on a scoliosis activity suit for adult scoliosis treatment [8] [9]. They report both radiographic and pain improvements in adult patients wearing this suit for up to 18 months. Although radiographic Cobb angle changes are logically unlikely in post-fusion patients, Morningstar and Joy demonstrate a Cobb angle correction in an adult post-Harrington fusion patient who participates in a chiropractic rehabilitation treatment [10]. This case report summarizes the findings and treatment of an adult post-Harrington fusion patient. Outcomes are reported after wearing a scoliosis activity suit for 8 months.

2. Case Report

A 59 year old female presented to an integrative medicine clinic with a history of adolescent idiopathic scoliosis diagnosed at age 13. The patient could not recall her initial Cobb angle measurement. She subsequently had Harrington rod instrumentation at age 19, which corrected the curve to 25˚. She had a revision surgery one year later due to pseudarthrosis, and a second revision surgery performed in 1992 due to hardware failure. The hardware was removed during this third surgery. Approximately 5 years after the third surgery, the patient recalled having back pain and right-sided sciatica with radiation from the right sacroiliac joint into the right posterior thigh above the knee. The pain was present at least 75% of the day most days. She had been using medicinal marijuana to help control her pain levels. She reports that the medicinal marijuana, along with turmeric allowed her to be more functional than compared to prescription pain medications.

As part of her initial intake paperwork, the patient completed a quadruple visual analog scale (QVAS) [11] and a revised Scoliosis Research Society 22 (SRS-22r) questionnaire [12] to quantify pain levels and quality of life. Her baseline QVAS score was an 80 out of a maximum score of 100. Her SRS-22r scores for each domain were as follows: Pain: 6/25, Function: 12/25, Self-image: 10/25, Mental health: 17/25, and Management satisfaction: 2/10 for a total score of 47/110. Baseline radiographic images in July of 2015 showed a Cobb angle of 84˚ from T11-L4 with an apex of L1/L2, and a 56˚ curve from T5-T11, apex T8.

3. Intervention and Outcomes

Since the patient's main purpose in seeking treatment was pain relief and functional improvement, the patient was scheduled to begin a course of therapy using the scoliosis activity suit. The patient presented for a trial fitting of the scoliosis activity suit. The activity suit is a neoprene wrap-based activity suit. The activity suit is composed of 4 separate pieces. The main piece, the Anchor, is the wrap that fits around the patient's thigh. The Lumbar piece attaches directly to the Anchor, and their configuration is dependent upon the location of the lumbar or thoracolumbar curvature. The third piece is called the Torso piece, and looks like a half-tank top shirt that acts upon the thoracic curvature. The fourth and final piece, or set of pieces, is the tension straps. The tension straps connect each of the first three pieces together in a rotational pattern, which introduces a variable amount of rotational force into the patient, to which he or she must react. These tension straps may be long or short. The longer tension straps are more elastic and provide more rotational resistance to which to resist. The activity suit was designed with the goal of creating a rotational resistance to which the postural reflexes and associated axial musculature must adapt. These rotational adaptations are measurable via visual posture analysis as well as comparative radiography.

Once a configuration was applied that produced a positive postural change, the patient was asked to wear it in the clinic while walking for 20 minutes. After that an in-suit radiograph was taken to evaluate correction. **Figure 1**

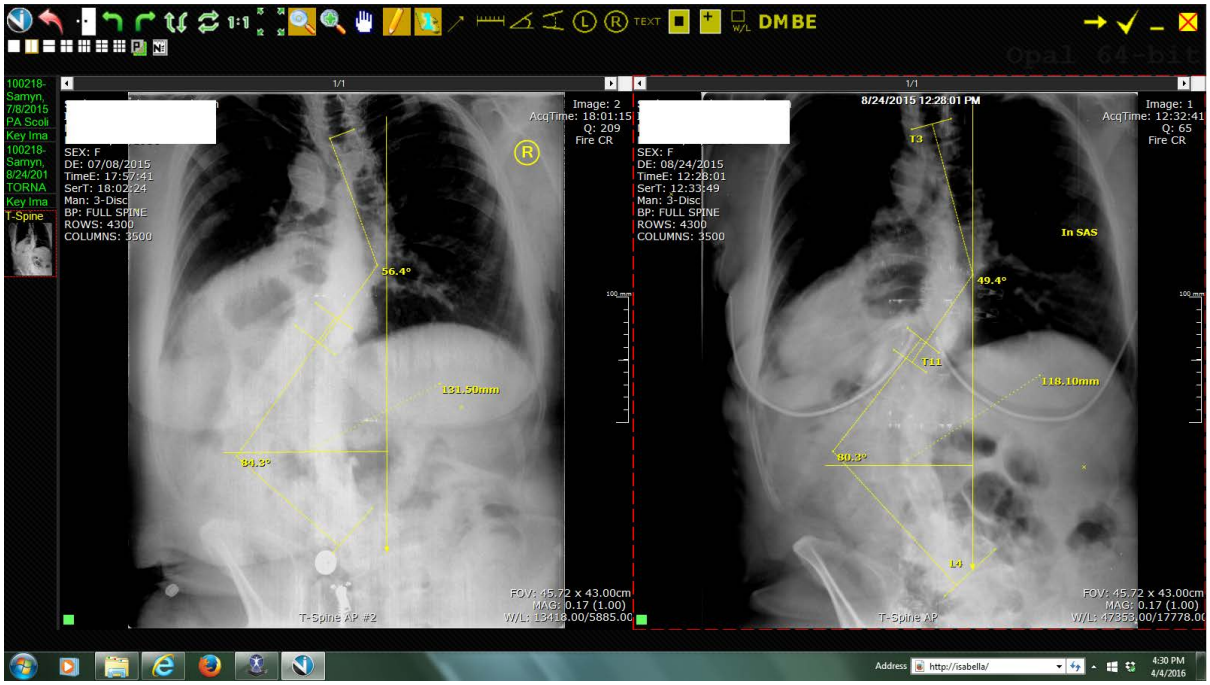

Figure 1. An illustration of the radiographic change while wearing the scoliosis activity suit.

shows the in-suit correction illustrated. The Cobb angle of the primary lumbar curvature mildly reduced to 80˚, while the thoracic curve reduced to 49˚. After instructing the patient on replicating the scoliosis activity suit's application, she was instructed to wear the suit for 1 hour twice daily, particularly around times of the day where she would be the most active. The patient followed up one month later to begin some basic at-home activities to perform while in the suit. These activities included some basic range of motion exercises, as well as some supine core strengthening exercises.

The patient was then instructed to follow-up in another month for additional exercises. During this follow-up, the patient, of her own volition, increased her activity suit time to 2 hours per session twice daily due to the pain relief she received while wearing it. After instructing her on additional core stability exercises, the patient was asked to follow-up 6 months later.

At her 6-month follow-up, the patient had completed follow-up QVAS and SRS-22r questionnaires for comparison. Her 6-month QVAS score was a 47/100 for a 59% reduction in pain. Her SRS-22r follow-up scores for each domain were as follows: Pain: 14/25, Function: 19/25, Self-image: 14/25, Mental health: 20/25, and Management satisfaction: 8/10 for a total score of 47/110, This is improved overall by 75/110, equating to a 60% improvement. A follow-up radiograph was obtained of the patient, prior to which the patient had not worn the scoliosis activity suit for 24 hours. **Figure 2** illustrates this follow-up radiograph. The lumbar curve measured 63˚, while the thoracic curve was reduced to 38˚.

4. Discussion

Since chronic pain and disability can significantly impact post-fusion scoliosis patients, it is imperative to explore new ways of helping this patient population. Given that this particular patient had her hardware removed by the time she presented for the treatment described herein, we cannot apply these results to other post-fusion patients necessarily. Due to the difference in surgical hardware and techniques, these results may not hold true for patients with pedicle screw instrumentation, Cotrel-Doubousset instrumentation, Luque instrumentation, etc. This report only outlines the treatment of a patient who underwent Harrington rod instrumentation as a young adult. It is unknown if or how the scoliosis activity suit could impart changes in the Cobb angle measurement in a patient who had their hardware in place at the time of scoliosis activity suit application. However, future studies should consider that this patient population may only want/need quality of life and pain improvements for a given treatment to be considered successful for these patients.

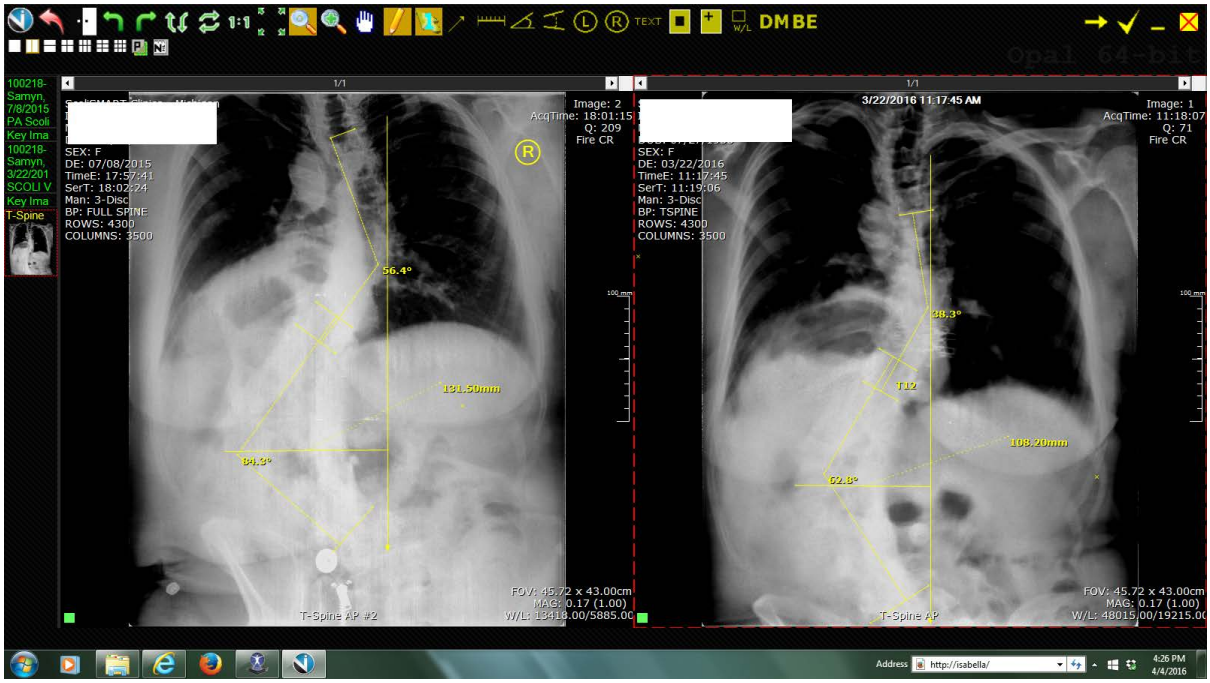

Figure 2. Radiographic changes after wearing the scoliosis activity suit for 8 months.

The amount of Cobb angle change in this case was significant. Our theory is that this could only be possible in someone with the hardware removed. We don't know what type of change, if any, would be possible in an adult of this age her still had her hardware in place. However, Morningstar and Joy were able to also get Cobb angle correction in an adult patient who did have Harrington instrumentation still in place. Both of these cases are single examples, and therefore their results cannot be applied broadly.

5. Conclusion

After wearing a scoliosis activity suit for 8 months, a 59 year old adult post-fusion female patient obtained clinically significant changes in self-reported pain and quality of life scores, as well as corrections in her thoracic and lumbar scoliosis Cobb angles. More research on scoliosis treatment for this particular patient population was needed, in light of the incidence of surgical complications associated with spinal fusion surgery.

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