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Alteration of cervical proprioception in postural scoliosis

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ABSTRACT
Background: Postural scoliosis is one of the most common problems in musculoskeletal system. Cervical proprioception function may be attributed in postural scoliosis. Objective: Determine the relation between postural scoliosis and cervical proprioception function. Subjects, Materials and Methods: Sixty subjects from both sexes represented the sample of the study. Their age ranges from 20-30 years old. Subjects were assigned into two equal groups. Group (I) thirty patients diagnosed with postural scoliosis based on x-ray in addition to thirty normal matched subject's group (II). Cervical range of motion device was used for assessment of proprioception error in all directions. Results: There was a significant ($p < 0.05$) positive correlation between postural scoliosis and absolute angular error from neutral head posture and target head position in all directions (flexion, extension, right side bending, left side bending, right rotation and left rotation) directions. Conclusion: Postural scoliosis is associated with reduced cervical proprioception function.

Keywords: Postural Scoliosis, Proprioception Function, CROM**.**

1. Introduction

Postural scoliosis is the most common type of spinal deformities and when presents in adults, it is often painful causing emotional problems related to pain, as well as pulmonary mechanic-related problems (Davies and Saifuddin, 2009). Small-scale postural scoliosis may create difficulties for carrying out physical activities, so exercise capacity can be reduced, due to decreased mobility of the chest wall and produce functional disabilities (Lee et al., 2009).

Pain in patients with postural scoliosis might be the reason for increased proprioception error in postural scoliosis patients. Recurrent episode of neck pain has reported to induce changes in the cervical mechanoreceptor function (Weinstein et al., 2008) and to affect the muscle spindle sensitivity (Nault et al., 2002)**.** Also, impairment in proprioception function is one of the main factors contributing to the development and maintenance of neck pain in cervical spine. Patients adopt posture which place greater load on the neck and change in the muscle length caused by poor posture for a sustained period of time can result in postural scoliosis (Weinstein et al., 2003)**.**

Orthostatic postural control is organized around multi-sensorial information (Lee et al., 2009). The cervical spine participates in the spatial stabilization of the head via biomechanical and proprioceptive mechanisms (Lee et al., 2016). Change in cervical proprioception in postural scoliosis can affect the postural strategy, especially head and neck stabilization which plays a major role in orthostatic posture control (Lee et al., 2009).
Cervical range of motion (CROM) device is one of the most common methods to assess cervical proprioception. It is widely used in clinical practice as it is easy to apply, cost effective and can be managed by one rater. It

shows cervical proprioception errors in degrees straight away without time consuming calculations. It has good criterion validity and reliability (Reddy et al., 2016).
There is a controversy in the literature regarding the effect of poor posture on cervical joint position sense accuracy. Hence, the understanding of the proprioception functions in patients with postural scoliosis can guide the rehabilitation program into better results through considering these points into plane of treatment. So, this study aimed to detect the relation between Cobb's angle and proprioception function.

2. Material and methods

2.1. Subjects

Sixty subjects from both sexes represented the sample of the study. Group (I) thirty patients diagnosed with postural scoliosis based on x-ray and group (II) thirty normal matched subjects. Their age ranges from 20-30 years old. The patients were recruited from the outpatient clinic in Kaser El Aini Hospital in the period from July 2019 to January 2020. The diagnosis was confirmed by x-rays. Patients with history of trauma (whiplash injury), cervical myelopathy, and cervical radiculopathy were excluded.

2.2 Materials

Cervical range of motion device (CROM) (Lindstorm, Minnesota 651-257-3040) is a type of goniometer designed specifically for cervical spine. It is a valid and reliable method to measure the cervical proprioception function **.**It is composed of three inclinometers strapped to the subject's head and two magnets placed over the subject's shoulders. Each inclinometer measures proprioception error in one plane of movements. One gravity dial meter measures flexion and extension, another gravity dial measures lateral flexion and a compass meter measures rotation with its accuracy reinforced by two magnets .The patients signed a written consent form after receiving information about the study purpose, whole procedures, and possible benefits to ensure full cooperation. This study was approved from ethical committee faculty of Physical Therapy Cairo University with reference number P.T.REC/012/002642.

2.3. Methods

Cervical proprioception was measured with the CROM device in all directions. This device was placed on patient's head. Two cervico-cephalic sensibility tests were applied (neutral head position and target head position) (Weinstein et al., 2003). In neutral head position test (NHP) each patient was asked to sit upright in a comfortable position and look straight ahead (Lee et al., 2016). The patients were instructed to flex, extend, right side bend, left side bend, right rotate and left rotate the head and reposition neck to neutral position after each movement while eyes closed. In target head position test (THP) each patient's head was moved passively slowly to the determined target position into 30 degree flexion or extension. The head was maintained in the target position for three seconds and the patient was asked to remember that position and head was brought to neutral position and then subjects were asked to reposition actively by moving the head to target position with closed eyes. The patients were then asked to reproduce target position three times with eyes closed within a 60-second period. Cervical flexion or extension was measured by gravity goniometer sited above the ear of subjects. Three trial of each measurement were taken within 60 second period and the average of them was calculated (Revel et al., 1991, Teng et al., 2007).

2.4. Statistical analysis

Data analysis was performed using statistical software program (SPSS for Windows, version 21, USA). The correlation between postural scoliosis and absolute angular error from neutral head position (NHP) and target head position (THP) was conducted using Spearman correlation. For all statistical examinations, results were considered significant at P-value ≤ 0.05(Rix et al., 2001).

3. Results

For both neutral head position (NHP) and target head position (THP), there was a significant ($p < 0.05$) positive correlation between postural scoliosis and absolute angular error from neutral head posture to (flexion, extension, right side bending, left side bending, right rotation and left rotation) directions.

Table 1
Correlation between postural scoliosis and proprioception (absolute angular error)

	Cobb's angle	
	Correlation coefficient (ρ)	P - value
Absolute angular error of neck flexion		
NHP	0.762 **	0.001 **
THP	0.690 **	0.001 **
Absolute angular error of neck extension		
NHP	0.799 **	0.001 **
THP	0.691 **	0.001 **
Absolute angular error of neck right side bending		
NHP	0.725 **	0.001 **
THP	0.788 **	0.001 **
Absolute angular error of neck left side bending		
NHP	0.683 **	0.001 **
THP	0.741 **	0.001 **
Absolute angular error of neck right rotation		
NHP	0.729 **	0.001 **
THP	0.769 **	0.001 **
Absolute angular error of neck left rotation		
NHP	0.761 **	0.001 **
THP	0.700 **	0.001 **

4. Discussion
The results of the present study showed that there was a significant positive correlation between postural scoliosis and absolute angular error from neutral head posture and target head position in all directions (flexion, extension, right side bending, left side bending, right rotation and left rotation) directions.
This result may be attributed to postural mal alignment of head and neck abnormal positions of the cervical spine resulting from postural adaptation to the trunk imbalance. This compensatory head and neck occurs in thoracic curvature of postural scoliosis patient. In postural scoliosis patient balance relies on a deficit spatial frame. This reorientation leads to modification on orthostatic dynamic postural involving all body segments including the cervico-cephalic complex. Such sensorial reorganization induces under use of dynamic proprioceptive input specially that coming from the cervical spine (Guyot et al., 2016).
Abnormal positions of the cervical spine resulting from a postural adaptation to the trunk imbalance. This compensatory head and neck posture occurs readily in major thoracic curvature in postural scoliosis leading to impaired ability to relocate their head on trunk accurately after an active movement of the head (Kwan et al., 2015).
This compensatory head and neck posture occurs readily in major thoracic curvature of postural scoliosis (Eijgelaar et al., 2014). Postural scoliosis induces a modification in head stabilization via an adaptive sensorio-perceptive strategy (Bruyneel et al., 2011).
The results of the current study contradict with the study of Sajjadi et al. (2014) who found that poor posture has no effect on cervical joint position sense accuracy. The discrepancy between the two studies may be due to differences in patient's age, disease and methods of position sense evaluation (Sajjadi et al., 2014).

Conclusion

Postural scoliosis is associated with reduced cervical proprioception function.

Disclosure

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References

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Bruyneel AV, Chavet P, Ebermeyer E, Mesure S. Idiopathic scoliosis: relations between the Cobb angle and the dynamical strategies when sitting on a seesaw. European Spine Journal. 2011; 20(2):247-53.

Davies A, Saifuddin A.: Imaging of painful scoliosis. Skeletal Radiol. 2009 ;(38):207–23.Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV- infected patients. N Eng1J Med. 2002; 347: 284-7.

Eijgelaar PN, Wapstra FH, Otten E, Veldhuizen AG. Altered head orientation patterns in children with idiopathic scoliosis in conditions with sensory conflict. European Spine Journal, 2014; 23(12):2626-34.

Guyot MA, Agnani O, Peyrodie L, Samantha D, Donze C, Catanzariti JF. Cervico-cephalic relocation test to evaluate cervical proprioception in adolescent idiopathic scoliosis. European Spine Journal. 2016; 25(10):3130-6.

Kwan MK, Wong KA, Lee CK, Chan CY. Is neck tilt and shoulder imbalance the same phenomenon? A prospective analysis of 89 adolescent idiopathic scoliosis patients (Lenke type 1 and 2). European Spine Journal. 2015; 25(2):401-8.

Lee H, Cheng C, Liau J. Correlation between proprioception, muscle strength, knee laxity, and dynamic standing balance in patients with chronic anterior cruciate ligament deficiency. The Knee. 2009; 16(5):387-391.

Lee M, Yong Y, Lee H. Correlation between head posture and proprioceptive function in the cervical region. Journal of physical therapy science.2016; 28(3):857-860.

Nault M, Allard P, Hinse S, Le B, Caron O. Relations between standing stabil-ity and body posture parameters in adolescent idiopathic scoliosis. 2002; 27(17): 1911-7.

Reddy R, Alahmari K, Silvian P. Test-retest reliability of assessing cervical proprioception using cervical range of motion device. Saudi Journal of Sports Medicine. 2016; 16(2):118.

Revel M, Deshays A, Minguet M. Cervicocephalic kinesthesia sensibility in patients with cervical pain. Arch Physical Med Rehab 1991; 72:288-9.

Rix G, Bagust J.Cervicocephalic kinesthetic. Sensibility in patients with chronic, nontraumatic cervical spine pain. Archives of physical medicine and rehabilitation.2001; 82(7): 911-919.

Sajjadi E, Olyaei GR, Talebian S, Hadian MR, Jalaie S. The effect of forward head posture on cervical joint position sense. Journal of Paramedical Sciences (JPS). 2014; 5(4):2008-4978.

Teng C, Chai H, Lai D, Wang S. Cervicocephalic kinesthetic sensibility in young and middle-aged adults with or without a history of mild neck pain. Manual Therapy. 2007; 12(1):22-28.

Weinstein S, Dolan L, Spratt K, Peterson K, Spoonamore M, Ponseti I. Health and function of patients with untreated scolioisis: A 50-year natural his-tory. 2003; (289): 559-67.

Weinstein S, Dolan L, Cheng J, Danielsson A, Morcuende J. Adolescent idiopathic scoliosis. Lancet.2008; (371): 1527–37.