

En Bloc Laminectomy in Cervical Spondylotic Myelopathy

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Abstract

Background: Cervical spondylosis is a problem that usually starts in the middle age with progressive degenerative changes of the cervical disc. This degenerative leads to motion abnormalities, loss of cervical disc heights and arthrosis in the uncovertebral and facet joints. These degenerations of the cervical spine leading to formation of the chondro-osseous spurs ultimately can lead to compression of spinal cord and myelopathy.

Methods: The study was conducted in department of Orthopaedics. The patient presented with progression of neurological sign and symptom of cervical spondylotic myelopathy, presence of myelopathy for 6 months or longer or severe spinal cord compression were included in the study considering the inclusion and exclusion criteria. Total 18 patients were considered for study and surgery were carried out on them. Adequate follow-up was done and evaluation was carried out using various criteria.

Results: Total of 18 patients with multilevel cervical spondylotic myelopathy were treated with En bloc cervical laminectomy. 16 patients were considered for final analysis as 2 patients could not fulfill the criteria for follow-up because of death. There were 14 male and 2 female age ranging from 35-79 years. The duration of symptom ranges from 4 months to 96 months with the average duration of 32.16 months. Neurological evaluation of patients was done using the JOA score. The average JOA score before surgery was 10.2 points with 50% of the group scoring above 10 points. At the 6 months follow-up, 15 patients had neurological improvement and 1 patient had same neurological status. 4 patients had complications in the form of CSF leak and wound dehiscence.

Conclusion: Under the appropriate condition, a multilevel cervical laminectomy (En bloc) is an effective management strategy for the treatment of cervical spondylotic myelopathy. Careful preoperative assessment of the pathological anatomy, clinical presentation and medical comorbidities is essential to achieve operative success. Patients requiring surgery with evidence of static lordosis are ideal candidate for posterior decompression.

Keywords: cervical spondylotic myelopathy, En bloc, cervical laminectomy.

Introduction

Cervical spondylosis is a problem that usually starts in the middle age with progressive degenerative changes of the cervical disc. This degenerative leads to motion abnormalities, loss of cervical disc heights and arthrosis in the uncovertebral and facet joints. These degenerations of the cervical spine leading to formation of the chondro-osseous spurs ultimately can lead to compression of spinal cord and myelopathy.

Prevalence of degenerative changes is about 10% by the age of 25 years and climb as high as 95% by the age of 65 years. However, not everyone with degenerative cervical disc has symptoms. Cervical spondylotic myelopathy is the most common cause of spinal dysfunction in the elderly. It is also the

most common cause of the nontraumatic spastic paraparesis and quadriparesis. Three symptom complexes related to cervical spondylosis includes axial pain, radicular pain and myelopathy.

Cervical spondylotic myelopathy is a constellation of symptoms and physical findings, including various pattern of motor and sensory disturbances. Myelopathy can present as an upper motor neuron dysfunction, gait disturbance, reflex abnormalities and bowel or bladder dysfunction. Long tract signs are the hallmark of myelopathic patient. The pathophysiology of cervical spondylotic myelopathy is a multifactorial. Both static and dynamic forces contribute to the compression, distortion and ischaemia of the spinal cord resulting in injury that often extend beyond the limits of the compression pathology. Existing literature suggest that operative intervention reliably arrests the progression of myelopathy and may lead to functional improvement in the majority of the methods.

Methods

The study was conducted on 18 patients in department of Orthopaedics with following criteria

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Table 1: Schatzker classification of tibial plateau fractures

Case	1	2	3	4	5	7	8	9	10	11	12	13	14	16	17	18
Pre Opt Grade	3	3	1	5	4	4	4	4	5	4	2	4	2	4	3	2
1st Month	3	2	1	5	3	3	3	3	4	4	1	3	2	4	3	2
6th Month	1	1	1	4	3	3	3	1	3	3	1	2	1	3	2	1

Inclusion criteria:

Multilevel cervical spondylotic myelopathy (3 or more level) with significant and progressive neurological deficit not responding to conservative.

Multilevel ossification of posterior longitudinal ligament with significant and progressive neurological deficit not responding to conservative treatment.

Normal or lordotic cervical curvature.

Presence of congenital canal stenosis.

Failed laminoplasty.

Exclusion criteria:

Fixed kyphotic deformity.

Cervical instability.

Single level compression.

Those patients who had symptoms and signs of cervical myelopathy were thoroughly assessed for their neurological status and document. They were further investigated with MRI of the cervical spine to evaluate the degree of compression and the level of cord compression. The curvature of cervical spine was evaluated using static lateral X ray and presence of kyphotic deformity was excluded from the study. Those patients who fulfilled the above inclusion criteria clinically and radiologically were further evaluated as per the preformed proforma and were included in the study after their consent for the same. Routine blood investigations and other investigations required for their fitness for surgery was done. Preanaesthetic fitness was done. The severity of the spondylotic myelopathy was graded using the Japanese Orthopaedics Association score (1), Nurick’s scale (2) and visual analogue scale. Selected patients were evaluated for spinal cord compression and canal diameters from MRI. Cord compression ratio was obtained by calculating the maximum sagittal cord diameter at the disc level is divided by the maximum transverse cord diameter at the same level (3).

Surgical Procedure

After anesthesia and positioning and after cleaning and draping of the cervical spine vertical midline incision was given at the posterior aspect of the neck. Paraspinal muscles were elevated in a subperiosteal fashion exposing the spinous process and the lamina. Lamina to be excised are identified using the anatomical landmark such as prominent C2 spinous process and thereby appropriately counting the spinous process. However, it was confirmed with the intraoperative imaging.

Drilling is begun with 3.5 mm round fluted burr. The drilling was performed with constant irrigation. Two troughs are drilled just medial to the facet joints, beginning with lower lamina to be excised and extending upwards. When the two troughs are completed, the loose spinous processes are lifted away from the dura and the ligamentum flavum remaining is cut using fine scissor or a fine Kerrison ronger. After this procedure the dura was visible and meticulous hemostasis was achieved by controlling the bleeding from the epidural vein. Cord decompression was identified intraoperatively by the cord pulsation. Wound closure was done in layer and Philadelphia cervical collar was given to the patient postoperatively.

Postoperative management

Gentle bedside physiotherapy of the limbs was started from day 1 as tolerated by the patient. Patient was advised bedrest for 3 days. On 4th day patient was allowed sitting with support, patient was allowed ambulating with help of the walker after 5 days. Philadelphia collar was given 3 months postoperatively. Patient was discharged from hospital after complete removal of sutures. Patients were called up for follow-up regularly at 1 month, 3 months, 6 months, 1 year and 2 years. During follow-up neurological status was recorded and scoring was done using the various criteria. These parameters were compared with preoperative values. Results were evaluated by the Japanese Orthopaedic criteria. A percentage improvement score was also obtained by doing the calculation (3).

Postoperative score / Preoperative score
 % Improvement = -----

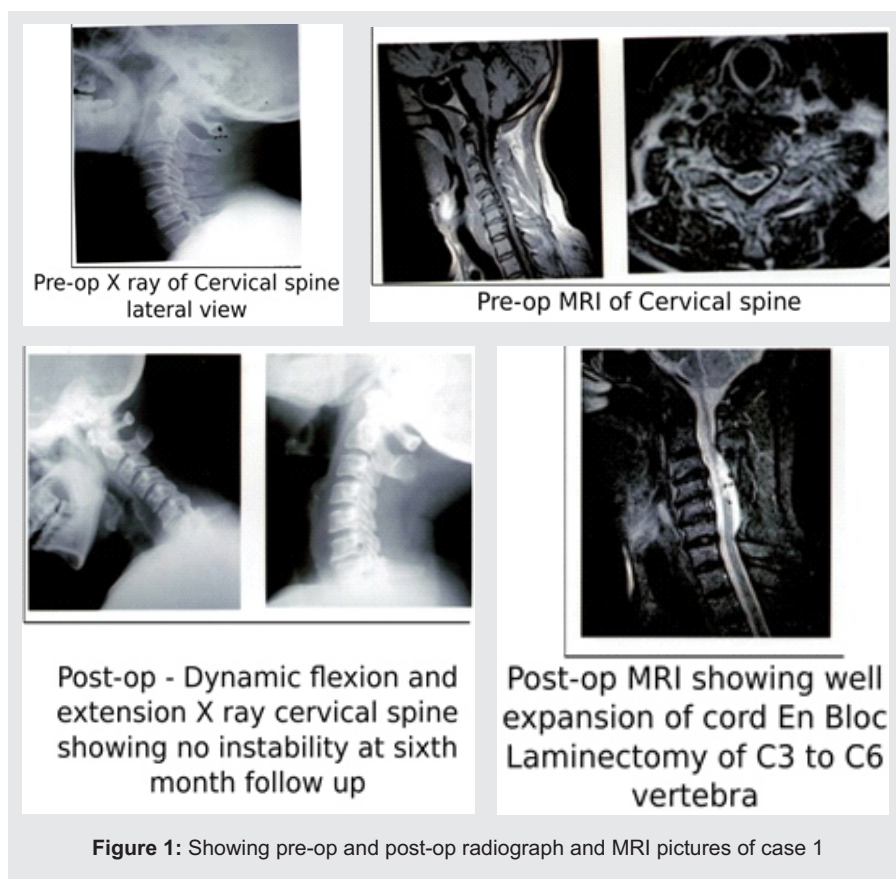
Normal (17) / Preoperative score
 At the 6 months visit radiograph of the cervical spine was obtained in flexion and extension lateral view were obtained to determine the stability of cervical spine.

Results

A total of 18 patients, 16 male (88.8%) and 2(11.2%), age ranging from 35 to 79 years with the mean of 50.1 years. The duration of symptoms was 4 months to 96 months with progressive neurological deficit. Average duration of symptoms was 32.16 month. 8 patients which amounts 44% of the total had duration of symptoms for less than 1 year, 33.3% of the total had a symptoms for more than 2 years. Pain at the neck was commonest complaint. All 18 patients had varying degree of weaknesses in the upper limb. 13

Table 2: Case wise relationship of cord compression ratio, JOA score and percentage of improvement.

Case	1	2	3	4	5	7	8	9	10	11	12	13	14	16	17	18
CCR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JOA score	12	11	13	5	11	11	6	8	9	9	15	9	14	10	12	14
%of improvement	1	50	50	17	50	50	18	67	38	38	100	50	67	0	60	67



patients had (72.3%) had a weakness in both upper and lower limb and also had sensory loss. 9 patients (50%) had a symptom of bowel and bladder involvement. 3 patients (16.6%) were bed ridden and 10 patients (55.5%) had a difficulty in walking and most of them were using walking aids.

8 patients (44.4%) had a Nurick's score of 4. One patient of 1 and 3 patients (16.6%) had a score of 2 and 3 each. 3 patients (16.6%) who were bed ridden had a score of 5. The mean Nurick's score was 3.61. (Table no. 1)

The mean JOA score was 10.2. The most frequent score was 9 and 11. The least cord compression ratio was 0.21 in which the clinical symptom was of 96 months and had low activity. The mean cord compression ratio for the 18 patients is 0.36. Maximum compression was seen at the level C4C5 amounting for 50%. The average transverse cord diameter at the maximum compression for the 18 patients was calculated to be 7.1 mm. the average surgical time was 123.3 min. there were 5 (27.7%) perioperative complications in the form of CSF leak in 4 cases and 1 case was having wound gaping. The mean postoperative hospitalization was for 16 days. Out of 18 cases only 16 patients were considered for the evaluation of final as 2 cases there was postoperative death. The cases which was operated in later part of the study were followed for 24 weeks. For those operated in early part the follow-up duration was 45. 25 weeks. The average change in the Nurick's score at the 6 months was 1.3 except in 1 case to remained bed ridden. The mean JOA score at the minimal evaluation was 10.5 which rose to 11.5

on the first column and on the 6 months the average was 13.3. The percentage of improvement on the first follow-up, 14 patients (87.5 %) had some improvement.

The mean percentage of improvement on the first follow-up was 20.12% the average percentage of improvement raised to 48.87%. 1 patient showed no neurological improvement, however, there was no neurological deterioration after the surgery amongst the study group.

In the study group, there was no significant correlation between the extent of improvement in JOA score with the age of the patient, duration of the symptom, the sagittal cord compression diameter or the transverse cord diameter. However, there was a correlation with the preoperative JOA score and cord compression ratio with the postoperative outcome. Patient who had preoperative JOA score did better after surgery and their percentage of improvement was

higher as compared to those who had lesser JOA score. There is also a correlation between the improvement percentage and the cord compression ratio. Higher the cord compression ratio better is the post-surgery improvement. Table no. 2 shows relationship of cord compression ratio, JOA score and percentage of improvement.

Discussion

Cervical spondylosis is often a progressively debilitating condition, and often operative intervention is frequently warranted to alter the natural history. Surgery for cervical spondylosis has been a popular form of treatment for nearly 50 years. Neurological improvement has been noted in a patient with significant myelopathy or progressive myelopathy that decompression surgery found widespread use. This was evident by the study conducted by Epstein and Epstein (4) in which 69% of 1241 patients treated operatively had a neurological improvement while 64% of 114 patients treated conservatively had no improvement and 26% of them had neurological deterioration. Snow and Weiner (5) also quoted that patient with generalized cervical spondylosis, if managed conservatively fare much worse than those treated with a decompressive laminectomy. The determination of the most appropriate surgical management for patient with multilevel stenosis secondary to spondylosis has often been a topic of debate. The concepts that are integral to this debate include concerns regarding

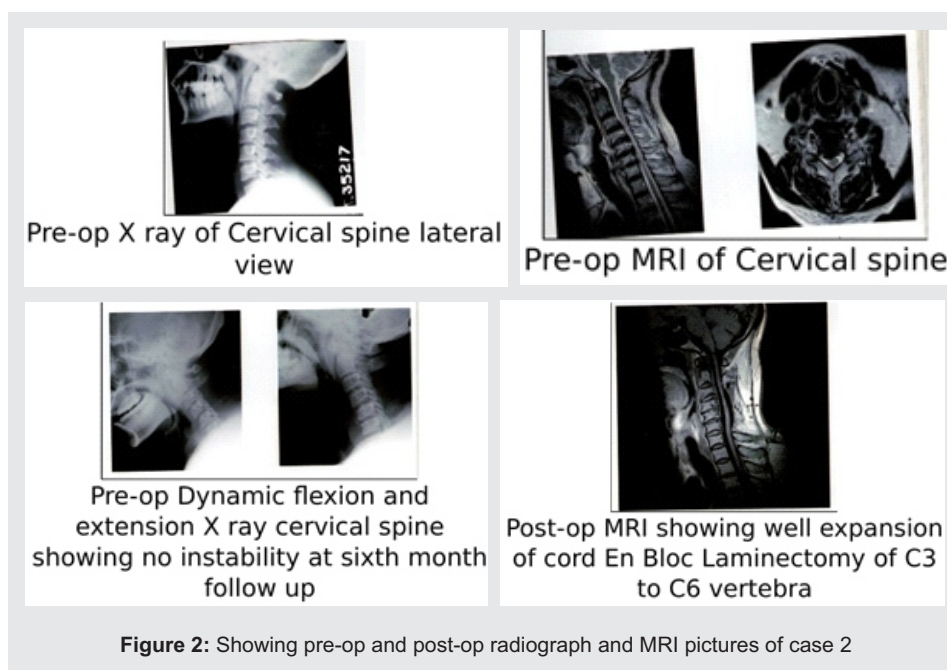


Figure 2: Showing pre-op and post-op radiograph and MRI pictures of case 2

approaching multilevel ventral compression lesion with an anterior cervical approach which includes the attendant risk of nonunion, graft dislodgement, and inadequate decompression. There is also a concern regarding the appropriateness of approaching a ventral compression with posterior approach and the creation of unstable spine with multilevel decompression surgery. Law et al (6) recommended posterior approach when there are more than two level involvement in our study the average operative time for En bloc cervical laminectomy was 123.3 min. as compared to an average of 165 min. for laminectomy procedure observed by Kaminsky et al (7). The average operative time for laminoplasty is documented 160 min by Bhalodiya et al (8). and Kaminsky et al (7) had an average of 201 min for the open door laminoplasty. Our study of En bloc cervical laminectomy had shorter operative time as compared to both the studies, even compared with the laminoplasty procedure. The current study shows that the En bloc cervical laminectomy brought a high number of patients with satisfactory neurological recovery within a short period of 6 months. In a study of 90 patients by Snow and Weiner (5) carried out multilevel cervical laminectomy, 77% of patient were improved, 13% without change and 10% worse at follow-up. The reason for the failure of this procedure in 23% of patients who did not improve was not identified in most cases. Reasons that were noted included persistent cord compression from anterior osteophyte and / or disc material, demyelinating disease, post-operative infection, lack of significant cord compression on preoperative radiological studies suggesting that the patient myelopathy was not caused by cervical spondylosis and spinal cord atrophy, while in our present study we could attribute the possible reasons for failure to improve in the functional outcome to be a prolonged duration of symptoms, severe cord compression and iatrogenic injury to

the dura during surgery. The JOA score is a more accepted heading as it has two advantages. It is comprehensive including motor and sensory level in arms and legs as well as bladder function. Secondly this numerical score for functional and neurological status allow simple statistical analysis for evaluating the final outcome. Complications in cervical laminoplasty encountered are postoperative C5 paresis, pain at C5/C6 root or segment, closure of the open door, excessive bony growth at the graft site, bleeding from epidural veins while preparing gutter or hinge and injuries to the cord or root (7,8). The incidence of kyphosis after dorsal

procedure has been reported as high as 21%. As many as 53% of the patients under 18 years of age, who undergo a multilevel laminectomy will develop a progressive kyphosis (9). The occurrence of instability of spine proved to be a marked disadvantage of laminectomy. Therefore, when instability is anticipated, decompression as well as stabilization is to be considered (10) Laminectomy of C2 increases the risk of post-operative destabilization. In C2 laminectomy the major part of musculus semispinalis cervicis and muscoli suboccipitalis, which are attached to the spinous process of C2 are damaged and loses their functions causing the risk of postoperative destabilization (11). Cervical lordosis must be present for a successful posterior decompression. After decompression, a bow-string effect occur as the spinal cord migrates dorsally away from the anterior structures, thereby providing decompression. This migration also decreases the axial tension on the cord and improves the perfusion to the cord. Kyphotic deformity of the cervical spine is a contraindication to posterior decompression because the spinal cord cannot be expected to migrate away from the anterior compression structure in the kyphotic position (6). A significant correlation was observed between the transverse area at the maximum compression level, age at surgery, and preoperative JOA score, with the rate of improvement after surgery and these were recognized as a predictive factors for the surgical prognosis (3). the most important factor that predicts poor neurological recovery is the transverse area of less than 30 mm at the maximum cord compression. Other factors, on order of importance were age at surgery, pre-operative neurological score and number of level involved (12). Following figure no.1 and Figure no. 2 shows pre-op and post-op radiograph and MRI pictures of case 1 and case 2 respectively.

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