

## ORIGINAL RESEARCH

### A Study on Outcome of Anterior Cervical Approach in Cervical Compressive Myelopathy

K. Indu Sekhar<sup>1</sup>, Banka Ravi Kumar<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Neurosurgery, Siddhartha Medical College, Vijayawada, AP, India

<sup>2</sup>Civil Surgeon, Govt District Hospital, Eluru, West Godavari, AP, India

#### ABSTRACT

**Background:**The aim of our study is to, Analyze the incidence, pathophysiology, clinical features and various treatment options for cervical compressive myelopathy. Predicting the surgical outcome in anterior cervical approach in cervical compressive myelopathy.

**Materials and Methods:** The present study is a prospective study comprising of 90 cases of cervical spondylotic myelopathy. Studied over a period from September 2013 to December 2015 in the department of neurosurgery, RMC, GGH, Kakinada. The cases included in this study were cases of cervical spondylotic myelopathy with ventral compression or 2 or 3 level of PIVD.

**Results:** The youngest patient in our study was 18 years old, whereas the eldest patient was 70 years old. The mean age in our study was 45.7 years. The commonest clinical presentation in our study was motor symptoms. Out of 46 grade I and II (mild) cases, 86.95% (40 cases) (10 cases) had improvement and 13.04% were remained as such after 1 month Of surgery. In moderate cases (grade III and IV) 70% cases improved, 27.5% cases remained static & 2.5% (1 case) developed MI in post op period. In 4 severe cases, 2 cases remained as such whereas 2 cases expired on 2nd post operative day because of myocardial infarction. Patients who are operated for single level lesion showed 100% improvement after 6 months followed by 2 level lesion it showed an improvement of 74% after 6 months and 3 level lesions With 56% after 6 months.

**Conclusion:** In cervical spondylotic myelopathy with anterior compression, decompression by posterior surgery is ineffective as you can't remove osteophytes more over multilevel cervical spondylotic myelopathy is accompanied by various levels of nerve root compression and posterior surgery is ineffective for the decompression of nerve roots resulting in persistence of post operative symptoms.

**Keywords:** cervical spondylotic myelopathy, Pathophysiology, Clinical Features, Posterior Surgery.

**Corresponding Author:**Dr. K. Indu Sekhar, Assistant Professor, Department of Neurosurgery, Siddhartha Medical College, Vijayawada, AP, India

#### INTRODUCTION

The cervical spine is a bioengineering marvel which provides strength, flexibility and at the same time protection to the underlying neural elements. The cervical spine is at constant motion during action. Being the most mobile segment of the whole spine, it is subjected to significant wear and tear.<sup>[1,2]</sup> This explains why cervical spine degenerates early, particularly in persons doing heavy manual work. These changes are ubiquitous in the elderly population.

No surgical procedure can cure the natural progression of cervical degeneration, which is a normal part of ageing process.

Cervical spondylosis is a chronic degenerative condition of the cervical spine that affects the vertebral bodies and intervertebral discs of the neck (eg disc herniation, spur formation), as well as the contents of the spinal canal (nerve roots and/or spinal cord). It also include the degenerative changes in the facet joints, longitudinal ligaments and ligamentum flavum.<sup>[3]</sup>

Spondylosis progresses with age and often develops at multiple levels. Chronic cervical degeneration is the most common cause of progressive spinal cord and nerve root compression.

Spondylotic changes can result in spinal canal, lateral recess, and foraminal stenosis. Spinal canal stenosis can result in myelopathy, whereas the latter two can cause radiculopathy. When cord compression is caused by degenerative changes it is referred to as cervical spondylotic myelopathy (CSM). Spondylosis may initially cause neck pain or a radiculopathy that progresses to a myelopathic syndrome when the cord becomes involved, though such progression is rare.<sup>[3]</sup>

Surgical procedures have been proposed by which the neural components can be decompressed by either an anterior approach (anterior cervical discectomy with or without fusion or corpectomy) or a posterior approach (decompressive cervical laminectomy or cervical laminoplasty). Anterior cervical discectomy is reserved for cervical radiculopathy or cervical myelopathy due to prolapsed cervical disc at one or two and very rarely at three levels. This procedure has to be followed by fusion by putting a bone graft in the disc space and may require instrumentation to keep the graft in position. Corpectomy is a procedure for cervical spondylotic myelopathy due to multiple prolapsed adjacent cervical discs, cervical ossified posterior longitudinal ligament (OPLL).<sup>[4]</sup>

The middle one third of the vertebral bodies are excised along with the adjacent and intervening discs, which is followed by fusion using an iliac or fibular bone graft. It is usually followed by instrumentation. Cervical decompressive laminectomy are reserved for cervical spondylotic myelopathy for any pathology posterior to the cord, more than three level discs or anterior pathology and often in continuous OPLL, Decompressive laminectomy for the treatment of cervical spondylotic myelopathy has been accepted as a standard procedure for years. It is most commonly indicated in patients who have a compressive myelopathy with an effective cervical lordosis. In these cases the laminae are to be removed, one level proximal and one level distal to the involved segments. In wide laminectomy up to 25% of involved facet joint can be excised. This provides more space for spinal cord and hence improvement.<sup>[5]</sup>

Cervical laminoplasty has become the choice of treatment for CSM in many countries, but even today it is been commonly practiced in India. This procedure has been recommended for CSM and OPLL. The theory behind laminoplasty in CSM is to prevent kyphosis and instability, post laminectomy membrane formation, arachnoiditis and restenosis. The main goal of laminoplasty is to enlarge the spinal canal and in turn to increase the cross-sectional area of the spinal cord without compromising stability. Cases with a straightened spine may be treated by either a ventral or dorsal decompressive operation.

### **Aims and Objectives**

The aim of our study is to

- Analyze the incidence, pathophysiology, clinical features and various treatment options for cervical compressive myelopathy.

- Predicting the surgical outcome in anterior cervical approach in cervical compressive myelopathy.

## **MATERIALS & METHODS**

The present study is a prospective study comprising of 90 cases of cervical spondylotic myelopathy. Studied over a period from September 2013 to December 2015 in the department of neurosurgery, RMC, GGH, Kakinada.

The cases included in this study were cases of cervical spondylotic myelopathy with ventral compression or 2 or 3 level of PIVD.

### **Inclusion criteria:**

- All patients of only cervical compressive myelopathy are taken
- Cervical compressive myelopathy's of any age or sex

### **Exclusion criteria**

- 1) Patients with associated compression at different spinal levels like thoracic, lumbar were excluded from this study.
- 2) Patients with gross subluxation and infective pathology were excluded from this study.

All the patients were analyzed under this following particular:

#### **a. Patient Particulars**

- Name
- Age
- Sex
- Address
- Registration Number
- Date of Admission

#### **b. Past History**

- Any h/o trauma
- Hypertension
- Diabetes

#### **c. Clinical Features**

- Neck pain
- Motor symptoms — Clumsiness of hands, paresis, plegias
- Sensory symptoms — Radiculopathy, Paresthesia
- Bladder and Bowel disturbances

### **Nurick's Grading**

Grade 0 — Signs and symptoms of root involvement, spinal cord not involved

Grade I — Signs of spinal cord disease. No difficulty in walking

Grade II — Slight difficulty in walking. Full employment not prevented,

Grade III — Difficulty in walking. Prevents fulltime employment or do all the house hold works.

Grade IV — Able to walk only with help

Grade V — Chair bound or bed ridden.

Grade I and II are taken as mild, Grade III and IV as moderate and

Grade V as severe grade.

**d. Investigations**

- Complete blood examination
- RBS
- Blood urea
- Serum creatine
- X-ray cervical spine — AP and Lateral view
- MRI cervical spine

All the patients were evaluated as per age group, sex, presence of various symptoms, duration of symptoms, nurick' grading and MRI findings.

All these patients underwent corpectomy and discectomy followed by fusion with bone graft from iliac crest and fixation with titanium cervical plates and screws.

Outcome was recorded under the following headings

- Improvement
- No change (Static) and
- Deterioration

**RESULTS****Table 1: Age Incidence The age incidence of 90 patients with CSM is analysed,**

Age group	No of Cases	Percentage %
<20	2	2.22
21-30	13	14.44
31-40	15	16.66
41-50	26	28.88
51-60	28	31.11
61-70	6	6.66

The youngest patient in our study was 18 years old, whereas the eldest patient was 70 years old. The mean age in our study was 45.7 years.

**Table 2. Sex Incidence Males outnumbered females in the present study**

Sex	No.of Cases	Percentage %
Male	79	87.78
Female	11	12.22

**Table 3: Clinical Features: The clinical symptoms and signs of the patients in the study were as follows.**

Clinical Symptoms	No. of cases	Percentage %
Sensory Symptoms		
Radiculopathy	28	31.11
Paresthesia	12	13.33
Motor Symptoms		
Clumsiness of hands	80	88.88
Paraparesis	76	84.44
Quadriparesis	70	77.77
Bladder disturbance	50	55.55
Bowel disturbance	38	42.22
Rombergs	45	50

The commonest clinical presentation in our study was motor symptoms.

**Table 4: Duration of Symptoms**

Duration	No. of cases	Percentage %
< 6 months	14	15.55
6-12 months	29	32.22
>12 months	47	52.22

Most of the patients in our study had symptoms for more than 12 months. The mean duration of symptoms in our study was 16months. Delay in presentation of symptoms is vague because most of them manual labourers once they have any moto impairment that made them to approach the doctor.

**Table 5: Level of Lesion: All the cases were analysed according to level of lesion, Most of the patients have 2 level involvement**

Level of lesion	No. of cases	Percentage %
1	24	26.66
2	43	47.77
3	23	125.55

**Table 6: Clinical Grading, All the cases were classified as per Nurick's grading**

Grading	No. of cases	Percentage %
0	0	0
I	8	8.88
II	38	42.22
III	34	37.77
IV	6	6.66
V	4	4.44

Most of the patients i.e 72/90 in our study were of grade II andIII. That is presented only when there is difficulty in walking.

**Table 7: Neurological Status After 1 Month of Surgery**

Clinical Symptoms	No. of cases	Improvement	Percentage %
Hand grip	80	54	67.5
Paresis	76	38	50
Bladder disturbance	50	17	34
Gait disturbance	45	28	62

**Table 8: Neurological Status After 6 Months**

Clinical Symptoms	No. of cases	Improvement	Percentage %
Hand grip	80	64	80
Paresis	76	49	64.4
Bladder disturbance	50	26	52

Gait disturbance	45	32	71.1
------------------	----	----	------

**Table 9: Outcome as Per Nurick's Grading After 1 Month of Surgery**

Grade	No. of cases	Improvement	Static	Deterioration
I,II(Mild)	46	40	6	0
III,IV(Moderate)	40	18	20	2
V(Severe)	4	0	2	2

Out of 46 grade I and II (mild) cases, 86.95% (40 cases) (10 cases) had improvement and 13.04% were remained as such after 1 month of surgery. In moderate cases (grade III and IV) 70% cases improved, 27.5% cases remained static & 2.5%(1 case) developed MI in post operative period. In 4 severe cases, 2 cases remained as such whereas 2 cases expired on 2nd post operative day because of myocardial infarction.

**Table 10: Outcome as Per Nurick's Grading After 6 Months of Surgery: Among mild cases (grade I and II), 100% improvement was seen after 6 months of surgery. In moderate cases (grade III and IV) 21% improved, 21% remained as such and 5% cases deteriorated.**

Grade	No. of cases	Improvement	Static	Deterioration
I,II(Mild)	46	46	0	0
III,IV(Moderate)	40	22	19	1
V(Severe)	4	1	2	1

Out of 4 severe cases (grade V), 1 case expired on 2nd post operative day due to Myocardial infarction and the rest 2 cases were remained as such after 6 months of surgery.

The overall improvement in our study was 71%. The p value was 0.046902, which is statistically significant.

**Table 11: Clinical Outcome as Per Age Group: The clinical outcome analyzed as per the age group were as follows**

Age group	No of Cases	Improvement after 1 month	Improvement after 6 month
<20	2	1	2
21-30	13	13	13
31-40	15	10	15
41-50	26	17	18
51-60	28	17	18
61-70	6	2	3

Clinical improvement was favorable in younger patients compared to elderly age group. At the end of (month 100% patients improved in 3rd decade. At the end of 6 months 100% patient improved in 4th decade out of 90 patients. 60 patients improved in the 1st month, 69 patients in the 6th month.

**Table 12: Clinical Outcome in Relation to Duration of Symptoms**

Duration	No. of cases	Improvement after 1 month	Improvement after 6 month
< 6 months	14	14	14
6-12 months	29	18	26
>12 months	47	26	29

In our study patients with symptoms for shorter duration fared better compared to those with symptoms for more than 12 months. The p value was 0.018702, which is statistically significant.

**Table 13: Improvement After 1 Month of Fixation**

Level of lesion	No. of cases	Improvement after 1 month	Percentage %
1	24	18	75%
2	43	29	67.4%
3	23	11	47.82%

**Table 14: Improvement After 6 months of Fixation**

Level of lesion	No. of cases	Improvement after 6 month	Percentage %
1	24	24	100%
2	43	32	74.41%
3	23	13	55.52%

Patients who are operated for single level lesion showed 100% improvement after 6 months followed by 2 level lesion it showed an improvement of 74% after 6 months and 3 level lesion With 56% after 6 months.

**Table 15: Clinical Outcome as Per MRI Findings: The clinical outcome of the patients as per the MRI findings were as follows**

Myelomalacia changes	No. of cases	Improvement	Percentage %
Present	34	22	64.70%
Absent	56	47	83.92%

Out of 90 Patients a total of 34 patients have shown myelomalacia changes, of these 22 patients have improve on post operative MRI. Similarly out of 56 patients with outmyelomalacia 47 patients as shown significant improvement. This clearly infers that the improvement as proved by MRI is better in patients without myelomalacia changes.

## DISCUSSION

Our study is a prospective study comprising of 90 cases studied over a period from September 2013 to December 2015 in the Department of Neurosurgery, Government General Hospital, Kakinada.

These are all cases of cervical spondylotic myelopathy with anterior compression. All these patients were decompressed or approached anteriorly either by Discectomy ie., ACD with Fusion or Corpectomy and fusion followed by fixation with cervical plate and cortical screws Age incidence ranged from 18-70 years with a mean age of 45.77. In our study males outnumbered the females (88% males). Commonest clinical presentation is motor symptoms — clumsiness of hands, quadriparesis, bladder disturbances etc., only 28/90 (31%) have presented with radiculopathy. Similarly majority of the patients 47/90 (52%) have long

standing symptoms of more than 1 year. The mean duration was 16 months. The delay in presentation is because of vague symptoms in the beginning, which were ignored by most of our patients, who are manual laborers.

However, these patients have immediately attended the OPD once serious symptoms like loss of power impairing their daily activity 72/90 approximately 80% have presented in Nurick's grade II & III, Majority of patients have II level involvement (43/90) i.e. 47.7%. Of 24 patients 18 single level discectomy and fusion was done. II level discectomy & corpectomy was done in 32 patients. II level corpectomy is performed in 43 patients. In majority of cases a tricorticate bone graft harvested from iliac crest patients clinically improvement was assessed at the end of 1st month & 6 months using Nurick's grading. Clinical improvement was compared with post operative MRI findings. The patients without pre-operative myelomalacia have better improvement (83%). The patient with myelomalacia have relatively less improvement (64.7%)

In our study 60% of patients were more than 40 years of age. The mean age of the study was 45.77 years. The outcome was better in younger age group. In patients upto 4th decade there was 100% improvement whereas in persons more than 60 years of age there was only 66% improvement.

Sex incidence in our study was showing a high preponderance among Males with Male to Female ratio is around 7:1. The other International studies were showing the same as 4:1. This shows the healthcare negligence among females in our country.

Most of the patients (52%) in our study have symptoms for more than a year. The mean duration of symptoms in our study was (15 months) which is comparable with 18.2 months by Jain et al. The outcome was also better in those with symptoms for less than 1 year. In our study 100% improvement was noticed in as early as 1 month following surgery in 3rd decade. In patients with symptoms for less than 6 months duration whereas in patients with symptoms for more than 1 year only 80% shown improvements even after 6 months of follow up.

Motor symptoms were the most common presentation in our study 89% of the patients had clumsiness of hand with weak hand grip. 59% of patients had bladder disturbances 79 following surgery. Motor symptoms improved early and significantly compared to bladder symptoms. 80% patients had improvement in their hand grip and 52% had improved bladder symptoms.

Most patients in this study were in Nurick grade II, III i.e., 42% and 38% respectively. The improvement was better in grade I and II compared to grade V. In our study 100% patients in grade I and II improved over a period of 6 months following surgery and grade V 50% had no change and rest 50% deteriorated.

Most patients in this study had 2 level lesions (48%). Single level lesions had 100% recovery over a period of 6 months following surgery whereas 2 level and 3 level lesions had 74% and 56% recovery after 6 months of surgery.

MRI of the patient without myelomalacia changes in the spinal cord fair better compared to those with myelomalacia changes. 84% of patients without myelomalacia changes improved clinically after 6 months compared to only 64% of patients with myelomalacia.

**Table 16. Surgical Results in CSM due to multiple levels of pathology in some famous international studies.**

Procedure	No. of cases	Better (%)	No. Changes (%)	Worse (%)
Anterior Surgery				
Phillips, <sup>[6]</sup>	65	74	12	14

Nurick, <sup>[7]</sup>	123	65	31	4
Lunsford, <sup>[8]</sup>	32	60	20	20
Wohlert, <sup>[9]</sup>	112	47	?	?
Present series	90	69	21	2

## CONCLUSION

There is an increase in the incidence of cervical spondylotic myelopathy due to increase in geriatric population. Life expectancy has gone higher worldwide. This is a condition commonly seen in elderly age group except traumatic cervical spondylotic myelopathy which is more common in younger age group. It affects mostly males.

The earliest symptoms like clumsiness of hands, mild weakness of limbs is usually overlooked by the patient. 50% of patients presented after gait disturbance (Nurick's Grade II & III). By the time moderate to severe weakness of limbs and sphincter disturbances appear it is already late.

The prognosis is related to duration of symptoms, cord changes, Nurick's Grade, Level of lesions. Age of patient & associated metabolic comorbid also are important. Proper health education and understanding of the disease at the bottom level of health care, is more important for better prognosis.

Compared to posterior approach, anterior approach has got better compliance. As post operative quality of life is significantly improved in anterior surgeries maybe as safe or safer than posterior surgery and most cost effective.

In cervical spondylotic myelopathy with anterior compression, decompression by posterior surgery is ineffective as you can't remove osteophytes more over multilevel cervical spondylotic myelopathy is accompanied by various levels of nerve root compression and posterior surgery is ineffective for the decompression of nerve roots resulting in persistence of post operative symptoms.

## Acknowledgment:

The author is thankful to Department of Neurosurgery for providing facilities to carry out this work.

## REFERENCES

1. Anderson DK, Nicolosi GR, Means ED, et al: Effects of laminectomy on spinal cord blood flow. J Neurosurg 48:232238, 1978
2. Batzdorf U, Batzdorf A: Analysis of cervical spine curvature in patients with cervical spondylosis. Neurosurgery 22:827836, 1988
3. Batzdorf U, Flannigan BD: Surgical decompressive procedures for cervical spondylotic myelopathy. A study using magnetic resonance imaging. Spine 16: 123127, 1991
4. Bennett MH, McCallum JE: Experimental decompression of spinal cord. surgNeurol 8:6367, 1977
5. Benzel EC: Biomechanics of Spine Stabilization. Principles and Clinical Practice. New York: McGraw-Hill, 1995.
6. Gregorius FK, Estrin T, Crandall PH. Cervical spondylitic radiculopathy and myelopathy, Arch Neurol 33: 618-625, 1976.
7. Guidetti B, Fortuna A: Long-term results of surgical treatment of myelopathy due to cervical spondylosis. J Neurosurg 30:714721, 1969

8. Hayashi H, Okada K, Hashimoto J, et al: Cervical spondylotic myelopathy in the aged patient. A radiographic evaluation of the aging changes in the cervical spine and etiologic factors of myelopathy. *Spine* 13:618625, 1988
9. Hinck VC, Sachdev NS: Developmental stenosis of the cervical spinal canal. *Brain* 89:2736, 1966.