

A Clinical Study on Outcomes Following Anterior Approach Surgery for Cervical Spondylotic Myelopathy

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Abstract: ***Background:** Cervical spondylosis is considered the most common progressive disorder in the ageing cervical spine and results from the process of degeneration of the intervertebral discs and facet joint of the cervical spine. The majority of patients with symptoms respond well to conservative management in the form of analgesics, cervical immobilization, physiotherapy and anti-inflammatory drugs. Patients with deterioration of symptoms, presence of sensory deficit, motor weakness and non responding to conservative management require surgical intervention. **Aim:** This study was designed to assess the outcome and complications in patients with cervical spondylosis myelopathy following an anterior approach to cervical decompression and fusion. It comprised 30 patients with a mean age 44.07 years. **Results:** All patients underwent decompression of the cervical spine by the anterior approach. 10 patients underwent single level discectomy. 15 patients underwent one level corpectomy and 05 patients for two level corpectomy. All the patients had significant improvement in their symptoms postoperatively and in follow up demonstrated by improvement & assess by mJOA Score scale improvement. **Conclusion:** There is a need for longer follow up for better result analysis and comparison. Rate of the follow up was not as high as expected.*

Keywords: cervical spondylosis, conservative management, surgical intervention, anterior cervical decompression, mJOA Score scale

1. Introduction

A study by Lawrence in 1969, based on cervical spine plain radiograph, showed that prevalence of cervical spondylosis increases with age [1]. Approximately 25% of the individuals <40 years of age, 50% of the individuals over 40 years of age & 85% of individuals over 60 years of age have some degree of disc degeneration [2]. This condition is often asymptomatic, but in 10-15% of patients the degeneration results in compression of spinal cord and spinal nerves presenting symptomatically as cervical myelopathy or radiculopathy [3, 4]. The clinical features of Cervical Spondylotic Myelopathy (CSM) vary from neck pain with or without radiating pain & numbness to weakness in upper and lower extremities with presence of long tract signs which include hyporeflexia of the deep tendon reflexes at the level of affection and hyperreflexia below the level of affection in upper and lower extremities with urinary bladder, bowel symptoms and autonomic nervous system dysfunction sometimes.

The diagnostic workup includes static and dynamic x-ray and Magnetic Resonance Imaging of cervical spine which shows decrease in disc space height, foraminal osteophytes, kyphosis, spinal canal stenosis, viz. intervertebral disc, OPLL, ligamentum flavum hypertrophy.

The management of CSM continues in controversy partially due to inadequate information available regarding its natural history. The treatment of CSM is not always satisfactory. Sometimes good therapeutic results are obtained by conservative management other times even complex surgery cannot arrest the cause of disease, incomplete knowledge of

the natural history of CSM. The pathophysiology of CSM is thought as resulting from three distinct components: static, dynamic and ischemic. The static component perhaps most directly correlated with the degenerative changes associated with cervical spondylosis due to the fixed diameter of the spinal canal. Patients are at high risk for the development of myelopathy changes with reduction in canal diameter to 13mm [5]. The dynamic component is secondary to repetitive moments of compressed spinal cord due to foraminal osteophytes & buckling of ligamentum flavum leading to chronic injury. Ischemic factor are likely secondary to compression of small pial and intramedullary arterioles or the larger spinal arteries although venous congestion causes cord ischemia involving the gray and white matter seen in myelopathy for the supporting vascular role.

The majority of patients with symptoms respond well to conservative management in the form of analgesics, cervical immobilization, physiotherapy and anti-inflammatory drugs. Patients with deterioration of symptoms, presence of sensory deficit, motor weakness and non responding to conservative management require surgical intervention. LaRocca [6] suggested that conservative management may be inappropriate for patients presenting with moderate functional disability when first seen and recommended early spinal cord decompression with or without stabilization to halt progression of the disease, possibly improve neurological recovery and eventual functions in patients population [6, 7, 8].

The goals of surgery are decompression of neural elements, restoration of normal alignment, stabilization of pathological

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segment and prevention of further deformity. Two surgical approaches are available: the anterior approach and the posterior approach. Posterior approach would dominate initially, with laminectomy & microdiscectomy as advocated by Scoville [9].

In 1955, Smith and Robinson described and refined an anterior approach involving removal of cervical disc followed by an arthrodesis of the involved segment [10]. Significant contributions were made early by Bailey & Badgley [11], and Cloward [12].

More recently, McAfee [13], Epstein [14] & others [15] have reported excellent neurological recovery following a combined anterior plus posterior decompression and fusion for cervical spondylosis. They also suggested that in patients with multi-level cervical spondylosis associated with degenerative kyphosis or congenital cervical spine stenosis resulting in severe anterior plus posterior cord compression, a circumferential decompression and fusion may provide a better environment for neurological recovery.

The unpredictable and often protracted course of CSM makes evolution of outcome difficult. Furthermore, outcomes from the various studies have been difficult to compare due to lack of uniformity of the population studied in terms of pathology, duration of follow up and assessment criteria.

This study was designed to assess the outcome and complications in patients with cervical spondylosis myelopathy following an anterior approach to cervical decompression and fusion.

Aims and Objectives:

To study demographic (Age, Sex. .), presentation, clinical presentation of Cervical Spondylotic Myelopathy and to seek data with respect to the outcome of the disease, severity of symptoms, preoperative and postoperative modified JOA Score and improvement following surgery (Ant. Approach Surgery).

Inclusion Criteria:

Patient with clinical & radiological diagnosis of Cervical Spondylotic Myelopathy affecting Subaxial cervical spine
Age: >20yrs to <70yrs and having three or less than three level involvement

Exclusion Criteria:

Patients with-Myelopathy, secondary to other causes like vascular, infection, connective tissue disorder, carcinoma. Traumatic myelopathy, congenital myelopathy, previous history of cervical spine surgery.

2. Materials and Methods

This was a prospective, observational study to compare outcome following surgery with anterior approach for cervical spondylotic myelopathy conducted at the department of neurosurgery at NRS MCH with patients

included as per above mentioned criteria's from April 2021 to October 2022. Sample size was 30, with level of alpha at 5%.

Parameters to be studied:

Demographic Parameters: Name, Age, Sex of the patient. Neurological Examination of the patient going for operative intervention Radiological findings with respect to X-ray, MRI cervical spine.

Preoperative & Postoperative modified mJOA Score grading Follow Up at 6 wks, 3 months, 6 months to see outcome following surgery with respect to improvement in modified JOA Score.

Complications (Intraoperative & Postoperative).

Modified Japanese Orthopaedic Association (mJOA) Score	
Category	Score
Motor Dysfunction	
Upper extremities	
Unable to move hands	0
Unable to eat with a spoon, but able to move hands	1
Unable to button shirt, but able to eat with a spoon	2
Able to button shirt with great difficulty	3
Able to button shirt with slight difficulty	4
No dysfunction	5
Lower extremities	
Complete loss of motor and sensory function	0
Sensory preservation without ability to move legs	1
Able to move legs, but unable to walk	2
Able to walk on flat floor with a walking aid	3
Able to walk up and/or down stairs with handrail	4
Moderate to significant lack of stability, but able to walk up and/or downstairs without handrail	5
Mild lack of stability, but able to walk unaided with smooth reciprocation	6
No dysfunction	7
Sensory Dysfunction	
Complete loss of hand sensation	0
Severe sensory loss of pain.	1
Mild sensory loss	2
No sensory loss	3
Sphincter Dysfunction	
Unable to void (complete retention)	0
Marked difficulty in micturition (hesitancy)	1
Mild difficulty in micturition (frequency)	2
Normal micturition	3

TotalScore-18; (The lower the score, the more severe the deficits. Normal Function:-Score-18

Grade-1: 15-17 (mild myelopathy) **Grade-2:** 12-14 (moderate myelopathy) **Grade-3:** 0-11 (severe myelopathy)

3. Result and Analysis

Table1: Age distribution of the patients
Total patients: 30

Age group (yrs)	No	%
<31yrs	01	3.33%
31-40yrs	12	40%
41-50yrs	10	33.33%
51-60yrs	06	20%
>61yrs	01	3.33%

Table2: Sex Distribution of the Patient

Sex	No of cases	%
Male	27	90%
Female	03	10
Total	30	

Table 3: Symptomsat presentation

Symptoms		Present	Absent	%
Neckpain		23	07	77%
Radiculopathy		24	06	80%
Gait disturbance		21	09	70%
Weakness	UL	25	05	83.33%
	LL	27	03	90%
Sensory		26	04	86.67%
Sphincter		13	17	43.33
Autonomic		10	20	33.33

Table 4: MRI Findings

Levels	No of cases	%
Single Disc	09	30%
One levels	13	43.33%
Two levels	07	23%
Three levels	01	3.33%

Table5: Analysis of mJOA Scale

mJOA Scale	Grade0 N. F.	Grade1 Mild	Grade 2 Moderate	Grade3 Severe
Preop	00	01	19	10
Post op (discharge)	00	01	23	06
6wks	00	06	20	04
3 months	00	08	20	02
6 months	03	15	12	00

4. Discussion

Our study group comprised 30 patients with a mean age 44.07 years (table-1). The incidence of males: females in our study was 9: 1 showing a male predominance (table 2). This corroborates with many of the other series. These patients have been symptomatic for a period ranging from 3 months to 2 years. About 13patients (43.33%) had difficulty in bladder and bowel normal function (table3). Epstein et al found 55% patients with CSM having sensory symptoms [16]. The clinical diagnosis was confirmed with x-ray of cervical spine and MRI of cervical spine. The lateral x-ray of the Cervical spine is taken in the neutral position so maintenance of normal lordosis in 10%, patients loss of lordosis in 86.67% and kyphosis in 3.33%. In Cloward's series 12% patients had normal lordosis, 81% patients had straight spine and 7% patients had Frank kyphosis [15].

Other radiological findings include reduced disc space with posterior and anterior osteophytes. The MRI of the cervical spine showed evidence of a narrow spinal canal in all patients including those with multi level stenosis. Anterior spinal cord compression was primarily due to disc osteophyte complex. 9 (30%) patients had compression at single disc protrusion. 13 patients (43.33%) had one functional level involvement, 7 (23%) patients had two functional level involvement (table 6). Although it has been quoted in various studies [16, 17] that multiplicity of levels involved on MRI is linked to the prognosis after surgery, we could not find any study directly showing the prognosis

affected by the number of levels involved. Only two of 30 patients also had significant posterior compression due to hypertrophy of ligamentum flavum, both of these patients had significant relief of symptoms following anterior cervical decompression.

In our study the suggested diameter of the spinal canal at the level of compression was less than 10 mm in all the patients. In a study conducted on MRI findings in CSM by Mitrasu et al found similar observations [18]. Patients with moderate to significant disability secondary to CSM are those patients with mild disability that had failed to improve with non-operating treatment for at least more than three months were selected for surgery.

In 10 patients (33.33%), ACCF (Single level) in 15 patients (50%), ACCF (Two levels) in 5 patients (16.67%). Jingferg Li et al in their series on surgical options for the treatment of cervical spondylotic myelopathy by Anterior approach had a ACDF in 28% of patients, ACCF (single level) in 63% of patients, ACC F (two level)in 3% of patients [19].

Postoperatively, patients were clinically assessed by using mJOA scale at preoperative, postoperative, 6 week, 3 months & 6 months of post operative. Acceptable post operative fusion was found in most of all patients at 6months. Frazer et al had a fusion rate of 97.1% for ACDF with plating, 92. 9% for ACCF with plating and 96.2% for two levels of ACCF with plating. They also stated that the use of plates significantly improves the fusion rate. Such plates were used in all our patients [20].

Sensory improvement is first, followed by improvement in neck pain and radiculopathy followed by gait difficulty and bladder bowel function. At 6 weeks post operative only 8% patients required support to walk. At 6 months 60% patients were able to walk with support and some patients were able to resume light work. Preoperatively 44% of the patients either used to walk with help of someone or with the help of a frame & 10% patients were chair or bed bound.

There are several grading system to study to assess symptoms and the efficacy of the treatment for Cervical Spondylotic Myelopathy. JOA'S Score is one of the more commonly used outcome measures in the literature, developed in 1975 for the global assessment of CSM. The major drawback of the JOA score was that it used the patient's ability to use chopsticks to assess fine motor dysfunction. Since chopstick users are culturally limited to East Asia. Therefore, the adaptation of JOA Score in other countries is difficult and requires changes [21]. Currently modified JOA score, modified by Benzel and colleagues in 1991, is globally used to assess severity in CSM. [22].

In our study we assess patient's severity by using mJOA Scale grading pre operatively and also postoperatively and in follow-up to assess effectiveness of intervention. Pre operatively maximum patients were in grade 2 (19) moderate, in grade 3 (10) severe & in grade 1 (1) mild myelopathy. After surgery through anterior approach patients gradually improve post operatively & in follow up asses by mJOA Scale. At the end of 6 months post operation the maximum number of patients were in grade 1 (15), in

grade 2 (12), no patient was in grade 3.

Our study 16% had postoperative complications (table 9) which was lower than 33% rate. About two patients had a superficial surgical site infection which was managed conservatively with dressing and antibiotics, thus prolonging their Hospital stay.

5. Conclusion

All the patients had significant improvement in their symptoms postoperatively and in follow up demonstrated by improvement & assess by mJOA Score scale improvement with a complication rate of 15% which lead to an increase in the hospital day in form of wound infection in 2 patients, partial dysphagia in 2 patients and implant dislodgement in 1 patient. Fusion was achieved in almost all patients with a follow up of 6 months.

However there is a need for longer follow up for better result analysis and comparison. There were some limitations associated with the study. Rate of the follow up was not as high as expected. Some patients came late after the surgery as they were satisfied with their postoperative results.

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