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Case Study

Effect of physical therapy scoliosis specific exercises using breathing pattern on adolescent idiopathic scoliosis

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Abstract. [Purpose] This study was performed to confirm physical therapy scoliosis specific exercises on adolescent idiopathic scoliosis patients. [Subject and Methods] A 15-year-old male middle school student with scoliosis. Cobb's angle, angle of rotation of the spine, and breathing pattern were measured before and after 8 weeks training. [Results] After 8 weeks training, Cobb's angle, angle of rotation of the spine, and breathing pattern were improved better. [Conclusion] These results indicate that physical therapy scoliosis specific exercises improves scoliosis curves and could provide an effective intervention and management of scoliosis.

Key words: Adolescent idiopathic scoliosis, Physical therapy scoliosis specific exercises

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INTRODUCTION

Scoliosis is defined as a condition of side-to-side spinal curves that measure greater than 10°. The spine of a person with scoliosis shows an "S" or a "C" line on an x-ray[1)]. The complex 3D deformity of the spine and the trunk is especially serious in growing healthy children as it influences their progression in relation to multiple factors during any rapid period of growth[2)].

Scoliosis is classified as functional and structural scoliosis, with structural scoliosis further divided into idiopathic, neuromuscular, congenital, and neuropathic types[3)]. The idiopathic form of structural scoliosis is diagnosed only when the history and the clinical and radiological findings do not provide clear evidence for any specific etiology[4)]. The pathological symptoms include breathing impairment, back pain, disability, progressive segmental instability during adult life, lower perception of health, adverse psychological impacts, and poor perception of self and body image[5)].

The Scoliosis Research Society (SRS) recommendation is to apply both physical therapy and bracing for improvement of scoliosis[1)]. Physical therapy scoliosis specific exercises (PSSE) are recommended. The exercises proposed by the Barcelona Scoliosis Physical Therapy School (BSPTS) differ from the conventional exercises as they treat spine alignment as well as respiratory insufficiency[6)]. The purpose of this study was to confirm the effectiveness of treating AIS patients using BSPTS concept training

SUBJECT AND METHODS

The subject of this study was a 15-year-old male middle school student whose height and weight were 171 cm and 50 kg. He was diagnosed with AIS in 2015. He did not wear a scoliosis brace. A radiographic image showed a Riser sign of about 3–4 steps. He was classed as A1 according to BSPTS as his pelvis translated to the concave thoracic side, he showed trunk

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imbalance to the convex thoracic side, and he had a long thoracic rib hump descending into the lumbar region[2]. The subject consented to participate after receiving an explanation about the purpose and procedure of the study. This study was approved by the institutional review board of Pusan National University Hospital (E-2016049).

The effect of BSPTS training was confirmed by comparing pretest and posttest (8 weeks after training) measurements of Cobb's angle, angle of rotation of the spine, and breathing pattern. Cobb's angle was measured in the standing posture by an A-P full spine x-ray[7]. The rotation angle of the spine was measured with a scoliometer. The changes in the breathing pattern were determined by measuring the rib cage circumference expansion in the resting and maximal inhalation phases in the standing posture. The subject's training was supervised by a physical therapist certified in BSPTS formal education. The subject underwent eight weeks of exercise in the exercise center, three times per week for one hour.

The diaphragm of scoliosis patients undergoes asymmetrical contraction. This was corrected in this subject by having him perform symmetric diaphragm contractions while lying on his side. He performed asymmetric breathing exercises while maintaining a correct alignment of his spine. His diaphragm movement in the supine position was facilitated by having him lie on his side (on the concave side of thorax) and while prone on his knees (especially on the weak side). Chest mobilization (especially in the ventral flat zone) was performed using exercises that employed BSPTS concepts. The principle of correction of the BSPTS included self-elongation, asymmetrical sagittal straightening, functional curve pattern correction, breathing mechanics, and stabilization.

RESULTS

Measurements obtained before and after training were as follows. Cobb's angle of the upper thorax decreased from 33 to 31 degrees, and the angle of the lower thoracic decreased from 37 to 29 degrees. Scoliometer measurements of the upper thorax decreased from 4 to 1 on the left side, and the measurements of the lower thorax decreased from 9 to 6 on the right side. The rib cage circumference expansion (Axilla-Xyphoid-Waist) was maintained from 81–73.5–67 cm to 81–73.5–67 cm at rest and changed from 84.5–76–68 cm to 85–77.5–69 cm at maximal inhalation.

DISCUSSION

The BSPTS method includes the following essential principles: The first is self-elongation through axial elongation, including counter flexion and lateral deviation relative to pelvic stabilization. The second is asymmetrical sagittal straightening to correct the alignment of the spine, based on the sagittal plane. The third is functional curve pattern correction to correct the alignment of the schema blocks in the coronal plane according to the curve classification method. The fourth concerns breathing mechanics, which is breathing in a state of structural correction of posture. The last is stabilization, with eccentric contraction of the concave side and concentric contraction of the convex side during expiration[2, 8].

Kim, HwangBo[9] subjected idiopathic scoliosis patients to PSSE treatments three times a week for 12 weeks and found a reduction in thoracic Cobb's angle of approximately 49%, from the 23.6° to 12°. The trend found in the present study is consistent with these previous results, as the upper thoracic Cobb's angle had decreased by about 6% after the eight week treatment, while the lower thoracic angle decreased by about 22%. However, the previous studies did not confirm the trunk rotation or the scalability of the thorax as the exercises progressed. Kim, Hwangbo[10] also reported a reduction in trunk rotation angle of approximately 58%, from 11.86° to 4.9° and an increase in the breathing volume of about 42%, from 2.83 to 4.04. In the present study, the trunk rotation angle had decreased by about 75% in the upper thorax and about 33% in the lower thorax. The abdomen circumference, determined during inhalation in the breathing pattern examination, increased by about 2%, which was consistent with previous research results and trends. The eight week exercise period was relatively short, so a larger PSSE effect would be expected if the exercises were performed over a longer time.

This study has the limitation of having only a single subject; however, the results confirm that BSPTS exercise can inhibit the progression of idiopathic scoliosis and help to restore the correct spinal curve. The addition of BSBTS exercise to the treatment of scoliosis patients would therefore create an effective exercise method.

REFERENCES

1) SRS: Adolescent idiopathic scoliosis. Scoliosis Research Society, 2016.
2) Rigo MD, Villagrasa M, Gallo D: A specific scoliosis classification correlating with brace treatment: description and reliability. Scoliosis, 2010, 5: 1–11. [Medline] [CrossRef]
3) Park Y, Bae Y: Change of range of motion of the temporomandibular joint after correction of mild scoliosis. J Phys Ther Sci, 2014, 26: 1157–1160. [Medline] [CrossRef]
4) Ekinci S, Ersen O: Adolescent idiopathic scoliosis. Arch Clin Exp Surg, 2014, 3: 174–182.
5) Bess S, Boachie-Adjei O, Burton D, et al. International Spine Study Group: Pain and disability determine treatment modality for older patients with adult scoliosis, while deformity guides treatment for younger patients. Spine, 2009, 34: 2186–2190. [Medline] [CrossRef]
6) Bettany-Saltikov J, Parent E, Romano M, et al.: Physiotherapeutic scoliosis-specific exercises for adolescents with idiopathic scoliosis. Eur J Phys Rehabil

Med, 2014, 50: 111–121. [Medline]
7) Cobb J: Outline for the study of scoliosis. Instr Course Lect, 1948, 5: 261–275.
8) Bettany-Saltikov J, del Campo A, M'hango A, et al: Physical therapy for adolescents with idiopathic scoliosis, Physical Therapy Perspectives in the 21st Century–Challenges and Possibilities, 2012: 3–40.
9) Kim G, HwangBo PN: Effects of Schroth and Pilates exercises on the Cobb angle and weight distribution of patients with scoliosis. J Phys Ther Sci, 2016, 28: 1012–1015. [Medline] [CrossRef]
10) Kim KD, Hwangbo PN: Effects of the Schroth exercise on the Cobb's angle and vital capacity of patients with idiopathic scoliosis that is an operative indication. J Phys Ther Sci, 2016, 28: 923–926. [Medline] [CrossRef]