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DECOMPRESSIVE LAMINECTOMY WITH LATERAL MASS FIXATION AND FUSION IN CERVICAL SPONDYLOTIC MYELOPATHY

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Abstract:

Cervical laminectomy with lateral mass plating and fusion is the technique of choice for posterior cervical stabilization in cases of cervical spondylotic myelopathy (CSM).

The aim of the study is to evaluate the outcome of decompressive laminectomy of CSM with lateral mass fixation. The study was conducted on 25 patients operated for cervical decompressive laminectomy with lateral mass fixation and fusion with age group of 40 to 71 years at PGIMER Chandigarh. 21 patients were males and 4 patients were females. Each patient was evaluated surgically using Japanese Orthopaedic Association scoring system (JOA) and radiologically by cervical spine X-ray in anteroposterior and lateral projections. The mean clinical follow up was one year. The mean preoperative JOA score was 10.64±2.4, while the mean maximum postoperative JOA score was 13.64±2.6 and the mean final JOA score was 13.24±2.7. Young age was found to be associated with greater recovery. The cervical lordosis was maintained in all patients except or in one patient. Four patients had late onset of cervical pain. No major complications were noticed in the course of the study. Thus demonstrating the safety and efficacy of cervical laminectomy with lateral mass plating and fusion in the management of CSM. This technique is an important part of a spine surgeons armamentarium

Key words: *Cervical, Fusion Lateral mass, Laminectomy, Myelopathy*

Introduction

Cervical spondylotic myelopathy (CSM) is defined as spinal cord compromise arising from degenerative changes in cervical vertebral column that can potentially cause devastating and irreversible impairment of neurological function.

The treatment for CSM is predominately surgical aiming to relieve mechanical compression of spinal cord by increasing the space available.[1,2]. Traditional methods of achieving this goal has included either laminectomy alone or anterior decompression with fusion[1,3]. While laminectomy alone has been associated with complications like Swan neck deformity, segmental instability, neurological deterioration, pseudo arthrosis and instrumentation failure[2,4,5]. Laminoplasty has been suggested as an alternative to these procedures, even it has been associated with problems like neurological deterioration, postoperative root paresis and limitation of range of motion[2,5,6].

Recently the technique of decompressive laminectomy with lateral mass plating and fusion have been recommended as a means of achieving adequate decompression, while minimising the short comings of the above said procedures[6,9]. A protocol was instituted to use cervical laminectomy with lateral mass fixation in the management of CSM among patients presenting in orthopaedics clinics at PGIMER, Chandigarh.

Aims And Objectives:

1. To evaluate, in patients of cervical spondylotic myelopathy, the efficacy of cervical laminectomy with lateral mass plating and fusion in:
- Relieving the neurological symptoms,
- Maintaining lordosis of the cervical spine.
2. To see for any complications arising from the above procedure.

Patients And Methods:

The study was conducted on 25 patients having CSM with clinical and radiological evidence who underwent decompressive laminectomy with lateral mass plating using modified Japanese Orthopaedic score, segmental alignment on X-rays and cervical canal diameters on MRI.

The mean age of patients included in this study was 51.44 years ranging 40 years to 71 years. 21 of the patients were males, while 4 were females.

Each study patient was evaluated clinically and radiologically with AP and lateral cervical spine X-ray and MRI. Patients with single level disc disease, those with kyphotic deformity and those with other pathology mimicking symptoms of CSM (multiple sclerosis, amylotropic lateral sclerosis, vertebral artery insufficiency) were excluded from the study. This was a retrospective and prospective non-randomized study. On lateral view cervical spine X-ray, each patient was classified as per classification of cervical alignment proposed by Toyama et al[13] The patient with non lordotic Spine alignment were excluded from the study. The patients were followed up at 3 months, 6 months, 1 year and 2 years with minimum follow up of one year. At, follow up, the patients were evaluated clinically to see for improvement in neurological function which was evaluated by using JOA scoring.

Clinical Presentation:

A total of 25 patients had multiple complaints of 3 months to 2 years duration at the time of presentation. Numbness/paraesthesia in the hands was seen in 21 patients, clumisiness/ weakness of hands seen in 19 patients, gait disturbance encountered in 19 patients, complained of numbness of feet in 11 patients, pain in the neck or shoulder region in only 6 patients and one of the patient has urinary incontinence with complete loss of bladder control.

Statistical Analysis

The maximum recovery (in percentage) was calculated using the following formula:

$$\frac{\text{Maximum post-operative JOA score - Pre-operative JOA score}}{\text{17 (Maximum possible JOA score) - Pre-operative JOA score}} \times 100$$

The final recovery (in percentage) was calculated using the following formula:

$$\frac{\text{Final post-operative JOA score - Pre-operative JOA score}}{\text{17 (Maximum possible JOA score) - Pre-operative JOA score}} \times 100$$

The Anova test was used for comparing the recovery among the three different age groups.

The unpaired t-test was used for comparing the recovery based on the sex distribution.

Surgical Procedure:

All the patients were operated in prone position with skeletal traction applied through tongs, and with the head in position of slight flexion, to allow good posterior access to the cervical spine. A radiographic marker was used to identify the vertebral levels to be operated. Standard posterior midline approach to the cervical spine was used. The paraspinal muscles were reflected laterally subperiosteal

on both sides, and the posterior aspect of the laminae were exposed upto the lateral extent of the facets. The level was re-confirmed with radiographic marker. The lateral mass was identified by marking the medial and lateral borders, and superior and inferior margins of the facets. The Magerl technique for screw insertion was used. The starting point for screw insertion in the lateral mass was chosen 2.0 mm medial to the center of the above four boundaries. Drill holes with a 2.0 mm drill bit were drilled, directing the drill 25 to 30 degrees lateral, and 30 to 40 degrees cranial, parallel to the facet joints. The plates were applied bilaterally after giving them a lordotic contour, and 2.7 mm cortical screws of appropriate length were inserted into the pre-drilled holes. While tightening the screws the neck was brought into extension to maintain the lordosis. Laminectomy was then performed at the affected levels using a high-speed burr, bone nibblers and rongeurs to decompress the dura, and adequacy of decompression was checked by the return of dural pulsation. The removed laminae and spinous processes were cut into small pieces and used as bone graft for posterior fusion Hemostasis was achieved.

Philadelphia collar was applied postoperatively to give extended support. The patient was permitted to sit with support and collar from the first post-operative day and onwards.

Results:

The study population was classified as patients having mild disease i.e. JOA score ≥14 in 3 patients and as having moderate to severe disease i.e. JOA score ≤13 in 21 patients. The maximum postoperative JOA score was 16.33±0.6 in 3 patients and the maximum postoperative JOA score was 13.27±2.6 in 21 patients. The preoperative JOA score was 11.00±2.5 in group A (symptoms <12 months) and 10.36±2.5 in group B (symptoms >12 months). The maximum JOA score in group A was 14.18±2.9 and in group B was 13.21±2.5.

The mean preoperative JOA score in this study was 10.67±2.4. The mean final JOA score was 13.24±2.7. The recovery was graded as excellent in 4 patients, good in 8 patients, fair in 9 patients and poor in 4 patients. This data shows that surgery in young patients is associated with better results.

Complications:

No major complication was noted in the course of disease, only 4 patients (11%) had cervical pain and 1 patient (4%) had loss of cervical alignment.

Discussion:

There is a lack of consensus regarding the optimal surgical technique for the management of moderate to severe CSM. A number of factors impact the choice of surgical procedure for CSM: Location of compressive pathology, spinal alignment, number of levels involved, clinical variables (e.g. age), surgeon preference, and even patient preference.[8]

Cervical spondylotic myelopathy (CSM) is essentially a degenerative disorder which manifests itself only after the cervical spine has been subjected to a few decades of wear and tear. The age of the patients included in the present study ranged from 40 to 71 years. An analysis of other studies on CSM reveals a striking similarity in the age of presentation.[4] In the current study, the patients were classified on the basis of age as <50 years of age (group I), 51-60 years of age (group II), or more than 60 years of age (group III). The maximum recovery in the first group was 64.62±21.4%, while in the second and third groups, it was 46.49±19.9% and 39.05±9.1% respectively. The final recovery in the group I was 58.61±22.8%, group II was 39.79±17.6% and in group III was 33.42±9.2%. The current study included 21 males and 4 females. The maximum recovery was 51.99±20.9% among males and 64.88±25.4% among females, while the final recovery was 45.15±19.9% among males and 61.76±21.5% among females. A statistical analysis of this data revealed this difference to be statistically insignificant. This study agrees with the study by Lee et al in noting that sex has no bearing on the results of surgery for CSM.[9]

In our study the most common symptoms were sensory abnormalities in upper limbs followed by clumsiness / weakness of hands and gait abnormalities. This analysis demonstrates the universality of presentation of CSM.[4-6]

In the current study, a kyphotic deformity of the cervical spine was not seen to develop in any of the patients at follow-up. The normal lordotic alignment of the cervical spine was maintained in all except in one of the patient, in whom it changed to straight. However, this was not associated with any neurological deterioration in this patient.

In the current study, high signal intensity changes in the T2-weighted images were noted in 12 patients, and low-signal intensity changes in the T1-weighted images were noted in 3 patients. A statistical analysis of the results of surgery, as evaluated using the JOA scoring system, revealed that the difference between the results of surgery for patients with high-signal

intensity changes on T2-weighted images and patients without signal intensity change was not significant. These findings suggest that atleast some of the high-signal intensity changes on T2 weighted images may represent reversible changes within the spinal cord, white low-signal intensity changes on T1-weighted sequences probably represent irreversible damage to a portion of the spinal cord, thus accounting for a poor prognosis.

On the basis of pre-op JOA score, the patients were classified as those having mild disease i.e. JOA score> 14 (Group I) and as having moderate to severe disease i.e. JOA score <13 (Group II). The maximum recovery was 77.78±19.2% in group I, and 50.81±20.2% in group II. The final recovery was 77.78±19.2% in group I, and 43.72±18.9% in group II. A statistical analysis reveals a significant difference in the results among the two groups.[10]

The patients in the present study were also divided into two groups on the basis of duration of symptoms. The maximum recovery was 61.74±25.2% among patients having symptoms for <12 months (Group A), while that among patients having symptoms for >12 months (Group B) was 48.01±16.9%. The final recovery was 53.93±25.0% in group A, while that in group B was 42.99±18.1%. The results of surgery in the two groups were compared statistically and no significant difference was found. Kumar et al found no such correlation between the duration of symptoms and the results of surgery.[11]

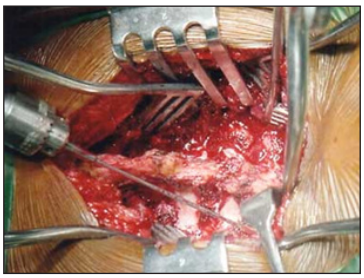
Conclusion:

The present study effectively establishes the safety and efficacy of cervical laminectomy with lateral mass plating and fusion in the management of cervical spondylotic myelopathy. The procedure was seen to improve the functional outcome of patients, while being associated with minimal morbidity.

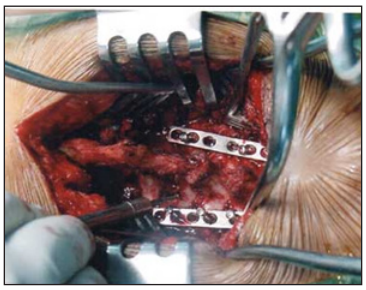
More prospective and controlled trials and a longer follow-up would help in better assessing the role of cervical laminectomy with lateral mass plating and fusion in maintaining the stability of neurological recovery.

Surgical Procedure:

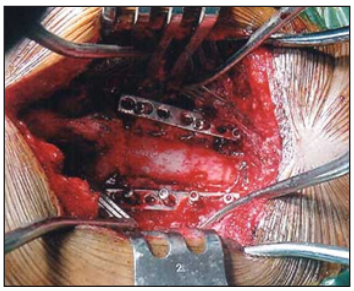
Positioning with cervical traction on



Drilling using Magerl technique



Laminectomy using high speed burr



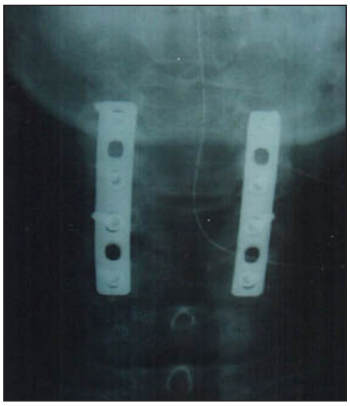
After laminectomy

Cases:

Pre-operative lateral view

Pre-operative MRI

Post-operative lateral view

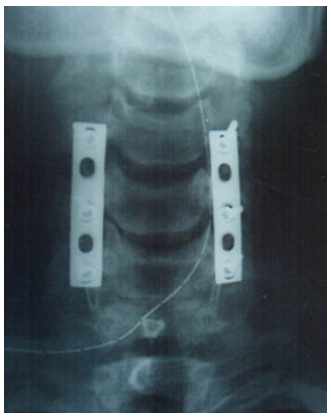


Post-operative AP view

Pre-operative lateral view

Pre-operative MRI

Post-operative lateral view



Post-operative AP view

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