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Original Article

Rehabilitation effects of combined respiratory guidance and chiropractic adjustment on adolescents with idiopathic scoliosis

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Abstract: Objective: To investigate the clinical efficacy of respiratory guidance combined with chiropractic adjustment in treating adolescent idiopathic scoliosis (AIS). Methods: Clinical data from 108 AIS patients treated between June 2023 and January 2025 were retrospectively reviewed. Based on the therapeutic approach, patients were allocated into a conventional group (n = 47) and a respiratory chiropractic treatment group (n = 61). Clinical outcomes, lumbar-back muscle strength, trunk rotation angle, and Cobb angle were compared. Lumbar-back pain intensity, exercise endurance, and quality of life were recorded before and after treatment. Results: The overall effective rate was significantly higher in the respiratory chiropractic group than that in the conventional group (96.72% vs. 80.85%, P = 0.017). Post-treatment, both groups demonstrated improved lumbar-back strength and reduced trunk rotation and Cobb angles, with greater improvements in the respiratory chiropractic group (all P < 0.05). Scoliosis severity, apical trunk inclination, head deviation, and asymmetry in shoulder and pelvic height were all reduced after treatment, again with superior outcomes in the respiratory chiropractic group (all P < 0.05). Compared with baseline, both groups showed longer six-minute walking test distances and lower visual analogue scale scores, with the combined therapy producing greater benefits (all P < 0.05). The posterior trunk symmetry index and Scoliosis Research Society-22 scores were also markedly improved in both groups, particularly in those receiving combined treatment (all P < 0.05). Conclusion: Integrating respiratory guidance with spinal adjustment provides significant rehabilitative benefits for adolescents with idiopathic scoliosis. This combined approach enhances spinal flexibility, strengthens back musculature, alleviates pain, improves exercise tolerance, and ultimately promotes better overall quality of life.

Keywords: Respiratory guidance, chiropractic adjustment, adolescent idiopathic scoliosis, rehabilitation

Introduction

Scoliosis is a complex three-dimensional spinal deformity, which is characterized not only by lateral curvature in the coronal plane, but also by vertebral rotation and changes in physiological curvature in the sagittal and transverse planes, often accompanied by mechanical imbalances of structures such as the thorax and pelvis. Adolescent idiopathic scoliosis (AIS) is a common type of scoliosis, predominantly affecting adolescents aged 10-18. It has complex etiology, involving genetic, biomechanical, neuroendocrine regulation, and environmental factors, and is not yet fully understood [1]. AIS can lead to physical deformities, localized pain, and impaired growth and development. Furthermore, it can cause cardiopulmonary dysfunction, threatening physical and mental health, and reducing quality of life [2, 3]. Adolescents are in a critical period of growth and development, so it is crucial to intensify the treatment of AIS. Currently, traction therapy is widely used in clinical practice for AIS. Although it yields certain therapeutic effects, its efficacy in improving vertebral rotation and thoracic collapse, two key components of the three-dimensional spinal deformity, is limited, resulting in suboptimal prognosis in some patients [4, 5].

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External therapy of traditional Chinese medicine (TCM) refers to a therapeutic approach that does not rely on oral medications, acting on the body's surface or musculoskeletal system via manual techniques, respiratory guidance, massage, and traction to regulate functional status. In recent years, two of its commonly used intervention modalities - respiratory guidance and spinal alignment for curvature correction - have demonstrated promising application prospects [6]. Respiratory guidance therapy, by consciously regulating respiratory movements, can redistribute the stress load on key parts such as the thorax, pelvis, and spine, effectively promoting the coordinated symmetry of muscle tension on both sides of the spine, thereby restoring its normal biomechanical balance. It not only helps strengthen muscles and enhances muscle endurance around the lumbar spine but also corrects scoliosis [7]. Spinal alignment adjustment is a therapeutic technique that corrects abnormal spinal curvature using professional manual manipulation. Through direct manual correction of abnormal spinal curvature and joint alignment, it alleviates resulting symptoms such as pain, thereby improving patients' quality of life [8, 9]. It is evident that the combination of active respiratory guidance and passive spinal alignment adjustment can theoretically form a complementarity between functional and structural interventions, which may further improve clinical efficacy. However, current research is mostly limited to a single therapy, with a lack of systematic reports on the combined use of the two. Based on this background, this study aims to systematically evaluate the impact of respiratory guidance combined with chiropractic adjustment therapy on multiple dimensional indicators of AIS patients through a retrospective analysis, so as to provide a reference for the clinical formulation of treatment plans for this condition.

Materials and methods

Participants

Clinical records of 108 adolescents with idiopathic scoliosis (AIS) admitted to our hospital between June 2023 and January 2025 were reviewed.

Patients were allocated to two groups according to their rehabilitation regimen: a conventional group (n = 47), which received standard traction treatment, and a respiratory chiropractic group (n = 61), which underwent combined respiratory guidance and spinal adjustment therapy. This study protocol was approved by the Ethics Committee of Shanghai Ethics Committee for Clinical Research. This was a retrospective observational study, with all data from previous clinical records. Patient information was anonymized during data collection and analysis, and no additional interventions were given to patients. For these reasons, the Ethics Committee waived the requirement for patients' written informed consent.

Eligibility criteria

Inclusion criteria: (1) Meeting the diagnostic criteria for idiopathic scoliosis, excluding congenital, neuromuscular, and other secondary scoliosis factors [10]; (2) Age between 10 and 18 years old; (3) Complete clinical data available; (4) Standing anteroposterior spinal X-ray shows a Cobb angle ≥ 20° and ≤ 40°; (5) No surgical or brace treatment within 3 months prior to enrollment; (6) No abnormal cardiac, hepatic, and renal function; (7) No cognitive impairment or psychiatric disorders.

Exclusion criteria: (1) Secondary scoliosis caused by congenital or metabolic disorders; (2) Coexisting spinal diseases such as spondylolisthesis, vertebral fracture, or spinal tumor; (3) Coagulation dysfunction; (4) Muscular atrophy or recent fractures; (5) Cognitive deficits or psychiatric illness; (6) Skin ulceration or infection at the treatment site.

Treatment procedures

The conventional group received routine treatment. In the prone position, the junction of the anterior and posterior bed plates were aligned with the patient's iliac crest level and fixed. The traction force was set to 40% of the patient's body weight, once a day, 20 minutes per treatment session, for a total of six weeks of treatment.

The respiratory chiropractic group received respiratory guidance combined with spinal alignment adjustment treatment, with the specific methods as follows: (1) Respiratory guidance: ① Respiratory function training. The patient was guided to perform deep breathing,

and focused on guiding them to exhale on the convex side of the spine and inhale on the concave side at the end of exhalation; 3 times a week, 25-30 minutes per training session, for a total of six weeks of treatment. ② Postural reverse traction training. The patient was guided to take an upright position, with feet naturally separated shoulder-width apart. Then the patient was instructed to slowly raise the right upper limb (palm up, dorsiflexion of the back of the hand) above the head, while slowly pressing down the left upper limb (palm down, dorsiflexion of the back of the hand) to form reverse traction. This posture was maintained for 3 minutes, followed by left and right alternation, twice a day, 5-10 sets per training session, for six weeks. The training intensity was adjusted in real time according to the patient's tolerance and respiratory rate to ensure that the patient maintains deep, steady breathing during training without obvious feeling of breath holding. (2) Spinal alignment adjustment: First, soft tissue relaxation was performed, using techniques such as kneading, pushing, and grasping on the patient's shoulders, neck, waist, back, and lower limbs for 10 minutes. Subsequently, core correction techniques were carried out: ① Pelvic correction. The patient lied supine with hands crossed on the chest, then turned to the right lateral position, with the left leg flexed at the hip and knee placed on top, and the right leg extended. The operator pressed the patient's left posterior superior iliac spine with the heel of the right hand, and at the same time stably pressed the left knee forward and downward with the right foot (or right knee) to keep the knee joint perpendicular to the edge of the bed. On the basis of continuous downward pressure with the right foot, the operator pushed forward with the left hand and coordinated with the right hand to complete the cutting and pressing technique with an instant inch force. The so-called "instant inch force" refers to applying a small-amplitude, high-speed, low-magnitude corrective thrust in an extremely short time when the joint is in a pre-tensioned state to promote joint reduction and avoid excessive traction on surrounding tissues. ② Lumbar joint reduction: The patient maintained the above-mentioned right lateral position. The operator fixed the patient's right wrist to their left upper arm with the left hand, placed the ulnar edge of the right palm against the left side of the target spinous process of the lumbar spine, and pressed the patient's left knee with the right foot. Similarly, under the synergistic effect of continuous downward pressure with the right foot and forward push with the left hand, the right hand used inch force to complete the joint reduction operation, for a total of 6 weeks of treatment. The strength, angle, and target segments of the manual operation are individually selected and were adjusted by an associate chief physicians with over 10 years of experience based on the palpation, X-ray films, and posture evaluation results of each patient.

Outcome measures

(1) Clinical efficacy. After the end of treatment, the efficacy was evaluated with reference to the Guidelines for the Rehabilitation Assessment and Treatment of Adolescent Idiopathic Scoliosis and the changes in Cobb angle [11]. Patients were categorized as follows:

Markedly effective: Symptoms such as low back pain basically disappeared, Cobb angle decreased by > 10° or improved to within 10°, and the spine regained balance.

Effective: Symptoms such as low back pain were significantly relieved, Cobb angle decreased by 5°-10°, and trunk deviation was significantly improved.

Ineffective: Symptoms such as low back pain were not relieved or aggravated, Cobb angle decreased by < 5° or increased, and trunk deviation was not improved. Total effective rate = (total number of cases - number of ineffective cases)/total number of cases × 100%.

(2) Low back muscle strength was measured before and after 6 weeks of treatment using a Hoggan back-strength tester (USA). Patients were placed in the prone position, and the sensor was positioned at the level of the fifth thoracic spinous process. They were instructed to elevate the trunk above the umbilicus and hold the posture for 15 seconds. The peak forces during forward flexion and extension were recorded for analysis.

(3) Spinal morphology and trunk rotation angle. The EK-8400 electronic spinal measuring instrument was used to detect the spinal morphological indicators of patients with idiopathic

Table 1. Comparison of baseline characteristics

Group	Gender (Male/Female)	Age (years)	BMI (kg/m^2)	Scoliosis Type (Single Lumbar Curve/Single Thoracic Curve/ Thoracolumbar Double Curve)	Course of Disease (years)
Conventional group (n=47)	27/20	15.98±1.69	22.35±3.52	20/15/12	1.84±0.55
Respiratory chiropractic group (n=61)	33/28	15.54±1.27	22.51±3.37	22/23/16	1.91±0.68
χ^2/t	0.121	1.537	0.24	0.461	0.575
P	0.729	0.127	0.811	0.497	0.566

scoliosis in both groups before treatment and 6 weeks after treatment, including the degree of scoliosis, trunk inclination angle (ATI), head deviation, shoulder height difference, and hip height difference, and the trunk rotation. During testing, patients bent forward so that the hip-shoulder line was parallel to the ground, with both hands joined and relaxed. The instrument was placed along the back to record spinal curvature and rotation data.

(4) X-rays were used to record the Cobb angle. X-ray was used to record the Cobb angle of patients with idiopathic scoliosis in both groups before treatment and 6 weeks after treatment. Patients were guided to take a standing position, while anteroposterior X-ray examination of the spine occurred, recording the Cobb angle.

(5) Low back pain degree. The Visual Analogue Scale (VAS) score was primarily intended to reflect changes in patients' low back pain symptoms before and after treatment, rather than to assess the radiological severity of scoliosis. Serving as a supplementary subjective indicator to structural parameters (e.g., Cobb angle), the degree of low back pain was therefore independently evaluated using the VAS, in both groups before treatment and 6 weeks after treatment, with a full score of 10 points. There is a positive correlation between the degree of low back pain and the VAS score.

(6) Exercise endurance. The 6-minute walk test (6MWT) was used to assess exercise endurance before treatment and 6 weeks after treatment. Patients were instructed to walk as far as possible within 6 minutes. After one test, they rested for 15-20 minutes before the next test, and the average of the two test results was taken.

(7) Posterior Trunk Symmetry Index (POTSI). The Potsi App was used to process the dorsal trunk images before treatment and 6 weeks after treatment, calculating three planar height difference indices and 3 frontal plane asymmetry indices, and the sum of the 6 indices is the POTSI.

(8) Quality of life. The Scoliosis Research Society-22 Questionnaire (SRS-22) was used to evaluate the quality of life of patients with idiopathic scoliosis in both groups before treatment and 6 weeks after treatment. This scale includes 3 dimensions: functional status, psychological status, and self-image score. Each dimension is scored 0-25 points. There is a positive correlation between the quality of life and the scores of each dimension of the SRS-22.

Statistical analysis

SPSS 24.0 software was utilized for data analysis. Quantitative data underwent Shapiro-Wilk tests for normality assessment. Normally distributed data were expressed as (mean ± standard deviation), with independent-samples t-tests and paired-samples t-tests used for inter-group and intra-group comparisons, respectively. Count data were presented as n (%) and analyzed using chi-squared tests. A *P*-value less than 0.05 was considered statistically significant.

Results

Comparison of baseline characteristics

At baseline, there were no significant differences between the two groups in terms of sex distribution, mean age, body mass index, curve pattern, or disease duration (all $P > 0.05$). These findings indicate that the two cohorts were comparable before treatment (**Table 1**).

Comparison of clinical outcomes

The overall effective rate in the respiratory chiropractic group reached 96.72%, significantly

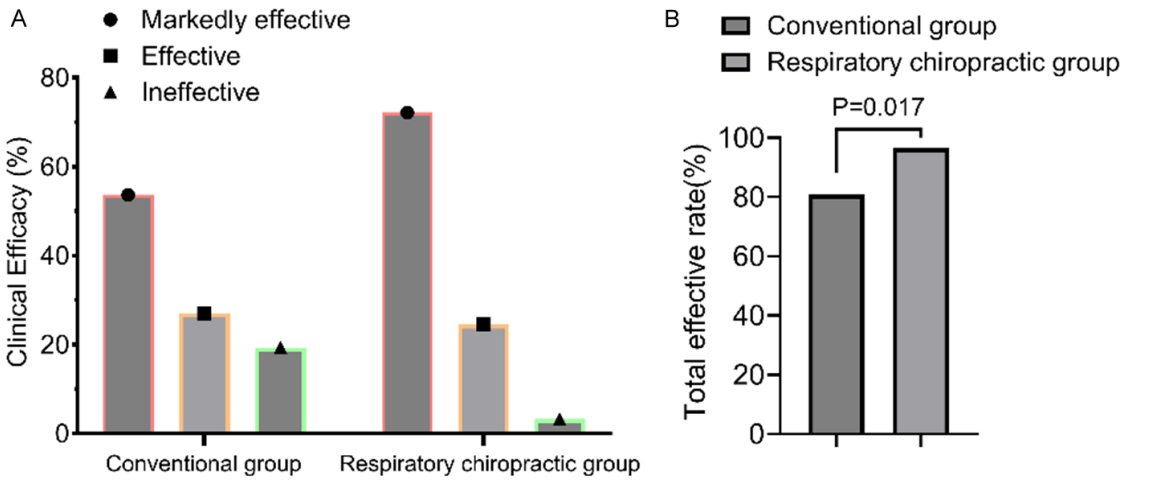

Figure 1. Comparison of clinical outcomes. A: Distribution of treatment effectiveness levels. B: Overall effective rate.

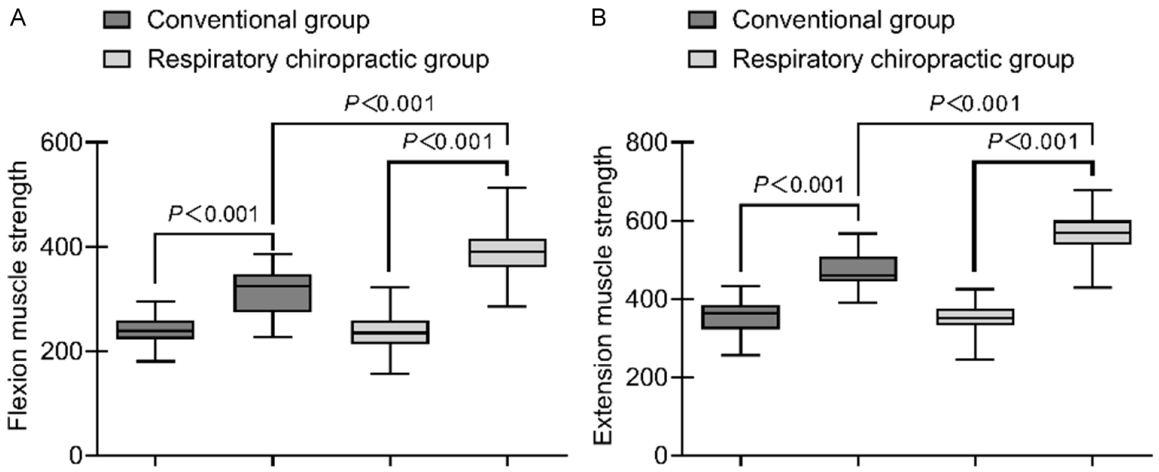

Figure 2. Comparison in lumbar-back muscle strength. A: Forward flexion strength. B: Back extension strength.

higher than the 80.85% observed in the conventional group (P < 0.05). Notably, in the respiratory chiropractic group, 72.13% of patients achieved a marked effect, with their lower back symptoms essentially disappearing and Cobb angle significantly improving. In contrast, the conventional group had an effective rate of 53.19%, and 19.15% of patients showed no improvement (**Figure 1**).

Comparison of lumbar back muscle strength

Before treatment, the baseline levels of anterior flexion and extension strength were comparable between the two groups (both P > 0.05). After treatment, the strength of the back muscles increased in both groups, with the respiratory chiropractic group showing significantly greater improvement than the conventional group during the same period (P < 0.05, **Figure 2**).

Comparison of spinal morphology

Before treatment, the two groups showed no significant differences in spinal curvature, ATI, head deviation, asymmetry in shoulder and pelvic height, (all P > 0.05). After the six-week intervention, all morphological parameters improved in both groups, but the respiratory chiropractic group demonstrated significantly greater reductions compared with the conventional group (all P < 0.05; **Table 2**).

Comparison of trunk rotation and Cobb angles

At baseline, trunk rotation and Cobb angles were comparable between the two groups

Table 2. Comparison of spinal morphology

Group	Scoliosis severity		Apical trunk inclination		Head deviation		Shoulder asymmetry		Pelvic height asymmetry	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Conventional group (n=47)	1.63±0.40	0.83±0.32*	7.12±1.27	5.03±1.20*	2.11±0.40	1.42±0.35*	2.31±0.45	1.06±0.44*	1.71±0.46	0.92±0.35*
Respiratory chiropractic group (n=61)	1.70±0.45	0.47±0.22*	7.26±1.25	4.12±0.87*	2.16±0.35	1.23±0.27*	2.26±0.37	0.63±0.22*	1.66±0.34	0.46±0.21*
t	0.841	6.921	0.548	4.568	0.692	3.186	0.634	6.638	0.65	8.48
P	0.402	0	0.585	0	0.491	0.002	0.528	0	0.517	0

Note: Inter-group comparison before treatment, $^{*}P < 0.05$.

Table 3. Comparison of trunk rotation and Cobb angles

Group	Trunk rotation angle		Cobb angle	
	Before treatment	After treatment	Before treatment	After treatment
Conventional group (n=47)	7.35±1.40	4.83±1.32*	33.12±4.80	28.77±4.20*
Respiratory chiropractic group (n=61)	7.51±1.25	4.02±1.26*	34.05±5.03	25.04±3.90*
t	0.626	3.244	0.972	4.765
P	0.533	0.002	0.333	0

Note: Inter-group comparison before treatment, *$P < 0.05$.

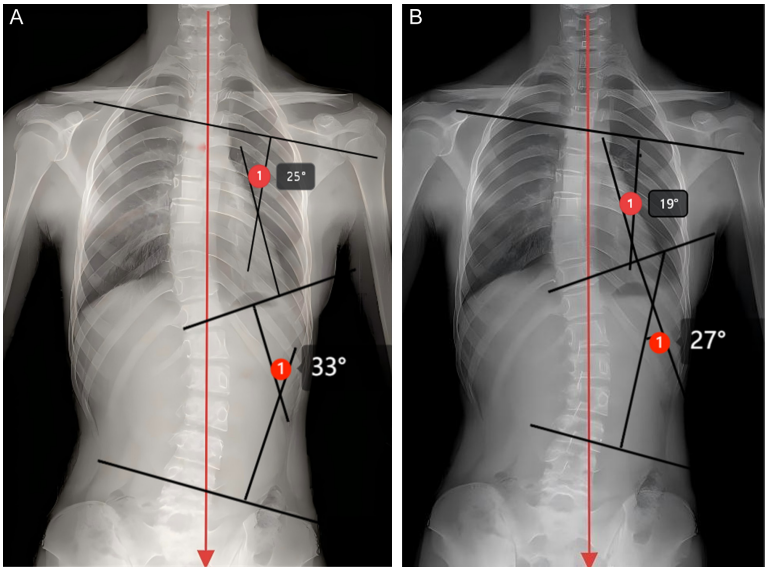

Figure 3. Radiographic comparison of spinal alignment before and after combined therapy. A: Pre-treatment image showing thoracolumbar S-shaped scoliosis (thoracic Cobb 25°, lumbar Cobb 33°). B: Post-treatment image showing improvement with thoracic Cobb reduced to 19° and lumbar Cobb to 27°.

(both P > 0.05). Following treatment, both parameters significantly decreased in each group, with more pronounced improvements in the respiratory chiropractic-spinal group (both P < 0.05; **Table 3**).

Figure 3 illustrates a typical case, a 12-year-old male, presenting with an S-shaped thoracolumbar scoliosis, predominantly lumbar. As shown in **Figure 3A**, the initial Cobb angle measurements were 25° for the thoracic curve and 33° for the lumbar curve. Following treatment with "respiratory guidance combined with chiropractic curve adjustment" (**Figure 3B**), both the thoracic and lumbar curves significantly improved. The thoracic Cobb angle reduced to 19°, and the lumbar Cobb angle decreased to 27°, indicating a notable reduction in the degree of scoliosis and an overall improvement in spinal balance.

Comparison of pain, exercise endurance, and POTSI

After treatment, both groups experienced marked improvement in subjective pain relief, physical endurance, and posterior trunk symmetry. The respiratory chiropractic group demonstrated a significantly greater decrease in pain scores, longer six-minute walk distances, and better optimization of the POTSI than the conventional group (P < 0.05; **Table 4**).

Comparison of quality of life

Post-treatment analysis revealed significant improvement in SRS-22 scores across all domains, including function, psychological well-being, and self-image in both groups. Between-group comparison showed that improvements in these dimensions were consistently greater in the respiratory chiropractic group (P < 0.05), with the most pronounced gains observed in functional capacity and self-image (**Table 5**).

Discussion

As a three-dimensional spinal deformity with complex etiology, the occurrence and development of AIS are comprehensively influenced by genetic, biomechanical, neuroendocrine and environmental factors [12, 13]. Currently, traction therapy, as a routine treatment for AIS, plays a certain role in improving spinal curvature, enhancing spinal flexibility and relieving pain [14, 15]. However, clinical practice indicates that for patients with large scoliosis angles, mature skeletal development or signifi-

Table 4. Comparison of pain, exercise endurance, and POTSI

Group	VAS scores (points)		6MWT (m)		POTSI	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Conventional group (n=47)	6.06±0.80	2.23±0.52*	322.77±32.10	403.25±41.33*	17.11±3.43	12.27±2.32*
Respiratory chiropractic group (n=61)	6.15±0.75	1.66±0.43*	317.23±41.25	461.68±40.12*	17.76±3.11	9.15±1.46*
t	0.601	6.233	0.76	7.406	1.03	8.541
P	0.549	0	0.449	0	0.306	0

Note: Inter-group comparison before treatment, *$P < 0.05$. VAS: Visual Analog Scale, 6MWT: 6-minute walk test, POTSI: Postural Trunk Symmetry Index.

Table 5. Comparison of quality of life

Group	Function		Psychological well-being		Self-image	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Conventional group (n=47)	16.12±3.80	20.16±2.52*	18.72±3.55	22.54±1.33*	16.04±3.07	21.04±2.04*
Respiratory chiropractic group (n=61)	15.52±2.72	22.56±2.13*	18.21±3.10	23.11±1.13*	15.72±3.12	23.41±1.20*
t	0.956	5.359	0.796	2.406	0.532	7.542
P	0.341	0	0.428	0.018	0.596	0

Note: Inter-group comparison before treatment, *$P < 0.05$.

cantly limited spinal flexibility, the corrective effect of simple traction therapy is often unsatisfactory, with shortcomings such as long treatment cycle, poor compliance of some patients, and even possible interference with the normal physiological curvature of the spine [16, 17]. Therefore, how to treat AIS more effectively has become one of the hot issues in clinical discussion.

In recent years, with the gradual deepening of clinical research on the treatment of AIS, the application rate of a series of external TCM therapies such as respiratory guidance and spinal alignment adjustment in the treatment of this disease has been continuously increasing [18, 19]. This study innovatively combines active "respiratory guidance" with passive "spinal alignment adjustment", aiming to achieve multi-targeted treatment of AIS through a comprehensive intervention model of internal and external treatment, and combination of dynamic and static therapy. The results of this study showed that the total effective rate of the respiratory chiropractic group was significantly higher than that of the conventional group. It suggests that respiratory guidance combined with spinal alignment adjustment in the treatment of AIS shows certain clinical advantages. Its possible mechanism of action lies in: respiratory guidance having the effect of regulating qi harmony and guiding the body to softness. By using breathing techniques to guide limb movement, it achieves comprehensive regulation of meridians and internal organs, so as to dredge meridians and relax the body and mind. This therapy focuses on the coordination of breathing and body posture. Through consciously guiding airflow in specific postures, it regulates the mechanical distribution of the thorax and pelvis and improves the tension balance of the muscles around the spine. Spinal alignment adjustment takes the holistic concept of TCM as the core, combines with modern spinal biomechanical principles, and systematically adjusts spinal joints and collaterals through specific techniques, which may help improve their anatomical position and physiological curvature, and promote the mechanical stability and functional coordination of the spine. Yin Jing et al. found that spinal alignment adjustment therapy in the treatment of AIS can reduce low back pain in patients and correct the degree of scoliosis [20]. The two work internally and externally, and their combined use can exert a synergistic effect.

This study found that after treatment, the improvement amplitudes of low back muscle strength, trunk rotation angle, Cobb angle, spinal morphological indicators, VAS score, 6MWT and POTSI in the respiratory chiropractic group were significantly better than those in the conventional group in the same period. Considering that the pain symptoms of patients with mild to moderate AIS are relatively mild, this study fur-

ther introduced the SRS-22 scale to evaluate the quality of life of patients from the dimensions of functional status, psychological status and self-image, so as to make up for the deficiency of a single pain indicator. The results showed that the scores of each dimension of SRS-22 in the respiratory chiropractic group were significantly higher than those in the conventional group in the same period. This comprehensive therapy has significant advantages in improving the core symptoms and functional status of AIS patients. The reasons are as follows: in terms of structure, spinal alignment adjustment may directly adjust the abnormal arrangement of the spine in three-dimensional space through manual manipulation, correct vertebral rotation and lateral flexion, and restore its physiological curvature; respiratory guidance can enhance thoracic mobility, regulate the expansion of lung tissue on the concave side through breathing induction in specific postures, and further promote the recovery of spinal morphological symmetry [21]. In terms of muscle strength and stability, spinal alignment adjustment techniques can not only release tense muscles due to compensation, but also activate core muscle fibers inhibited by long-term abnormal force lines, laying a foundation for the reconstruction of spinal stability. The maintenance of specific postures and reverse traction in respiratory guidance training can form resistance training of core muscles, which helps to strengthen the core muscles [22]. The combination of the two enhances the dynamic stability of the spine. Regarding respiration and metabolism, regular deep breathing training in respiratory guidance can significantly improve pulmonary ventilation efficiency and oxygenation capacity, while spinal alignment adjustment techniques can optimize the mechanical conditions of breathing and reduce unnecessary energy consumption by improving thoracic structure and spinal alignment. This simultaneous improvement of respiratory function and body mechanics jointly enhances the exercise endurance of patients. Regarding pain regulation, spinal alignment adjustment techniques mainly relieve pain directly by relieving nerve compression and releasing soft tissue adhesion. Respiratory guidance may improve local blood circulation, promote the metabolism of pain-causing substances, and at the same time regulate autonomic nerve function through slow and deep breathing rhythm, reduce pain sensitization, and then reduce pain intensity. The two exert pain relief effects through different pathways, forming a multi-level analgesic effect. In terms of quality of life, with the correction of posture, relief of pain and recovery of motor ability, patients' daily living ability gradually returns to normal, and their psychological state also improves, ultimately promoting the improvement of quality of life [23].

Notably, this study primarily included patients with mild-to-moderate AIS (20°-40°), where pain is not the primary manifestation in all cases. Thus, the VAS score was used to reflect pre- and post-treatment pain trends rather than assess structural severity. Combining it with quality-of-life indicators such as the SRS-22 enables multi-dimensional evaluation of treatment efficacy. However, the VAS score has limitations in reflecting structural lesion severity in AIS patients with small Cobb angles, and its results should only serve as an auxiliary reference for symptom changes.

This retrospective observational study is subject to inherent limitations: potential selection bias (due to treatment plan selection based on prior clinical practice), incomplete clinical information, and a relatively small sample size, which may affect result stability. Additionally, the 6-week follow-up only reflects short-term efficacy; the lack of medium- and long-term follow-up data precludes evaluating the sustained effects of this combined therapy on scoliosis progression control and long-term quality-of-life improvement. Furthermore, systematic imaging records during treatment were not retained, limiting the availability of real-time intra-treatment photos (only pre- and post-treatment imaging data of typical cases were provided to demonstrate spinal morphological changes).

Future prospective randomized controlled trials with multi-center, large-sample designs and long-term follow-up are warranted. Simultaneous recording of standardized imaging data during treatment will further verify the reliability and reproducibility of the current conclusions, ultimately benefiting more AIS patients.

In summary, the combination of respiratory guidance combined with spinal alignment adjustment integrates the holistic concept of TCM

and the concept of modern rehabilitation medicine. Through multi-targeted and multi-level comprehensive treatment intervention, it can significantly improve the spinal function of AIS patients, enhance low back muscle strength and exercise endurance, reduce low back pain, and improve quality of life. Respiratory and chiropractic care for AIS has definite clinical efficacy and shows certain potential for clinical application.

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Disclosure of conflict of interest

None.

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