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Multilevel Anterior Cervical Fusion Versus Posterior Cervical Laminectomy and Lateral Mass Fixation or laminoplasty for Cervical Spondylotic Myelopathy

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Abstract

Background Data: Optimal surgical treatment of cervical myelopathy is timely essential before progressive spinal cord demyelination occurs.

Purpose: To compare the neurological outcomes and associated complication of anterior and posterior approaches in the treatment of multilevel cervical spondylotic myelopathy (CSM).

Study Design: Retrospective comparative clinical case study.

Patients and Methods: Between January 2010 and January 2015, a total of 48 consecutive patients with Multilevel CSM were operated in Suez Canal University hospital. Multilevel anterior cervical fusion (ACF) were performed in 25/48 patients, posterior laminectomy lateral mass fixation in 18/48, and laminoplasty in 5/48 patients. All patients had MRI and plain radiographs preoperative and postoperative radiographs. The neurologic status was assessed preoperatively and postoperatively of all patients using the Japanese Orthopaedic Association (JOA) score and modified Nurick disability index (DI) score. Postoperative complication was documented. Regular follow up at 3 months, 6 months, and then yearly after surgery.

Results: Preoperative JOA score was (anterior=10.8±2.1, posterior=11.4±2.1), and modified Nurick DI score was (anterior=3.2±0.5, posterior=2.9±0.64).However, the patients' preoperative radiological imaging using Cobb's angle was lower in the posterior group (posterior=6±3.6; anterior=9.9±4.5).At last follow-up, significant improvements were reported in both groups regarding JOA scores, and Nurick DI score with no significant differences among the two groups with respect to postoperative JOA score (P=0.451), and postoperative Nurick DI (P=0.216). Post-operative Hirabayashi's recovery was relatively better in anterior than posterior group (anterior, 29.1±19.4%, posterior, 24.6±19.1%). Kyphotic angle improved from 9.9±4.5 to 13±3.3 degree and from 6± 3.6 to 7±3.4 degree in anterior and

posterior group respectively. Fusion rate was better in posterior group 13/18 than anterior group 11/25 with significance (P=.081). The overall complication rates of the two groups did not differ significantly (P=0.237).
Conclusion: Multilevel CSM with Kyphotic angle can be treated by posterior laminectomy and lateral mass fixation with good fusion and neurological outcome. Instrumented fusion prevents progressive kyphosis when laminectomy is used. Laminoplasty is recommended for younger patient to preserve function with no kyphotic progression. Anterior surgery had good outcome in younger patient, lower number of the affected levels, and with less MRI T2 signal changes. (2015ESJ092)
Keywords: Cervical spondylotic myelopathy, multilevel anterior cervical fusion, cervical laminectomy, laminoplasty, lateral mass fixation.

Introduction

Cervical myelopathy is a disease characterized by compression of the cervical spinal cord by static and/or dynamic motion leading to a variety of neurological long tract signs and symptoms. Cord compression causes myelopathy either by a direct mechanical or vascular insult of the cord.[17,24] Early identification and treatment is essential for optimal results before irreversible progression of spinal cord demyelination occurs.[16,24]

Although there have been several studies on the diagnosis and management of multilevel cervical spondylotic myelopathy (3 or more intervertebral segments involved), the optimal surgical approaches remain undetermined.[18,20]

The Surgical option of multilevel cervical spondylotic myelopathy (CSM) including anterior cervical discectomy and fusion (ACDF), anterior cervical corpectomy and fusion, and 'skip' corpectomy operated through anterior approaches, or Laminectomy, laminectomy and fusion, and laminoplasty done through posterior approaches.[2,24,29] Laminectomy without fusion has a tendency for post laminectomy kyphosis.[2,24] The combined anterior/posterior procedures sometimes needed, although its technical difficulties, increased blood loss, and prolonged surgical times.[22] The suitable choice of procedure doesn't depend only on surgeon training and patient preference, but also the number of involved levels, and the location of spinal cord compression, instability with sagittal alignment, associated axial neck pain and neurological state, and accompanied patient co-morbidities.[24]

For example, 1-3 Multilevel ACDF can be associated with lower complication and high rates of fusion. But When 3 or more levels are involved the reverse is true.[4,20] Furthermore, in many patients, the stenosis extends beyond the disk level to adjacent osteophytes that mandate removal by corpectomy (long segment or skipped) and fusion with a relative risk of neurological compromise in long standing compressed cord.[4,20] The overall aim of Posterior approaches is to provide canal decompression which is sometimes insufficient in ventral compression pathology.[20,26] Therefore, the optimal approach to provide satisfactory decompression with minimal complications is still unachievable.[20] The recent publication of a large, prospective multicenter study found that there is relatively no difference between anterior or posterior approaches for CSM.[9,10]

In light of these controversies, we conducted a retrospective study in CSM patient to compare the neurological outcomes and associated complication of anterior and posterior approaches in the treatment of CSM.

Patients and Methods

Between January 2010 and January 2015, a total of 48 consecutive patients with multilevel CSM were operated in Suez Canal University hospital. Patient consent for data acquisition was obtained along with the operative consent that was taken before surgery. Patients with progressive cervical myelopathy and radiological evidence of three or more level compressing cord were included in this study. Patient suffering from associated neurological diseases (e.g. Parkinsonism, motor neuron disease, etc.), cervical trauma or tumor, history of previous cervical surgery, sever kyphotic deformity, and patients with ossified posterior longitudinal ligament were excluded.

Anterior Discectomy:

The exposure of the cervical spine was performed through a standard left sided Robinson-Smith anterior approach.[31] For more than three levels, the skin was opened in an oblique incision anterior to

the anterior border the sternocleidomastoid. We used polyetheretherketone (PEEK) cage filled with Nan crystalline hydroxyapatite and cancellous bone from the iliac crest.

Laminectomy:

Under general anesthesia, a wide laminectomy was performed followed by bicortical mini polyaxial screw fixation of C3 to C6 lateral mass or C7 pedicle. We used the modified Magerl method for screw insertion.[13,27] The size of all screws used was 3.5 X 14 mm, except C7 which usually purchased with 18 mm. The system used was the Vertex Reconstruction System (Medtronic Sofamor Danek, Memphis, TN). The screw tip should never overpass the posterior fourth of the vertebral body.[33] Bone grafts from laminectomies were implanted into bilateral facet joints after decortications.

Laminoplasty:

With the patient in a prone position an Expansive Open-door Cervical laminoplasty was performed.[8] Sutures were placed through the facet joint capsules, passed through the base of the spinous processes and tied to fix laminae in place.[8]

Postoperatively, neck collar was worn for 2 months for anterior group patients, and 2 weeks for posterior group ones.[29] Follow up Information, data collected from patients included age, sex, duration of neurological symptoms, presence or absence of chronic illnesses, radiographic findings, and the JOA scores pre and postoperative. Regular follow up was organized at 3 months, 6 months, and then yearly after surgery. Recovery rate (RR) was calculated by the Hirabayashi's method.[3] Recovery rate RR was defined as an RR was 50% or greater and poor recovery if RR was less than 50%.[21]

Recovery Rate = ×100

The Nurick disability index (DI) was also used in assessment of the outcome.[7] Outcome was graded according to DI into; excellent, good, fair and poor.[3] Intraoperative assessment was designed to calculate the time of surgery, the amount of blood loss, levels of decompression, and postoperative complication and hospital stay.

Postoperative complication was documented. Radiographic evaluation was done in every patient. Plain X-ray, CT, and MRI were used. Cobb angle between C3-C7 was used. The angle between the vertical lines was defined as positive when there was a kyphosis in the cervical spine and negative when it was lordosis. Flexion and extension X-ray films were done only when instability was suspected.

The degree of cervical stenosis was defined by the mean Pavlov ratio at levels C3 through the C7.[1] MRI cervical spine was defined to measure significant anterior or posterior CSF/cord compression and cord signal intensity in T2-weighted image.[3,22]

CT taken with a slice thickness of 3 mm. The axial thin slices to verify the vertebral artery (VA) foramen and the sagittal slices including the facet joint were checked. It used postoperatively to clarify fusion described below. It also checked screw violation of the VA foramen or the facet joint. Furthermore, lateral mass fractures were also identified.[13,29]

Instrumentation failure was diagnosed by either screw or rod breakage. Anterior fusion was assessed by dynamic lateral radiography and defined by the following; presence of bridging trabeculae across the fusion site; absence of motion between the spinous processes on flexion–extension X-rays,[12] or motion less than 2 mm.[29] In the posterior fusion using screw, more definition was added, including: (1) changes in Cobb angle more than 5^{o} in the sagittal plane during follow up, (2) screw pullout from the lateral mass,[28] and (3)absence of radiolucent area around the screw sites or across the fusion site.[21] A sagittal reconstructive CT scan was used if there was fusion failure to assess new bony trabeculae formed across the fusion side, or presence of radiolucent lines around the screw site.[21]

Statistical Analysis:

Data analysis was performed using SPSS for Windows version 20 (SPSS, Inc., Chicago, IL). Data analyses were expressed by the mean±SD. Subgroups were compared by Chi-square ($\chi 2$) test, when appropriate. Student's t-test was used to test mean differences between groups. The pre and post-surgical management was assessed using a paired t-test. Statistical significance was determined at the 95% level of confidence. The results were considered statistically significant at $P<0.05$.

Results

Of total 48 patients, ACF was performed in 25/48 patients, laminectomy and lateral mass fixation in 18/48 patients, and laminoplasty in 5/48 patients, accounting for anterior group of 25 and posterior

group of 23 patient. No significant differences were found between the two groups in the pre-operative demographic parameters including; ages, sex, chronic illness, or durations of symptoms. (Table 1) The patients' preoperative neurological conditions using JOA score was 10.8±2.1 and 11.4±2.1 in anterior and posterior group respectively. Whereas, the modified Nurick DI score was 3.2±0.5 and 2.9±0.64 in anterior and posterior group respectively.

The canal diameter according to Pavlov ratio was relatively equal in both group (anterior=0.74±0.06, posterior=0.74±0.04), Ishihara's curvature index cervical index (CI) and Cobb's angle were lower in the posterior group (posterior, 0.48±11.69; anterior, 9.12±9.21), and (posterior, 6±3.6; anterior, 9.9±4.5) respectively. (Table 1) The majority anterior group patients had three to four level operations (23/25), while all patients in the posterior group had four to five level operations (23/23). The anterior and posterior group patients had comparable mean operating time (anterior=159±30 min, posterior=153±26 min). Mean blood loss was more in posterior than anterior group patients (anterior, 151.6±34.12 ml; posterior, 225.22±35.91 ml).

After surgery, patients in the anterior group stayed in the hospital for 5.5±1.8 days, whereas patients in the posterior group stayed for 6±1.8 days. During follow up, 3 patients were lost. The follow-up period was 24±8.2, range from 8-40 months. At the final follow-up, there were a significant neurological improvements in both groups in both the JOA and Nurick DIscores. The JOA score improved in anterior group from 10.8±2.1 to 12.7±1.2, and posterior group from 11.4±2.1 to 12.8±1.2), whereas the NurickDI improved in anterior group from 3.2±0.5 to 3.9±0.66, and in posterior group from 2.9±0.64 to 4±0.56). (Table 2, 3)

Pre-operative positive cervical cord signal on T2-MRI was significantly affecting the neurological outcome (anterior, JOA 0.041, Nurick DI .087, and posterior JOA 0.002, Nurick DI 0.00). The majority anterior group patients had pre-operative lordosis (13/25) or straight (9/25) angle, while all patients in the posterior group had straight (9/23) or kyphotic angle (9/23).

The postoperative outcome of the Cobb's angle was not significant in the anterior group (p = 0.039) comparable to the posterior group (P=0.001), however, the difference of the Cobb's angle between anterior and posterior groups was not significant (P=0.532).The mean post-operative Cobb's angle difference was relatively high in anterior group than the posterior group (anterior=13±3.3 degree, posterior=7±3.4 degrees). Also, analysis of Cobb's angle revealed that correction of kyphotic angle improved from 9.9±4.5 to 13±3.3 degree in anterior group and from 6±3.6 to 7±3.4 degree in posterior one. (Table 2, 3) (Figures 1-4)

Although the pre-operative instability was significant different in both groups (P=0.001) in which 6/23 of cases were unstable in the posterior group compared to 2/25 cases were unstable in anterior group. In post-operative, the fusion rate was more on posterior 13/18 (72%) than anterior group 11/25 (44%) with relatively significant relationship (P=0.081). The preoperative Pavlov ratio of cervical canal diameter improved in both groups from (anterior=0.74±0.06, posterior=0.74±0.04) to (anterior=0.77±0.5; posterior, 0.86 \±0.019) in the post-operative period (P=0.001). (Table 4)

Although no significant differences were found among the two groups with respect to postoperative total JOA score (P=0.451), postoperative total Nurick DI (P=0.216), and postoperative total recovery (P=0.880).Post-operative recovery rate (Hirabayashi's method) was relatively better in the anterior rather than the posterior group (anterior=29.1±19.4%, posterior=24.6±19.1%). (Table 4)

In the anterior group, one patient had deep venous thrombosis, one had dysphagia and dysphonia (disappeared after two months), one had post-operative deterioration improved three months later. One patient had an adjacent segment disc herniation with cord compression mandated reoperations. (Table 5)

In the posterior approach group, 2 patients had C5 palsy and radiculopathy (recovered after 6 months), and one patient developed cerebrovascular accident. Axial pain was reported in 3 patients and two of them had no improvement. Facet violation presented during operation in two cases, and one case presented with malposition of screw toward the vertebral artery canal with no complication. No instrumental failure or instability was observed. (Table 5) The overall complication rates of the two groups did not differ significantly from each other (P=0.237). (Table 4)

Table 1. Demographic, clinical and radiological data for the anterior and posterior group.

Variable	Anterior Group	Posterior Group
	Mean±SD	Mean±SD
Age	53.1±8.8	52.04±9.5
Symptoms Duration	12.8±8.3	14.1±7
PreOp JOA	10.8±2.1	11.4±2.1
Nurick	3.2±.5	2.9±.64
PreOp Cobb's angle	9.9±4.5	6.6±3.6
Blood loss	151.60±34.12	225.22±35.9
Pavlov	0.74±.06	0.74±.04
Hospital Stay	5.5±1.8	6±1.8
PostOp JOA	12.7±1.2	12.8±1.1
PostOp Nurick	3.9±.66	4±.56
PostOp Pavlov	0.77±.05	0.86±.019
PostOp Cobb's Angle	13±3.3	7±3.4
Recovery	29.1±19.1	24.6±19.1

Table 2. Comparative between Variables Pre and Post Operative for the Anterior Group.

PosOp / PreOp	JOA	Nurick	Ishihara	Pavlov	fusion rate	Cobb's angle	Morbidity	Recovery
JOA	0.236	0.51	0.682	0.382	0.498	0.271	0.394	.061
Nurick	0.52	0.25	0.553	0.428	0.460	0.969	0.472	0.291
T Signal	0.041	.087	.93	0.230	.111	0.211	0.55	0.139
Spine alignment	0.281	0.427	0.000	0.573	0. 587	0.013	0.22	.130
Stability	0.569	0.692	0.101	0.653	0.859	0.501	0.589	0.886
Cobb's angle	0.533	0.249	0.154	0.627	0.407	0.039	0.134	0.730
Operated level	0.954	0.615	0.258	0.351	0.432	0.065	0.220	0.675
Ishihara's	0.640	0.334	0.000	0.050	0.499	0.254	0.333	0.257
Pavlov	0.151	0.029	0.511	0.156	0.388	0.392	0.256	0.199
Hospital stay	0.728	0.531	0.755	0.313	0.414	0.488	0.315	0.812

JOA: Japanese Orthopaedic Association

Table 3. Comparative between Variables Pre and Post Operative for the Posterior Group.

PostOp / PreOp	JOA	Nurick	Ishihara	Pavlov	fusion Rate	Cobb's angle	Morbidity	Recovery
JOA	0.11	0.016	0.416	.846	.721	.195	.197	.030
Nurick	0.035	.010	0.214	0.792	0.606	0.355	0.162	0.083
T Signal	0.002	0.000	0.335	0.578	0.944	0.287	0.320	0.506
Spine alignment	0.081	0.050	0.001	0.466	0.158	0.002	0.854	0.470
Stability	0.622	0.169	0.97	0.986	0.918	0.545	0.585	0.784
Cobb's angle	0.88	0.056	0.013	0.335	0.505	0.001	0.535	0.229
Operated level	0.693	0.265	0.165	0.165	0.313	0.281	0.687	0.532
Ishihara's	0.003	0.010	0.000	0.737	0.249	0.014	0.344	0.353
Pavlov	0.757	0.831	0.583	0.163	0.235	0.285	0.724	0.579
Hospital stay	0.528	0.654	0.414	0.799	0.391	0.570	0.298	0.621

Table 4. Comparative pre and postoperative finding between two groups.

Levene's Test for Equality of Variances		
Variances	**F**	**Sig.**
Age	0.038	0.847
Symptoms Duration/mos	0.361	0.551
Pre JOA	0.120	0.731
Nurick	0.077	0.783
Chronic Illness	0.018	0.895
T signal	2.247	0.141
Spine Alignment	0.047	0.830
Stability	13.546	0.001
Pre Cobb's angle	4.834	0.033
Blood loss	0.369	0.546
Operative Time	2.042	0.160
Operative Level	2.563	0.116
Pavlov	0.190	0.665
Hospital Stay	0.095	0.760
Post JOA	0.579	0.451
Post Nurick	1.573	0.216
Post Pavlov	12.164	0.001
Fusion Rate	3.177	0.081
Post Cobb's Angle	0.396	0.532
Complication	1.508	0.234
Recovery	0.023	0.880

Table 5. Post-operative Complication Finding in both Group.

Complication	Anterior	Posterior	Total
DVT	1	0	1
Hematoma/ Seroma	1	2	3
Graft site pain	1	0	1
C5 palsy and radiculopathy	0	2	2
Post-operative deterioration	1	0	1
Late neurological deterioration	0	2	2
Pseudarthrosis	0	2	2
Malpositioned screw	0	1	1
Reoperation	1	0	1
Adjacent segment degeneration	1	0	1
Dysphagia	1	0	1
Dysphonia	1	0	1
Axial pain	2	3	5
Total	10	12	22

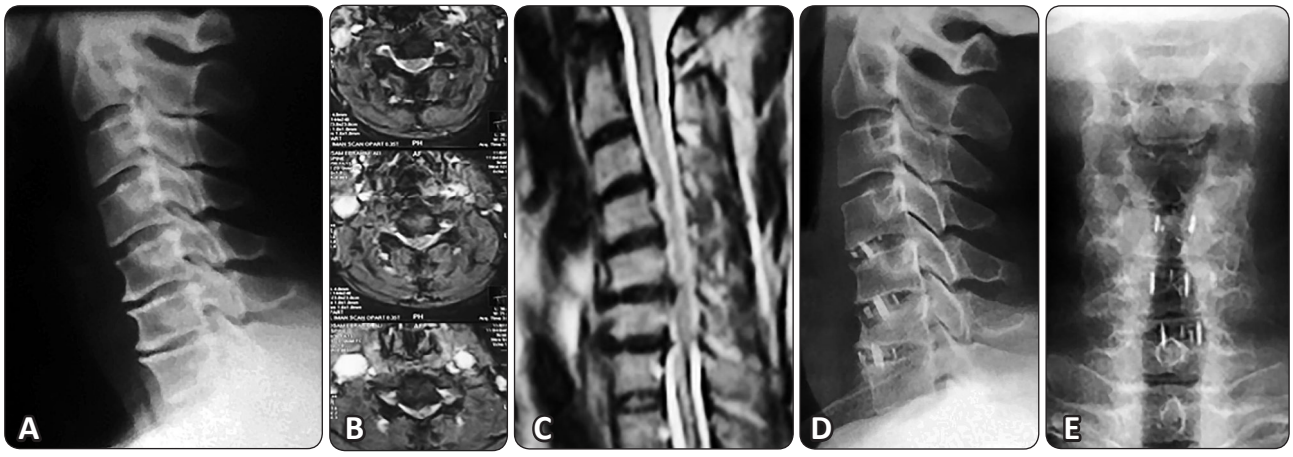


Figure 1. 45-year-old man suffered from multi level cervical discs C4/5, C5/6, C6/7. (A,B,C) Preoperative lateral X-ray and MRI demonstrated significant compression of the spinal cord and flattening of the sagittal plane. The patient underwent multilevel anterior cervical discectomies C4-C7 and cages. (D) Postoperative lateral X-ray showing satisfactory discectomies and midline cage with adequate height comparable to healthy discs to avoid adjacent segment disease. The patient improved clinical on JOA from 11 to 13 and Nurick DI from 3 to 4.

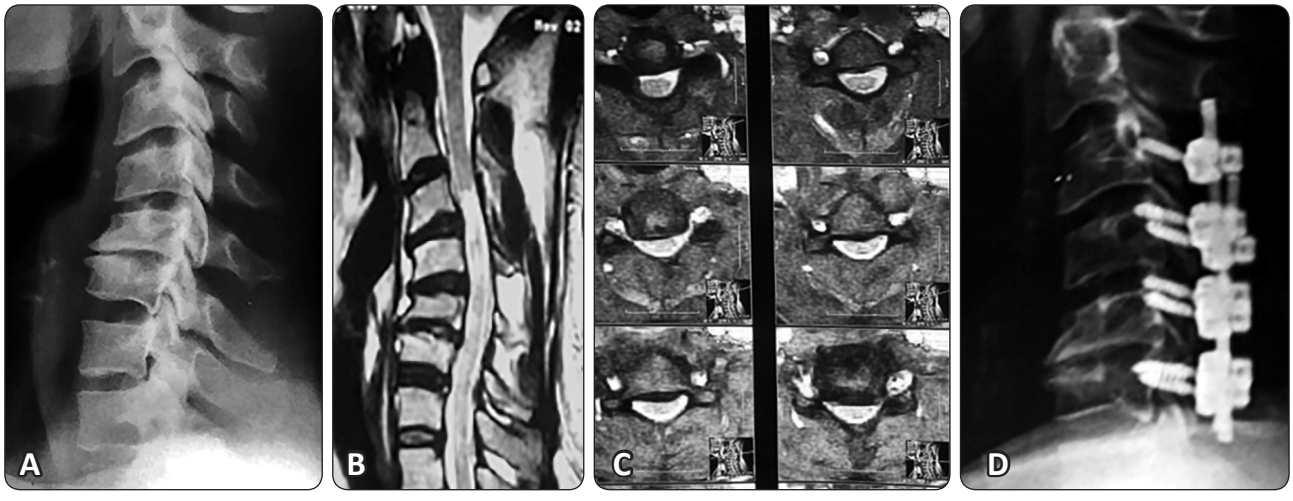


Figure 2. An 34-year-old man suffered from multi level cervical discs C3/4, C4/5, C5/6, C6/7, and progressive kyphosis. (A,B,C) Preoperative x ray and MRI demonstrated that the cervical canal was narrowed at c3/4 level with cord malacia. The patient underwent multilevel laminectomy and lateral mass fusion C3-C6. (D) Postoperative lateral X-ray showing satisfactory screws with facet violation at left c3 lateral mass. The patient improved clinical on JOA from 13 to 15 and Nurick DI from 4 to 5

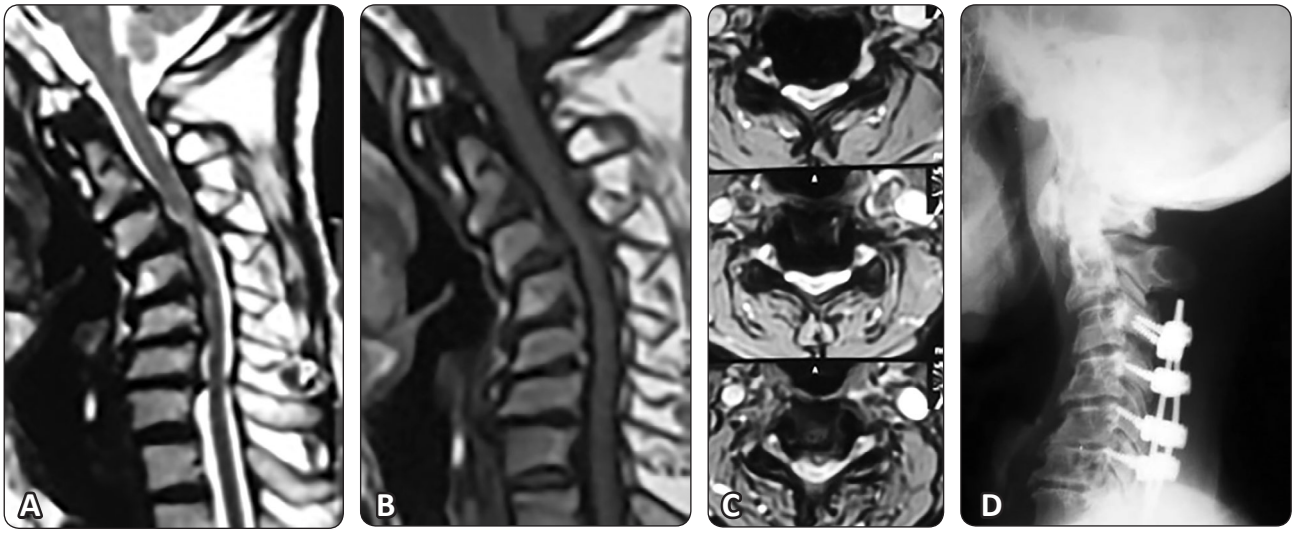
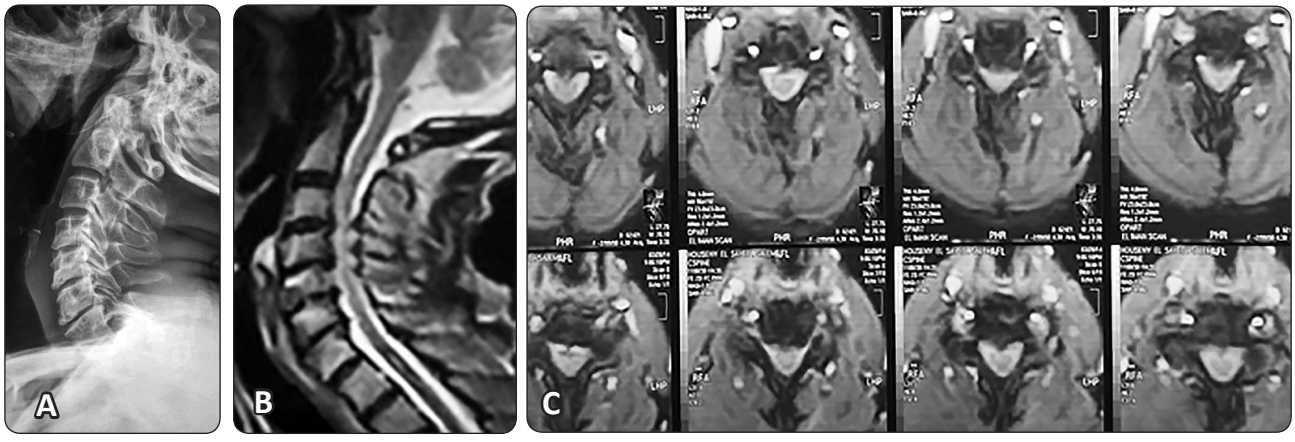


Figure 3. 48-year-old man suffered from multi level cervical discs C3/4, C4/5, C5/6, C6/7, he also instability at C3/4 level and progressive kyphosis. (A,B,C) Preoperative MRI demonstrated that the cervical canal was extremely narrowed with flattening of the cord but no cord malacia. The patient underwent multilevel posterior laminectomies and lateral mass fusion C3-C6. (D) Postoperative lateral X-ray showing satisfactory laminectomies and screws. The patient improved clinical on JOA from 11 to 14 and Nurick DI from 3 to 4.



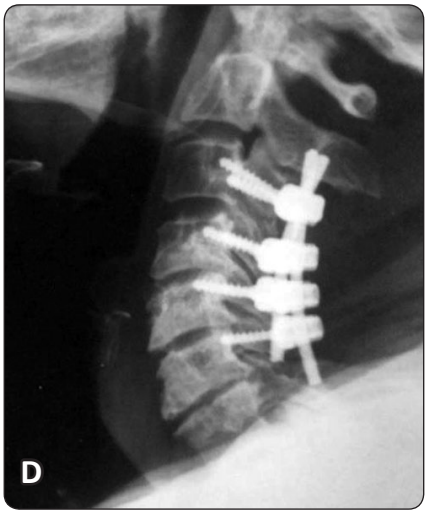


Figure 4. An 59-year-old man suffered from multi level cervical discs c3/4, c4/5, c5/6, c6/7, he also complained of hypertrophied ligamentum flavum. (A,B,C) Preoperative x ray and MRI demonstrated that the cord is pinched at c3/4 and c4/5. The patient underwent multilevel posterior laminectomies and lateral mass fusion C3-C6. (D) Postoperative lateral X-ray showing satisfactory laminectomies and screws. The patient improved clinical on JOA from 12 to 13 and Nurick DI stationary at 4.

Discussion

The treatment goal of Multilevel CSM is to decompress the spinal cord and improve the cord morphology and circulation, restore the physiological curve as possible, and achieve bony fusion.[29]

The surgical strategies for cervical spondylotic myelopathy are depend on the primary site and cause of compression, the stenotic canal measurement (10-mm or less segmental sagittal diameter of the spinal canal), the number of levels involved and the sagittal alignment of the spine.[8,24] Anterior approaches were reserved usually for one or two level spondylosis, and nowadays the indications extend to 3 or even 4 levels. It restores the cervical lordosis, and decompresses the anterior compression.[24]

In the presenting data, anterior cervical discectomy cages operations were done in 25 patients, and 23 patients operated with posterior laminoplasty, and laminectomy lateral mass fixation. The majority of the patient of the anterior group had three or four level operation, while the majority of the posterior group had four or five level operation. In the presenting study, surgical multilevel cervical discectomy and cages was used instead of corpectomy fixation. Many studies [14,20,32] showed that Multilevel anterior cervical discectomy and fusion can be safe and effective for managing multilevel cervical spondylotic myelopathy. However, complications were more frequent after more than one level anterior cervical corpectomy.[15,30] Furthermore, the fusion rate was estimated to be 50% in patients with a three-level corpectomy was 50%.[29,34]

Sagittal kyphosis of the cervical spine is associated with cervical spondylotic myelopathy. It is result from progressive subluxation of the apophyseal joints after degeneration of the facet and discs.[5]

Many studies[3,12,18,22] suggesting that operating kyphosis by corpectomy fixation are associated with good result, as the compression was anterior. Posterior laminectomy carried a risk of tethering of the spinal cord the "sagittal bowing" over ventral osteophytes in the sagittal plane.[18] König SA et al,[18] and Li X et al,[22] suggested combining surgical approaches for patients who have CSM with severe kyphotic deformity, instability, or osteoporosis. However, Du W et al,[5] Ferch RD et al,[11] Law JR et al,[19] suggested that anterior surgery in patients with multiple levels of anterior and posterior cord compression associated with a developmentally canal stenosis, may have a risk of spinal cord injury. This risk attributed to compression and adhesion of the dura and the spinal cord against the posterior longitudinal ligament in a stenotic canal. Post-operative complication includes; CSF leakage, fusion failure, implants complications, and grafted bone extrusion and subsidence.

Collecting data from the study revealed that mild kyphotic angles were treated by discectomy cages (pre Cobb's 9.9±4.5, post Cobb's 13±3.3), where most of kyphotic angles cases were treated by posterior approaches (pre Cobb's 6.6±3.6, post Cobb's 7±3.4). It is apart away from normal lordosis which is ranged from 31° to 40° lordosis.[5] Analysis of fusion rate postoperative revealed a relatively significant relationship (P=0.081) where the fusion rate was more on posterior 13/18 than anterior group 11/25. The same for Pavlov cervical canal diameter (P=0.001) (anterior, 0.77±0.5 degrees; posterior, 0.86±0.019 degrees) due to laminectomies and laminoplasty. The progression of the angle was nearly nil in the posterior approach due to solid fusion. The canal was wide postoperative for spinal cord. Although one of the primary goals of surgery is to restore cervical lordosis,[2,7,24] the study found with others,[9,20] that posterior surgery had no advantage for preoperative kyphotic alignment of the cervical spine. However, there is no neurological deterioration during follow up by JOA scores, and Nurick DI. Decompression of the facet joints by removing the inner edge associated with decompression of the nerve foramina, together with lateral mass screw had been reported with good result and no neurological deterioration.[9,13,26]

In the presenting study, we used laminoplasty instead of laminectomy in younger cases for the concept of physiological decompression with preservation of the spinal posterior column. However, Posterior laminoplasty without fusion could result in kyphotic change.[23, 26] Although laminoplasty procedure is aiming to widen the cervical canal and preserve the cervical motion, instrumented fusion may be helpful to prevent progressive kyphosis when laminoplasty is dedicated for the treatment of CSM.[23]

Clinical and demographic data had been suggested as factors that affect surgical outcome.[3,8,9] However, Patient age, general medical and neurological state status and co morbidities can influence surgical decision.[22] In this study, no significant differences were found between the two groups in the demographic parameters including; ages, sex, chronic illness, or durations of symptoms Cord insult, neurological, and general medical co morbidities. This finding encourages the surgeon to prefer the less risky posterior approach for multilevel with good outcome as with other studies.[3,10,23] The surgeon's familiarity with each technique must be considered as a factor that affects decision making and outcome.[9]

Peri-operative complications are depending on the type of surgical approach. Most of the surgery of the anterior approach represents 1 to 3 levels, 4 or more levels are associated with is associated with some risk. The existing literature discusses about young age, less pre-operative co morbidities, shorter hospital stay are associated with less complication.[3,9,24]

In the presenting data, one patient in the anterior group experienced postoperative deterioration which improved three months later. One patient had an adjacent segment disc herniation with cord compression mandated reoperation.

Fehlings MG et al,[9] Gao R et al,[12], Liu X et al,[23] and Yonenobu et al,[35] reported a higher rate of adjacent segment degeneration in the anterior cervical corpectomy fusion compared to laminectomy or laminoplasty in comparative studies. The incidence of reoperation extended to 17.1%. This risk is attributed to long adjacent segment fusion not presented in our study. This finding could explain the lower incidence of adjacent segment disease.

In the posterior approach group, C5 palsy and radiculopathy presented on 2 patients (recovered after 6 months), late neurological deterioration in one patient but he developed cerebrovascular accident. After laminectomy, the spinal cord move backward. This motion keeps it clear of anterior compression. However, if the cord moves excessively posterior, it can lead to tethering of the nerve root (C5 nerve root palsy).[5,13,21,29]

Axial pain in 3 patients and two had no improvement. Axial symptom is usually attributed to injury and fibrosis of the posterior cervical muscles which limit the cervical range of motion and increase flexion mechanical stress.[23] Du W et al,[5] reported a decrease in the cervical axial pain after reconstruction of the posterior tension band.

Facet violation presented during an operation in two cases, and one case presented with a malposition of screw toward the vertebral artery canal with no complication. The small size of the lateral masses represents a small amount of bony purchase.[28] Violation of the facet is a common problem. Ebraheim NA et al,[6] described violation of the caudal facet occurs when the screw purchase into the inferior facet. Facet violation is a leading cause for surgery revision.[9,13,28] Invasion of the vertebra artery canal by screw had an incidence of 9.6% and related to low axial screw trajectory.[13]

Although no significant differences were found among the two groups during operation and postoperative follow up and recovery, the mean blood loss was more frequent in the posterior group, and post-operative recovery was relatively better in the anterior than the posterior approach. Low recovery rates for patient in general and more for posterior surgery patients were attributed to lower preoperative JOA score, and spinal MRIT2 signal change.[9,13,24] The anterior group had relative better recovery attributed to lower surgical segment, and lower kyphosis comparable to the posterior group.[9,14,18] However, fusion rate was better in the posterior than the anterior group.[18,20]

The limitation of this study is due to a small sample size which may influence the conclusion. Long-term follow-up is necessary to evaluate the safety and effectiveness of this technique, and regard to the potential complications.

Conclusion

Treatment of CSM is to decompress the spinal cord and stabilize the cervical curve with bony fusion. Multilevel cervical discs with kyphotic angle can be treated with posterior laminectomy and lateral mass fixation with good fusion and neurological outcome. Laminoplasty instead of laminectomy was done in younger cases for the concept of physiological decompression with preservation of the spinal posterior column. During follow up, there was no progression of kyphotic angle in posterior group. Anterior cervical discectomy cage fusion surgery had

a good outcome in younger patient with less MRI T2 signal changes. Lower number of the affected level had adequate fusion with good outcome. Neurosurgeon decision and capability to use either the anterior or posterior approach in management of CSM can provide a safe surgery and outcome.

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الملخص العربي

استئصال القرص العنقي الأمامي ووضع قفص مقابل توسيع القناة العصبية العنقية من الخلف مع تثبيت الفقرات أو توسعية الباب المفتوح في حالات اختناق القناة العصبية متعدد المستويات مع الاعتلال النخاعي وانخفاض زاوية كوب.

الخلفية العلمية: أن العلاج الجراحي الأمثل للاعتلال النخاعي العنقي يكمن في تحقيق النتائج المثلى قبل حدوث الإزالة التدريجية لميالين الحبل الشوكي العنقي مع تقدم المرض.

الهدف: أجريت هذه الدراسة لمقارنة النتائج العصبية والمضاعفات الناتجة من التدخل الجراحي الأمامي أو الخلفي في معالجة الاعتلال النخاعي العنقي متعدد المستويات.

نوع الدراسة: دراسة مقارنة بأثر رجعي.

المرضى والطرق: بين يناير ٢٠١٠ وحتى يناير ٢٠١٥، تم علاج مجموعه من ٤٨ مريضا على التوالي يعانون من الاعتلال النخاعي العنقي متعدد المستويات في مستشفى جامعة قناة السويس. أجريت ثلاث تدخلات جراحية: استئصال الأقراص العنقية متعددة المستويات من الأمام مع تركيب أقفاص، التوسعة العنقية الخلفية مع تثبيت الكتل الجانبية، وتوسعية الباب المفتوح العنقية. تم تقييم الحالة العصبية والتصوير الإشعاعي قبل وبعد الجراحة لجميع المرضى. وتم توثيق مضاعفات ما بعد الجراحة. وكانت المتابعة الدورية بعد ٣ أشهر، ٦ أشهر، ثم سنويا بعد الجراحة.

النتائج: كانت نتائج الأولية للمرضى (٤٨ مريض) كالتالي: أجريت الجراحة الأمامية لعدد ٢٥ مريضا، و١٨ مريضا تم عمل توسعة خلفية مع تثبيت الكتلة الجانبية, و٥ مرضى تم توسعة الباب المفتوح من الخلف. وكانت الحالة العامة للأعصاب متماثلة قبل الجراحة في كل مجموعة باستخدام مقياس جمعية جراحي العظام اليابانية, وكذلك مقياس ناريك للإعاقة. في حين كانت الحالة بالتصوير الإشعاعي مختلفة على إن المرضى قبل الجراحة كان مقياس ايشيهارا لمنحنى الفقرات العنقية وزاوية كوب من أدنى المعدلات في المجموعة الخلفية ٦±٣,٦ مقارنة بالمجموعة الأمامية ٩,٩± ٤,٥ درجة. وخلال المتابعة، تم تحقيق تحسينات كبيرة في حالة الأعصاب العامة في كل المجموعتين من خلال تقييم جمعية جراحة العظام اليابانية و مقياس ناريك. و على الرغم من أنه لا توجد فروق ذات دلالة إحصائية بين المجموعتين فيما يتعلق بتقييم جمعية جراحة العظام اليابانية و مقياس ناريك حيث كانت النتيجة (ب = ٠,٤٥١)،(ع = ٠,٢١٦) على التوالي. وعلية فقد كانت نسبة التعافي بعد الجراحة كانت أفضل نسبيا في حالات التدخل الأمامي عن الخلفي (الأمامي، ٢٩,١ ± ١٩,٤٪، الخلفي، ٢٤,٦ ± ١٩,١٪). كما كشفت تصحيح زاوية التحدب العنقي أن متوسط زاوية كوب تحسنت من ٩,٩ ± ٤,٥ إلى ١٣± ٣,٣ درجة في التدخل الأمامي بينما كانت ٦ ± ٣,٦ لتصبح ٧ ± ٣,٤ درجة في التدخل الخلفي. وعلى العكس فان معدل التحام الفقرات كان أعلى في المجموعة الخلفية ١٨/١٣ عن المجموعة الأمامية ٢٥/١١ وكان ذو دلالة إحصائية (ب = ٠,٠٨١)

الاستنتاج: أن النهج الجراحي الأمثل لحالات الاعتلال النخاعي العنقي متعدد المستويات لا تزال قابلة للنقاش.

وكان المريض من المجموعة الأمامية تميزوا بمستويات إصابة أقل من المجموعة الخلفية. كما وجدت الدراسة انه يمكن معالجة الحالات مع تحدب الزاوية العقية متعددة المستويات من الخلف مع نتيجة عصبية جيدة ومعدل التحام فقاري عالى. بينما كان التدخل الجراحي من الأمام ذو نتائج جيدة في المريض الأصغر سنا و أقل في معدل تغير إشارة التصوير بالرنين المغناطيسي ت ٢ للحبل الشوكي, وللحصول على نتائج افضل في التدخل الخلفي توصى الدراسة بعمل تثبيت للكتل الجانبية لمنع الحداب التدريجي لفقرات.