ORIGINAL RESEARCH

Improvement in Idiopathic Scoliotic and Sub-Scoliotic Curvatures in Children Following Subluxation Correction Utilizing the Pierce Results System: A Retrospective Analysis of Outcomes

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Abstract

Objective: The intent of this study is to demonstrate the effectiveness of the Pierce Results System of vertebral subluxation analysis and correction in 14 patients with adolescent idiopathic scoliosis and 22 patients with 'sub-scoliotic' spinal curvatures.

Methods: Plain film A-P lumbopelvic X-rays of 14 subjects aged 7-16 with idiopathic scoliosis of 11 degrees or higher were evaluated prior to, and after at least 2 weeks of Pierce Results chiropractic care using the Cobb-Lippman method of scoliosis mensuration. A 'sub-scoliotic' group of 22 subjects aged 2-17 with lesser curvatures of 7 to 10 degrees were also evaluated in the same manner. All subjects were patients in a private clinic in which the Pierce Results System of correcting vertebral subluxation was the only method of intervention.

Results: The scoliosis sub-group experienced an average correction of 25.96% over an average of 4.75 specific spinal adjustments. The sub-scoliosis group experienced an average correction of 51.84% over an average of 6.41 adjustments. Six subjects in the sub-scoliosis group experienced 100% correction upon post-X-ray.

Conclusions: The results of this study suggest that: 1) Pierce Results chiropractic care involving specific spinal adjustment for the correction of vertebral subluxation alone is a potentially viable conservative intervention for idiopathic scoliosis, 2) intervention prior to the point that a patient can be considered to have a true scoliotic curve may be more effective based on the sub-scoliosis group's results, and 3) the absolute amount of intervention may not be as important for spinal correction as a conservative, methodical approach to spinal analysis. This is the largest study to date to objectively examine the results of a group of patients with adolescent idiopathic scoliosis from a random sampling in an individual practice following a treatment protocol involving specific spinal adjustment alone.

Keywords: *Subluxation, Adjustment, Manipulation, Pierce Results System, Adolescent, Scoliosis, Chiropractic*

Introduction

Scoliosis is commonly defined as a lateral curvature of the spine greater than 10 degrees in the coronal plane, although as Yochum and Rowe state, the term 'scoliosis' is often used to describe any lateral spinal deviation.[1] The prevalence of adolescent idiopathic scoliosis is estimated to be within 2-3% in children aged 10-16.[2] Debate has existed as to the long-term health implications of scoliosis, especially progressive scoliosis in children, however, long-term follow up of patients with the condition reveal several important findings, among these are: Potentially substantial curve progression, loss of

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pulmonary function, increased overall mortality, increased mortality in women due to cancer, increased prevalence of self-reported arthritis, negative perception of health, increased difficulty in basic strenuous and semistrenuous physical tasks, more days of limitation due to sickness, injury, and other health problems, and increased prevalence and intensity of back pain.[3-9] The available evidence therefore presents the long-term implications of scoliosis as far more than merely a cosmetic defect, but a potentially serious impediment to a given individual's long-term state of health and well-being.

Still more debate exists as to what effective conservative interventions exist to address the condition. Interventions such as chiropractic care, physical therapy and electric stimulation have been largely dismissed as viable alternatives to more invasive intervention such as Harrington Rod surgery.[10-12] Although studies exist to show the effectiveness of bracing to to halt curve progression, insufficient data exists to form conclusions about the effectiveness of bracing to actually treat or reverse the condition, the current accepted standard of care being to inform the patient of this fact.[7,13,14] Despite the fact that chiropractic care has not traditionally been viewed as a viable intervention for the condition, it is estimated that approximately 2.7 million patient visits are made to American chiropractors each year for scoliosis and scoliosis-related complaints.[15] If chiropractic care can indeed improve scoliosis, the need to first identify and then legitimize an effective method of intervention is therefore warranted.

The research available on chiropractic approaches to treatment is minimal but includes two case studies showing favorable results using chiropractic adjustment alone, one under specific upper cervical care and one under Pierce Results care.[16,17] A pilot study involving use of diversified adjusting in a randomized clinically controlled trial also exists.[18] In addition, Morningstar et al. has produced three studies documenting changes in patients with scoliosis using a combination of spinal manipulation, Pettibon weighting systems and traction, perhaps the most significant of these a retrospective case series involving 19 patients aged 15-64 who experienced at least a 25% improvement and an average reduction in scoliosis of 17 degrees over an intensive 4-6 week treatment program.[19-21] The major differences between Morningstar's case series and the study presented here is that this study deals with a younger average age group, a randomized sample format, and the use of spinal adjustment without any other ancillary intervention.

Methods

Subject Selection:

Thirty-six subjects were included in this retrospective case series. Eligible subjects were determined by running a query through the 'Platinum' chiropractic software system for patients aged 0-18 who had received care at Burlington Chiropractic (Burlington, New Jersey) within the last five years. 169 patient X-rays were recovered from office archives in this sampling process as per the results of the list produced. These results were narrowed down further by patients who had an A-P lumbopelvic film prior to care and at least two weeks after starting care, and exhibited a lumbar or thoracolumbar scoliosis of at least 11 degrees or greater as defined by traditional definitions of scoliosis mentioned previously (a lateral deviation of the spine of greater than 10 degrees) as determined by the Cobb-Lippman method of scoliosis mensuration outlined in Yochum and Rowe.[1] To summarize, eligible patients from this sampling process were determined as those who:

1. Were aged 0-18.
2. Had received care within the last 5 years.
3. Had a 'pre' A-P lumbar film exhibiting scoliosis of at least 11 degrees as measured by Cobb-Lippmann method.
4. Had a 'post' A-P lumbar film after at least two weeks of care.

This search subsequently produced 14 eligible patients aged 7-16 with initial scoliosis ranging from 11 to 27 degrees. To the doctors' knowledge none of these subjects were receiving any other intervention for their scoliosis (bracing, physical therapy, etc.).

While searching for eligible subjects we subsequently discovered 22 subjects aged 2-17 with pre-care spinal curvatures that were close to, but did not qualify as scoliotic curvatures (greater than 10 degrees) as they were within the 7 to 10 degree range. After observing the pre-post measurements of this group we felt it worth describing the results of this 'sub-scoliotic' group both individually and in comparison to the true 'scoliotic' group.

Intervention

The objectives of care through the Pierce "Results System™" can be simplified to two goals: 1) Restoring proper spinal structure and 2) restoring proper motion within that structure through the correction of vertebral subluxation. With particular relevance to the discussion of scoliosis, proper spinal structure is defined as straight in the anterior to posterior view, with the center of the head directly over the pubic symphysis, the lateral spine having 4 distinct curves falling into certain measurable 'normals'.[17] The late Dr. Walter Vernon Pierce (after whom the Pierce Results system is named) was the first to theorize in chiropractic terms the existence of a 'pelvic normal' corresponding with the spinal structure aforementioned. This view of the pelvis and spine differ somewhat from other chiropractic approaches in that pelvic and spinal 'normals' are thought to be theoretically achievable in patients barring any congenital spinal abnormalities.[22]

With these structural and biomechanical objectives for the spine in mind, the intervention given to each patient varied depending on several factors based on Pierce Results System analysis. These tools of analysis include: 1) The individual's static structural findings on X-ray, 2) Their findings of intervertebral motion dysfunction (kinesiopatholgy) on videofluoroscopy (motion X-ray), and 3) Their full-spine paraspinal Titron thermographic findings. Static films, particularly the lateral cervical and A-P lumbopelvic views are used to determine spinal and pelvic misalignment with respect to Pierce's model of the ideal spinal and pelvic structure. As mentioned, low-radiation videofluoroscopy or motion X-ray (formerly known commonly as cineradiography) is utilized to

Objectively ascertain intersegmental motion dysfunction (kinesiopathology) within the spine. As long as the patient was able to comprehend instructions and perform the movements necessary to gather data needed to determine levels of spinal fixation, this useful tool was also used. Finally, full spine Titron paraspinal thermography was used prior to every visit as a means of measuring the body's initial neurological state at the beginning of care and its response to spinal adjustment after. Analyzing a given patient's current full spine thermal scan and comparing it to previous 'patterns' determines both when and where an adjustment is warranted, and how aggressive an adjustment is needed to be given.

The adjustments given meant to correct these subluxations were given on a Zenith 230 hylo or Zenith model 80 stationary table in the prone position using the sectional 'dropping mechanisms' of the table with a high velocity, low-amplitude in the direction of correction needed based on prior analysis. When analysis of thermal pattern scans determined that a less aggressive adjustment was needed, thumb pressure or percussion instrument adjustment using a variable frequency adjusting instrument was also used.

All data were listed in a Microsoft Excel spreadsheet; each column was analyzed separately by comparing the pre-care Cobb-Lippman measurement of spinal curvature, post care Cobb-Lippman measurement, number of adjustments, number of weeks of care prior to post X-ray, age, sex, and absolute and percent change (table #1 and #2).

Results

Scoliosis Group

The average number of adjustments given prior to the post X-ray was 5.75, the average time between pre and post adjustment X-ray was 39.43 days, and the average percent of scoliotic improvement was 25.96%. The average subject age at pre X-ray was 10.77 years old. Nine of 14 subjects showed improvement, two showed no change and three subjects worsened. The Two-Tailed T-Test statistical analysis of our pre-post measurements scores is 0.02.

Sub-Scoliosis Group

The average number of adjustments given prior to the post X-ray was 6.41, the average time between pre and post adjustment X-ray was 141.32 days, and the average percent of curve improvement was 51.84%. The average subject age at pre X-ray was 8.91 years old. 18 of 22 subjects showed improvement, one showed no change and two subjects worsened. Six patients showed 100% improvement over the course of their care. The Two-Tailed T-Test statistical analysis of our pre-post measurements scores for this group was 0.00.

Discussion

The limitations of using Cobb-Lippmann angles are documented. Scoliosis is not a 2-dimensional phenomenon but rather a three dimensional condition involving a combination of lordosis, rotation/torsion, and lateral deformity, and validity and reliability issues exist when using the Cobb-Lippmann method to measure it.[23] Although quanifying each individual's scoliosis in as accurate a manner as possible using a different method would have been desirable, the greater purpose of this study was to demonstrate at least some level of improvement following care, both on an individual basis and within a group trend. Statistical analysis of the data gathered appears to have established this, especially when considering the relatively small amount of intervention that was given for each patient.

The Pierce "Results System™" is a combination of several techniques, including: 5th Cervical Key, Logan Basic, HIO, Thompson, Nimmo and Dr. Pierce's method of adjusting. In fact, Pierce developed a percussion instrument adjusting tool to help facilitate certain adjustments with a very specific amount of force.[22] Pierce insisted on referring to his approach as a 'System' of analysis rather than a 'technique' due to his emphasis on the importance of specific chiropractic analysis of the spine. Perhaps the most significant contributions Dr. Pierce made to chiropractic was the pioneering of more effective ways to analyze and identify two of the most measurable components of vertebral subluxation as discussed by Kent: kinesiopathology and neuropathology.[24]

Videofluoroscopy or motion X-ray (a low-radiation adaptation to medical grade videofluoroscopy) was developed to measure the kinesiopathological aspect of this complex in a highly reliable and objective manner.[25,26] To more accurately evaluate the neuropathological component of this complex and the effect of a given spinal adjustment, Pierce and Stillwagon developed the single-probed infrared Dermathermograph (DTG) to to be used in a chiropractic setting. The use of this device on every patient prior to adjustment with a full-spine pattern image is meant to track the state of the autonomic nervous system due to its role in temperature regulation of the skin.[27] The combination of several objective measures of spinal structure, biomechanics, and neurological state is meant to produce specificity in analysis and adjustment of the spine, resulting in superior spinal correction.

Several factors are thought to contribute to the etiology of idiopathic scoliosis, including genetic, neuromuscular, hormonal, and biochemical causes- the eventual culmination of these being a biomechanical aberration of the spine.[28] Regardless of whether the biomechanical phenomenon of idiopathic scoliosis is a cause of biomechanical problems (such as vertebral subluxation) or simply the end product of predisposing factors such as those listed, it is reasonable to suggest that a biomechanical expert (chiropractor) manage the condition, especially one who considers the interplay of structure, motion, and neurology of the spine with the analytical detail used within the context of the Pierce Results approach. As a condition affecting one individual differently from the next, we would suggest that a standardized approach to correction may not be appropriate (a pre-determined number of adjustments, for example). Rather, an adjustment should only be warranted when the body expresses a neurological need for it as determined by objective thermal pattern scanning, especially in a patient with idiopathic scoliosis who likely has some level of aberrant neuromuscular function. It is for this reason that we attribute the overall success of the two groups presented in this study despite the very conservative approach that was administerd to each

patient in this study.

The limitations of this study are evident. The amount of time and number of adjustments between pre and post X-rays were not standardized but determined by the doctor based on the need for re-evaluation. In addition, the only films available for this study were A-P lumbopelvic views as per the preference of the doctors' analytical uses. Thoracic views were not included in the study as they were not typically used for analysis in this particular private practice. The potential issue of patient compliance was also not addressed in the study, several patients having large gaps of time between care. Several outliers (especially in the sub-scoliosis group) significantly altered the overall average time of care for their group. We also recognize that this study does not include a follow-up of these patients and whether they maintained their initial improvements or continued to experience further improvement. Finally, as previously mentioned, problems inherently arise when using the Cobb method of scoliosis mensuration. Conversely, we feel that this study represents an accurate depiction of the everyday results being obtained in a strictly Pierce Results-based practice. Eligible subjects included any and all patients who met the selection criteria, not only those who exhibited favorable results, thus maintaining a random sampling format.

Conclusion

This study demonstrates a group trend towards structural change within the scoliosis group of 25.96% over an average of 4.75 specific spinal adjustments. An even greater trend towards correction of 51.84% over an average of 6.41 adjustments was found in the sub-scoliosis group who started care with curvatures of 7-10 degrees. Six subjects in this group experienced 100% correction at their first re-examination X-ray. This is the largest study to date to objectively examine the results of a group of patients with adolescent idiopathic scoliosis from a sampling in an individual practice following a treatment protocol involving specific spinal adjustment alone. Although more research is needed, the data presented in this study suggests several things: 1) Pierce Results chiropractic care involving specific spinal adjustment for the correction of vertebral subluxation alone without any other intervention is a potentially viable conservative intervention for idiopathic scoliosis, 2) intervention prior to the point that a patient can be considered to have a true scoliotic curve may be more effective based on the sub-scoliosis group's results, and 3) the absolute amount of intervention may not be as important for spinal correction as a conservative, methodical approach to spinal analysis.

The current available literature lacks evidence for the existence of a consistently effective conservative intervention for adolescent idiopathic scoliosis. The evidence for a specifically chiropractic-oriented conservative approach, in particular one that doesn't require any ancillary intervention besides spinal adjustment is lacking even more. Similar research on a greater study population addressing the limitations of this study is therefore greatly warranted to confirm the results found here.

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FIGURES

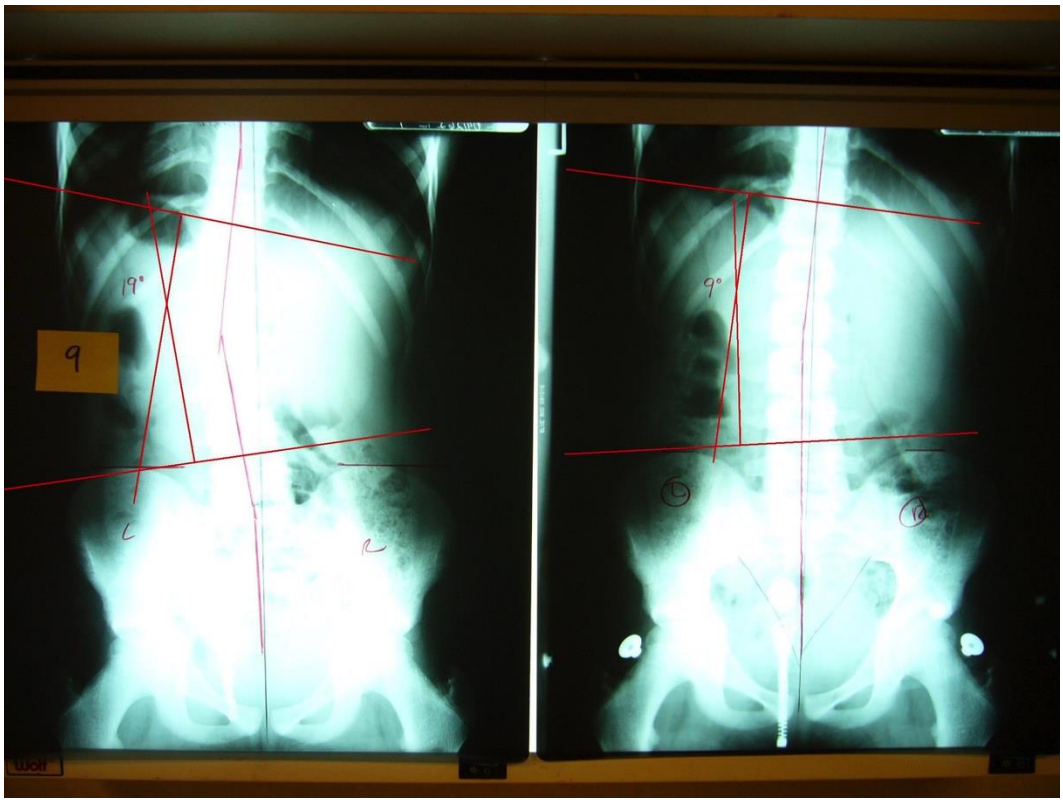

Figure 1. An example of correction from the scoliosis sub-group.

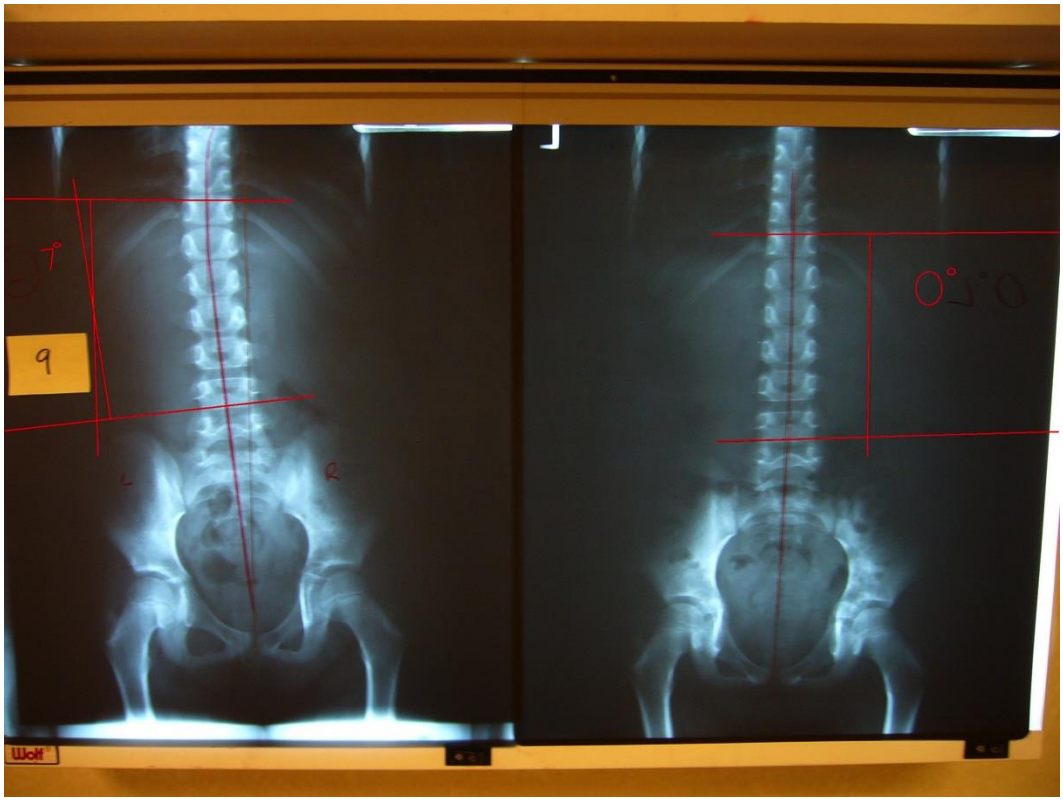

Figure 2. Example 1 of correction from the sub-scoliosis subgroup.

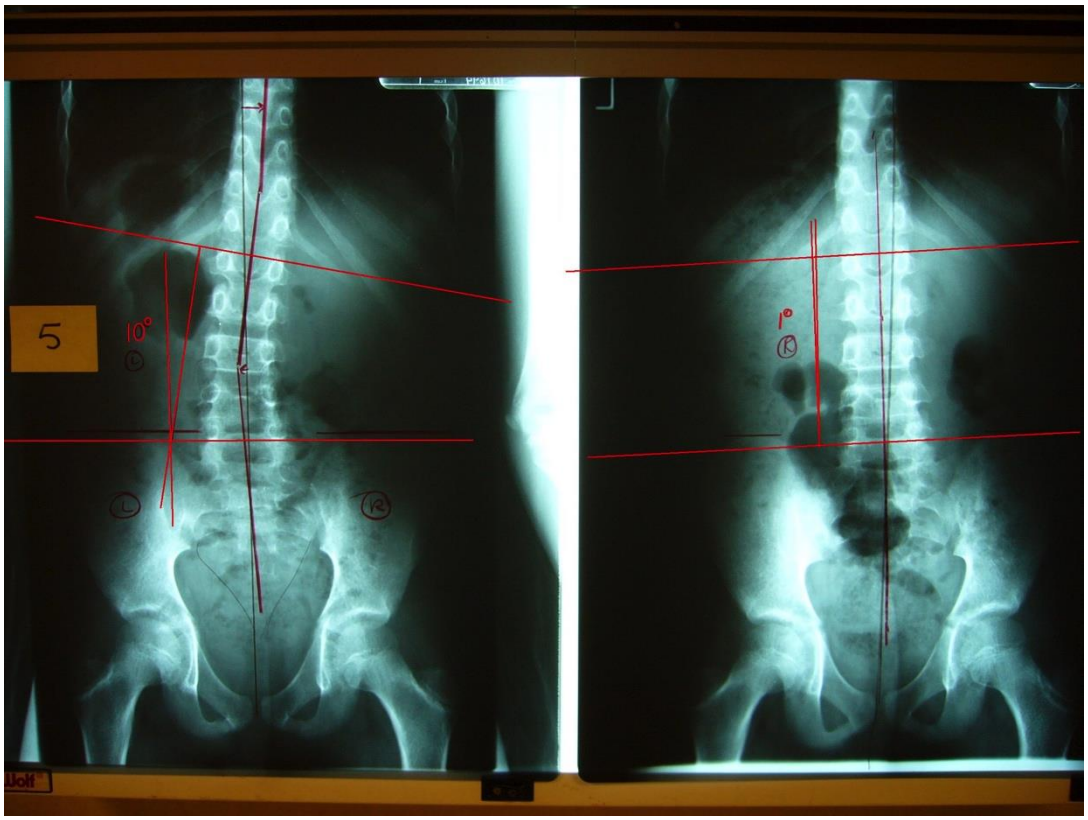

Figure 3. Example 2 of correction from the sub-scoliosis subgroup

TABLES

Patient #	Exam 1 Pre measurement	Exam 2 Post Measurement	Absolute change (degrees)	% Change	Exam 1 date	Exam 2 date	Time Elapsed (Days)	# adjustments	Age Exam 1	Sex
2	21	21	0	0	11/05/2009	26/05/2009	15	5	16	M
3	23	24	1	4.2	13/01/2010	01/02/2010	19	4	7	F
5	11	11	0	0	12/05/2010	25/06/2010	44	5	10	M
6	12	10	-2	-20	23/06/2010	12/08/2010	50	5	13	F
7	11	6	-5	-45.5	24/07/2008	13/10/2008	81	8	9	F
8	20	17	-3	-15	17/05/2010	16/06/2010	30	6	16	F
9	19	9	-10	-52.6	31/08/2009	18/11/2009	79	3	10	F
10	12	5	-7	-58.3	26/10/2005	03/11/2005	8	2	7	F
11	11	2	-9	-81.8	04/08/2010	08/09/2010	35	3	9	M
12	15	13	-2	-13.3	06/08/2010	10/09/2010	35	2	11	F
13	27	26	-1	3.7	22/09/2008	26/09/2008	4	2	12	F
14	22	29	7	24.1	29/08/2008	17/11/2008	80	5	13	F
16	11	5	-6	-54.5	29/01/2009	12/03/2009	42	7	7	F
17	11	5	-6	-54.5	13/04/2009	13/05/2009	30	9	17	M
Average	16.142	13.071	-3.071	-25.964			39.428	4.714	11.214	
Std Dev			4.333	30.288				2.152		
Ttest	0.0239									

Table 1 Scoliosis Group

Patient #	Exam 1 Pre Measurement	Exam 2 Post Measurement	Absolute change (degrees)	% Change	Exam 1 date	Exam 2 date	Time Elapsed (days)	# adjustments	Age Exam 1	Sex
1	9	5	-4	-44.4	01/08/2007	29/07/2008	363	12	13	F
2	7	4	-3	-42.9	18/05/2009	11/06/2009	24	4	13	M
3	8	0	-8	-100	30/11/2009	28/12/2009	28	4	2	M
4	7	4	-3	-42.9	27/04/2007	18/06/2007	52	2	12	F
5	8	8	0	-100	30/01/2009	07/05/2009	97	5	3	M
6	9	8	-1	-11.1	30/01/2009	07/05/2009	97	5	5	F
7	3	8	5	62.5	26/10/2005	07/02/2008	834	15	7	M
8	9	1	-8	-88.9	20/06/2008	13/08/2008	54	4	4	M
9	7	0	-7	-100	08/02/2007	16/07/2007	158	8	6	F
10	7	1	-6	-85.7	20/06/2008	13/08/2008	54	4	7	M
11	8	0	-8	-100	24/02/2010	07/04/2010	42	4	9	F
12	5	9	4	44.4	14/01/2010	12/02/2010	29	4	10	M
13	9	5	-4	-44.4	22/09/2008	07/10/2009	380	12	4	M
14	9	1	-8	-88.9	03/08/2009	13/01/2010	163	6	9	F
15	7	4	-3	-42.9	02/11/2009	07/12/2009	35	5	12	M
16	7	0	-7	-100	14/07/2010	21/10/2010	99	4	11	M
17	8	0	-8	-100	08/04/2009	14/07/2010	462	12	3	M
18	7	6	-1	-14.28	17/06/2010	19/07/2010	32	13	17	F
19	7	7	0	0	14/01/2010	11/02/2010	28	5	17	F
*1	10	11	1	9.1	09/12/2009	04/01/2010	26	5	6	F
*4	10	1	-9	-90	14/01/2010	11/02/2010	28	3	11	M
*15	10	4	-6	-60	09/02/2009	05/03/2009	24	5	15	F

Average	7.773	3.955	-3.818	-51.835			141.318	6.409	8.909
STD Dev			3.961	49.334				3.837	
Ttest	0.000270551								

Table 2 Sub Scoliosis Group