

EFFECTS OF SCHROTH EXERCISE ON COBB'S ANGLE, VITAL CAPACITY AND THE IMPROVEMENT OF DAILY ACTIVITIES ON PATIENTS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

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Abstract

The aim of this study was to investigate the effects of Schroth exercise on Cobb's angle, vital capacity as well as the improvement of daily activities on patients with idiopathic adolescent scoliosis.

Forty patients with idiopathic scoliosis with a Cobb thoracic vertebral angle of 15-30 degrees or higher and the Risser sign stage 3 or higher. The Schroth exercise was applied 3 times a week for 12 weeks. We measured the chest trunk inclination, Cobb angle and vital capacity before and after exercise program. A comprehensive search for all published review articles for spinal deformity was undertaken on PubMed, PEDRO, Google Scholar, Physiopedia up to December 2018. All full-text articles reporting evaluation, validation, surgical, orthotic, and/or physiotherapeutic scoliosis specific exercises (PSSE) treatment outcomes of these spinal deformities were retrieved and analyzed by us and methodology for functional assessment of patients with AIS was developed. Forty patients with idiopathic scoliosis with a Cobb thoracic vertebral angle of 15-30 degrees or higher and the Risser sign stage 3 or higher. The Schroth exercise was applied 3 times a week for 12 weeks. We measured the chest trunk inclination, Cobb angle and vital capacity before and after exercise program.

For a period of 12 weeks we accessed adolescents with AIS. All adolescents make Schroth PSSE. The analysis of the results confirms the positive effect of the PSSE to improve muscle endurance, balance and correction of the scoliosis. Within a month from the beginning, patients reported no back pain and within 2 months – a respiratory improvement, an enlargement of the chest, a reduced Cobb angle, an increased vital capacity. PSSE seem to have positive effects by reducing the symptoms and improving functions and body asymmetries.

Schroth method is effective of preventing the scoliosis' progression. The conservative method of treating scoliosis was found to be effective even at a Cobb angle of 35 degrees or higher. In the future, universal methods of approaching exercises and preventive training for the treatment of scoliosis needs to be further developed.

Keywords: Adolescent idiopathic scoliosis, Schroth method, Physiotherapy, Vital capacity.

INTRODUCTION

Scoliosis is defined as a lateral curvature of the spinal cord with Cobb angle of 10° or more. Scoliosis usually develops before puberty and leads to a 3-dimensional deformation of the trunk. Compared to healthy individuals, patients with idiopathic scoliosis have reduced overall and asymmetric balance of the transversus abdominal muscles.

Schroth exercises are 3-dimensional exercises used for the treatment of scoliosis, (which were developed by Katharina Schroth in 1920); these provide sensory and kinesthetic stimulation, correcting abnormal breathing patterns present in patients with scoliosis. This program also includes training to help patients consciously maintain correct behavior in activities of daily living. Healthcare interventions are under increasing scrutiny regarding effectiveness.

The aims of our study were to investigate the effects of Schroth exercise on Cobb's angle, vital capacity as well as the improvement of daily activities on patients with idiopathic adolescent scoliosis.

In this study, stretching, Schroth and strengthening exercises were applied sequentially in adolescents with idiopathic

scoliosis to evaluate their effects on the Cobb angle and on the ribs.

SUBJECT AND METHODS

The level of evidence in conservative management of AIS is not too high. The treatments applied include surgery (instrumentation and fusion), stopping progression, or exercises. In the past, electrical stimulation has also been used, but without any significant results. Other treatments that are not recommended by current guidelines include manipulations and scars to change gait.

For a period of 1 year we accessed forty children's with adolescent idiopathic scoliosis (AIS) with Cobb angle 15° - 35° and documented curve progression during growth (at least 4° Cobb). We included (14 females and 26 males) ranged in age between 18 and 23 years old. They were distributed as follows: single thoracic 7 (15.3%), single thoraco-lumbar 14 (30.8%), single lumbar 10 (23.1%) and double major (thoracic and lumbar) 14 (30.8%).

All patients we taught to make exercises for correction according to Schroth method after the initial evaluation. All patients had to practice their exercises regularly for at least 12 weeks.

To evaluate the effect of treatment, we considered the last x-rays available for each single patient (Fig. 1.).



Figure 1

Angle of trunk rotation (ATR) – rib hump (difference in elevation between right and left chest) was averaged over each individual 15°, as measured by Adam's flexion test using a scoliometer, during which the patient grasped her two hands together while in a standing position, naturally he slid his hands between his legs and leaned forward at 90°. We



Figure 2

utilized the SAQ (Spinal Appearance Questionnaire) for every single patient.

The exercise program used in this study consisted of 3 phases and was implemented 3 times a week, for 12 weeks. The first stage was made up of stretches for 10 minutes to relax tight muscles and improve joint flexibility. The second phase consisted of Schroth exercises. Schroth Breathing (mostly rotational breathing), mostly the basic Schroth Exercise, was used to correct breathing patterns. The third phase was a soothing phase which consists of 10 minutes of muscle strengthening exercises to activate muscles that are corrected using Schroth exercises and for maintained the skeleton. Each 60-minute session consisted of preparation (cat walking and breathing exercise: 10 min), stretching (stretching the chest part: 5 min), the main exercise (the muscle cylinder (Fig.2), the 50x exercise, the door handle exercise, the frog at the ponds, raising the pelvis: 40 min), and wrap-up (moving ribs: 5 min).

RESULTS AND DISCUSSION

The analysis of the research results after the treatment course confirms the positive effect of the physiotherapy program to improve muscle endurance, balance and correction of the scoliosis.

Within a month from the beginning, patients reported no back pain.

Within 2 months, they reported a respiratory improvement. Patients also benefited from an enlargement of the chest, a reduced scoliosis curve angle (measured in Cobb degrees), and an increased vitality. Corrective, therapeutic exercises seem to have positive effects by reducing the symptoms and improving function at different angles and body asymmetries.

The Cobb angle decreased from $18.51 \pm 3.9^\circ$ to $14.35 \pm 3.3^\circ$, $\Delta X = 4.16^\circ$, $p < 0.05$, the ATR (rib hump) decreased from $15.3 \pm 6.9^\circ$ to $9.1 \pm 3.5^\circ$, $\Delta X = 6.2^\circ$, $p < 0.05$, and a vital capacity increase from 2.83 ± 1.23 l to 4.04 ± 1.67 l on average.

In this study, the successive application of the extension, Schroth methodology, and strengthening exercises lowered the patient's Cobb's angle and rib hump. To treat scoliosis, extend muscles should be shortened, and muscles shortened should be extended again to restore the shape of the spine. Stretching exercises implemented in the first stage may have relaxed the muscles that were asymmetrically shortened around the spine and stretched the muscles around the trunk, increasing flexibility. Zakaria et al. (2012) showed that stretching exercises reduced muscle spasms in the concave side

and hyperactivity and corrected bending of the lumbar region extending shortened muscles.

CONCLUSION

The Schroth exercise has the advantage of posture correction according to the type of flexion and is an effective mechanism to facilitate posture correction in the 3 dimensions scoliosis deformation. With Schroth 3-dimensional rotational breathing exercises causes significant increase in rib movements and improvement of daily activities, vital capacities and promotes a significant increase in sagittal breathing exercises to improve the flat back.

The conservative method of treating scoliosis was found to be effective even at a Cobb angle of 35 degrees or higher. In the future, universal methods of approaching exercises and preventive training for the treatment of scoliosis needs to be further developed.

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