CASE STUDY

Four-Year Follow-Up of a Patient Undergoing Chiropractic Rehabilitation for Adolescent Idiopathic Scoliosis

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Abstract

Objective: To report on the care of a patient with adolescent idiopathic scoliosis over four years.

Clinical Features: A 14 year old female with adolescent idiopathic scoliosis presented to a private chiropractic rehabilitation clinic for care. She had complaints of mild thoracic and right sacroiliac pain which worsened during prolonged sitting or while running long distances. Her scoliosis measured 24° in the thoracic spine and 17° in the lumbar spine. Abnormalities in chest expansion and axial trunk rotation were also observed and recorded.

Intervention and Outcome: Patient participated in a multimodal chiropractic rehabilitation program consisting of 28 clinic visits over 17 months. She also committed to a specific home exercise program. After 17 months, her curvatures decreased to 15°/6°, while showing concomitant improvements in peak expiratory flow, axial trunk rotation, and chest expansion. These outcome measures further improved at follow-up after 4 years with the Cobb angles reducing to 12°/4° respectively.

Conclusion: A patient with adolescent idiopathic scoliosis achieved improved outcomes following chiropractic rehabilitation. These improvements were evident at long-term follow-up while performing home-based rehabilitation. Home care exercises should be further explored to aid chiropractic outcomes. Further research may provide more understanding on how the specific modalities utilized in conjunction with chiropractic could have an impact on adolescent idiopathic scoliosis.

Key Words: *Adolescent Idiopathic Scoliosis; chiropractic; rehabilitation, subluxation*

Introduction

Adolescent idiopathic scoliosis affects approximately 2-9% of the population,[1-3] with geographic variations based on potential genetic and environmental factors.[4] Historically, observation has been the preferred management for scoliosis measuring between 10° and 30°.[5] However, even when the scoliosis falls within this range, it can cause a variety of potential health problems. Chronic back pain[6,7] is significantly more frequent, self-image is consistently poorer,[6,8] and respiratory function is inversely impacted starting with curvatures at 10°.[9-11]

Relatively little information on chiropractic management of adolescent idiopathic scoliosis is available. In searching the PubMed database using keywords "scoliosis" AND "chiropractic", a total of 8 studies were found specifically discussing chiropractic management. None of these studies contained long-term follow-up after the treatment had been

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completed. Using the search term "scoliosis" in the Index to Chiropractic Literature, a total of 167 entries were found. However, none of these studies reported information obtained at long-term follow-up, meaning at least 6 months following conclusion of clinic treatment.

The purpose of this paper is to discuss the treatment and results of a patient with a diagnosis of adolescent idiopathic scoliosis. This report details the total treatment time, as well as long-term follow-up schedule. Multiple outcome assessments are reported, including chest expansion, peak expiratory flow, disability, axial trunk rotation (ATR), Cobb angle, and apical deviation (compensation).

Case Report

Clinical Features

A 14 year old female presented for evaluation and treatment of adolescent idiopathic scoliosis. Her chief complaint was mild mechanical thoracic pain made worse by running cross-country at school and sitting in a chair for prolonged periods of time. She also reported not having the same level of stamina as other girls on her cross-country team.

She also had mild right sacroiliac pain which radiated into the right gluteal and posterior upper thigh regions. She had a negative family history of scoliosis, and was initially given the diagnosis of adolescent idiopathic scoliosis by her primary care physician at the age of 12. However, given that the Cobb angle was less than 30°, the management strategy chosen at that time was observation.

The initial examination included an anteroposterior scoliosis radiograph, as well as lateral cervical and lumbar radiographs. At baseline, she had a 24° primary right thoracic curvature, as well as a compensatory 17° levoscoliosis. She was rated as a Risser 3. The maximal apical deviation occurred at T7 and measured 24mm. Figure 1 illustrates these measurements.

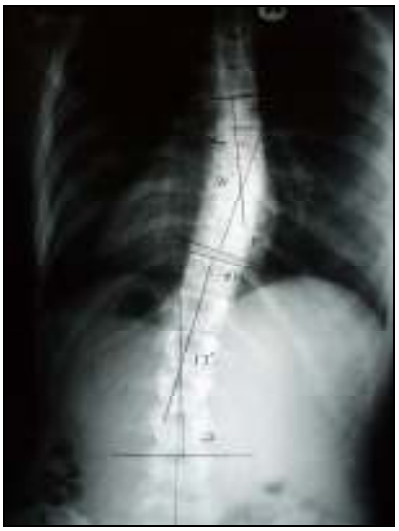

Figure 1. Baseline Anteroposterior Radiograph

Her initial ATR measured 17° using a scoliometer by Orthopedic Systems, Inc. Her initial disability score on the Functional Rating Index was 0%, Peak Expiratory Flow measured 400 L/min using an ASSESS® Peak Flow Meter, total chest expansion was one inch when measured at the axilla with a tape measure. This was calculated by subtracting the observed circumference during expiration from the total circumference at full inspiration.

Intervention & Outcomes

She was seen a total of 28 visits over a 17 month period. Her visit schedule began at two times a week then decreasing to weekly after two months of care. She was eventually seen on a monthly basis.

During each office visit, the patient performed a multimodal rehabilitation regimen that has been previously tested and illustrated in adult patients.[12,13] The modalities included wobble chair functional activities, deep paraspinal tissue massage, ambulatory external head and body weighting, and positional traction. Figures 2-4 illustrate these rehabilitation procedures.

Figure 2. This figure represents the warm-up or 'prehab' exercises the patient performed at the beginning of each clinic visit.

Figure 3. This figure illustrates a sample configuration of the Pettibon external head and body weighting system. This is the main focus of the entire rehabilitation program. It was performed in the clinic and at home.

Figure 4. This procedure demonstrates the positional traction. This was performed last in the clinic, and after the weighting system at home twice daily.

Chiropractic adjustments were administered on each visit, based on specific functional and postural testing. She was only adjusted if a supine leg check demonstrated an inequality. Adjustments were directed at reduction of rotational pelvic subluxations using side posture technique, as well as distraction-type cervical adjustments of the upper cervical region to regain orthogonality. Of the 28 visits, she was adjusted only 17 times.

In addition to the rehabilitation regimen, the patient was initially prescribed a specific set of home care procedures that were to be performed twice daily for 20 minutes each time. These included the ambulatory external head and body weighting, along with high density fulcrum blocks to perform positional traction.

As the patient progressed through treatment her home exercise schedule decreased from two times a day to three times a week. By the time she was released from care she was doing home exercises once a week. She was encouraged to continue performing the exercises at least once weekly for maintenance.

Follow-Up Results

At the end of active clinical treatment, her Cobb angles had decreased from 24°/17° down to 15°/6°. (Figure 5) Her maximal apical deviation at T7 reduced from 24mm to 19mm. Her peak expiratory flow increased to 460 L/min, while her chest expansion increased to 2.5 inches. ATR decreased to 14°. At that time she was discharged from care. However, it was recommended that she continue to follow-up until she was skeletally mature (Risser 5) to account for any remaining unforeseen growth that may spur a scoliosis progression.

Figure 5. Anteroposterior radiograph one year after starting care.

At the time of discharge, she remained a Risser 3. She presented for 7 follow-up visits over four years after release from active care. At the last follow-up visit, her Cobb angles were 12°/4° (Figure 6). Her maximal apical deviation at T7 decreased from 19mm to 14mm. Her ATR improved to 4°. She was deemed skeletally mature as she was graded a Risser 5. Her chest expansion increased to 3 inches and peak expiratory flow increased to 470 L/min. (Table 1)

Figure 6. Anteroposterior radiograph 4 years after starting care.

Discussion

This report outlines the long-term follow-up of a single patient. This is the first report in the chiropractic literature to report on four-year outcomes following management for adolescent idiopathic scoliosis. Because of the combination of modalities used in her treatment plan, it is impossible to know which of the procedures had the biggest impact on the outcomes reported and observed.

Adolescent patients with scoliosis often exhibit a significant amount of instability. This may be perhaps due to lack of full muscular development, neuromotor dyscoordination secondary to the primary scoliosis disorder, or a combination of these. Therefore, when the treatment goals were developed it was very important that any corrections in her spinal curvature be done without further compromising her current level of stability (or instability).

Over the duration of the patient's treatment she only grew one inch, thus confirming the initial Risser staging. Hence, the spinal curvature is not likely to have resolved without treatment. The patient was also six months post menarche at the initiation of care, which correlates with the initial Risser staging as well. Skeletal maturity, and hence minimal risk of progression, are typically reached when the patient approaches one year post menarche. [14,15]

Anecdotally, cases of adolescent idiopathic scoliosis progress when short term correction of the Cobb angle increases apical deviation beyond what is likely the ability of the spinal musculature to support an increased translated posture in forsake of the Cobb angle. This is consistent with the vicious cycle model proposed by Hawes and O'Brien. They write:

> *"Once asymmetric loading is established and maintained beyond a critical threshold for weight and time, there will be an inevitable tendency for progression to occur unless compensatory action offsets the biomechanical effects of the imbalance. Most important, when the load asymmetry is removed while significant growth potential remains, progression stops; when the asymmetry of the vertebral column is reversed and the unbalanced loading is thereby corrected, complete resolution of deformity occurs."* [16]

This suggests that increasing the apical deviation at the expense of a Cobb angle correction may be detrimental long-term. Therefore, it was important to make sure that any observed corrections could be stabilized intrinsically by the spine and its supporting musculature.

The breathing function tests used in this report signify the importance of respiratory function in patients with scoliosis. Chest wall excursion and vital capacity are inversely correlated with scoliosis, even for curvatures beginning at a Cobb angle of 10°.[17]

Interestingly, despite the patient reporting decreased exercise capacity, she did not report any disability during normal daily activities as measured by the initial Functional Rating Index. It has been suggested that a reason for this is that scoliosis curvatures often progress at a subclinical rate, and therefore any detriment to normal physiological function also remains subclinical until a threshold is reached.[18]

Being a case report, no solid conclusions can be drawn from this study. However, it does provide insight that chiropractic rehabilitation, when correctly applied to patients with adolescent idiopathic scoliosis, can have a significant, longstanding effect on the structure of the spine and related symptoms.

Conclusion

Following a trial of chiropractic care, a patient with adolescent idiopathic scoliosis had improvements in axial trunk rotation, peak expiratory flow, and chest expansion. Radiographic improvements in Cobb angle and apical deviation were also noted. These outcomes continued to improve at a 4-year follow-up. Further research on similar cases may provide more understanding on how the specific modalities utilized in conjunction with chiropractic could have an impact on adolescent idiopathic scoliosis.

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Table 1.

Assessment	**Baseline**	**After One Year**	**4- Year Follow Up**
Chest Expansion	1"	2.5"	3"
Peak Expiratory Flow	400L/min	460L/min	470L/min
Axial Trunk Rotation (ATR)	17°	14°	4°
Cobb Angle	24°/17°	15°/6°	12°/4°
Apical Deviation (Compensation)	24mm	19mm	14mm
Risser	3	--	5