

The Functional Outcome of Multisegmental Cervical Myelopathy Treated by Anterior Cervical Surgery

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Abstract

Background: Cervical spondylosis is a degenerative condition in which there is narrowing of cervical spinal canal and neural foramina secondarily due to multifactorial degenerative changes. In cervical spondylotic myelopathy there is spinal cord dysfunction. The degenerative changes cause reduction in disc height, facetarthrosis, motion abnormality, spur formation which leads to compression of the cervical spinal cord. **Methods:** In this prospective study 40 patients of cervical myelopathy radiculopathy and myeloradiculopathy were included in the study. After doing the anterior cervical surgery in Multisegmental Cervical Myelopathy, postoperatively all the patients were assessed for the functional outcome using MJOAss at postoperative interval of one month, three months and six months. **Results:** Mild, moderate and severe MJOAss (postoperative) at 6 months was present in 87.5%, 10% and 2.5% of the study population respectively. Hoarseness of voice (10%) was the most common complication followed by dysphagia (5%), graft site infection (2.5%) and myocardial infarction (2.5%) amongst the study population. **Conclusion:** Surgery is preferred in clinically evident Cervical Spondylotic Myelopathy patients. The decision of surgery is made on the basis of disability duration, symptoms and cervical spinal stenosis which are outweighed to the risk of operative intervention. The purpose of surgery is to decompress the spinal cord and stabilise the spinal column.

Keywords: Anterior Cervical Disectomy, Cervical Spondylotic Myelopathy, Corpectomy with Instrumentation

1. Introduction

Cervical Spondylotic Myelopathy (CSM) is a degenerative condition where in there is cord compression in cervical region which leads to progressive neural degeneration in majority of cases. Cervical spondylosis begins in the middle age which gradually progress with degenerative changes in cervical spinal cord. The degenerative changes which occur in disc causes reduction in the disc height, costo vertebral arthrosis and osteophyte formation which causes compression on the cervical spinal cord from the front, also ossified posterior longitudinal ligament and

ligamentum flavum hypertrophy causes compression from back.

Cervical Spondylotic Myelopathy in which motor and sensory disturbance are seen, lower extremity are affected first with gait instability with spasticity and paresis followed by involvement of the upper extremity in the form of decreased strength and weak hand grip and loss of fine finger movement, with the involvement of bowel and bladder in late stage.

Aetiology of Cervical Spondylotic Myelopathy is multifactorial in which small spinal canal size is an important predisposing factor. Surgery is indicated in both

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clinically and radiologically evident CSM as the disorder is gradually progressive without any intervention. There are various methods for decompression of the cervical spinal cord such as anterior cervical discectomy with instrumentation, corpectomy with instrumentation and posterior cervical decompression with instrumentation.

The surgical approach was decided on the basis of certain clinical and radiological parameters. This study shows that if the surgical approach is chosen correctly, surgery in the multi segmental cervical myelopathy can result in significant improvement in the clinical outcome of this patient.

2. Aims and Objectives

- To study the functional outcome of Multisegmental Cervical Myelopathy treated with anterior cervical surgery.
- To study the complications of anterior cervical surgery.

3. Methodology

The present study was conducted in department of Orthopaedics at a Medical college and tertiary healthcare center. A total of 40 patients were included in the study after satisfying the eligibility criteria.

The detailed clinical history, complete general, systemic examination and pre-operative investigation findings were noted in a predesigned proforma.

After doing the anterior cervical surgery in multisegmental cervical myelopathy, postoperatively all the patient were assessed for the functional outcome using modified Japanese Orthopaedic Association Scoring System at postoperative interval of one month, three months and six months.

To study postoperative complications of procedure the patient were assessed after 24 hours and on subsequent schedule follow up. Any postoperative complication was also noted.

The study participants were informed to report to health facility as and when required apart from scheduled visit. The data was analysed by appropriate statistical software.

4. Eligibility Criteria

4.1 Inclusion Criteria

- Patients with myeloradiculopathy.
- Patients with predominant anterior compression and radiculopathy.
- Patients with Multisegmental Cervical Myelopathy <3 levels.

4.2 Exclusion Criteria

- Patients with traumatic injury of cervical spine, infective (Kochs spine), tumors and congenital abnormality of cervical spine.
- Patients previously operated for cervical myelopathy.
- Patients not willing to participate in study.
- Patients with ossification of posterior longitudinal ligament.
- Patient with Multisegmental Cervical Myelopathy in more than 3 levels.

5. Procedure

For anterior cervical approach standard Smith Robison method was used. The exact procedure performed such as decompressive discectomy, corpectomy with instrumentation decided on the basis of site of compression, cervical spinal alignment and number of vertebral level involved.

5.1 Operative Procedure

5.1.1 Positioning and Anaesthetic Consideration

When the patient was under GA, precautions were taken not to extend the patients neck beyond voluntary range of motion which may jeopardize even more the narrow canal.

For anterior cervical approach the patients were positioned supine with neck neutral or if safe slightly extended. Admitted patients with myelopathy, hypertension and resultant diminished spinal cord perfusion were avoided and these required careful monitoring of fluid status and blood pressure.

5.1.2 Other Preoperative Preparation

Perioperative antibiotics reduce the occurrence of wound infection provided the first dose is given before skin incision and that average is continued for 24 hours. We gave antibiotics pre and postoperatively to all the patients included in this series.

5.1.3 Anterior Approach: Incision

The skin incision was taken transversely on the right side with reference to the palpating the cartilage which is at the level of C5 vertebral body level extending from midline to posterior border of sternocleidomastoid.

5.1.4 Approach to Spine

The skin incision should be continued through the platysma which is mobilised. The anterior border of sternocleidomastoid must be identified and fascia investing this muscle is incised at this point, so that the muscle can be retracted laterally. The omohyoid muscle is

seen crossing the field at approximately level of C4 and usually this muscle is retracted superiorly or inferiorly. Sternocleidomastoid, Carotid sheath and contents are retracted laterally. Strap muscles are mobilized and retracted medially. Trachea and oesophagus are retracted towards the midline to allow the palpation of anterior cervical spine. The prevertebral fascia over the spine may be opened in midline. The medial edges of the longus colli muscles on each side should be elevated sharply and retracted laterally to provide maximum exposure of vertebral bodies and disc space. With an X-ray localization of disc space is done with a spinal needle. Further surgical procedure (discectomy, discectomy with fusion, with instrumentation, partial corpectomy, subtotal corpectomy) were decided according to number of vertebra involved.

6. Results

Table 1. Preoperative MJOAss (amongst study population)

Preoperative MJOAss		Frequency	Percent
Valid	Mild	18	45.0
	Moderate	21	52.5
	Severe	1	2.5
	Total	40	100.0

Table 2. Surgery amongst study population

		Frequency	Percent
Valid	ACCFI	4	10.0
	ACDF	26	65.0
	ACDFI	10	25.0
	Total	40	100.0

As seen in table 1, mild, moderate and severe MJOAss (preoperative) was present in 45%, 52.5% and 2.5% of study population respectively.

As seen in the table 2, majority of patients (65%) treated by anterior cervical discectomy with fusion, followed by anterior cervical discectomy and fusion with instrumentation (ACDFI) (25%) and anterior cervical corpectomy and fusion with bone grafting with instrumentation (ACCFI) (10%) amongst study population.

As seen in the table 3, mild, moderate and severe MJOAss (preoperative) at 6 months was present in 87.5%, 10% and 2.5% of study population respectively.

As seen in the table 4, hoarseness of voice (10%) was the most common complication occurred followed by dysphagia (5%), graft site infection (2.5%) and myocardial infarction (2.5%) amongst study population.

As seen in the table 5, there was significantly increase in MJOAss at 1 month, 3 month and 6 month as compared to preoperative values.

Table 3. Post operative MJOAss (6 month) amongst study population

Post operative MJOAss (6 months)		Frequency	Percent
Valid	Mild	35	87.5
	Moderate	4	10.0
	Severe	1	2.5
	Total	40	100.0

Table 4. Complications amongst study population

Complications		Frequency	Percent
Valid	Absent	32	80.0
	Dysphagia	2	5.0
	Graft site Infection	1	2.5
	Hoarseness of Voice	4	10.0
	Myocardial Infarction	1	2.5
	Total	40	100.0

Table 5. MJS at various time interval amongst study population

Time points	pre op	1 month	3 month	6 month
MJOAss	14.15 ± 1.2	14.65 ± 1.2	14.98 ± 1.3	15.90 ± 1.4
P value		0.0001	0.0001	0.0001

7. Discussion

Cervical Spondylotic Myelopathy is a disorder of the cervical spinal cord which occurs due to the compression of the cervical spinal cord due to multifactorial causes such as degenerative changes, degenerative disc disease, osteophyte formation, ossification of posterior longitudinal ligament and hypertrophy of ligamentum flavum.

Compression of spinal cord and repeated minor injuries over the affected segment leads to neuronal degeneration at the affected level which results in alteration in neurologic pathway. CSM is gradually progressive disorder in which patient presented with gait instability with spasticity and paresis followed by upper limb extremity involvement in the form of weak hand grip and in advanced stage with bowel and bladder involvement. Majority of patient requires surgical option as treatment modality since the disorder is gradually progressive which leads to neuro deficit. Treatment modality such as Anterior cervical disectomy with fusion, corpectomy with instrumentation for anterior approach and decompressive laminoplasty with or without instrumentation for posterior approach.

The purpose of surgical intervention in cervical spondyloticmyelopathy is decompression of the spinal cord regardless approach, earlier decompression leads to improvement in spinal cord morphology with improvement in blood supply and reduction in odema and neurological recovery and also to achieve spinal cord stability by instrumentation and bone grafting to prevent further compression and loss of cervical lordosis. Cervical Spondylotic Myelopathy was most common cord dysfunction over the age of 55 years.

In the present study, the most common age group amongst study population was 56 to 65 years (52.5%) followed by 43 to 55 years (30%) with the mean age of 59.55 ± 7.03 years. Similarly in the study conducted by

Montgomery DM et al Cervical Spondylotic Myelopathy was most common cord dysfunction over the age of 55 years⁵.

In the present study, there was higher number of male (62.5%) amongst study population as compared to female (37.5%). This findings correlate well with the study conducted by Thiago Pereira Coutinho et al., in which male contributes 70.58% of study population⁶.

In the present study, the most common diagnosis amongst study population was C4-C5 C5-C6 radiculopathy (27.5%) followed by C4-C5 C5-C6 myelopathy (17.5%). Similarly in the study conducted by Bertalanffy H. et al. majority of patient presented with radicular symptoms, followed by myelopathic symptoms and combination of both⁷.

In the present study, Anterior Cervical Disectomy and Fusion with bone graft (ACDF) (65%) was the most common surgical procedure performed followed by Anterior Cervical Disectomy and Fusion with Instrumentation (ACDFI) (25%) and Anterior Cervical Corpectomy and Fusion with bone grafting with instrumentation (ACCFI) (10%) amongst study population. Since disectomy is a good option for the treatment of one or two levels, in contrast to what the literature says about the treatment of multiple levels^{2,8}. This findings correlate well with the study conducted by Thiagopereiracoutinho et al., in which disectomy with anterior arthrodesis was the most common type of surgery in their study⁶.

Both anterior and posterior approaches are used for Cervical Spondylotic Myelopathy to decompress spinal cord, nerve root and to achieve spinal column stability by instrumentation and bone grafting. The best approach depends on 1. Site of compression in spinal column, 2. Alignment of spinal coloumn, 3. Involvement of the vertebral level, 4. Risk of post operative dysphagia and laryngeal nerve injury and 5. Adequacy of exposure.

In the present study, hoarseness of voice (10%) was the most common complication that occurred followed by dysphagia (5%), graft site Infection (2.5%) and Myocardial Infarction (2.5%) amongst the study population. The incidence of dysphagia an graft related complication increases as the number of level increases. Difficulty in swallowing and voice changes can occur following anterior cervical surgery.

In the present study, there was a significant increase in MJOAss at 1 month, 3 month and 6 month as compared to preoperative values. This findings correlate well with the study conducted by Vitzthum et al.,⁹ in which 43 patients with myelopathy undergoing surgery with an anterior approach were analyzed retrospectively, where patients were followed up for a minimum period of six months, and was found that the JOA and Nurick scores showed statistically significant improvement after surgery, where $p < 0.001$ for both, as was the case in our study. Similar findings was observed in the study conducted by Emery SE, 2001¹⁰, Suda K, 2003¹¹, Houten JK, 2003¹².

8. Conclusion

Surgery is preferred in clinically evident Cervical Spondylotic Myelopathy patients. The decision of surgery is made on the basis of disability duration, symptoms and cervical spinal stenosis which are out weighted to the risk of operative intervention. The purpose of surgery is to decompress the spinal cord and stabilise the spinal column. The choice of surgical approach is based on site of compression, number of vertebral involvement and clinico radiological parameters.

9. References

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How to cite this article: Tupe PP and Agrawal MO. The Functional Outcome of Multisegmental Cervical Myelopathy Treated by Anterior Cervical Surgery. *MVP J. Med. Sci*. 2020; 7(1):123-128.