

Chronic neck pain and its association with the angle of the cervical curve

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Abstract

Objective

This study was conducted to investigate the relationship between the angle of the cervical curve and the presence of chronic neck pain.

Material and Methods

Case control study was conducted among 363 patients, (females 76.9%), who had neck pain (>3 months) and 349 individuals, (females 58.5%), with no neck pain, aged 20-69 years. Angle of the cervical curve was measured in lateral x-rays of cervical spine using AutoCAD 2014 and cross checked by

two Consultant Radiologists. Angle of the cervical curve was categorized as 35°-45°-normal lordosis, <35°-hypolordosis and >45°-hyperlordosis. Percentages of each category were calculated.

Results

Among the patients with chronic neck pain, 44.9% (n=163) had hypolordosis, 49% (n=178) had hyperlordosis and 6.1% (n=22) had the normal lordosis. Among the individuals with no neck pain, the majority (80.8%, n=282) had the normal lordosis, 12.3% (n=43) had hypolordosis and 6.9% (n=24) had hyperlordosis. Chi square test

showed a statistically significant association between neck pain and the angle of cervical curve ($p=0.001$). According to Cramer's V (0.615) there was a strong association between the two variables. For purposes of analysis both hypolordosis or hyperlordosis were categorized as atypical angle. When compared to individuals with a normal lordosis, those with an atypical angle have a 3.3 times risk of having neck pain.

Introduction

Neck pain is one of the common health problems in the adult population worldwide [1,2], and ranks fourth in global disability [3] with a prevalence ranging from 16.7% to 75.1% [4]. Chronic neck pain has a complex etiology with several factors contributing to this condition. The possible risk factors are of occupational, individual, behavioral, and psychological origin [1,5,6]. Most of the Sri Lankan studies reported were on work-related chronic neck

Conclusion

Hypolordosis or hyperlordosis, atypical angle of the cervical curve contribute to chronic neck pain.

Key words: Neck pain, Angle of the cervical curve Hypolordosis, Hyperlordosis, lateral x-rays of cervical spine

pain [7,8]. A one year prevalence of work related complaints of arm, neck and shoulder was 63.6% in Sri Lanka [7].

Neck pain is defined as “a pain originating from musculoskeletal tissue in the region from the occiput to the first thoracic vertebrae”[9].

The association of the angle of the cervical curve with pain [10,11], disability [12], and health-related quality of life [13] is well established. Cervical malalignment of the cervical curve can cause headaches, neck

and shoulder pain, mastication problems, and greater energy expenditure to maintain an upright posture [14]. The association of the changes in the angle of the cervical curve and the neck pain of the patients is a well-known fact among clinicians[15]. Researchers however have different views on this subject [10,11,12].

Although there is evidence that the angle of the cervical curve is significantly associated with chronic neck pain some studies have given contradictory results [10,12]. The scarcity of a clear consensus on the relationship between the angle of the cervical curve and chronic neck pain warrants further investigations.

The objective of this study was to investigate the relationship between the angle of the cervical curve and the presence of chronic neck pain. A clearer understanding of this correlation would be of great help in the clinical management of this chronic disease.

Materials and Methods

This case control study was conducted among convenient sample of 363 patients (279 female and 84 male) with chronic neck pain presented to the rheumatology clinic at the Colombo South Teaching Hospital (CSTH). We have defined chronic neck pain as neck pain of more than 3 months duration

The control group of the study was made up of 349 individuals (204 female, 145 male) with no neck pain who presented to the ENT (Ear, Nose and Throat) clinic, CSTH, with foreign body aspiration and had undergone a radiological investigation. We could not obtain the age/sex matched control group for this study as we were reluctant to unnecessarily expose healthy individuals to radiation.

Both patients with chronic neck pain and individuals with no neck pain aged 20-69 years, who had undergone radiological investigations (x-ray cervical spine-

Anteroposterior and lateral) of the neck were included in this study.

The ethical approval was obtained from the Ethics Review Committee (ERC) of the Faculty of Medical Sciences, University of Sri Jayewardenepura and ERC of Colombo South Teaching Hospital. Participants with past history of neck surgery or surgery of the cervical spine, cervical tumors or cervical ribs, metabolic bone disease (eg. osteoporosis, osteomalacia), neoplasia (eg. metastases, multiple myeloma), or bone infections (TB, osteomyelitis, abscess in the vertebral column) and pregnant females were excluded. Participants were included in the study after obtaining their written informed consent. The sociodemographic data of the participants were obtained from the pretested interviewer administered questionnaire. The angle of the cervical curve was measured in lateral x-rays of cervical spine using AutoCAD 2014 and cross checked by two Consultant

Radiologists, blinded to the clinical history.

Several methods of analyzing the angle of the cervical curve have been described [12].

In this study, the angle of the cervical curve was assessed by Cobb angle C1-C7 [16] (Figure 1), The angle of cervical curve at C1-C7 was assess by constructing a line, bisecting the C1 (atlas) and drawing another line through the inferior end plate of C7.

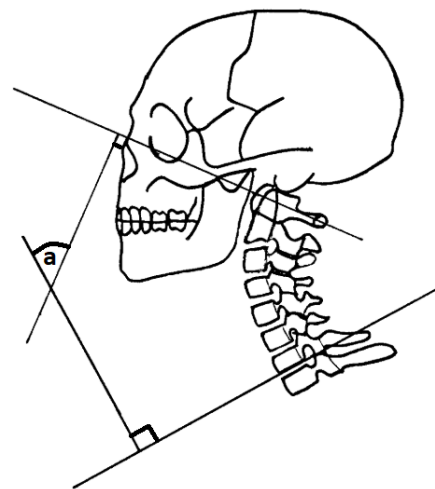


Figure 1: Cobb angle C1-C7 (a) is formed by four-line Cobb method on lateral cervical radiograph at C1-C7.

Two more lines were constructed perpendicular to the first two lines. The angle of the intersecting lines formed was considered as the angle of the cervical curve.

It was considered 35°-45° as “normal lordosis” [11]. Less than 35° and more than 45° were measured as hypolordosis and hyperlordosis in respectively (Figure 2). For the purposes of analysis both hypolordosis and hyperlordosis are categorized as “atypical angle of cervical curve” in this study.

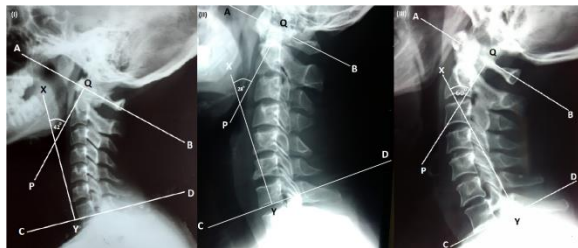


Figure 2: (I) Normal lordosis (42°), (II) Hypolordosis (28°), (III) Hyperlordosis (60°)

Statistical Analysis

Data entry and analysis was done by using the Statistical Package of Social Sciences (SPSS). Qualitative data were presented using percentages. Chi square test was used to determine the association between the angle of the cervical curve and chronic neck pain. Cramer's V test was performed to

determine the strength of association between the variables.

A risk analysis was done to determine how an atypical angle of cervical curve affects the incidence of chronic neck pain. P value of < 0.05 was taken as statistically significant.

Results

The mean age of patients with chronic neck pain was 53.6 ± 11.9 years and the mean age of individuals with no neck pain was 45.6 ± 15.5 .

Among the patients with chronic neck pain, 44.9% (n=163) had hypolordosis, 49% (n=178) had hyperlordosis and 6.1% (n=22) had normal lordosis. Among the individuals with no neck pain, the majority (80.8%, n=282) had normal lordosis, 12.3% (n=43) had hypolordosis and 6.9% (n=24) had hyperlordosis. Chi square test showed a statistically significant association between

neck pain and the angle of the cervical curve (p=0.001) (Table 1).

The association was strong according to Cramer's V (0.615).

The majority (93.9%) of the neck pain patients had either hypolordosis or hyperlordosis categorized as "atypical angle of curve" in this study.

According to risk analysis, individuals who have an atypical angle of the cervical curve have 3.3 times the risk of getting neck pain compared to individuals who have a normal lordosis. The majority (80.8%) of the individuals with no neck pain had normal lordosis.

Discussion

Neck pain is associated with anthropometric measurements [6], physical and psychosocial factors [17,18]. Deviation from the normal angle of the cervical curve is multifactorial and can be due to postural changes, musculoskeletal disorders, neuromuscular and congenital conditions [17].

Although it is generally stated that the angle of the cervical curve indicates the normal position of the cervical spine [19] there is no definite information about the

Table 1: Correlations of chronic neck

Characteristic	Chronic neck pain		
	With chronic neck pain	With no neck pain	
Angle of cervical curve			$\chi^2=269.110, df=2, p=0.001$
Hypolordosis	163 (44.9%)	43 (12.3%)	
Normal lordosis	22 (6.1%)	282 (80.8%)	
Hyperlordosis	178 (49%)	24 (6.9%)	
Total	363	349	

pain and angle of cervical curve

9precise value of the angle of the cervical curve and the recommended methods of measurement. A wide range of methods has been used to measure the angle of the cervical curve [12]. The normal value of angle of cervical curve however varies with the method of measurement used [12].

In the present study, according to Cobb angle C1-C7 the normal lordosis considered as 35°-45° of the angle of the cervical curve [11]. Less than 35° and more than 45° were considered as hypolordosis and hyperlordosis in respectively. For the purposes of analysis, we have categorized hypolordosis and hyperlordosis as “atypical angle of cervical curve”. The significant association between the atypical angle of cervical curve and chronic neck pain demonstrated in this study, indicates that an atypical angle of cervical curve is a factor that contributes to the occurrence of chronic neck pain.

Varying views regarding the association

between the angle of the cervical curve and neck pain have been demonstrated in previous studies. A study conducted among normal individuals and patients with acute and chronic neck pain, showed that acute and chronic neck pain patients had a hypolordotic cervical curvature when compared with normal individuals [20,15]. An Australian study carried out among patients with neck pain and with no neck pain, has shown that statistically significant association between cervical pain and lordosis [11]. Conversely, European study did not detect any difference in the angle of cervical curve between the patients with neck pain and individuals with no neck pain [12], while a similar study carried out among a Japanese population, found that there was no significant association between sagittal alignment of the cervical spine and neck symptoms [21].

We realize the limitations of the present study, where patients with chronic neck pain

and the individuals of control group were not age and sex matched, and where the mean age of chronic neck pain patients was higher than that of the control group. Reasons for this age and sex mismatch between the two groups was due to our reluctance to expose healthy individuals to radiation. The lateral x-ray of cervical spine the control group was from patients who attended the ENT clinic with foreign body aspiration and who have already undergone radiological investigations and gave consent to be included in the study.

We have not assessed other factors which could be associated with neck pain such as: physical activity, psychological and occupation related factors. Further studies are needed to determine the association of the angle of the cervical curve and chronic neck pain in relation to these factors.

Conclusion

Both hypolordosis and hyperlordosis categorized as atypical angle of cervical curve contribute to the occurrence of chronic neck pain. When compared to individuals with a normal lordosis of cervical curve, those with an atypical angle of cervical curve are 3.3 times more at a risk of getting neck pain. The majority (80.8%) of the individuals with no neck pain had a normal lordosis of the cervical curve. The detection of atypical angle of the cervical curve needs early attention in preventing developing chronic neck pain.

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