Research Article

Correlation between cervical proprioception with the neck length and neck pain in patients of cervical spondylosis

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ABSTRACT

Background: Cervical proprioception has been a major source of attention among the population of cervical spondylosis as it is associated to neck pain, whereas it can lead to alteration in physiological manifestations which enhance neck pain as a consequence of disturbed proprioception.

Objective: To determine the correlation between cervical proprioception with neck length and neck pain in patients of cervical spondylosis.

Methodology: It is a cross-sectional correlational study conducted at Innovative Health Concepts (IHC) and Pakistan Society for Rehabilitation for Differently-abled Lahore, in the duration six months from November 2021 to March 2022. The sample size of n=130 participants recruited and data collected through non probability purposive sampling. Patients diagnosed with cervical spondylosis aged 25 to 50 years with neck pain, decreased neck range of motions, osteophytes formation were included. Whereas, vestibule basilar artery insufficiency or any systemic illness were excluded. Joint Position Error Test (JPET) for cervical proprioception assessment, Numeric Pain Rating Scale (NPRS) was used for the neck pain and lateral view X-rays were taken for neck length measurement. Data was analysed using Statistical Package for Social Sciences (IBM-SPSS) version 22.

Results: There was no significant association between proprioception except for left rotation (r=0.21, p=0.016) which showed weak positive correlation. On the other hand, neck pain showed significant strong positive correlation with flexion (r=0.88, p=0.002), moderate with extension (r=0.39, p=0.004), strong with right rotation (r=0.81, p=0.001) and left rotation (r=0.61, p=0.001) respectively.

Conclusion: It was concluded that population of cervical spondylosis have no correlation between cervical proprioception and cervical length. Whereas, a positive strong correlation was found between cervical proprioception and neck pain.

Keywords: joint position error test; neck pain; proprioception.

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INTRODUCTION

Cervical spondylosis (CS) which is related to age factor having prevalence of 3.3 persons per 1000 [1]. It is mostly found at the level of C5-C6 and C6-C7, but it can also be found at higher levels. Tingling, pain, weakness and numbness in the upper extremity are common complaints in people with CS, and these symptoms can contribute to considerable impairment and functional limitations [2]. Osteophytes, intervertebral disc space narrowing, sub-chondral sclerosis, and sub-chondral cyst formation are all symptoms of CS [3]. Neck or back pain is the most prevalent symptom. Because of its great frequency and gradual start, it is a substantial healthcare burden and a major public health concern [4]. In today's world, contemporary technologies and ergonomic improvements have made the neck and shoulder areas more vulnerable to injury [5].

Proprioception is a feeling of movement of position of the body that encompasses joint position as well as movement sense [6]. The cervical muscles have a high density of muscle spindles, indicating a well-developed proprioceptive system [7, 8]. This contributes to improved sensorimotor function, and hence plays a significant role in keeping static and dynamic postures with good muscular control [9, 10]. Patients with neck pain is the impairment of cervical proprioception, which subsequently leads to cervical sensorimotor control disturbances [11]. Cervical proprioceptive errors in the CS group significantly and positively correlated with neck pain intensity. The cervical JPE increased with increased neck pain intensity showing that an increase in pain intensity will impair the proprioceptive functionality [2].

Neck pain and functional impairment might be influenced by cervical proprioception. Understanding the elements that contribute to neck discomfort in individuals with cervical spondylosis is crucial for efficient diagnosis and therapy. Cervical spondylosis is a degenerative disorder that affects the cervical spine. Understanding the relationship between cervical proprioception, neck length, and neck pain can help identify prospective therapeutic targets and underpinning processes for treating symptoms of cervical spondylosis. The objective of this research is to explore how neck length, cervical proprioception, and neck pain are related in people with cervical spondylosis. The objective of study is to determine the correlation between cervical proprioception, neck pain and neck length in patients of cervical spondylosis.

METHODOLOGY

This cross-sectional study was conducted from November 2021 to March 2022. Data was collected from the Innovative Health Concepts and Research Centre (IHC) and the Pakistan Society for Rehabilitation for Differently abled (PSRD) Hospital. The ethical approval obtained from the Institutional Review Board of PSRD College of Rehabilitation Sciences ((PSRD/CRS/RH/REC/Letter-03), and the Innovative Health Concepts (REF: PSRD-CRS\PF\RH\PL-03). The study carried out according to principles of the Helsinki Declaration. Prior to the study, written consent was obtained from the participants. The duration for the study was six months having the sample size of 130 subjects diagnosed cervical spondylosis aged 25 to 50 with neck pain, decreased neck range of motions, osteophytes formation whereas. Sample size was calculated through online sample size calculator Rao soft with confidence interval of 95% and margin of error 5%. Exclusion criteria was subjects with vestibule basilar artery insufficiency or any systemic illness. Joint Position Error Test (JPET) for cervical proprioception assessment, Numeric Pain Rating Scale was used for the neck pain and lateral view X-rays were taken for neck length measurement. The Joint Position Sense Error (JPSE) is considered the mainly essential measure to clinically operationalize cervical proprioception. The reliability of the test is good reliability (ICC: 0.77–0.78) [12].The subject was asked to sit with back support & the foot. A laser light head pointer band with a pointer chart containing error markers, was used to test the cervical proprioception, subject was seated on a stool 90cm away from the target chart, head was positioned on central position and the target point. Then the subjects were asked to rotate his neck to right and then to left with eyes opened and subject had to reset the pointer right on the target. Same procedure was repeated for flexion and extension of the neck. Every movement was repeated six times with slow and controlled movements in all directions of movements the error less than 4.5 degrees on target chart was considered [2]. Neck lengths were measured on lateral view x rays taken in 60-70KV (kilo-voltage) and 18-30MAS (mili-ampare Second) from 2.6feet. The length was measured by measuring tape in (mm). Pain assessment is done by using numeric pain scale (NPRS) by rating the intensity of pain by from 0 to 10 according to severity of the pain. NPRS reliability (0.90) was acceptable (13). The study carried out according to Declaration of Helsinki. Written consent form was contained from participant before study conduction.

Data was analysed by using a software Statistical Package for Social Sciences (SPSS) version 22. Demographics data were analysed by frequencies and percentages while for the correlation analysis between the dependant and the independent variables, Pearson's correlation was used. The quantitative variables were presented as mean and standard deviation.

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RESULTS

A total sample size of 130 subjects out of which n=82 (63.8%) were female and n=48 (36.2%) were male, having Mean age calculated was 40.45±8.165 years and the Mean height calculated was 165.47±9.84 centimetres, Body Mass Index (BMI) was 28.02±5.129 kg/m2 which showed majority of the participants were over weighted having frequency of 46 (35.4%).Subjects presented with normal disc spacing were 3.1%(4), reduced disc spacing from C1to C2 was 2.3%(3), from C2 toC3 was 13.8%(18), from C3 to C4 was 30.8%(40), from C5 to C6 was 40.8%(53) and from C6 to C7 was 9.3%(12). Whereas, 9.2 %(12) subjects presented with no cervical oedema, 21.5 %(28) showed right sided oedema, 27.7 %(36) had left sided oedema while 41.5% (54) presented with bilateral oedema. Participants who complained for vomiting and nausea were 79.2 %(103) and 20.8 %(27) didn't complain. While the pain parameters by using NPRS, 105 (80.8%) came with severe neck pain, (23)17.7% presented with moderate pain and 2 (1.5%) with mild pain with average mean of 7.75±1.6. Whereas, average neck length calculated was 99.75±7.79 mm while the joint position error in flexion was 4.3±.95degrees, joint position error in extension was 3.5±1.1degrees, joint position error in right rotation 6.7±1.1degrees and joint position error in left rotation was 6.6±1.8 degrees. There is no significant association between proprioception except for left rotation (r=0.21, p=0.016) which showed weak positive correlation. On the other hand, neck pain showed significant strong positive correlation with flexion (r=0.88, p=0.002), moderate with extension (r=0.39, p=0.004), strong with right rotation (r=0.81, p=0.001) and left rotation (r=0.61, p=0.001) respectively. (Table1)

Table.1. Showing relationship between neck length and neck length with neck proprioception

		Joint Position Error			
		Flexion	**Extension**	**Right rotation**	**Left rotation**
Neck length (99.75±7.79)	Mean±SD	4.3±.95	3.5±1.1	6.7±1.1	6.6±1.8
	p-value	0.449	0.979	0.81	0.016
	r- value	0.07	0.002	0.02	0.21
Neck pain (7.75±1.6)	Mean±SD	4.3±.95	3.5±1.1	6.7±1.1	6.6±1.8
	p-value	0.002***	0.004***	0.001***	0.001***
	r- value	0.88	0.39	0.81	0.61

Level of significance: p< 0.05, p<0.01**, p<0.001****

DISCUSSION

The study's goal was to ascertain the relationship between cervical proprioception, neck pain, and neck length. The neck JPE increased with increasing intensity of pain, demonstrating that an increase in pain scale will decrease proprioception. This study found a correlation between neck pain and cervical proprioception. These results are consistent with those from Reddy et al 2019's study, which showed that participants with cervical spine pain had mean JPE of 6.3° in flexion, 5.2° in extension, 6.9° in right rotation, and 4.2° in left rotation [2]. According to 2017 study by Alahmari et al., the cervical joint position errors in young and older participants with chronic neck pain were considerably different, and the JPE indicated much bigger mistakes with chronic neck pain [14]. Four studies out of fourteen found that participants with neck pain had a significantly greater JPE than healthy controls, according to J. de Vries et al 2015.'s systematic review [15] .

A correlation was assessed between the neck length and neck proprioception. According to the results of this research it has been proved that cervical proprioception has no significant relationship with neck length as it is known from the literature that cervical spondylosis is more common in people with short height and short neck length having greater joint position error and disturbed neck proprioception [16]. So, there should be some relation between neck length and neck proprioception as there is no previous literature was found on the direct correlation between neck length and JPE. Nevertheless, a prior study by Jouibari MF et al. in 2019 found that, despite the fact that neck pain and neck proprioception are substantially and positively correlated, there was no statistically significant correlation between cervical sagittal characteristics or neck length and neck pain [17].

As it is already proven in a previous literature that length or lever arm has no correlation with the joint proprioception of the joint as in the previous research by Annadale A. et al. asserted that proprioception and arm length did not significantly predict student performance. As a result, shorter students with relatively shorter arms are not necessarily at a disadvantage [18]. According to the mechanical principles of the atlanto-occiput and shoulder joints, it was demonstrated in a study by Phillips D. et al. in 2018 that there is no significant correlation between joint position error, joint force, and arm length because the first order of the lever is most likely to affect the atlanto-occiput joint. Thus, the head and neck were also affected by the same illness [19].

There is no demonstrable correlation between neck length and cervical proprioception, despite the fact that cervical deep neck flexors (DNF) are undoubtedly responsible for stabilising cervical proprioception, which is disturbed by changes in

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posture, particularly forward head posture, according to previous literature [20].

The association between cervical proprioception and Forward Head Posture was examined in a different study, and the results showed a positive correlation with statistical significance between the variables. It intensifies the compressive stresses acting on the cervical structures, such as the facet joints and the tissues in the back of the neck. These structures are made up of a sizable number of nociceptors. Intervertebral discs and facet joints experience degenerative alterations. So, it is established that the relationship between cervical proprioception and neck length is not very strong since proprioception is mainly impacted by poor posture, which results in an abnormal cranio-vertebral angle [21].

Furthermore, this study observed some limitations for which further studies should be done to establish more significant results and conclusions. The limitations were the study time was too short having limited target population from two settings only this work should be done on even larger population. Tools used can be enhanced for more precise values as this study was self-financed having limited resources and funds.

CONCLUSION

Study concluded that there was no correlation found between cervical proprioception and cervical length. Whereas, there is strong positive correlation found between neck pain and neck proprioception which is statistically significant.

DCLARATIONS & STATEMENTS

Author's Contribution

RH: substantial contributions to the conception and design of the study.
RH and MFA: acquisition of data for the study.
SZ: interpretation of data for the study.
AH: analysis of the data for the study.
NI: drafted the work.
RH and NI: revised it critically for important intellectual content.
RH, MFA, SZ, AH and NI: final approval of the version to be published and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors contributed to the article and approved the submitted version.

Ethical Statement

The study was conducted after getting approval from the Research & Ethics Committee of Riphah College of Rehabilitation Sciences (RIPHAH/RCRS/REC/Letter-00749).

Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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None to declare.

Conflicts of Interest

The authors declare no conflict of interest.

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