



CLINICO-FUNCTIONAL OUTCOME IN SURGICALLY TREATED COMPRESSIVE CERVICAL SPONDYLOTIC MYELOPATHY- AN INSTITUTIONAL EXPERIENCE.

Neurosurgery

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ABSTRACT

Objectives: To study the clinical and functional outcome for patients undergoing surgery for compressive cervical spondylotic myelopathy.

Methods: This is a Prospective and Retrospective study of 43 patients done at Department of Neurosurgery, Christian Medical College and Hospital, Ludhiana over a period of 5.5 years. Appropriate Clinical and Radiological preoperative and postoperative evaluation was done. Post operatively were evaluated at the time of discharge, at one month and at 6 months to assess the clinical and functional outcome.

Results: Majority of patients with compressive cervical spondylotic myelopathy were with mean age above 55 +/- 9.86 years SD and were predominately male (67%). There was improvement following surgical intervention in the clinical and functional status post operatively at 6 months follow up. The preoperative mean mJOA scores among the patients was 13.17 and post operatively was 15.07 at 6 months follow up, which was suggestive of significant functional improvement ($p < 0.001$). The mean Nurick's score preoperatively was 2.36 and post operatively at 6 months was 1.27 which showed improvement which was statistically significant ($p < 0.001$). The mean recovery rate at 6 months post-operative follow up was 58.88% for the overall distribution of the patients. Better recovery rates were observed for lower age group, in females, in patients with acute onset of symptoms and in those patients with no associated comorbidities.

Conclusion: This study concludes that surgical intervention results in improved clinical and functional outcomes in patients with compressive cervical spondylotic myelopathy.

KEYWORDS

Surgical Intervention, Compressive Cervical Spondylotic Myelopathy, Outcome

INTRODUCTION

Compressive cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in older patients. The aging process results in degenerative changes in cervical spine.¹ These spondylotic changes may result in direct compressive and ischaemic dysfunction of spinal cord known as cervical spondylotic myelopathy.² The pathophysiology of CSM is now thought to be multifactorial with both static factors causing stenosis and dynamic factors resulting in repetitive injury to spinal cord playing a role. It is believed that impaired blood flow through the spinal cord microcirculation plays a role in CSM.³ The symptoms of this disorder are generally related to the degree of compression of the various spinal cord tracts. Compressive cervical spondylotic myelopathy is an important indication for early microsurgical intervention to relieve the compression involved. The primary goal of surgery is to decompress the spinal cord, thus giving neural elements more room.⁴ The recovery of the patient after surgery is of par importance as there is associated morbidity and mortality associated with surgery. The patient and the relatives need to be counselled about the expected outcome in terms of symptomatic relief and functional recovery. The Study is an effort for the assessment of the Clinical and Functional outcome using Nurick score⁵ and mJOA score.⁶

MATERIAL AND METHODS

This is a Prospective and Retrospective study of 43 patients with Compressive cervical Spondylotic myelopathy was done at Department of Neurosurgery, Christian Medical College and Hospital, Ludhiana from for a total period of 5.5 years. Patients with clinical features suggestive of compressive cervical spondylotic myelopathy were selected after applying inclusion and exclusion criteria. Inclusion criteria included all patients of cervical myelopathy due to compressive cervical spondylotic degenerative disorder. Exclusion criteria excluded all patients of non-compressive cervical myelopathy. Appropriate Clinical, radiological imaging (Figure 1) and functional outcome scores were done preoperatively and postoperatively for every patient undergoing surgical intervention for compressive cervical spondylotic myelopathy after taking a written consent. The patients post operatively were evaluated at the time of discharge, at one month and at 6 months to assess the clinical and functional outcome using Nurick score⁵ and mJOA score⁶. Surgical intervention was contemplated as indicated

either with Anterior Cervical Discectomy/ Corpectomy with Iliac bone grafting with fixation or Posterior approach or both anterior and posterior approach depending on the indication with the primary goal of surgery to decompress the spinal cord, thus giving neural elements more room.⁴ The data collected preoperatively and post operatively at the time of discharge, at one month and at 6 months was analysed using appropriate statistical methods.



Figure 1 : MRI Showing Compressive Cervical Myelopathy

RESULT AND ANALYSIS

A total of 43 patients were included in the study. In this study the maximum number of patients were in the age group of 56-65 years and the age range was from 35 years to 75 years of age. The mean age was 55.83 years with +/- 9.86 SD. The male to female ratio was 2.01:1 with a male predominance. Majority of the patients 31 (72%) had insidious onset of symptoms. The mean duration of the symptoms was 6.38 months with a range from 2 weeks to one and half years. Majority of the patients presented with the symptoms of Neck Pain in 16 (37 %) and Weakness of all limbs in 16 (37%) followed by weakness of upper limbs only in 5 (12%) Numbness of limbs in 3 (7%) and jerky movements as chief complaint in 1 (2%). The progression of symptoms was rapid in 12 (28%) of patients recruited in the study and was slow in 31 (72%) of patients. The mean duration of the symptoms from the data was 6.38 months with a range from 2 weeks to one and half years. Majority of the patients 24 (48%) had no co-morbidities and 10 patients (20%) had Hypertension followed by Diabetes Mellitus in 9 (18%), Smoking

as comorbidity was seen in 3 (6%) and remaining single individuals were found to have Hypothyroidism, HCV infection.

Neck pain was present in patients 24 (58.53 %) preoperatively and post operatively at time of discharge neck pain was present in 6 patients (14.63%) and post operatively at time of 1 months and 6 months neck pain was present in 1 patients (2.43%) only. **Headache** was present in 2 patients (4.87%) preoperatively and post operatively at time of discharge Headache was present in 2 patients (4.87%) and post operatively at time of 1 month and 6 months Headache was present in none of the patients (0%). **Giddiness** was present in patients 4 (9.75 %) preoperatively and post operatively at time of discharge giddiness was present in patients 2 (4.87%) and post operatively at time of 1 month and 6 months giddiness was present in a single patient (2.43 %). **Pain radiation along upper limbs** was present in patients 35 (85.36%) preoperatively and post operatively at time of discharge pain radiation along upper limbs was present in patients 10 (24.39%), post operatively at time of 1 month was present in patients 4 (9.75%) and 6 months pain radiation along upper limbs was present in only 3 patients (7.31 %). **Paraesthesia's along upper limbs** was present in patients 36 (87.80 %) preoperatively and post operatively at time of discharge Paresthesias was present in patients 30 (73.17 %), post operatively at time of 1 month was present in patients 20 (48.78%) and 6 months paresthesias along upper limbs was present in 12 patients (29.26%).

The various improvement trends in the clinical features after surgical intervention are shown in **figure 2**.

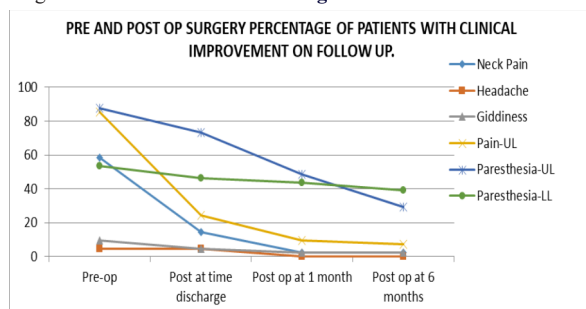


Figure2: Showing Percentage Of Patients With Clinical Features After Surgical Intervention

Weakness of upper limbs was present in patients 34 (82.92%) preoperatively and post operatively at time of discharge weakness of upper limbs was present in patients 29 (70.73 %), post operatively at time of 1 month was present in patients 21 (51.21%) and 6 months weakness of upper limbs was present in 19 patients (46.34%). **Fine Motor function of Hand impairment** was seen in patients 27 (65.85 %) preoperatively and post operatively at time of discharge was present in patients 24 (58.53 %), post operatively at time of 1 month was present in patients 24 (58.53 %) and 6 months Fine Motor function of Hand impairment was present in 21 patients (51.21 %). **Paraesthesia's along the lower limb** was present in 22 (53.65%) patients preoperatively and post operatively at time of discharge Paraesthesia's along the lower limb was present in patients 19 (46.34%), post operatively at time of 1 month Paraesthesia's along the lower limb was present in 18 (43.90%) patients and at 6 months was present in 16 patients (39.02 %). **weakness of lower limbs** was present in 22 (53.65%) patients preoperatively and post operatively at time of discharge weakness of lower limbs was present in patients 20 (48.78%), post operatively at time of 1 month and at 6 months weakness of lower limbs was present in 19 patients (46.34%). **Numbness of lower limbs** was present in 21 (51.21%) patients preoperatively and post operatively at time of discharge numbness of lower limbs was present in 19 patients (46.34%). **Fasciculation's of muscles** of the lower limbs was present in 13 (31.70%) patients preoperatively and post operatively at time of discharge was present in 12 (29.26%), post operatively at time of 1 month, 6 (14.63%) patients and at 6 months 5 (12.19%) patients had fasciculation's of muscles of the lower limbs of lower limbs. P value = 0.03. **Gait abnormalities** was present in 23 (56.09%) patients preoperatively and post operatively at time of discharge, post operatively at time of 1 month and at 6 months Gait abnormalities was present in 19 (46.34 %) patients.

upper limbs sensory loss was present in patients 29 (70.73%) preoperatively and post operatively at time of discharge and at post op 1 month sensory loss in upper limbs was present in patients 29 (70.73%), post operatively at time 6 months sensory loss in upper limbs was present in 24 patients (58.53%). **Sensory loss in the lower limbs** was present in patients 21 (51.21%) preoperatively and post operatively at time of discharge and post operatively at postop 1 month was present in patients 19 (46.34%) and at 6 months was present in 18 patients (43.90%). **Lehermittes Sign** was present in 13 (31.70%) preoperatively and post operatively at time of discharge was present in 7 (17.07%) and post operatively at postop at 1 month and at 6 months was present in 3 patients (7.31%) only. P value = 0.005

Exaggerated Deep Tendon Reflexes (DTRs) at the Biceps, Triceps, Brachioradialis, Knee and the Ankle was noted. None of the patients had exaggerated Jaw jerk. Compared to the Preoperative time the Exaggerated DTRs at 6 months was noted to have decreased from 20 to 16 among the Biceps, Triceps and Brachioradialis groups and from 22 to 17 among the Knee and Ankle reflexes groups. Suggestive of improvement in the Exaggerated DTRs post operatively. **Babinski's reflex** was present in 28 (68.29%) patients preoperatively and post operatively at time of discharge was present in 25 (60.97%) and post operatively at postop at 1 month in 24 patients (58.53%) and at 6 months 21 patients (51.21%) has positive Babinski's reflex. Compared to the Preoperative number of 3 patients with Bladder disturbances and sexual dysfunction there was no change in the number of people having Bladder disturbance and sexual dysfunction postoperatively.

Surgical Intervention:- Majority 41 (95%) underwent anterior surgical decompression and the remaining 2 (5%) underwent posterior surgical decompression. Anterior Cervical Corpectomy and Anterior Cervical Discectomy. The Majority 30 (73%) underwent Anterior Cervical Corpectomy and the remaining 11 (27%) underwent Anterior Cervical Discectomy. Anterior Cervical Corpectomy various levels 1,2,3 levels. The Majority 19 (63 %) underwent one level Anterior Cervical Corpectomy, 9 patients (30 %) underwent two level Anterior Cervical Corpectomy and 2 (7%) underwent three level Anterior Cervical Corpectomy.

The Majority 20 (46.51%) had no complications. 6 (13.95%) had respiratory distress and quadriparesis, 4 (9.30%) had other complications such as seroma and wound delayed healing, 3 (6.97%) had graft displacement, 2 patients (4.87%) had mortality, 1 patient (2.32%) had screw back out and another one patient had vocal cord paralysis.

mJOA scores - comparison PreOP and Post OP:

Table 1 and figure 3 shows mean mJOA Scores of patients with cervical spondylotic myelopathy who have presented on preop and post op at discharge, at 1 month and at 6 months. The Mean mJOA score preoperatively was 13.17. The mJOA score and the mean Recovery rate, based on the Preop and follow up mJOA scores, were at time of discharge mean mJOA score of 14.09 with a mean Recovery rate of 37.23%, at 1 month follow up the mean mJOA was 14.68 with mean recovery rate of 50.36%, and at 6 months follow up the mean mJOA score was 15.07 with a mean recovery rate of 58.88% shown in figure 4 . The mean mJOA scores were compared using t test which shows statistically significant improvement (p < 0.001).

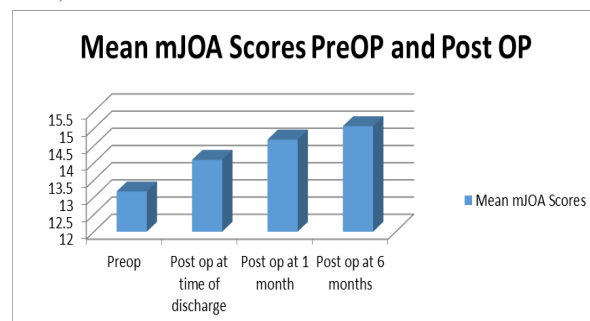


Figure 3: Showing The Mean Mjoa Scores Were Compared Using T Test Which Shows Statistically Significant Improvement (P < 0.001).

Table1.mJOA Scores - Comparison PreOP And Post OP With Mean Recovery Rate**mJOA Scores**

	MeanmJOAScores	MeanRecoveryRate
Preop	13.17	
Postop time of discharge	14.09	37.23%
Postop at 1 month	14.68	50.36%
Postop at 6 months	15.07	58.88%

P value < 0.001

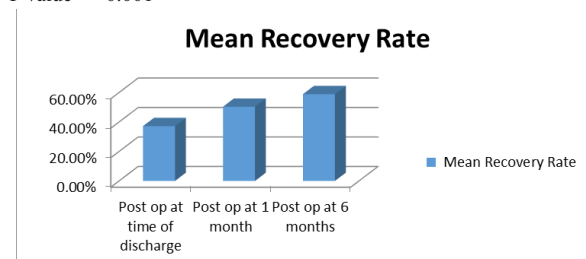
**Figure 4: Showing Mean Recovery Rate On Follow Up****Correlation Of The Recovery Rates In Various Age Groups:**

Table 2 shows mean Recovery Rate percentage of patients with cervical spondylotic myelopathy who have presented on preop and post op at discharge, at 1 month and at 6 months. Recovery rate based on the Preop and follow up mJOA scores was best noted in the younger age group 35-45 yrs at 75% and least recovery rate is seen in Elderly age group 66-67 years.

Correlation Of The Recovery Rates In Males And Females.

Table 3 shows mean Recovery Rate percentage of patients with cervical spondylotic myelopathy with best Recovery rate noted in the females at 75.82 % and the Recovery rate in Males was 54%.

Correlation Of The Recovery Rates Comparison In Patients With Acute Onset And Slow Onset Symptoms

Table 4 shows mean Recovery Rate percentage of patients with cervical spondylotic myelopathy with best Recovery rate noted in the patients who presented with acute symptoms at 65 % and Recovery rate in patients with slow insidious onset symptoms was 54%.

Correlation Of The Recovery Rates With Morbidity

Table 5 shows mean Recovery Rate percentage of patients with cervical spondylotic myelopathy who have presented on preop and post op at discharge, at 1 month and at 6 months. Recovery rate based on the Preop and follow up mJOA scores was best noted in the patients in no morbidity at 65% and lesser recovery rate is seen in patients with morbidity group with 56% recovery rate.

Table 2: Recovery Rates In Various Age Groups.

Age	Age Distribution	Mean RR Percentage
35-45yrs	6	75%
46-55yrs	12	71%
56-65yrs	16	59%
66-75yrs	9	39%

P value < 0.001

Table 3: Correlation of the Recovery rates in Males and Females.

Sex	No of patients(n)	MeanRRPercentage
Male	28	54%
Female	13	75.82%

P value < 0.001

Table 4: Correlation Of The Recovery Rates Comparison In Patients With Acute Onset And Slow Onset Symptoms

	Recovery Rate Post op at 6months	MeanRR Percentage
Acute Rapid on set symptoms	12	65%
Slow insidious on set symptoms	31	59%

Table5: Correlation Of The Recovery Rates With Morbidity

Morbidity	Number	Recovery Rates
Morbidity present	19	56%
Morbidity absent	22	65%

Nuricks scores - comparison PreOP and Post OP Table 6 shows the number of patients with cervical spondylotic myelopathy who have presented with various nurick's scores at preop and post op at 6 months. The mean Nurick's score at preop was 2.36 and the mean Nurick's score at post op at 6 months was 1.27. There is a marked improvement of the nuricks score which was statistically significant. (P value < 0.001)

Table 6: Nuricks scores - comparison PreOP and Post OP

Nuricks score N=41	Preop Nuricks score Number of patients	Postop at 6months Nuricks score Number of patients
0	0	18
1	18	7
2	5	8
3	10	6
4	4	1
5	4	1
Mean Nuricks score	2.36	1.27
Total number	41	41

P value < 0.001

DISCUSSION

The recovery of the patient after surgery is of par importance as there is associated morbidity and mortality associated with surgery. The patient and the relatives need to be counselled about the expected outcome in terms of symptomatic relief and functional recovery. Age of patients recruited in the study ranged from 35 years to 75 years. Mean age was 55.83 years. In a study done by Victor Chang et al⁷ the age group was 42-92 years with a mean age of 64 years. Angel Macagno et al⁸ did a retrospective analysis of 54,416 patients. The mean age in the study was 59.6 years which was close to our study. Male predominance was seen in our study which is in accordance to studies done by Song KJ⁹, Guo et al¹⁰, Park et al¹¹. 37% patients presented with neck pain and weakness of all limbs. Sadasivan KK et al¹² did a retrospective study and had found neck pain in 36% and weakness of limbs in 45% which is close to our study. In our study there was significant improvement in neck pain postoperatively (97.69%) (p value < 0.001). In a study done by Yue et al¹³, neck pain improvement was seen in 95.5% patients. Giddiness was present in 4 patients preoperatively; persisted in one patient postoperatively. In a retrospective study done by Hong Liu¹⁴, giddiness improved in all patients postoperatively. In our study upper limb symptoms improved significantly (p value < 0.001) with respect to pain, paraesthesias, weakness of upper limbs. Sherief T et al¹⁵ showed improvement in 72.9% patients. In our study sensory improvement was present but was not statistically significant. Similar findings were reported in a study done by Woernle, K et al¹⁶. In our study the complication rate was 27.06%. Study done by Macagno A et al⁸ had a complication rate of 27.9% which is close to our study. The mean JOA score improved significantly in our study from 13.17 to 15.07 (p value < 0.001). Similar improvement in mJOA scores was seen in studies done by Fehling et al¹⁷, Furlan et al¹⁸, Highsmith et al¹⁹, Holy et al²⁰ and Houten et al²¹. Nurick score showed significant improvement in our study from 2.36 to 1.27 (p value < 0.001). Similar improvement was shown by studies done by Bhatia et al²², Yeh et al²³ and Chagas et al²⁴.

CONCLUSIONS

Compressive Cervical Spondylotic Myelopathy is the most common cause of spinal cord dysfunction in older people. After surgical intervention and decompression of the spinal cord there was clinical improvement and also improvement was seen in mJOA and Nurick score. Better recovery was seen in lower age group, in females, in patients with acute onset of symptoms and in those patients with no associated comorbidities. Surgical intervention results in improved clinical and functional outcomes in patients with compressive cervical myelopathy.

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