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The Application of Schroth Therapy Combined with Pilates Training in the Rehabilitation Treatment of Adolescent Idiopathic Scoliosis

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Abstract: *Objective:* To explore the application effect of Schroth therapy combined with Pilates training in the rehabilitation treatment of adolescent idiopathic scoliosis (AIS). *Methods:* A total of 100 patients from Tianjin Hospital in Tianjin were randomly selected as the research subjects. The time period was from June 2024 to March 2025. They were evenly divided into two groups by the random number table method. There were 50 cases in the control group who were given Schroth therapy, and 50 cases in the observation group. Pilates training was added on the basis of the control group to observe the rehabilitation effect. *Result:* The effective rate of treatment in the observation group was higher than that in the control group ($P < 0.05$). After the intervention, the Cobb Angle and ATR Angle in the observation group were both smaller than those in the control group ($P < 0.05$). *Conclusion:* For patients with AIS, the combination of Ross therapy and Pilates has a better effect and is of practical value.

Keywords: Schroth therapy; Pilates; Scoliosis; Occurs particularly

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1. Introduction

AIS is the most common three-dimensional spinal deformity in adolescence. Its etiology is not yet fully clear. The main manifestations are coronal scoliosis, abnormal sagittal physiological curvature, and horizontal vertebral body rotation [1]. With the rapid development of bones, it not only leads to asymmetrical posture and restricted movement functions, but also may cause secondary problems such as chronic pain and cardiopulmonary dysfunction, seriously affecting the physical and mental health and quality of life of patients. At present, clinical rehabilitation methods mainly include brace therapy, physical therapy, and exercise intervention etc. However, there are significant differences among various methods in terms of corrective effect, compliance, and long-term prognosis [2]. To improve the therapeutic effect, this study aims to analyze the application effect of combined treatment by integrating Schroth therapy with Pilates training.

2. Data and methods

2.1. General information

During the period from June 2024 to March 2025 in the hospital, a total of 100 patients from Tianjin Hospital in Tianjin are selected and divided into the observation group and the control group according to the random number table method. In the control group, there are 26 males and 24 females, aged between 10 and 16 years old, with an average age of (13.25 ± 2.11) years old. In the observation group, there are 27 males and 23 females, aged between 10 and 15 years old, with an average age of (13.22 ± 2.21) years old. The basic data of the two groups of patients are statistically analyzed, and there was no difference ($P > 0.05$).

2.2. Methods

The control group is given Schroth therapy. Before treatment, through systematic assessment, the specific characteristics of the patient's spinal deformity are identified. On this basis, a personalized training plan is formulated as follows: Static posture adjustment focused on improving the spinal alignment when standing, sitting, and lying down, while dynamic movement training optimized the movement pattern through Schroth gait re-education. The breathing training adopts three-dimensional control technology and combines the spiral angular breathing method to enhance the ability of thoracic cage movement. Muscle group activation training includes deep muscle group strengthening in the prone position and shoulder girdle resistance exercises in the sitting position. At the same time, it is combined with lateral position traction to improve thoracic vertebral rotation. Functional training introduces unstable plane core stability exercises and enhances neuromuscular control ability with the help of fitness balls and suspension systems. Thoracic range of motion training improves restricted rib movement through specific techniques, while muscle strength balance training focuses on symmetrical strengthening of weak muscle groups. The entire rehabilitation program lasts for 90 minutes each time and is implemented three times a week. During this period, specialist physicians regularly assess and adjust the training content. The entire intervention cycle lasts for six months.

Meanwhile, the observation group added Pilates on the basis of the control group. The training program adopted a multi-dimensional movement combination, with the core goal of improving the function of the spinal-pelvic-lower limb dynamic chain. The training content was as follows: Standing trunk forward flexion exercise. Each group completed 6 cycles, and each cycle lasted no more than 25 seconds. Four-legged kneeling cat stretch, 6 repetitions per set, holding for 30 seconds each time. Alternate swimming-style limb lifts in the prone position for 8 cycles, with each movement lasting 20 seconds. Prone Superman maintenance training, 10 repetitions per set, 30 seconds each time. Supine baby hip flexion exercise, 3 cycles per set, 20 seconds each time. Flexibility training includes 3 to 5 cycles of hamstring stretching in the supine position and 5 to 8 supine spinal rotation exercises on each side. Perform a fitness ball back muscle group extension training on an unstable surface, including 5 cycles of stretching and 10 cycles of stretching movements. Dynamic stability training consists of 20 cycles of standing crunches, 10 cycles of lateral trunk extensions, and 20 cycles each of two variations of rowing exercises, namely standing and Pilates. Bilateral symmetry training is achieved through lunge step pull movements, with 20 cycles completed alternately on the left and right sides. The entire training program is implemented three times a week, alternating with Schroder therapy, and lasts for three months under the guidance of professional rehabilitation therapists.

2.3. Observation indicators

2.3.1 Therapeutic effect

It is divided into three grades: marked effect, effective, and ineffective. If the patient's posture is significantly improved, functional recovery is good and the quality of life is significantly enhanced, it is regarded as effective. The patient's posture has partially improved. For instance, the asymmetry of the trunk has been alleviated, but there is still a slight imbalance. The function has partially recovered, the core stability has improved, but there is still a slight posture compensation. The exercise endurance has increased, and the quality of life has improved, which is considered ineffective. If the above-mentioned indicators of the patient do not improve or worsen, it is regarded as ineffective. The effective rate of treatment = (marked effect + effective effect)/number of patients × 100%.

2.3.2 Cobb Angle and Spinal Rotation Angle (ATR)

Before and after the intervention, the Cobb Angle of the patients was monitored by digital X-ray photography, and the ATR Angle was monitored by a spinal measurement instrument.

2.4. Statistical analysis

Statistical analysis is performed using SPSS 28.0 software. Measurement data are displayed as [x±s] tables and t-tests are used. Count data are expressed as percentages and comparisons are conducted using chi-square tests. A *P*-value < 0.05 is considered statistically significant.

3. Result

3.1. Compare the therapeutic effects

The therapeutic effect of the observation group was higher than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of therapeutic effects between the two groups (n=100)

Grouping	Number of cases	Show effect	Effective	Invalid	Efficiency %
Observation group	50	32	17	1	98.00
Control group	50	19	23	8	84.00
X^2	-	-	-	-	5.982
P	-	-	-	-	0.014

3.2. Compare Cobb angles with ATR angles

After treatment, the Cobb Angle and ATR Angle in the observation group were both smaller than those in the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of Cobb angles and ATR angles in the two groups (x±s, °)

Grouping	Number of cases	Cobb angle		ATR angle	
		Before the intervention	After the intervention	Before the intervention	After the intervention
Observation group	50	22.23 ± 3.11	10.21 ± 2.11	8.11 ± 1.25	4.54 ± 0.63
Control group	50	22.15 ± 3.20	13.56 ± 2.85	8.20 ± 1.05	6.19 ± 0.77
t	-	0.127	6.680	0.390	11.727
p	-	0.899	0.000	0.698	0.000

4. Discussion

AIS is the most common spinal deformity among people aged 10 to 18, with a global incidence rate of approximately 2% to 3%. In clinical treatment, the Schroth therapy is a commonly used treatment method. Through three-dimensional autonomous correction training combined with rotational angle breathing training, it specifically improves the abnormal alignment of the spine in the coronal, sagittal, and horizontal planes [3–9]. This method emphasizes conducting specific movement training under the corrected posture to enhance the coordinated control ability of the muscles around the spine, thereby gradually reconstructing the normal spinal force line.

However, relying solely on this method has a limited activation efficiency for the deep core muscle groups, which will affect its corrective effect to a certain extent. Pilates training, as a kind of exercise therapy emphasizing neuromuscular control, effectively enhances the overall stability of the spinal-pelvic complex through precise trunk stability training and dynamic posture control [10-11]. This training system particularly focuses on the coordinated activation of deep core muscle groups, such as the transverse abdominis and multifus muscles. It adopts the progressive resistance principle, which can significantly improve the proprioception and motor control abilities of patients and provide the necessary mechanical support basis for the corrective effect of Schroth therapy. Therefore, when the two methods are applied in combination, a complementary effect can be formed, which is conducive to improving the therapeutic effect [12–15].

In this study, the effective rate of treatment and the performance of Cobb Angle and ATR Angle in the observation group were all better than those in the control group ($P < 0.05$), indicating that compared with individual training, the combined application is more conducive to improving the therapeutic effect and improving the Cobb Angle and ATR Angle. Combined training can simultaneously improve the strength balance of the surface muscle groups and the neural control of the deep muscle groups. It is more effective than single training in breaking the abnormal movement patterns of patients with scoliosis, thereby enhancing the therapeutic effect. To sum up, in the treatment of AIS patients, the combination of Schroth therapy and Pilates has a significant effect and is worthy of promotion.

5. Conclusion

However, this study had a relatively small sample size and a short follow-up period, which may affect the reliability of the results and the evaluation of long-term efficacy. Future research should expand the sample size, extend the follow-

up duration, and adopt a more rigorous randomized controlled design to further validate the clinical value of this combined therapy. To sum up, in the treatment of AIS patients, the combination of Schroth therapy and Pilates has a significant effect and is worthy of promotion.

Disclosure statement

The author declares no conflict of interest.

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