SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Orthopaedic Surgery

Disc Space Involvement in Cervical Spondylotic Myelopathy: A Prospective Study

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DOI: 10.36347/sasjs.2022.v08i11.001 | **Received:** 07.09.2022 | **Accepted:** 15.10.2022 | **Published:** 01.11.2022

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Abstract **Original Research Article**

Introduction: Cervical spondylotic myelopathy (CSM) most frequently occur in old age because of degenerative change in the cervical vertebrate, intervertebral disc, and hypertrophy of ligamentum flava that create pressure on the spinal cord. Cervical spondylotic myelopathy manifests as long-tract clinical findings in the upper and lower extremities caused by spinal cord compression. Cervical myelopathy is a clinical syndrome that may result from cervical spondylosis. When cervical myelopathy is a result of spondylosis, it is referred to as cervical spondylotic myelopathy. The study aimed to analyze the involvement of the disc space of the vertebral column in cervical spondylotic myelopathy. ***Methods:*** This study was carried out at the department of orthopaedics, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study was conducted on 30 participants from March 2012 to September 2014. ***Result:*** Among the 30 cases, 24 (80%) cases were male and 6 (20%) cases were female. The age range was from 31-60 years. 15(50%) were manual workers, 12(40%) were sedentary workers and 3(10%) were housewives. the majority of the patients 15(50%) had suffered from the symptoms for 10 to 12 months. The most common level of myelopathy was the $C_{5/6}$ level 13 (44.44%). Among the 30 patients, 27 (90%) cases were presented with myelopathy and the other 3(10%) cases were presented with myeloradiculopathy. ***Conclusion:*** Cervical spondylotic myelopathy is a progressive neurological disease that requires surgical intervention in most cases. In terms of interspace disc involvement, C_5 C_6 was the most frequent space which is 66.7%. C_4 C_5 and C_6 C_7 had the same frequency of involvement which was 10% indicating the second most common spaces concurrently.

Keywords: Cervical, Degenerative, Myelopathy, Spondylosis.

INTRODUCTION

Cervical degenerative disease or cervical spondylosis is an age-related change affecting the cervical spinal column [1]. Cervical myelopathy is a clinical syndrome that may result from cervical spondylosis. When cervical myelopathy is a result of spondylosis, it is called cervical spondylotic myelopathy. Cervical spondylotic myelopathy demonstrates long-tract clinical findings both in the upper and lower extremities due to spinal cord compression. Patients present with a variety of findings, including clumsiness, loss of manual adroitness, trouble with gait or balance, urinary complaints, motor weakness, sensory changes, and pathologic reflexes [2] in terms of anatomy. The cervical spine, C1 to C7 provides exceptional function and range of motion. The upper cervical spine, C1 also called Atlus which articulates with the occiput, and C2 called the axis are highly specialized, letting significant ranges of motion including rotation, flexion, extension, and side-bending which are related to facet orientation allowing for more rotation. Structures adjacent to the cervical vertebrae include the spinal cord and nerve roots, blood vessels as well as the trachea and esophagus. The intervertebral

disc is found from the C2-C3 level down, assistances in cervical spine mobility and stabilization. The cervical vertebrae have a unique bony prominence called the uncinate process, which articulates with the adjacent level to form the joint of Luschka or uncovertebral joint. This joint helps to reinforce the intervertebral disc and provides additional stability and motion. Among all cervical disc spaces, C5-6 is the most commonly affected space due to biomechanics of the cervical spine [3]. The intervertebral discs lie between the vertebral bodies and link them together. The components of the disc consist of nucleus pulposus, annulus fibrosus, and cartilaginous end-plates. The blood supply to the disc is only to the cartilaginous end-plates. So if a lack of blood supply occurs due to compression or blood supply to the neurons are compromised due to some other reasons the neurons of the spinal cord are deprived of oxygen and essential nutrients and so they initiate an irreversible apoptotic cascade in the affected tissue. This molecular sequence of events is believed to target oligodendrocytes and cause the demyelination of adjacent neurons. As oligodendrocytes die, chronic demyelination of the neurons in the spinal cord occurs, resulting in residual or even permanent nerve damage [4, 5]. Biochemically, the important constituents of the disc are collagen fibres and elastin. As the disc ages, degeneration occurs, and osmotic pressure is lost in the nucleus resulting in dehydration for which the disc loses its height. During these changes, nociceptive nuclear material leaks through the outer rim of the annulus which is the main source of pain. The degenerated disc, having lost its height, affects the structures like ligamentum flavum, and facet joints. It also changes the shape of the neural foramina. This is the main cause of spinal stenosis and radicular pain due to disc degeneration in the aged populations [4]. The most common cause of spinal cord dysfunction seen in an older person is cervical spondylotic myelopathy [6]. Because With age, the spine endures natural degenerative changes that affect its basic anatomy which lead to stenosis of the spinal canal. Many pathologies relating to the vertebra, intervertebral disc, and ligaments of the vertebral column can contribute to the manifestation of this disease [5]. The study aimed to analyze the involvement of the disc space of the vertebral column in cervical spondylotic myelopathy.

METHODS

This prospective cross-sectional study was carried out in the Department of Orthopedic Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka from January 2013 to December 2014. A total of 30 patients with cervical spondylotic myelopathy were selected as per inclusion and exclusion criteria. Ethical clearance was obtained by the Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka, Bangladesh. All necessary history and data were collected through a questionnaire that was prepared previously, and medical information was also collected and analyzed. After data collection was done, available data were analyzed through SPSS software.

Inclusion Criteria

- Patients with progressive spinal cord compression due to cervical spondylotic myelopathy.
- Patients with motor weakness in upper and lower extremities.
- Patients with gait disturbance-spastic gait.
- Patients with the sign of Myelopathy.
- Patients with bowel and bladder dysfunction are present.
- Patients with positive X-ray MRI CT scan for cervical spondylotic myelopathy.

Exclusion Criteria

- Patients with cervical spine injuries like fracture or dislocation.
- Patients with peripheral neuropathy.
- Patients with nerve injury.
- Patients with cervical tumours and infections.
- Patients with inflammatory and autoimmune disorders.
- Patients with hereditary spastic paraplegia.

RESULTS

Considering the distribution of patients by age, it ranged from 31 to 60 years. The highest number of cases (15,50%) were in the 5th decade in this study, the age of the youngest patient was 38 years and the age of the oldest patient was 60 years. the mean age was 41.5years±SD. There were 24 (80%) males and 6(20%) females, so there is a gross male predominance was found in the present study. By occupation 15(50%) were manual workers, 12(40%) were sedentary workers and 3(10%) were housewives (Table 1). Duration of symptoms ranged from 6 months to 15 months while the majority of the patients (15,50%) were suffering from the symptoms for 10 to 12 months. The mean duration of symptoms was 8.7 months ±SD (Table 2). In terms of the distribution of interspaces involved among the 30 cases, the highest frequency of 13(44.44%) of interspaces involved was C_5 and C_6. Then the frequency of C_{6-7}, C_{4-5}, C_{3-4} were 7(24.44%), 7(22.22%), 3(8.89%) respectively. This table indicates that C_5 and C_6 were the most frequently affected disc space (Table 3). Among the study population, the majority of the study population (27,80%) had only myelopathy, and three patients (3,10%) had myeloradiculopathy (Table 4).

Table 1: Distribution of participants by characteristics of the participants (N=30)

Characteristics	N	%
Age group in years		
38-40	03	10%
41-50	15	50%
51-60	12	40%
Total	30	100%

Sex		
Male	24	80%
Female	06	20%
Occupation		
Manual worker	15	50%
Sedentary worker	12	40%
Housewife	03	40%

Table 2: Duration of symptoms on admission (N=30)

Duration of symptoms in months	N	%
6-9	12	40%
10-12	15	50%
13-15	03	10%
Total	30	100%

Table 3: Distribution by disc space involvement (N=30)

Interspaces involved	N	%
C3-4	03	8.89%
C4-5	07	22.22%
C5-6	13	44.44%
C6-7	7	24.44%
Total	30	100

Table 4: Distribution by nature of involvement (N=30)

Interspaces involved	N	%
Myelopathy	27	90%
Myeloradiculopathy	03	10%
Total	30	100%

DISCUSSION

This prospective study was conducted to see the involvement of disc space in cervical spondylotic myelopathy. The mean age of the patients in the present study was 41.5years±SD with the majority of the patients being older than 50 years. As disc space involvement is an age-related condition this age distribution is quite understandable. Similar studies regarding disc space involvement also prioritized patients of old age [6] the present study showed male predominance concerning sex having 24(80%) males and 6(20%) females other studies also showed a similar scenario with the ratio of males and females which is approximately 2.7:1 [7]. Among 30 patients in this study 15(50%) were manual workers which is quite understandable because spondylosis more frequently occurs in the cervical region due to their anatomical and physiological characteristics since the cervical vertebra moves in almost all axes to the greatest extent in contrary to the lumbar and thoracic vertebra. Several studies mentioned recurrent occupational trauma as the risk of spondylosis since it involves axial loading [8]. Duration of symptoms before operation ranged from 6 months to 15 months and the majority of the patients 15(50%) had suffered from the symptoms for 10 to 12 months in this study while a study by another author showed the mean duration of myelopathic symptoms before surgery was 15.1 months [9]. Among the 30 cases of the present study the highest frequency of 13(44.44%) of interspaces involved was C_{5-6}. Then the frequency of $C_{6-7,}$ $C_{4-5,}$ and C_{3-4} were 7(24.44%), 7(22.22%), and 3(8.89%) respectively which indicates that C_{5-6} is the most frequently affected disc space. Another study also gave the same picture [7]. In terms of distribution by the nature of involvement among the 30 patients, the majority 27(80%) had only myelopathy, and 3(10%) had myeloradiculopathy in the present study which is demonstrating the same scenario in another study [10]. The cervical spinal cord is anchored firmly through the ligamenta denticulata and the roots run a direct course to the intervertebral foramina, the uppermost running slightly upwards, the mid-cervical roots transversely and the lowermost slightly downwards. Disc protrusions are common in the cervical regions and rare in the thoracic. The cervical and lumbar regions of the spine both exhibit a secondary lordotic curve which, in the cervical region, is largely contributed by the intervertebral discs. The cervical region is the site of much greater mobility than the thoracic spine, and they are each especially exposed to trauma. In the cervical spine, the intervertebral discs are larger relative to the vertebra than in the lumbar spine, and they are related to the spinal cord as well as to the nerve roots [11] patients having spondylosis in the cervical area come with various symptoms such as pain, stiffness, and neurological issues on the neck, shoulder, some part of the arm, and also lower extremities to some extent as these areas are supplied by the cervical spinal nerves [12].

The neurologist should give more concentration to the patients with CSM. Patients with mild signs and symptoms of CSM could be monitored and should be kept under follow-up [13, 14]. Surgical decompression from an anterior or posterior approach should be considered in patients with progressive and moderate to severe neurologic deficits [14, 15].

CONCLUSION

The study showed that the most common disc space involved was C^{5-6} as the cervical region is more prone to spondylosis because this segment of the spinal column provides a greater extent of movement than any other region of the spinal column. Spondylotic myelopathy is mostly seen in the patients of the 5^{th} decade onwards because it is related to degeneration of the spinal nerves. As this area supplies the arm and shoulder, patients mostly come with complaints of pain and other symptoms in those areas for a considerable duration.

RECOMMENDATION

A few steps may prevent the risk of developing cervical spondylotic myelopathy. Staying physically

active, maintaining good posture, and using the right equipment and right form while exercising or playing sports are some of the steps to prevent spondylosis. The burden of long-term morbidity due to cervical spondylosis should be put to the notice of the concerned authorities. The is an importunate demand for extensive research in CSM. Moreover, to get robust data multicenter study could be carried out.

Funding: No funding sources.

Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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