Changes in clinical and radiographic parameters after a regimen of chiropractic manipulation combined with soft tissue therapy and neuromuscular rehabilitation in 7 patients with Adolescent Idiopathic Scoliosis

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BACKGROUND

The causes of idiopathic scoliosis (IS) are likely multifactorial, including genetic and environmental. It is unlikely one therapy addresses all involved factors. Evidence supports a comprehensive approach to evaluation and treatment using a variety of outcome assessments.

AIM

This study presents a review of files of seven adolescent idiopathic scoliosis (AIS) patients treated with a comprehensive two-week treatment protocol including chiropractic manipulative therapy, massage, exercise, and whole-body vibration therapy, followed by a home rehabilitation regimen.

OUTCOME MEASURES

Primary outcome measures reported include Cobb angle, apical vertebral rotation, disc index, apical vertebral deviation, digital spirometry, scoliometry, timed one-legged stability with eyes closed (TOLSWEC), numeric pain scale, health-related quality of life questionnaires (RAND SF-36 and SRS-22), and computerized dual inclinometry. Data was recorded pre/post-treatment and at follow-up ranging from four to seven months. P-values for the differences in pre/post mean values were computed from the paired t-test while those for the differences in median values were computed using the Wilcoxon matched pair (related sample) signed rank test.

Table 1.1 –Patient Descriptors

ID	*Sex*	*Age*	*Curve*	*Menarche*	*Risser*
1	M	12	C	N/A	0
2	F	12	S	3/08	1
3	F	15	S	11/10	4
4	F	13	S	7/11	1
5	M	14	S	N/A	3
6	F	15	S	Pre	1
7	F	10	S	Pre	0

Table 2.1a –Spirometry

ID	*FVC*	*% PV FVC*	*FEV1*
1	3220/3380	71/75	2220
2	2360/2440	59/61	2000
3	3100/3190	66/69	2680
4	1820/1820	54/54	1490
5	3270/4090	58/73	3150
6	2190/2370	51/55	2090
7	1490/1820	41/51	1380
M_n			

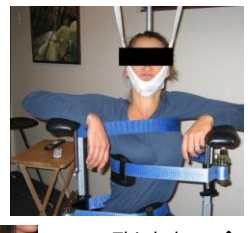
ID	*% PV FEV1*	*FER*	*PEF*
1	56/68	68/79	1400/2570
2	57/60	87/86	1370/2550
3	69/69	87/85	3780/4020
4	48/46	81/99	1120/1300
5	67/78	96/97	5960/5000
6	56/56	89/93	2620/2710
7	41/55	96/97	1750/2770
M_n			

TREATMENT

Each patient underwent twenty treatment sessions over a two week period (2 times day/five days) for an average length of 180 minutes/session. Treatment sessions were divided into three phases.

↑ First phase, Soft tissue rehab

Second phase ↓
Specific manual therapy



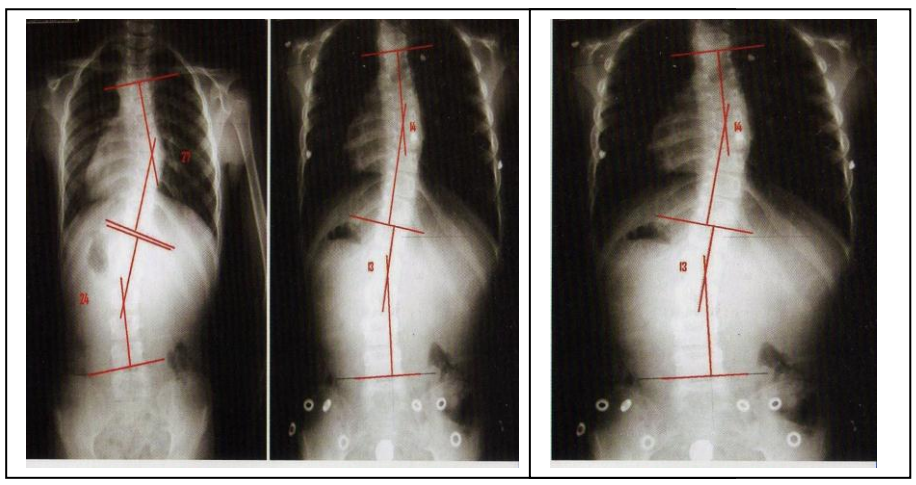
Third phase ↑
Neuromuscular Re-education

The first phase of treatment addressed soft tissue deformations and improving spinal flexibility, the second phase influenced spinal biomechanics, and the third impacted neuromuscular function.

Table 2.3: Mean and median values of radiographic parameters of the thoracic and lumbar spine pre/post treatment and at follow-up, as well as the p-value assessing the difference in the values from pre to post (n=7)

Radiographic parameters		Pre	Post	4 Mo. FU	P-value* Pre/post
			Thoracic		
Cobb angle	Mean	51.6	43.0	50.7	<0.001
	Median	55.5	49.0	53.5	0.018
% Rotation	Mean	19.4	13.6	18.3	0.048
	Median	19.6	10.7	16.9	0.018
Disc Index	Mean	1.6	1.4	1.6	0.025
	Median	1.6	1.5	1.6	0.018
Apical Vert. Dev.	Mean	27.9	30.1	33.9	0.631
	Median	24.0	26.0	30.3	0.611
			Lumbar		
Cobb angle	Mean	41.9	33.9	40.2	0.005
	Median	46.5	37.5	44.0	0.043
% Rotation	Mean	11.8	6.4	10.7	0.070
	Median	11.3	6.1	8.3	0.042
Disc Index	Mean	1.5	1.4	1.4	0.639
	Median	1.5	1.4	1.4	0.752
Apical Vert. Dev.	Mean	28.5	22.4	27.4	0.001
	Median	33.5	27.0	29.5	0.028

* Mean/median values did not differ significantly from pre/ post to 4 month follow-up and are not reported in the table



RESULTS

The mean and range for the following primary outcome measures were recorded: Cobb angle changes: thoracic (8.4°, 6.5° – 11°); lumbar (8°, 0° - 12°); apical vertebral rotation: thoracic (5.9%, 1.8% – 19.6%); lumbar (5.4%, 0% – 13.5%); disc index: thoracic (0.18, 0.01 – 0.4); lumbar (0.06, -0.2 – 0.44); apical vertebral deviation: thoracic (-2.3 mm, -21.5 mm to 13 mm); lumbar (5.6 mm, 4 mm – 7 mm); forced vital capacity: (237 cc, 0-820 cc); forced expiratory volume in 1 second: (212 cc, -50 cc to 520 cc); forced expiratory rate: (5%, -2 to 1180 cc); scoliometer readings: (3.0°, -1° to 10°); TOLSWEC: left (3 seconds, -8 to 13); right (6 seconds, -3 to 24); pain scales (-1.4, +1 to -4); RAND (8%, -21% to 36%). The greatest mean improvements in spinal ranges of motion (ROM) occurred in thoracic rotation, lumbar flexion, and lumbar lateral flexion. At follow-up, Cobb angle changes were maintained in two patients and improved in two. Mean SRS score was 3.91. Cobb angle changes were statistically significant between pre- and post-treatment.

DISCUSSION

While scoliosis is characterized primarily by a lateral deviation, it involves all three dimensions. According to SOSORT, cosmesis (aesthetics) and quality of life are ranked as the two most important factors in scoliosis care. The patients experienced objective improvement in both scoliometry and vertebral rotation, and subjective improvements in posture as demonstrated through grid photography. Quality of life improvements were noted with the RAND SF-36 and SRS-22, and overall patient satisfaction with the protocol was also favorable as demonstrated by the SRS-22. Compliance with the at-home exercise regimen appears to have a dramatic influence upon the long-term results of the presented protocol.

Table 2.1b – Scoliometer readings at T6, T12, & L3 respectively

ID	*Scol T6*	*Scol T12*	*Scol L3*
1	4/1	13/9	5/4
2	15/14	5/2	13/5
3	23/25	15/15	5/0
4	7/9	14/4	10/2
5	12/14	9/2	12/3
6	9/9	6/2	0/0
7	10/10	2/1	4/1

Table 2.4 –Questionnaires

ID	*Pre VAS*	*Post VAS*	*Pre RAND*	*FU RAND*	*SRS-22*
1	2	1	52	88	3.84
2	6	3	67	74	4.02
3	6	2	73	86	4.45
4	0	0	68	72	3.68
5	0	0	96	75	3.64
6	1	2	52	87	3.66
7	5	2	75	87	4.08

CONCLUSION

The applied protocols effected positive functional and/or radiological changes in seven cases of AIS, with two cases demonstrating continued benefit at follow-up. Additional research is needed to determine the benefit of these various approaches.

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Table Legends: FVC – forced vital capacity; %PV FVC - percent predicted values (age/height/gender) for forced vital capacity; FEV1 – forced expiratory volume in one second; %PV FEV1 – percent predicted values (age/height/gender) for forced expiratory volume in one second; FER – forced expiratory rate; PEF – peak expiratory flow;