

Original Research

Study On Morphometric Analysis Of Cervical Canal Using Computerized Tomography (Ct) Scan

Dr. Pavan Kumar Sisodia^{1*}

^{1*}Assistant Professor, Dept. of Anatomy, Shri Balaji Institute of Medical Sciences, Mowa, Raipur

Dr. Deepak Jaiswal²

²Assistant Professor, Dept. of General Medicine, Shri Balaji Institute of Medical Sciences, Mowa, Raipur

Dr. Sushma BJ³

³Professor and Head, Dept. of Biochemistry, National Institute of Medical Sciences, Jaipur

***Corresponding Author:** - Dr. Pavan Kumar Sisodia

*Assistant Professor, Dept. of Anatomy, Shri Balaji Institute of Medical Sciences, Mowa, Raipur

ABSTRACT

Introduction: Cervical spinal stenosis is a common disease that results in considerable morbidity and disability. It requires prompt diagnosis and treatment to prevent long-term disabilities secondary to irreversible spinal cord injury. The bodies of the cervical vertebrae are smaller in size compared with those of other vertebrae and function to protect the spinal cord, support the head, and allow movement of the head (in flexion, extension, and rotation).

Material and Methods: : Patients with either cervical spine stenosis or facet joint arthrosis or both (age 20-80 years of either gender) who were attending OPD of our hospital. Diagnosed cases of Neck pain with suspected cervical canal stenosis and facet joint arthrosis from OPD of department of Orthopaedics and Neurology referred to Radio diagnosis department of our hospital for CT scan was chosen as subject. Whole age group of subject was further divided in different age groups.

CT scan Examination Antero-posterior diameter of Spinal Canal, Antero-posterior diameter of Vertebral Body, Cervical Facet Joints

Result: In the present study, a total of 90 subjects were included out of which, 46 were males and 44 were females. The mean age was 54.68 ± 5.63 , mean height was 163.56 ± 7.65 cm and mean weight was 64.58 ± 8.32 kgs respectively. There were no significant differences in the dimensions of VBD, SCD, VCD and TCD at C3, C4, C5, C6 and C7 levels and there were no statistically significant differences between males and females. Neurological symptoms were evaluated in these subjects, 98% presented with neck pain, 58% had numbness, 28.8% had tingling, 11.11% had weakness and 8.88% had gait instability.

Conclusion: CT scan can provide accurate cervical canal measurements that could serve as a useful guide in the determination of the cervical canal stenosis, replacing the old lateral plain x-ray technique. Neck pain is complex to diagnose and treat due to the sheer number as well as the diversity of probable pain triggers in the spinal lumbar region. Most of the studies on low back pain

focused just on intervertebral discs; nevertheless, it has become abundantly clear that the facet joint (zygapophysial joint) plays a crucial influence. Spinal pain induced due to facets remains harder to diagnose. The facet joint may be the source of discomfort based on the patient's history and physical examination, but this cannot be confirmed.

Keywords: Computerized Tomography, Cervical Canal Stenosis, Facet Joint Arthrosis

INTRODUCTION

Cervical spinal stenosis is a common disease that results in considerable morbidity and disability [1]. To avoid long-term disability caused by irreversible spinal cord damage, quick diagnosis and treatment are required. Cervical vertebrae have smaller bodies than other vertebrae, and their purpose is to protect the spinal cord, support the head, and enable movement of the head in flexion, extension, and rotation [2]. It is estimated that 24.4% of the population suffers from spinal cord compression, which affects the cervical cord in 10% of cases [3]. Tumors, infections, trauma, and degenerative changes such as intervertebral disc herniation, osteophytes, and ossification of the posterior longitudinal ligaments can all cause the cervical canal to narrow [4]. Pain is the most prevalent presenting symptom, followed by numbness, tingling, weakness, gait instability, bowel and bladder dysfunction, spasticity and paresthesia, and, in rare cases, irreversible paraplegia. These variables may cause increasing cord compression, culminating in spinal cord ischemia, and histopathologic alterations in the cervical spinal cord [5,6].

The facet joints, also known as the zygapophysial joints, are affected by osteoarthritis (OA) of the spine. In humans, the only functional synovial joints between neighboring spinal levels are paired diarthrodial joints (DJ) in the vertebral column's (VC) posterior section. When it comes to facet joint osteoarthritis (FJOA), it is important to remember that it is closely linked to the separate but functionally similar illness known as degenerative disc disease, which affects components in the anterior section of the spinal column. It is believed that both FJOA and degenerative disc disease are widespread causes of back and neck pain, which in effect get a significant influence on the healthcare systems and economy of developed nations [6].

FJOA is a clinicopathological phenomenon that is characterized by the dysfunction of synovial facet joints. The process of failure, although commonly thought of as a disorder characterized by loss of articular cartilages and hypertrophied bones, actually affects entire joints, along with soft tissue, periarticular paraspinal muscle, subchondral cartilages, bones and ligament, the capsule, and the synovium. The facet joint is part of a "motion segment" in the spine that also comprises the intervertebral discs, which degenerate in tandem with the facet joints. Thus, FJOA is usually linked to degenerative disc degeneration (DDD) [7].

At some time in their lives, majority of adults will have neck discomfort that radiates to their upper limbs. Cervical spinal canal stenosis is a common cause of this issue. This disorder is characterized by a narrowing of the cervical spinal canal within the VC, which includes the spinal cord and its surrounding meninges, blood vessels, and spinal nerve roots [8]. This stenosis has long been associated with cervical spondylotic myelopathy and cervical neuropraxia associated with trauma, degeneration, and inflammation [9]. According to one study, 82% of persons aged 54 years and above show radiologic indications of cervical spine degeneration [10].

All the spinal compression force, which rises in magnitude from the axis vertebra to the lumbosacral joint, is sustained by the vertebral bodies and intervertebral discs [11]. Narrowing of the sagittal diameter of the cervical canal in the adult spine is a causative factor, measured radiologically by X-ray [12]. The zygapophysial or facet joints are the most important structures in determining the biomechanical properties of the cervical spinal column [13]. The foramen of the

vertebrae creates the spinal canal, which is a hollow tunnel through which the spinal cord flows. The narrowing of the spinal canal, known as stenosis, has been linked to neurological damage. There is paucity in data in our population hence we have taken up this study to evaluate cervical canal stenosis and associated facet joint arthrosis as the major cause of neck pain, so the current study used computed tomography (CT) scans to determine the prevalence of cervical canal stenosis and facet joint osteoarthritis in patients who presented with neck pain, including its relationship with age, sex, and cervical spinal levels (C3-C7).

MATERIAL AND METHODS

Place of Study: The present study was conducted in the department of Anatomy Shri Balaji Institute of Medical Sciences, Mowa, Raipur.

Study setting and design: The current clinical descriptive cross-sectional study was conducted for a period of 18 months in the Department of Anatomy in association with department of Radiodiagnosis at Shri Balaji Institute of Medical Sciences, Mowa, Raipur

Study population: Patients with either cervical spine stenosis or facet joint arthrosis or both (age 20-80 years of either gender) who were attending OPD of our hospital. Diagnosed cases of Neck pain with suspected cervical canal stenosis and facet joint arthrosis from OPD of department of Orthopaedics and Neurology referred to Radio diagnosis department of our hospital for CT scan was chosen as subject. Whole age group of subject was further divided in different age groups.

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Figure 1: Sagittal CT image of cervical spine Showing measurements of Antero-posterior diameter of Vertebral Body





Figure 2- Sagittal CT image of cervical spine showing Measurements of Antero-posterior diameter of Spinal Canal

Statistical Analysis Methods: Data were collected manually, tabulated in MS windows excel sheet and data was analyzed by using Social Package for Social Sciences (SPSS) version 16. Testing of hypothesis using parametric and non- parametric. To study the between group differences ANOVA with post hoc test was used.

RESULTS

In the present study, a total of 90 subjects were included out of which, 46 were males and 44 were females. The mean age was 54.68 ± 5.63 , mean height was 163.56 ± 7.65 cm and mean weight was 64.58 ± 8.32 Kgs respectively.

Table 1: Shows the Baseline demographics of study population

Category	Value
N	90
Gender, n (%)	
Male	46
Female	44
Age in years	
Mean \pm SD	54.68 ± 5.63
Height in cms	
Mean \pm SD	163.56 ± 7.65
Weight in kg	
Mean \pm SD	64.58 ± 8.32

Table 2: Shows mean \pm SD of vertebral body diameter (VBD), spinal cord diameter (SCD), vertebral canal diameter (VCD) and Transverse canal diameter (TCD) in study subjects

	VBD	SCD	VCD	TCD
C3	14.16 ± 0.72	13.52 ± 0.48	10.97 ± 0.78	19.43 ± 1.72
C4	14.35 ± 0.73	13.41 ± 0.46	10.77 ± 0.78	18.90 ± 1.54
C5	14.28 ± 0.72	13.68 ± 0.44	10.91 ± 0.78	18.86 ± 1.60
C6	14.23 ± 0.73	13.23 ± 0.42	11.23 ± 0.78	19.12 ± 1.52
C7	14.54 ± 0.73	13.76 ± 0.39	11.00 ± 0.78	18.56 ± 1.78

There were no significant differences in the dimensions of VBD, SCD, VCD and TCD at C3, C4, C5, C6 and C7 levels and there were no statistically significant differences between males and females.

Table 3: Shows the frequency of distribution of neurological symptoms in the study subjects

Neurological symptoms	Number	Percentage
Neck pain	88	98%
Numbness	52	58%
Tingling	26	28.8%
Weakness	10	11.11%
Gait instability	8	8.88%

Neurological symptoms were evaluated in these subjects, 98% presented with neck pain, 58% had numbness, 28.8% had tingling, 11.11% had weakness and 8.88% had gait instability.

DISCUSSION

In the present study, a total of 90 subjects were included out of which, 46 were males and 44 were females. The mean age was 54.68 ± 5.63 , mean height was 163.56 ± 7.65 cm and mean weight was 64.58 ± 8.32 kgs respectively. According to Freedman et al., patients who met the diagnostic criteria for myelopathy or myeloradiculopathy were enrolled in the "myelopathic" group with an average age of 64.4 ± 13.4 years [14]. Kalichman et al. showed a high prevalence of FJOA in a community-based population (59.6% of males and 6.7% of females), which increased with age and reached 89.2% in individuals over 60 years old. Risk factors for FJOA include age, sex, spinal level, facet orientation (sagittal), and associated background of intervertebral disc degeneration. The correlation between degenerative changes in the FJOA and clinical back problems, on the other hand, is uncertain and a subject of considerable research [15].

There were no significant differences in the dimensions of VBD, SCD, VCD and TCD at C3, C4, C5, C6 and C7 levels and there were no statistically significant differences between males and females. Neurological symptoms were evaluated in these subjects, 98% presented with neck pain, 58% had numbness, 28.8% had tingling, 11.11% had weakness and 8.88% had gait instability.

The prevalence of spinal stenosis was shown to be significantly different across groups of patients with and without neck pain. Neck pain and its consequences are a huge burden on the society, healthcare systems, and the economy of developed countries. There is little information available on the pathophysiology of neck pain, which is surprising given the high incidence of the complaints. Many practitioners commonly obtain radiography to establish a diagnosis as well as to provide confidence in clinical practice. Others say that radiography should only be used in subjects requiring invasive therapy and those who have evidence of potentially serious disorders because it can convey incorrect facts, cause undue stress, and lead to inaccurate treatment. Previous studies have revealed a higher proportion of asymptomatic subjects with spinal degeneration features, but there is no evidence to suggest a statistically significant association between such changes and the onset of neck pain in these patients

CONCLUSION

CT scan can provide accurate cervical canal measurements that could serve as a useful guide in the determination of the cervical canal stenosis, replacing the old lateral plain x-ray technique. Neck pain is complex to diagnose and treat due to the sheer number as well as the diversity of probable

pain triggers in the spinal lumbar region. Most of the studies on low back pain focused just on intervertebral discs; nevertheless, it has become abundantly clear that the facet joint (zygapophysial joint) plays a crucial influence. Spinal pain induced due to facets remains harder to diagnose. The facet joint may be the source of discomfort based on the patient's history and physical examination, but this cannot be confirmed.

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