

# Effect of Surgical and Non Surgical Modalities in the Management of Cervical Spondylosis: A Prospective Interventional Study from a Tertiary Care Hospital

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## ABSTRACT

**Introduction:** Cervical spondylosis is an age-related degenerative condition of cervical spine that leads to compression of exiting nerve roots and in more severe cases compression of spinal cord, giving rise to symptoms of radiculopathy and myelopathy, respectively. Till date there have been various studies on the management of cervical spondylosis, some supporting the conservative line of management whereas others favouring the surgical approach. But still there is no clear consensus about which line of management is better than the other.

**Aim:** To assess the role of surgical and non surgical modalities in the management of cervical spondylosis using the American Spinal Injury Association (ASIA) and Visual Analog Scale (VAS) scores.

**Materials and Methods:** The present prospective interventional study was conducted on a total sample of 100 patients presenting in Outpatient Department (OPD) of Department of General Surgery, Hamidia Hospital, Bhopal, Madhya Pradesh, India, who were diagnosed to have cervical spondylosis, between November 2018 to July 2020. Patients were divided into two groups based on the mode of intervention i.e. surgical and non surgical groups. Preintervention and Postintervention scores were recorded according to ASIA scale (which included sensory and motor score) and VAS for pain score. The significance of change in these scores was determined by using Paired t-test. The data was analysed using XLSTAT version 2021.5.1.

**Results:** Total 100 patients included initially, 14 patients were lost to follow-up. The remaining 86 patients were evaluated and included in the final analysis. Out of these 86 patients, 80 were managed conservatively and six underwent surgical management. Under the conservative group, the mean preinterventional motor score was found to be  $43.3 \pm 5.99$  which improved to  $45.7 \pm 4.78$  postinterventional ( $p < 0.001$ ). The mean preinterventional sensory score was  $105.9 \pm 6.33$  which improved to  $108.6 \pm 4.50$  postinterventional ( $p < 0.001$ ) and the pain score changed from  $5.17 \pm 1.14$  preinterventional to  $4 \pm 1.40$  postinterventional ( $p < 0.001$ ). Similarly, in the surgical group, the mean preinterventional motor score was  $31.6 \pm 4.08$  which improved to  $37.1 \pm 7.33$  postinterventional ( $p = 0.038$ ). The mean sensory score changed from  $90.8 \pm 16.13$  preinterventional to  $99.1 \pm 8.16$  postinterventional ( $p = 0.107$ ) and the pain score improved from  $7.5 \pm 1.05$  preinterventional to  $6.3 \pm 1.37$  postinterventional ( $p = 0.034$ ). The p-value was found to be highly significant for the conservative group and significant for the surgical group except the sensory scores.

**Conclusions:** Both the interventions, non surgical and surgical interventions were found to be effective. The conservative or the non surgical approach led to improvement in all three components (motor, sensory and pain), whereas the surgical management was found beneficial only in terms of motor and pain compartment, the sensory compartment did not show any significant benefit in present study.

**Keywords:** Cervical pain, Discectomy, Myelopathy, Radiculopathy

## INTRODUCTION

Cervical spondylosis is a chronic degenerative condition of cervical spine, that affects not only the vertebral bodies and intervertebral disc, in the form of disc herniation and spurs formation, but also affects the spinal cord and its nerve roots [1]. Chronic cervical degeneration is the most common cause of progressive spinal cord and nerve root compression. Spondylotic changes could lead to stenosis of vertebral canal, lateral recess and foramina which subsequently leads to myelopathy and radiculopathy [2]. The incidence of cervical spondylosis in general population is 83 per 100,000 and prevalence being 3.3 cases per 1000 people and occurs mostly after fourth and fifth decade of life [3,4].

Management of cervical spondylosis could be conservative or surgical. Immobilisation of cervical spine (use of cervical collar) being the mainstay of the conservative management. Surgical management on the other hand aims to relieve pain and neuronal decompression as well as to achieve immobilisation. There have been various studies evaluating the conservative and the surgical management in the past using various scoring systems [5-7]. Most studies in this regard have been based on

the modified Japanese Orthopaedic Association (mJOA) scoring system [5]. As with every other scoring system, there are some limitations of the score as well, such as it being more of a subjective assessment (use of terms such as 'great difficulty', 'slight difficulty', 'severe sensory loss', 'mild sensory loss') [6], lack of studies to establish intra and interobserver reliability [7] and not assessing pain scores.

In this study, authors have used two scales for evaluation, one being the ASIA scale [8] and the other is VAS [9]. Using these two simultaneously nullifies the above mentioned limitations to a certain extent. Currently, there are no studies in the literature using ASIA scale in the evaluation of cervical spondylosis. Present study, thus attempts to evaluate the surgical and the non surgical managements on these new parameters so as to further ascertain their effectiveness on these new parameters.

## MATERIALS AND METHODS

This was a prospective interventional study conducted in Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh, India and was approved by Ethical Clearance Committee (IEC no.-

ECR/1055/Inst/MP/2018) of the hospital vide letter number- 36133-35/MC/IEC/2018 dated 14/11/2018. In this study, 100 patients were included who were diagnosed to have cervical spondylosis in Hamidia Hospital, Bhopal between November 2018 to July 2020.

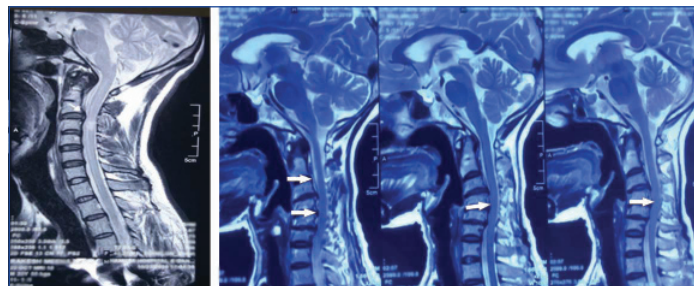
**Inclusion criteria:** All the people attending the hospital who were clinically (eg. neck pain radiating to upper limbs) and radiologically (eg. herniated discs, bony spurs etc.) diagnosed to have symptomatic cervical spondylosis, who had not received any previous treatment and who gave written informed consent to be a part of the study were included in the study.

**Exclusion criteria:** Patients who were suspected or confirmed to have any bone, joint or soft tissue tumours (such as osteoblastoma, chordoma plasmacytoma etc.), those who suffered from any other co-morbidities (eg: diabetes, hypertension etc.) of cardiovascular, liver, lung, kidney or haematopoietic systems leading to any serious illness or impairment and those with severe congenital malformations of cervical vertebrae (such as hemivertebra, block vertebra, occipitalization of atlas etc.) were excluded from the study.

The distribution of patients for conservative and surgical therapy was done on the basis of surgeon's choice based on clinical features, patient's performance status, Magnetic Resonance Imaging (MRI) findings etc.

### Collection of Data

Details of these patients who presented in the OPD and having features of cervical spondylosis, their pain (as per VAS) [9], sensory score and motor score (as per the ASIA scale) [8] were recorded in a predesigned proforma after taking an informed consent. Details of X-ray and MRI findings in these patients were also recorded as seen in [Table/Fig-1].



[Table/Fig-1]: MRI Cervical spine (Arrows showing the level of spinal cord compression).

The pain score was given using the VAS scale which had scores from 0-10, with 0 being no pain, gradually increasing in intensity to 10 which refers to unbearable pain. Similarly, motor and sensory scores were also noted according to ASIA scale [8]. The motor scores were recorded by assessing 10 key muscles, 5 in each upper limb, one from each respective segment of spinal cord and were scored on a 5-point scale, with 0 being total paralysis to 5 being active full range movement. The sum of all 10 muscle yields a total motor score from a maximum score of 50 points. The sensory scores are given on a scale of 0-2 for each dermatome bilaterally. Here, 0 refers to absent sensation, 1 means sensation being present but impaired and 2 for normal sensation. These scores were tested for both light touch and pinprick and a total score was being given from maximum of 112 [10].

Patients were then given appropriate intervention (conservative or surgical), based on the surgeon's preference. Conservative treatment was mainly given by neck immobilisation (cervical collars) [11], analgesic and anti-inflammatory medications [1]. Surgical management on the other hand, was performed in cases of progressive symptomatic myelopathy [12], documented nerve root compression and intractable pain [11]. Decompressive surgeries were performed by either anterior or posterior approach. In patients with ventral compression at one to three levels, were operated by anterior approach (Discectomy with anterior plating) [Table/Fig-2],

whereas those with multilevel disease were operated by posterior approach (Laminoplasty). Patients were then followed-up after a period of six months to assess outcomes.



[Table/Fig-2]: a) Showing approach to spinal cord via anterior approach to reach the intravertebral disc and perform Anterior Cervical Discectomy; b) Showing anterior cervical plating to accomplish spinal fusion.

### STATISTICAL ANALYSIS

The change in the postinterventional scores as compared to the preinterventional scores was assessed using the paired t-test for both conservative and surgical groups using XLSTAT version 2021.5.1. The p-value in both the groups (under 95% confidence intervals) calculated and thereby statistical significance of both conservative and surgical management was determined individually in each group. A p-value<0.05 was considered statistically significant.

### RESULTS

Out of total 100 patients included initially, 14 patients could not be followed-up due to various reasons and were eventually lost to follow-up. The remaining 86 patients were evaluated on follow-up and thus were included in the final analysis. Out of these 86 patients, 80 were managed conservatively and six underwent surgical management.

Preinterventional and postinterventional scores were recorded in both conservative and surgical groups (in each of the three parameters), their mean values determined and finally their p-value were calculated thereby to determine their significance. As shown in [Table/Fig-3], highly significant difference ( $p<0.001$ ) was found on comparing the mean score of pain, motor and sensory pre and postinterventional scores in the conservative treatment group ( $n=80$ ). In the surgical group, a significant difference in the pain ( $p=0.034$ ) and motor scores ( $p=0.038$ ), but the difference in the sensory score was not found to be significant ( $p=0.107$ ).

### DISCUSSION

The present study was aimed to assess separately the effect of surgical and conservative line of management for cervical spondylosis. A total of 86 patients were included in the study, 80 in the conservative group and six in the surgical group. The conservative and surgical management was studied on the basis of three parameters viz. pain score (VAS score), motor score, sensory score. A statistically significant difference was observed in both the conservative as well as surgical groups in terms of improvement in motor, sensory scores and pain scores except in case of sensory scores in surgical group, where the change came out to be insignificant.

Present study findings were in accordance with a study published by Kadanka Z et al., published the results of their first randomised study, where they compared surgical vs non operative treatment for Cervical Spondylotic Myelopathy (CSM) in 48 patients (27 in conservative group and 21 in surgical group), using mJOA score. They concluded no significant difference between the two groups in two years follow-up [13]. In the subsequent year they published

	Motor score				Pain score				Sensory score			
	Mean preinterventional Score	Mean postinterventional score	t-value	p-value	Mean preinterventional score	Mean postinterventional score	t-value	p-value	Mean preinterventional score	Mean postinterventional score	t-value	p-value
Conservative (n=80)	43.3±5.99	45.7±4.78	-5.834 (tc=1.990)	<0.001** (Sig.)	5.17±1.14	4±1.40	9.188	<0.001** (Sig.)	105.9±6.33	108.6±4.50	-6.782	<0.001** (Sig.)
Surgical (n=6)	31.6±4.08	37.1±7.33	-2.803 (tc=2.251)	0.038* (Sig.)	7.5±1.05	6.3±1.37	2.907	0.034* (Sig.)	90.8±16.13	99.1±8.16	-1.962	0.107 (Not Sig.)

**[Table/Fig-3]:** Representation of motor, pain and sensory scores in conservative and surgical approaches and statistical comparison of pre and postinterventional scores in each group.

p-value<0.05 considered significant

another study in which they had included 68 patients and similarly did not find any difference in mJOA score between the two groups over a three year follow-up [14]. Again, they published a 10-year follow-up in 2011, in which they prospectively studied 47 patients (25 in conservative group and 22 in surgical group) using mJOA score and again found no statistically significant difference between the two groups [15]. Matsumoto M et al., followed-up 27 patients with mild cervical myelopathy for more than six months on conservative management. They used mJOA score for evaluating these patients. Of these 27 patients, 10 had deterioration of symptoms and were thus managed surgically. At the end of three months, the conservative group had a score of 14.9, which was better when compared to the surgical group, where the score worsened to 12.9. They subsequently concluded conservative treatment to be an effective treatment option for mild cervical myelopathy resulting from cervical disc herniation [16]. In another study, Nakamura K et al., followed-up 66 patients for three months, retrospectively after collar and traction treatment using mJOA scoring, and noted an overall improvement rate to "no disability" in 30% of patients [17]. Shimomura T et al., published a study, in which they prospectively enrolled 70 patients with mild Cervical Spondylotic Myelopathy (CSM) (JOA score >12). Patients were followed-up from 1990 to 2003 with non surgical care with 56 patients remaining after follow-up.

Overall, patient's JOA scores showed no statistically significant decline. Ten patients showed a deterioration on Magnetic Resonance Imaging (MRI), but no clinical deterioration. The authors subsequently concluded that although it is reasonable and effective to treat patients with mild CSM non surgically, the higher risk of deterioration and the potential for such deterioration should be discussed with the patient [18]. Nikolaidis I et al., concluded that there is low evidence in favour of surgery that it provides pain relief faster than physiotherapy or hard collar immobilisation in patients with cervical radiculopathy. The authors further concluded that there is very low-quality evidence that patients with mild myelopathy feel subjectively better shortly after surgery, but same cannot be said for long-term benefits [19]. Yoshimatsu H et al., assessed the role of conservative treatment in CSM by retrospectively assessing 69 patients and found a significant correlation between clinical outcome, disease duration and presence of rigorous conservative treatment. They concluded conservative treatment to be effective if performed intensively in selected patients. Further they also said that surgical intervention should be considered if symptoms show no change or there is exacerbation with conservative treatment [20].

In another multicenter study, conducted by Sampath P et al., included 43 patients (23 in conservative group and 20 in the surgical group), concluded surgically treated patients to have better outcomes in terms of functional status, overall pain and neurologic symptoms [21]. In yet another prospective study conducted by Wilson JRF et al., where 180 patients, on the basis of evaluating mJOA scores at 6,12 and 24 months after surgery. They concluded to have a significant improvement in the quality of life in patients with mild Degenerative Cervical Myelopathy [22]. Ghogawala Z et al., summarised in their article, conservative treatment to be reasonable in cases of mild myelopathy, who are stable and not progressing. They reported surgery to be standard of care for progressive CSM

and that surgery results in improvement in symptoms and Quality of Life (QoL) when appropriate surgery is done on right patients [23]. A most recent meta-analysis done by Feng S et al., where they included 10 studies from 2000-2018 including 517 patients (256 treated surgically and 261 treated conservatively), concluded surgical treatment to be an efficient way for management of patients with CSM. Further, in comparison to the conservative treatment modality, surgery showed a greater increase in JOA score, enhanced recovery rates and ASIA grade improvement [24].

Proponents of the conservative group often talk in terms of the complications associated with the surgical methods. There have been various studies conducted in this regard [25-28]. One such study by Yadla S et al., conducted on 121 patients who underwent cervical spine surgery and found out an overall incidence of early complications to be 47.1%, 40.5% incidence of minor complications and 18.2% that of major complications. Since, most of the conservative approaches have none or minimal complications, this aspect of treatment must be kept in mind while deciding treatment approach [29]. In yet another systematic review conducted by Rhee JM et al., where they studied efficacy of non operative treatment in patients with cervical myelopathy, concluded that that non operative treatment may yield equivalent or better outcomes in cases with mild myelopathy, but for moderate to severe myelopathy, non operative treatment has inferior outcomes than surgery [30]. Similar was the conclusion in another review article by Bakhsheshian J et al., who also concluded conservative options more suitable for mild CSM with careful observation and surgical intervention superior for moderate to severe CSM [31].

The most notable drawback in most of these above mentioned studies is the unavailability of the sufficient sample size or short follow-up duration.

In a multicentric trial conducted by Sampath P et al., they included a large sample size (n=503) initially but ended up with small sample size (n=43) as most cases could not be followed-up due to either death or other reasons [21]. The study conducted by Wilson JRF et al., included 180 patients but follow-up period was just 24 months [22]. Same was the case with the study conducted by Kadanka Z et al., where they did a sufficiently long follow-up of 10 years but had to compromise with the sample size (47 patients) [15].

### Limitation(s)

First of all, the sample size after follow-up was 86. Moreover, the surgical group could have more candidates which was limited due to the limited number of elective surgeries being performed due to the Coronavirus Disease-2019 (COVID-19) pandemic. Secondly, the follow-up period in present study was six months, which if more could have led us to more accurate results, but due to the paucity of time and the risk of patients being lost on higher time interval, six months was the best that could be managed. Lastly and most importantly, is the treating surgeon's bias, which patient to undergo surgery or not; with obviously the patients with more severe symptoms being taken for surgery and therefore poorer postoperative outcomes.

## CONCLUSION(S)

The results of present study clearly indicate that both conservative and surgical managements are significant in the management of cervical spondylosis. However, it cannot be commented upon that which type of the management is better. The conservative or the non surgical approach led to improvement in all three components (motor, sensory and pain), whereas the surgical management was found beneficial only in terms of motor and pain compartment, the sensory compartment not showed any significant benefit. The findings of this study could not be extrapolated to a large population, but this study does serve to be an adjunct in the process of deciding the appropriate line of management of the cervical spondylosis. Further studies in this regard are definitely required.

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