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Original Research Paper

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A CORRELATIVE STUDY OF CERVICAL LORDOSIS AND CERVICAL SPONDYLOSIS IN SUB URBAN POPULATION.

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ABSTRACT

Neck pain is the commonly seen problem in the general population. Cervical Spondylosis is a common degenerative condition of the cervical spine, Md S Laskar. In day-to-day life various positions during work may demand repeated or prolonged flexion, extension, or extreme bending of the neck, L Levy & S.Jager. They may lead to degenerative changes in the cervical spine and alterations of the neck posture, Tadakiwakui. Yet data is lacking to establish specific interpretations.

OBJECTIVES:

1. To Measure the Global Curvature of the Cervical Spine by using Cobb's double line method in the x-rays of patients with Cervical Spondylosis.
2. To Quantify the Intensity of Neck pain levels in patients with Cervical Spondylosis by using Visual Analogue Scale.
3. To find the association of the Global Cervical lordosis and neck pain in patients with cervical spondylosis.

METHODOLOGY:

A sample group of 30 patients who are diagnosed as Cervical Spondylosis were included in this study. The alteration of the cervical spine curve was determined by using the Cobb's method by drawing the angles on 30 lateral Cervical Radiographs. The intensity of neck pain was assessed by the Visual Analogue scale.

RESULTS:

The pain intensity was measured by using visual analogue scale and cervical curvature was measured by double line Cobb's method. The statistics used was correlation to find the degree of association between cervical curvature and intensity of neck pain in patients with cervical Spondylosis. For 28 degrees of freedom at 5% of level of significance, the tabled 'r' value is 2.05. This is more than the calculated 't' value i.e. 1.704 and thus there is no correlation between cervical curvature at C2-C7 level and neck pain. Hence the null hypothesis proved true.

For 28 degrees of freedom at 5% level of significance, the 'r' value is -0.08109. There is negative correlation between cervical curvature at C1-C7 level and neck pain. Hence the null hypothesis proved true.

For 1 degree of freedom at 5% level of significance, the tabled 'χ^2' value is 3.84. This is more than the calculated value i.e. 0.13. So, there is no significant association of Sex and Age with the cervical spinal curve.

CONCLUSION:

The study statistical analysis concluded that there is absolutely no significant association observed between altered cervical spine curvature and neck pain.

KEYWORDS : Cervical lordosis, Cervical Spondylosis, Cobb's angle, Global Curvature, Visual Analog Scale (VAS), Cervical radiculopathy, Sagittal cervical curvature

INTRODUCTION:

At the top of our spine rests a 4 kilogram object called our "Head" that bounces up and down with every bodily movement. The Cervical Spine which is also reffered as Neck region takes most of the compressive forces from this undulating motion.[1,2]It is the result of demands placed on the neck because of repeated/sustained movements of daily life activities.

Cervical spondylosis i.e degeneration of the cervical spine gradually occurs and it is commonly accompained by reduction or loss of segmental/global lordosis which are often considered to be the cause of the Neck pain.[3]

Degenerative changeswhich are evident on radiographic examination are part of the normal physiologic ageing process.[4]The most typical changes observed includes osteo-arthritis of the facets with reduced joint space and disc space narrowing. In contrast to radicular symptomology which is anatomically defined and can usually be explained by the presence of the Osteophytes or narrowing of the intervertebral foramen at corresponding vertebral level.[5]

Systematic review reveals that degeneration shows consistent (weak) association with pain , atleast for lumbar spine.[6]Some have identified a relationship between number of levels of the cervical spine degeneration and the chronicity of complaint in women only[7].Others have shown that asymptomatic individuals with degenarative changes of C6-C7 are significantly more likely to develop neck pain in the future(10 years later)[8,4].

Degenerative changes of the cervical spine are often accompained by a shortening of the anterior and posterior vertebral column[9,10]which results in alteration of the sagittal profile of the cervical spine[11]. There is much discussion in the literature from the bio-mechanical point of view, the loss of the physiological lordosis could be a possible cause of the neck pain due to muscular imbalance[12] or in the case of the structural deformity due to structural overload of the anterior parts of the spine.[13,14]

So the aim of the present study is to measure the altered cervical lordosis and to find its association with neck pain in the Cervical Spondylosis.

AIM

The aim of the study is to measure the cervical curvature on LateralCervical radiograph and to find its association with the intensity of neck pain levels in Cervical Spondylosis.

MATERIALS AND METHODS

This cross sectional study was conducted with a sample group of 30 individuals who are diagnosed as Cervical Spondylosis who were referred to the Department of Physical Medicine and Rehabilitation, KING GEORGE HOSPITAL, and V.A.P.M.S College outpatient unit, Visakhapatnam.

INCLUSION CRITERIA

1. Patients with Cervical Spondylosis only.
2. Age: 20-60 years.

3. Sex: Both male and female.
4. Neck pain duration less than 6months.
5. Neck pain following indirect trauma.
6. Neck disability index score >20.
7. Kellgren & Lawrence index score[15] should not exceed Grade 3: This classification is a "5-grade scale" ranging from 0 – 4:-

0- Absence of degeneration.
1- Minimal anterior osteophytes.
2- Definite Osteophytosis with a possible narrowing of the disc space and some sclerosis of vertebral plates.
3- Moderate Narrowing of Joint Space& definite sclerosis of vertebral plates and Osteophytosis.
4- Severe narrowing of disc space, sclerosis of the vertebral plates and multiple large Osteophytosis.

EXCLUSION CRITERIA

1. Radicular symptoms involving bi-lateral upper extremity.
2. Serious pathological diagnosis of cervical canal stenosis / myelopathy.
3. Traumatic injuries to the spine which can lead to instability of the cervical spine.
4. Post-operative conditions of cervical spine or shoulder.
5. Congenital abnormalities of the spine.
6. Patients with history of low back pain.
7. Deformities of the spine.
8. Shoulder pathology.
9. Cardio-Vascular conditions such as angina.
10. Tumors and Infections.

EVALUATION OF NECK PAIN:

Pain recorded on VISUAL ANALOGUE SCALE (VAS). The Patient is asked to mark the pain scale which is measured from 0-10. '0' represents no pain. '10' represents severe pain.

SL.NO	NECK PAIN	CERVICAL CURVATUREANGLE in (degrees)	
		C_2-C_7	C_1-C_7
1	5	35	70
2	7	40	70
3	6	35	70
4	8	40	14
5	3	20	60
6	7	170	35
7	3	18	41
8	9	22	55
9	6	18	55
10	6	178	33
11	4	30	60
12	6	20	45
13	6	20	54
14	5	10	52
15	5	20	62
16	4	15	38
17	7	38	68
18	8	20	42
19	8	5	45
20	7	22	48
21	3	5	40
22	2	3	42
23	7	25	45
24	5	10	50
25	5	23	38
26	9	25	45
27	6	5	20
28	7	35	45
29	6	6	45
30	5	35	50

MEASUREMENT OF SAGITTAL CERVICAL CURVE:

"COBB'S DOUBLE-LINE METHOD" was used to measure the Sagittal Cervical angle in Lateral view X-ray.

PROCEDURE: C_1-C_7 measurement was obtained by line drawn by an X-ray marker from anterior arch of the atlas approaching till the posterior arch and line drawn parallel to the inferior end plates of C_7 by joining perpendiculars. C_2-C_7 measurement was obtained by joining the perpendiculars to line drawn parallel to the inferior end plates of C_2 and C_7. The angle between them was measured using a Standard Protractor. If C_7 is not visualized on lateral film then inferior end plate of C_6 can be used.

OBSERVATION AND RESULTS

	PAIN LEVELS	**C_1-C_7 ANGLES**
Mean	5.833	47.9
S.D	1.78	13.04
'r' value	-0.08109	
't' value	0.429 at df =28	
P value and level of significance	P>0.05 and not significant	

	PAIN LEVELS	**C_2-C_7 ANGLES**
Mean	5.833	31.7
S.D	1.78	40.26
'r' value	0.20	
't' value	1.019	
P value	P=2.05, Thus P>0.05 and not significant at df=28	
level of significance	At 5% level of significance H0 is accepted	

Analysis of results between neck curvature between (C_1-C_7) and intensity of neck pain:

For 28 degrees of freedom at 5% level of significance, the tabled 'r' value is 0.381. This is more than the calculated 't' value i.e. 1.704 and hence the null hypothesis proved true.

Analysis of results between neck curvature between (C_2-C_7) and intensity of neck pain:

For 28 degrees of freedom at 5% of level of significance, the tabled 'r' value is 2.05. This is more than the calculated 't' value i.e. 1.704 and thus there is no correlation between altered cervical curvature and neck pain. Hence the null hypothesis proved true.

Analysis of study population according to Sex and Age:

CERVICAL SPINAL CURVATURE	**MALE**	**FEMALE**	**TOTAL**	**'χ^2' value & p value**
Curvature <40	7	8	15	0.13 at df=1& p>0.05
Curvature >40	9	15	15	
	13	17	30	

For 1 degree of freedom at 5% level of significance, the tabled 'χ^2' value is 3.84. This is more than the calculated value i.e. 0.13. So, there is no significant association of Sex and Age with the cervical spinal curvature.

RESULTS:

The pain intensity was measured by using visual analogue scale and cervical curvature was measured by double line Cobb's method. The statistics used was correlation to find the degree of association between cervical curvature and intensity of neck pain in patients with cervical Spondylosis.

For 28 degrees of freedom at 5% of level of significance, the tabled 'r' value is 2.05. This is more than the calculated 't' value i.e. 1.704 and thus there is no correlation between cervical curvature at C_2-C_7 level and neck pain. Hence the null hypothesis proved true.

For 28 degrees of freedom at 5% level of significance, the 'r' value is -0.08109. There is negative correlation between cervical curvature at C_1-C_7 level and neck pain. Hence the null hypothesis proved true.

For 1 degree of freedom at 5% level of significance, the tabled 'χ^2' value is 3.84. This is more than the calculated value i.e. 0.13. So, there is no significant association of Sex and Age with the cervical spinal curve.

DISCUSSION

Cervical curvature has been considered to be normally Lordotic, similar to thoracic kyphosis. The cervical lordosis can be considered a primary curve, because it is formed at approximately 10 weeks of fetal development. Cervical lordosis is due to posterior wedging of the cervical discs and is necessary for the development of the joints of Luschka and for the proper spinal coupling. Diminished lordosis may cause clinical problems. If the curvature straightens, residual ossification of the posterior longitudinal ligament or disc herniation may compress the spinal cord. Therefore, an effort should be made to maintain the lordosis of the cervical spine. Thus, measurement of the sagittal spinal curve is of great interest. Several methods have been developed for measurement of overall lordosis and intersegmental angles. The average range of overall lordosis using different methods varies from 21^0-34^0 in normal subjects.[16]

In literature, the Cobb's angle analysis has been the method of choice for measurement of overall lordosis and kyphosis of the sagittal curves on lateral radiographs. Good to high intra-class coefficients are reported for Cobb's angle analysis for inter- and intra-examinerreliability.[17]

Several studies have pointed that there is vague information regarding the exact values and recommendation of the methods so we have followed standard procedure of lateral radiographs in terms of position of taking radiographs. To avoid the measurement error all the cervical curvature angles in 30 x-rays has been drawn by the same radiologist and measured.

In this study we have observed obliteration of the cervical curvature (straight curves) in the lower grades of cervical spondylosis i.e. at grade 1 and 2 along with severe neck pain. The possible explanation is that it might be due to tear in the annulus fibrous or degeneration of vertebral end plate which can cause disc material to protrude peripherally or superiorly or because of liberation of chemical toxins during disc protrusion causing reflux muscle spasm due to irritation of the nerve roots which are exiting from the corresponding vertebral level causing obliteration of the cervical curvature even observed in the lower grades of cervical spondylosis and without much bony changes seen in most of our subjects presenting with symptoms of localized neck pain.

In one of the case of our study subject we have noticed that there is reversal of curvature at the lower cervical spine with G1 degenerative changes suggests high degree of associated muscle spasm may be as one of the causes mentioned above.

On the other hand we have also observed that in some cases of higher grades i.e. around grade 3 there is obliteration of the cervical curvature it might be because of the degenerative disease process as a result of bony changes and most of the cases remain asymptomatic i.e. presents with compression of nerve roots (radiculopathy) and cord (myelopathy).

Helliwellet al[18] studied the cervical curvature of patients with acute neck pain, those with chronic neck pain and a normal population and they noted that there was no significant difference in the prevalence of straight cervical spine between the patients with acute neck pain and chronic neck pain. The normal population showed a straight cervical spine more frequently than did those with neck pain. They attributed this result to the variations in radiographic positioning of cervical spine. In a large number of patients with whiplash injury and control subjects, Matsumoto[19] found no difference in the prevalence of non-lordotic curvature/or angular kyphosis and concluded that these patterns of cervical curve constitute normal variants rather than pathological findings.

In this study no significant difference was found in the association of upper and lower cervical curvature and neck pain in cervical spondylosis, suggesting that non-lordotic cervical curvatures might constitute normal variants rather than pathological findings.

In this study we have found there are no significant changes in the cervical curvature and neck pain. The small numbers of subjects in the group hasn't allowed stratification by age and gender, which might be related to the cervical curvature and there are less subjects with grade 3 so to say that degeneration is significant cause of obliteration of cervical curve. Subjects are not equally divided on the basis of severity of grades of degeneration. Inter-reliability changes were not observed to assure the measurement of the cervical curvature due to lack of affordability.

Parallax error is a random error may occur in any *measurement* as a result of variations in the measurement technique (It is displacement or difference in the apparent position of an object viewed along two different lines of sight, Nearby objects have a larger parallax than more distant objects when observed from different positions.) during measurement of cervical curvatures.

MRI interpretation can provide better outcome for further analysis. Evaluation of segmental measurement of cervical curvature at each vertebral level will help us in better understanding along with measurement of A-P diameter of each vertebrae and measuring the length of the osteophytes in relation to the A-P diameter of the vertebrae.

Segmental evaluation of the cervical spine can be done to interpret association of individual segments with the disease process.

CONCLUSION

This study was conducted to study the association between altered cervical curvature and neck pain in patients with cervical spondylosis.30 subjects with cervical spondylosis presenting with neck pain on the day of examination and evaluation of x-ray were studied and their cervical curvatures were measured on lateral view radiographs. (Which were taken in standard position by single radiographer and assessed by experienced radiologist)

The study statistical analysis concluded that there is absolutely no significant association observed between altered cervical spine curvature and pain severity in cervical spondylosis.

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