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Original Article

Effects of Schroth and Pilates exercises on the Cobb angle and weight distribution of patients with scoliosis

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Abstract. [Purpose] The purpose of this study was to compare the effect of Schroth and Pilates exercises on the Cobb angle and body weight distribution of patients with idiopathic scoliosis. [Subjects] Twenty-four scoliosis patients with a Cobb angle of ≥20° were divided into the Schroth exercise group (SEG, n = 12) and the Pilates exercise group (PEG, n = 12). [Methods] The SEG and PEG performed Schroth and Pilates exercises, respectively, three times a week for 12 weeks. The Cobb angle was measured in the standing position with a radiography apparatus, and weight load was measured with Gait View Pro 1.0. [Results] In the intragroup comparison, both groups showed significant changes in the Cobb angle. For weight distribution, the SEG showed significant differences in the total weight between the concave and convex sides, but the PEG did not show significant differences. Furthermore, in the intragroup comparison, the SEG showed significant differences in the changes in the Cobb angle and weight distribution compared with the PEG. [Conclusion] Both Schroth and Pilates exercises were effective in changing the Cobb angle and weight distribution of scoliosis patients; however, the intergroup comparison showed that the Schroth exercise was more effective than the Pilates exercise.

Key words: Schroth exercise, Pilates exercise, Cobb angle

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INTRODUCTION

In modern society, abnormal bending of the spinal column is caused by sitting for long periods[1)], and an unbalanced body shape is caused by a lack of awareness about body imbalance[2)]. Furthermore, although the causes are unclear, scoliosis is associated with genetic factors, poor posture, and insufficient exercise[3)]. Physical problems resulting from these factors include deformation of the spinal column and structures[4)], and changed characteristics of the erector spinae muscle, leading to low back pain, reduced flexibility of the spinal column, and degraded cardiopulmonary function[5)].

There are various therapeutic approaches to scoliosis from various perspectives, and the basis for the effects of exercise therapy as a conservative treatment method has been reported recently[6)]. The goal of conservative treatment is to stop the progress of bending[7)]. The therapeutic effects of the Schroth exercise have been reported receently[8)], as well as the effects of the Pilates exercise on the improvement of the Cobb angle and flexibility of scoliosis patients[9)]. The asymmetry of the trunk and pelvis affect the shape and angle of scoliosis[10)], and the weight distribution position changes depending on the Cobb angle and the shape of scoliosis[11)].

Many studies reported the effects of Schroth and Pilates exercises on the improvement of the Cobb angle in scoliosis patients; however, no study has compared these two exercises. Therefore, the effects of these two exercise therapies on scoliosis patients were compared in this study.

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SUBJECTS AND METHODS

This study was conducted on 24 female students with scoliosis, who were then randomly divided into two groups. The average age, height, weight, Cobb angle of the Schroth exercise group (SEG, n = 12) were 15.6 ± 1.1 years, 160.5 ± 2.6 cm, 47.6 ± 3.5 kg, and 23.6 ± 1.5°, respectively, whereas those of the Pilates exercise group (PEG, n = 12) were 15.3 ± 0.8 years, 161.8 ± 2.8 cm, 49.0 ± 4.4 kg, and 24.0 ± 2.6°, respectively (Table 1). Each subject was given an explanation about the purpose of this study and the exercise method, and voluntarily signed the informed consent form before participating in this experiment. The experiment was conducted according to the ethical standards of the Declaration of Helsinki. Participants who had neurological findings or an operation, those who recently received surgical treatment, those who wore an orthosis, or those who were periodically taking medicine were excluded.

Schroth exercises were performed three times a week for 12 weeks. Each 60-min session consisted of preparation (cat walking and breathing exercise: 10 min), stretching (stretching the chest part: 5 min), the main exercise (lying right click concave, lying aside static postural control training, sitting posture adjustment exercise, and muscle cylinder: 40 min), and wrap-up (moving the ribs: 5 min)[1]. The Schroth exercise was applied in accordance with the bending shape of each subject, along with three-dimensional Schroth rotational breathing. In everyday life, it is important to maintain a correct posture, and depending on the curve type during daily life activities (such as sitting, standing, or walking), primarily for students who sit for long periods in school, activities need to be detailed and implemented[12]. The Cobb angle was measured in a standing-straight position with a radiography apparatus (CR 85-X, USA).

Each 60-min session of the Pilates exercise consisted of preparation (10 min); the main exercise divided into spinal correction exercises, core-strengthening exercises, and balance exercises (40 min); and wrap-up (5 min). The Pilates exercise was applied along with Pilates trunk breathing.

The Cobb angle was measured in the standing-straight position with a radiography apparatus (CR 85-X). The weight distribution change was measured in the standing position for 8 s in a static condition by using the radiography apparatus (CR 85-X), and the average of the three measurements was analyzed.

An intragroup comparison was conducted on the changes in the Cobb angle and weight distribution by using SPSS 18.0. A paired t-test was performed for the intragroup comparison, and an independent t-test was done for the intergroup comparison. The significance level was set to 0.05.

RESULTS

In this study, the intragroup comparison showed significant effects on the Cobb angle for both groups ($p < 0.05$). For weight distribution, concerning the difference between the concave and convex sides, there was a significant difference in the total weight of the SEG ($p < 0.05$) but no significant difference was found in the PEG ($p > 0.05$). The intergroup comparison showed that the SEG demonstrated significant changes in the Cobb angle and weight distribution compared with the PEG ($p < 0.05$) (Table 2).

Table 1. General characteristics of the subjects

Variable	PEG (n = 12)	SEG (n = 12)
Gender	Female	Female
Age (years)	15.3±0.8	15.60±1.1
Height (cm)	161.8±2.8	160.50±2.6
Weight (kg)	49.0±4.4	47.60±3.5
Cobb angle (°)	24.0±2.6	23.63±1.5

PEG: Pilates exercise group; SEG: Schroth exercise group

Table 2. Comparison of the Cobb angle and weight distribution within and between groups (unit: ratio)

		PEG (n = 12)		SEG (n = 12)	
		Pre-test	Post-test	Pre-test	Post-test
Cobb angle (°)		24.0±2.6	16.0±6.9*	23.6±1.5	12.0±4.7*a
Weight distribution (%)	Convex	55.3±2.3	54.7±1.7	56.7±2.5	52.7±1.7*a
	Concave	44.6±2.7	45.3±2.1	43.2±3.5	47.2±1.6*a

Mean ± SE. *Significant difference from pre-test, $p < 0.05$. [a]Significant difference in gains between the two groups, $p < 0.05$. PEG: Pilates exercise group; SEG: Schroth exercise group

DISCUSSION

In this study, the Schroth exercise and the Pilates exercise were compared in terms of their effect on the change in the Cobb angle and weight distribution of scoliosis patients. The exercises were performed three times a week, and the experiment was conducted for a 12-week period.

The Schroth three-dimensional exercise approach had significant effects on decreasing the Cobb angle and pain in patients with scoliosis[13, 14]. It has been reported that scoliosis decreases the bias of weight, considering that it affects the degree of lateral bending and the imbalance of pressure on the soles, and that the difference in weight load decreases with an improved angle[15]. The Pilates exercise has been reported to change the trunk flexibility through the backbone segmentation movement[16], and to improve the lateral bending of the spinal column and static balance[17]. Furthermore, the application of the Pilates exercise in women in their 20s improved posture and caused significant differences in the sense of static feet balance[18].

In the intragroup comparison, the Cobb angle showed significant changes in both groups. For weight distribution, the SEG showed significant differences in the total weight between the concave and convex sides but the PEG did not show significant differences ($p > 0.05$). Also in the intragroup comparison, the SEG showed significant differences in the changes to the Cobb angle and weight distribution compared with the PEG.

These results suggest that both the Schroth and Pilates exercises significantly improved the Cobb angle; however, the Cobb angle decreased more effectively in the SEG than in the PEG owing to the three-dimensional rotational breathing during Schroth exercises. For the weight distribution changes, it has been reported in a previous study that the weight loading position changed according to the level, degree, and shape of bending of the scoliosis patients[11]. Thus, in this study, the SEG also showed significant effects on weight loading, as the Cobb angle was more effectively improved in this group.

Therefore, in patients with scoliosis, the Schroth exercise is thought to be more effective in improving the Cobb angle and weight distribution than the Pilates exercise.

Concerning the limitations of this study, the patients with scoliosis were limited to the age of students, and these students had difficulty in finding time to participate in this study owing to conflict with their class schedules. Furthermore, male scoliosis patients were not included. Future studies need to investigate the differences in the effects of the Schroth and Pilates exercises in relation to age or gender.

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