Research Article

Cervical Spondylotic Myelopathy Surgicaly treated by Median Cervical Corpectomy

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Abstract
Cervical spondylotic myelopathy is a common degenerative disorder that affects the cervical spine. A combination of circumferential compression causing spinal canal narrowing and instability are the cause of progressive neurological deterioration. till now , the most effective method for decompression, reconstruction and stabilization of patients with cervical spondylotic myelopathy remains controversial. In this study, 40 patients with cervical spondylolic myelopathy were treated by median cervical corpectomy, iliac crest bone graft and instrumentation using anterior plating system. The clinical presentation, the operative details, as well as the outcome and complications are discussed. Thirty three out of 40 patients (82.5%) showed improvement of their neurological condition. Although the operation has a long learning curve, yet the results are superior than that encountered in patients treated with laminectomy or than the natural history of non-.surgically treated patients.
Key words: Cervical spondylotic myelopathy, cervical corpectomy, cervical spine, spinal fusion.

Introduction
There is a universal perception among neurosurgeons that the currently available surgical options yield suboptirmal results in the treatment of cervical spondylotic myelopathy, in contrast to cervical radiculo-pathy. Cervical laminectomy seems to offer the least favorable results, where the aim of this operation is to stop progression[1].

The anterior approach for median cervical corpectomy, combined with internal fixation using bone graft and metallic platting system is a safe and effective method for treatment of cervical spondylotic myelopathy [2].

In this study, we discuss our experience for treatment of cervical spondylotic myelo-pathy using median cervical corpectomy and fusion using bone graft and platting system.

Material and Methods
Between 2010 and 2014, 40 patients with complex spondylotic myelopathy under-went median cervical corpectomy and fusion. There were 32 males and 8 female patients who ranged in age from 42 to 69 years with a mean age of 61 years. Out of these 40 patients, 26 had a single level corpectomy, 10 had a 2 levels corpectomy and 4 had 3 levels coipectomy. The duration of symptoms ranged between I and 8 years with the mean duration of symptoms was 3.7 years. All of the patients complained of slowly progressive deterio-ration of neurological functions (Table 1). The commonest patients' complaints was gait disturbance were it was found in 31 patients (77.5%), followed by clumsiness of the hands in 30 patients (75%), neck pain in 12 patients (30%), upper limbs pain in 11 patients (27.5%). sensory complaint in 9 patients (22.59%) and bladder dysfunction in 5 patients (12.5%). All of the patients had plain X-ray cervical spine done including flexion-extension views.

Magnetic resonance imaging (MRI) was the investigation of choice in diagnosing cervical spondylotic myelopathy and was done for all patients. Computed tomography (CT) and myelography were not done to patients included in this study.

Surgical technique:
After induction of general anesthesia, and insertion of an endotracheal tube, the

patients were positioned supine on the operating table with the neck slightly extended and chin turned left 15°. The skin incision was always done on the right side of the neck. All of the patients who had a single level corpectomy had the skin incision done transversely in one of the neck creases, patients with 2 or 3 levels corpectomy had an oblique transverse incision along the anterior border of the stemomastoid muscle. Once the skin incision was completed, the platisma was divided and retracted. The superficial fascia overlying the stemomastoid muscle was sharply divided along the medial edge of the muscle. The carotid artery was palpated and identified, and using sharp and blunt dissection, the plane between the carotid artery and the jugular vein laterally and the esophagus and the trachea medially was entered leading to the anterior surface of the cervical vertebral bodies. At this stage, confirmation of the anatomical level was done using a lateral X-ray with a spinal needle inserted in the disc space. Once the proper level was identified, the operating microscope was introduced. We start by removing the discs at either side of the body intended to be removed using rongeures and curettes. This was followed by partial corpectomy which was done using bone nibblers to remove the bulk of bone of the vertebral bodies. Final thinning out of the bone was done using a high speed air drill. The thinned out bony rim and osteophyte adjacent to the posterior longitudinal ligament were removed using curettes and fine Kerrison roungeures. Iliac crest bone graft was then taken and fashioned to the size of the corpectomy done. With the anesthetist applying neck traction, the bone graft was fit in place. Anterior cervical plating was done in all patients. The wound was then closed in layers over a suction drainage. Cervical hard collar was worn for 12 weeks and the patients were allowed out of bed on the 1st postoperative day.

Postoperative follow-up

All of the patients had a plain X-ray cervical spine done on the 1st postoperative day and was assessed clinically and radiologicaly at discharge and al 3,6,9 and 12 months period.

The scoring system described by Nurick (Table 2)[3] was used to quantify and compare the neurological function pre and post-operatively. Patients were followed up for intervals ranging between 7 and 36 months (mean 18 months).

Results

Thirty three patients out of 40(82.5%) showed improvement of at least one Nurick score grade. All of the 11 patients (100%) who presented with radiculopathy impr-oved. Gait disturbance improved in 21 out of 31 patients (67,7%), clumsiness of hands improved in 21 out of 30 patients (70%). sensory complaints improved in 6 out of 9 patients (66.7%), neck pain improved in 7 out of 12 patients (58.3%), while 2 out of 5 patients with bladder dysfunction improved (40%).

Five out of 40 patients (12.5%) showed no change from their preoperative Neurick score grade.

Two patients out of 40(5%) showed neuro-logical deterioration, one of whom improved to his preoperative Neurick score grade in 5 days while the other showed slower improvement over a period of 3 months.

Fusion was documented in 34 patients (85%). A stable fibrous union developed in 6 patients (15%). No unstable pseudo-arthrosis was encountered in this study and no patient needed re-operation to stabilize the spine.

Donor site pain was the commonest postoperative complication encountered in this study as it occurred in all of the 40 patients included in this study with a variable degree of severity. Pre-incision infiltration of the wound site with Marcaine greatly decreased the severity of donor site pain.

Although the larynx and the trachea were not perforated in any case, dyspnea was observed in 6 patients (15%). Five out of 6 patients had transient dyspnea and was most probably due to prolonged retraction of the larynx. Only one patient had dyspnea due to postoperative hematoma which was

treated by immediate evacuation and the patient recovered fully.

Seven patients (17.5%) had transient postoperative dysphagia. Only one patient had dysphagia accompanied with hoarseness of voice due to ipsilateral recurrent laryngeal nerve concussion. This patient recovered fully over a period of 6 weeks. Superficial wound infection at the donor site occurred in 2 patients (5%).

There was no CSF leak, nerve root injury, vertebral artery injury or esophageal injury.

Table (1): Preoperative symptoms in 40 patients included in the study.

Symptoms	Number of patients	Percentage
Gait disturbance	31	77.5%
Clumsiness of the hands	30	75%
Neck pain	12	30%
Radiculopathy	11	27.5%
Sensory complaint	9	22.5%
Bladder dysfunction	5	12.5%

Table (2): Nurick grading system of neurological function.

Nurick grade	Definition
0	Signs and symptoms of root involvement but without signs of spinal cord disease.
I	Signs of spinal cord disease without difficulty in walking.
2	Slight difficulty in walking that does not prevent full-time employment.
3	Difficulty in walking that prevents full-time employment or daily tasks but does not require assistance with walking.
4	Ability to walk only with help or with the assistance of a walker.
5	Chairbound or bedridden.

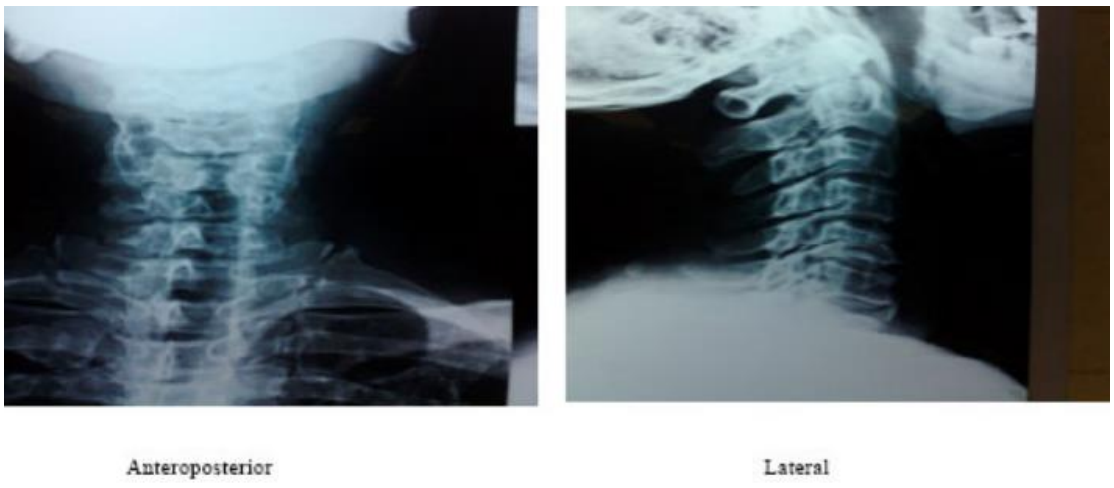

Figure (1): Plain X-Ray showing Cervical Spondylotic Myelopathy

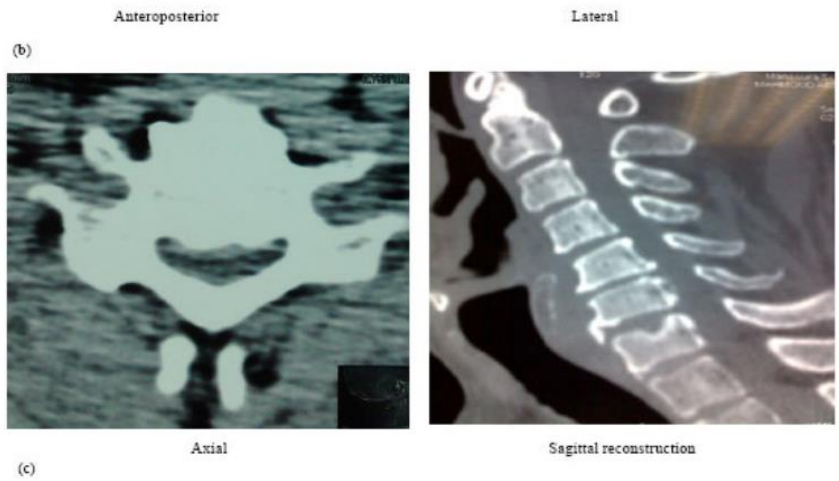

Figure (2): CT Scan showing Cervical Spondylotic Myelopathy

Figure (3): MRI showing Cervical Spondylotic Myelopath

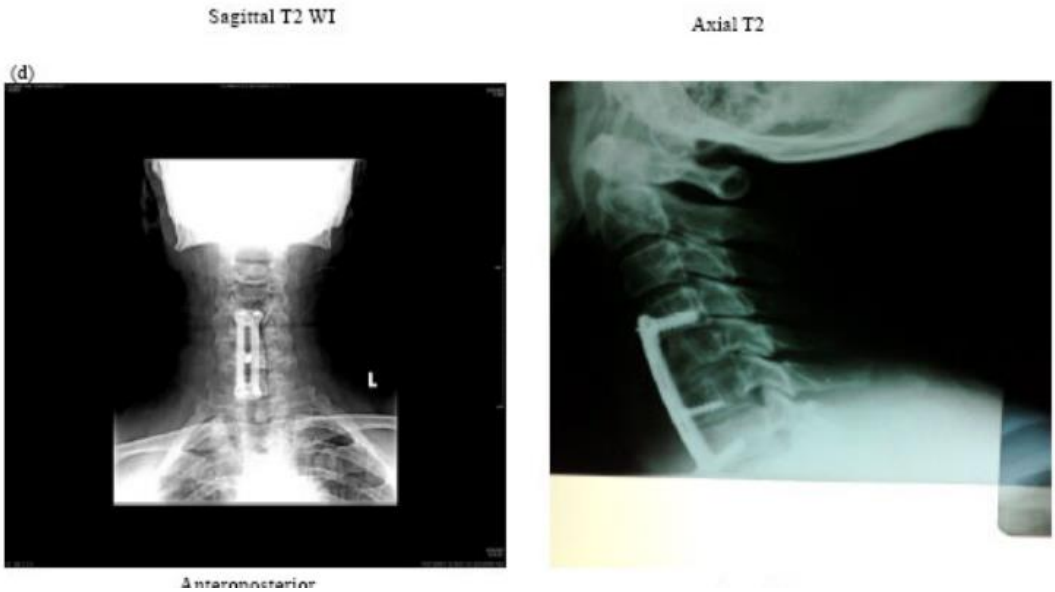

Figure (4): Post operative plain X-Ray showing internal fixation using bone graft and metallic platting system

Figure (5): Post operative C.T. showing internal fixation using bone graft and metallic platting system

Discussion

Cervical spondylotic myelopathy is one of the most common degenerative disorder affecting the spine. It is also one of the most common causes of spinal cord dysfunction in patients over the age of 5o years,[4]. The natural history of cervical spondylotic myelopathy has not been fully deleniated in the literature, however, from the currently available data we can conclude that cervical spondylotic myelopathy usually presents insidiously over a long period of time. Patients either follow a course of gradual progressive decline or have periods of stabilization followed by episodic decline, [5]. At this time, there is no way to predict which patient will ultimately deteriorate. Because of this uncertainty, surgical intervention may be indicated for mild to moderate signs of myelopathy [6].

Cervical spondylosis is a problem that usually starts in middle age with progressive degenerative changes in cervical discs. This degeneration leads to motion abnormalities, loss of disc height, and arthrosis in the uncovertebral and the facet joints. This circumferential compression caused by spondylosis leads to spinal canal narrowing and a static impingement of the spinal cord. There is also a dynamic component of spinal cord compression because extension of the cervical spine can cause buckling of the ligamentum flavum and flexion can cause disc bulging [7].

Cervical motion and instability can cause pinching of the spinal cord between the anterior chondro-osseus spurs and the posterior ligamentous redundancy and hypertrophied facets [8].

The most effective method for decompression, reconstruction, and stabilization of patients with cervical spondylotic myelopathy remains controversial [9].

In 1955, Robinson and Smith described an anterior cervical approach from decompression and stabilization of segmental cervical disease in which they placed tricortical horseshoe-shaped iliac crest graft into the intervertebral space. In 1958, Cloward used bone graft to perform anterior cervical decompression and fusion. Anterior decompression and fusion has since been considered useful in the treatment of cervical spondylotic myelopathy[10,11,12,13,14].

Forty patients with cervical spondylotic myelopathy were included in this study. There were 32 male patients and 8 female patients with a mean age of 61 years. This was consistent with many clinical series [15,16,17,18,19,20] where the patient population in most series in the literature consisted of males to females in a 3:1 ratio and the mean age of patients was above 60 years.

In our series, the mean duration of symptoms was 3.7 years which was much longer than that stated by Chiles, et al., where the duration of symptoms in their series was 16.9 months [21].

In our series, the clinical picture was that of a slowly progressive myeloradiculopathy. The commonest patients' complaint was gait disturbance, followed by clumsiness of hands, neck pain, upper limb pain and bladder dysfunction. This was consistent with many series in the literature, where slowly progressive neurological deterioration was the main indication for surgical intervention, [22,23,24].

In our series, 33 patients (82.5%) showed improvement of at least one Nurick score grade. This was consistent with the results of Mayer, et al., [25] and Macdonald, et al., [26]. Radiculopathy was the most favorable pre-operative symptom as it improved in all patients in our series.

In our series, 2 patients (5%) showed transient neurological deterioration. This was comparable to the results achieved by Mayer, et al., [25].

Solid fusion was documented in 34 patients (85%) while stable fibrous union was encountered in 6 patients (15%). No unstable pseudoartherosis was encountered in this study and no patient needed subsequent surgery to achieve osseous fusion. This fusion rate is comparable to the results achieved by Wang, et al., [27,281 and Epstein [29J. In these series, as well as in ours, the use of anterior platting system greatly enhances bony fusion and even if osseous fusion was not achieved, a stable non-union usually results and rarely we need re-operation to achieve osseous fusion.

Complications encountered in this series were minor and transient. Commonest complications seen were donor site pain, transient dysphagie and dyspnea as well as transient vocal cord paralysis.

Predictive factors influencing outcome:

Previous reports[6,30,31] investigated several clinical factors as potential predictors of outcome after surgery for treatment of cervical spondylotic myelopathy. These factors include age, severity of myelopathy, duration of symptoms and extent of compressive disease. In our series, we assume that the following factors are useful in predicting the outcome.

1. Age: The older the patient, the less the expected improvement.
2. Level of Nurick score: The higher the score, the less expected improvement.
3. Duration of symptoms: The longer the duration of symptoms, the less expected improvement.
4. Spinal cord signals changes on MRI: Presence of cord edema or cord malacia lessen the expected improvement.

Conclusion

This series documents that median cervical corpectomy and fusion is a safe, effective treatment for cervical spondylotic myelopathy. Results are much superior than patients treated with laminectomy or than the natural history of non-surgically treated patients. Indeed the operation has a long learning curve, but the results achieved are worthwhile. Better results occur in younger patients with short duration of symptoms and good preoperative neurological condition.

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