

OBLIQUE CERVICAL CORPECTOMY
IN THE MANAGEMENT OF
UNILATERAL MULTILEVEL
SPONDYLOTIC RADICULOPATHY
ASSOCIATED WITH MYELOPATHY

Oblique Cervical Corpectomy in the Management of Unilateral Multilevel Spondylotic Radiculopathy Associated With Myelopathy

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Abstract

Background Data: Oblique cervical corpectomy involves direct decompression of the spinal cord as well as the ipsilateral nerve root but does not require bone fusion or postoperative immobilization. This approach preserves the motion unit anatomically and decreases the risk of adjacent segment disease.

Purpose: is to assess the indications, safety, efficacy and complications of oblique cervical corpectomy in the management of unilateral cervical spondylotic radiculopathy associated with myelopathy.

Study Design: A prospective clinical case study.

Patients and Methods: This study conducted on twelve patients with unilateral cervical spondylotic radiculopathy associated with myelopathy refractory to non-surgical measures for at least 6 months in the period between October 2013 and November 2015. The diagnosis was confirmed by clinical and radiological data. All patients were operated upon at Cairo university hospitals and Al-Haram hospital. Outcome of

Received on:

January 2nd, 2017

Accepted on:

February 28th, 2017

patients was categorized according to the modified Japanese Orthopaedic Association (mJOA) Scale and the recovery rate was calculated.

Results: in this study the average age of presentation was 51 years, the male to female ratio was 1:1, and the average duration of symptoms was 11.7 months. Eight cases had right sided radiculopathy and 4 cases had left sided radiculopathy. The most common presenting symptom after brachialgia was neck pain (100%). The most common sign was motor weakness (100%). Most common operated level was C5 and C6 oblique corpectomy. Excellent and good outcomes of patients were obtained in 83.3%. There was statistically significant improvement in the post-operative mJOA score in comparison to the pre-operative. The mean follow up period was 16.5 months with no reported recurrence, instability, progressive kyphosis, vertebral collapse nor other late complications like adjacent segment disease.

Conclusion: Oblique corpectomy is a good alternative to conventional median corpectomy and fusion in selected cases for the treatment of unilateral multilevel spondylotic radiculopathy and myelopathy. By avoiding the use of implants and fusion in oblique corpectomy, the procedure is cost effect with no fusion-related complications particularly adjacent segment disease. (2017ESJ130)

Key words: Cervical spine, cervical spondylosis, cervical radiculopathy, oblique cervical corpectomy.

Introduction

Cervical spondylosis is a term used to describe the degenerative aging process that includes a sequence of changes in the intervertebral discs, vertebral bodies, facet joints, and ligaments of the cervical spine. It is a common condition that occurs as a natural consequence of aging in the majority of the adult population. As a result, it is often difficult to distinguish normal physiological degeneration from pathological degeneration. Anatomic changes should only be considered pathological only if they are clinically symptomatic.¹¹

There are three main clinical categories of cervical spondylosis: cervicgia (non-radiating neck pain), cervical radiculopathy, and cervical myelopathy but different combinations of such syndromes can be also being seen.¹ Cervical spondylotic myelopathy is the most common type of spinal cord dysfunction in patients older than 55 years.¹⁵

This study has been designed to assess the indications, safety, efficacy and complications of

oblique cervical corpectomy in the management of unilateral cervical spondylotic radiculopathy associated with myelopathy.

Patients and Methods

This is a prospective study conducted on twelve patients with unilateral cervical spondylotic radiculopathy associated with myelopathy. Patients were selected in the study if: they had unilateral radiculopathy associated with cervical myelopathy confirmed by clinical and radiological data, refractory to non-surgical measures for at least 6 months. Patients were not included in the study if; they had central soft disc prolapsed, preoperative lysis > 2 millimeter between any two contiguous vertebrae, cervical myelopathy, bilateral radiculopathy; or if they had a contraindication of anesthesia. In the period between October 2013 and November 2015, patients were operated upon at Cairo university hospitals and Al-Haram hospital by an anterolateral approach. Patients were followed up on an outpatient basis for a period ranging from 6 month to two years.

Pre-Operative Assessment:

1) History: Including personal, present, social, medical, past and family history. Present history, stressing on analysis of brachialgia, neck pain, sensory manifestations and motor weakness.

2) Clinical Examination: A complete thorough general and neurological examination was performed, including the following; a. Motor system examination; including tone, power and reflexes. b. Sensory system examination; including radicular hypoesthesia, parathesias and deep sensations

3) Radiological Assessment: Patients were submitted for; 1. Plain x-rays of the cervical spine were done for all cases, including antero-posterior view, dynamic views to assess stability, oblique views for foraminal and facet details and the standard lateral view to assess curvature, sagittal rotation and alignment. 2. Computerized tomography and MRI of the cervical spine. (Figure 1,2)

Operative Technique:

The approach is lateralized on the side of the radiculopathy or on the side of the most compressive elements. Pathological levels are checked with fluoroscopy before draping. The dissection is pursued first medially to the medial border of the sternomastoid muscle and then laterally to the lateral border of the internal jugular vein. The sternomastoid muscle is retracted laterally, whereas the neurovascular package, the trachea, and the esophagus are left undissected and medially displaced with a retractor blade (Figure 3).

Progressing deeply in the underlying fat tissue leads to the lateral aspect of the cervical spine. Under the aponeurosis of the longus colli muscle, the stellate ganglion runs along the sympathetic chain. To avoid postoperative

Horner's syndrome, the sympathetic chain and the stellate ganglion must be identified and left intact. The aponeurosis is divided lateral to the sympathetic chain and then retracted medially with the medial two-thirds of longus colli muscle (Figure 3). After checking level accuracy with fluoroscopy, the intervertebral disc spaces of the pathological levels are incised 8 mm away from the uncovertebral joint. The discs are then resected with rongeurs up to the posterior vertebral border. The surgical microscope is positioned to obtain a vertical view. The drilling starts with a 4-mm cutting drill bit at the lateral border of the vertebral body with the goal of leaving 3 mm of bone laterally. The drilling starts vertically, creating an 8-mm wide window up to the posterior cortical bone (Vertical arrow, Figure4).

The surgical microscope is then repositioned to obtain an oblique view. With the microscope obliquely oriented, the drilling is then extended horizontally along the cortical bone of the posterior vertebral border up to the contralateral side (Horizontal arrow, Figure4). To reach the contralateral side, the vertebral body has to be drilled as minimally as possible, generating the convex shape of the remaining bone (arrow heads, Figure 4). For radiculopathy, the intervertebral foramen is opened over its length. Removing the anterior part of the transverse foramen with a Kerrison rongeur after subperiosteal dissection can be helpful for the next step of the dissection by improving the lateral VA mobility. The hypertrophied uncovertebral joint can be safely removed with a drill and rongeurs (Figure 4). In such a way, the cervical nerve root can be completely decompressed from its dural origin up to the VA lateral border (Figure4).

Bone hemostasis is completed with bone wax. A small suction drainage is sometimes placed in the depth of the surgical field. The retracting blade is removed. The platysma muscle is closed with a 3–0 resorbable suture and the skin with a 4–0 intradermal suture. The patient is permitted to stand up on the first postoperative day. All patients were to be discharged at 48 hours post-operative and to resume normal daily activity at 6 weeks post-operative. Physiotherapy and comfort, a soft cervical collar may be recommended postoperatively for 15 days.

Postoperative Follow-Up

Clinical follow-Up:

Patients were routinely seen immediately post-operatively before discharge and at regular follow-up intervals of 2 weeks and then 3, 6 and 12 months and subsequently every 6 months.

Outcome was determined for recording at least 6 months post-operatively. It was graded according to the modified Japanese Orthopaedic Association (mJOA) Scale, and the recovery rate was calculated (Table 1). The recovery rate was calculated by dividing the improvement of the mJOA score obtained by operation to the disability point using the following formula, which was adapted from Hirabayashi et al.,⁷

Recovery rate = (postoperative JOA score - preoperative JOA score) / (18 - preoperative JOA score)

The recovery rates resulting from this formula were graded as follows: less than 0.25, poor; 0.25 to 0.49, fair; 0.50 to 0.75, good; and 0.75 to 1.00, excellent.

Results

The average duration of symptoms was 11.6 months ranging from 6 to 18 months. The most common symptoms were radicular pain and neck pain (100%). The most common signs were motor weakness (100%). Eight cases had

right sided radiculopathy and four cases had left sided radiculopathy (Table 2).

According to X-ray criteria; two cases had a normal cervical lordotic curve (16.6 %), Eight cases had a straight cervical spine (66.6%) and two case had a reversed cervical curve (16.6%) (Table 1).

A total of 14 oblique corpectomies were operated, the most common level affected in this series was C4-5 and C5-6 presented in 12 cases (100%), followed by C6-7 presented in two case (16.6). Operative time at this study ranged from 45 to 150 minutes with a mean of 67.5 and a median of 75 minutes and standard deviation 32.724 minutes.

Outcome of patients was graded according to the modified Japanese Orthopaedic Association (mJOA) Scale, and the recovery rate was calculated (Table 2).

The mean pre-operative mJOA score of patients was 10.33 and standard deviation was ± 1.105 while the mean 6-month post-operative mJOA score was 16 and standard deviation was ± 1.47 . Ten patients (83,33%) had excellent or good outcome, six of them (50%) had excellent outcome, four (33.33%) had a good outcome, two (16.67%) patient had a fair outcome and the mean recovery rate was 68.5% (Table 3).

There was statistically significant improvement in the mean post-operative mJOA score in such patients as compared to the mean pre-operative mJOA score (Table 3, Figure 6).

The follow up period in this series varied from 12 to 21 months with a mean of 16.5 ± 3.31 months and median of 17 months. During follow up period, there have been no incidence of recurrence, instability, progressive kyphosis, vertebral body collapse nor other late complications like adjacent segment disease as measured by dynamic flexion and extension views.

Table 1. Patients' Clinical, Radiographic and Operative Data.

Patient no.	Age(Year) \ Sex	symptoms Duration (month)	Radiculopathy (side)	Neck pain	Pre Op JOA Score	Cervical curve (degree)	Levels of operation (oblique corpectomy)	Post Op JOA Score	Follow up (month)
1	60\Male	12	+ \ left	+	10	(0 degree)	C5 (1)	15	21
2	42\Male	17	+\left	+	11	(0 degree)	C5(1)	15	18
3	43\Female	12	+ \ Right	+	10	(0 degree)	C5(1)	17	18
4	56 \Female	13	+ \Right	+	11	+(25degree)	C5(1)	16	15
5	55\Female	12	+ \Left	+	11	(0 degree)	C5(1)	15	15
6	42 \Male	12	+ \Right	+	9	(0 degree)	C5(1)	14	12
7	40\Male	18	+\ Right	+	10	+(30degree)	C5(1)	18	18
8	56\Female	8	+\Right	+	9	-(11degree)	C5-6-(2)	14	20
9	58\Male	6	+\ Right	+	11	(0 degree)	C5(1)	16	15
10	52\Male	9	+\Left	+	11	(0 degree)	C5(1)	17	16
11	50\Female	10	+\Right	+	10	-(10 degree)	C5-6(2)	17	12
12	60\female	11	+\Right	+	11	(0 degree)	C5(1)	18	18

Table 2. Recovery rate in 6 month follow up.

Recovery rate	(N=12)(%)
Poor	0
Fair	2 (16.67)
Good	4 (33.33)
Excellent	6(50)

Table 3. Changes of the Japanese Orthopedic Association score.

Item	Preoperative m JOA score	6-month Postoperative JOA score	Improvement of 6 month-mJOA score	Was the improvement significant?
Total score	10.33±1.105	16±1.47	5.66±1.37	P<0.0001

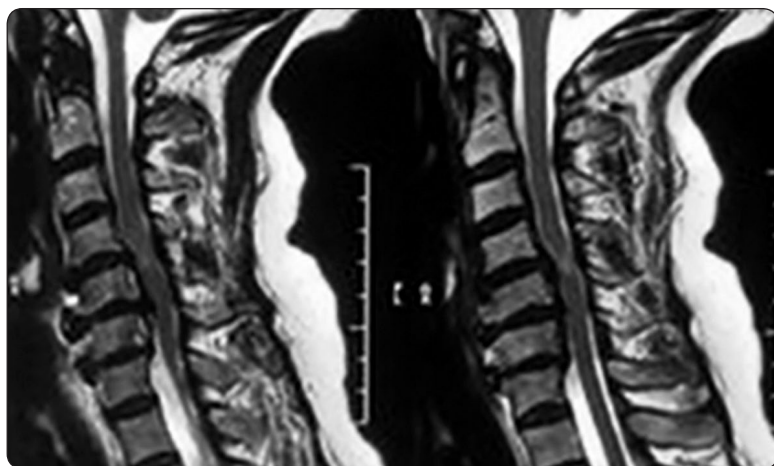


Figure 1.

Preoperative T2-weighted sagittal MRI of a female patient 50 years old with cervical canal stenosis, ossified posterior longitudinal ligament, and cord signals at C4,5-C5,6-C6,7 with main complaint of right brachialgia, shoulder pain, neck pain, paresthesias, numbness and weakness of both UL and urinary incontinence.

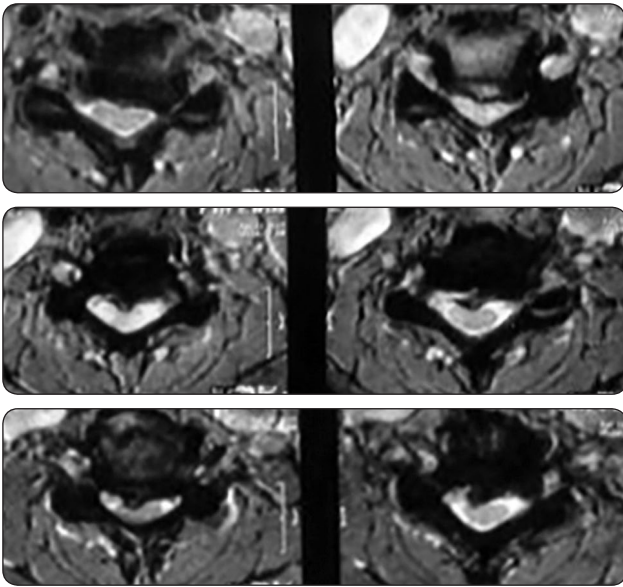


Figure 2. Preoperative T2-weighted axial MRI at C4-5, C5-6 and C6-7 of the same patient.

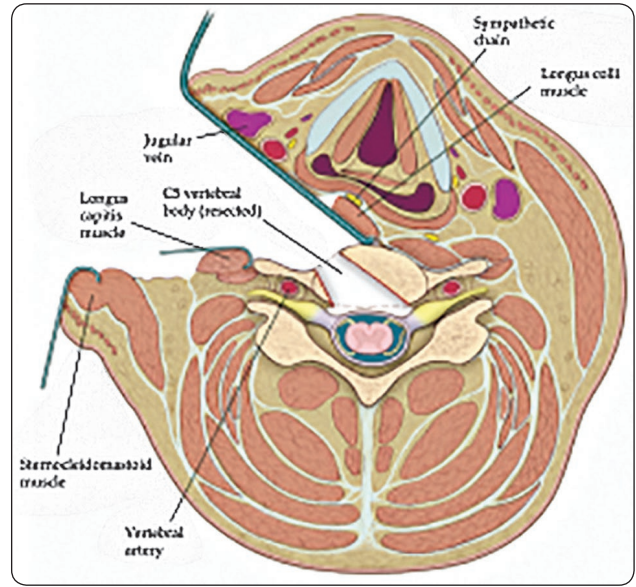


Figure 3. Artist's illustration showing the dissection plane³

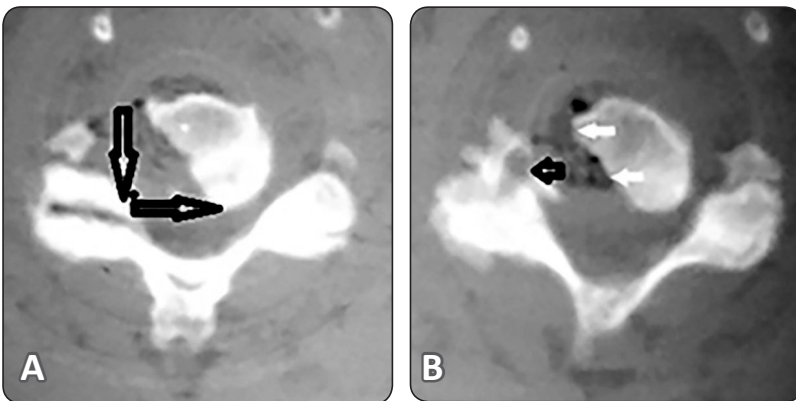


Figure 4. Postoperative axial ct scans of the same patient .Vertical arrow (figure A) shows direction of drilling as first step then horizontal arrow (figure A) the second step of corpectomy, white arrow heads (figure B) display medial limit of corpectomy, and black arrow head (figure B) shows the medial boundary of foramen transversarium.

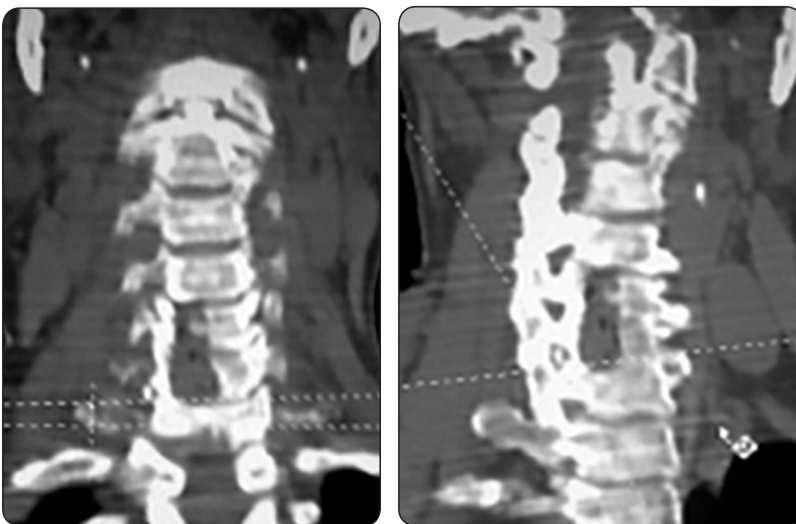


Figure 5. Post-operative coronal and oblique 3MS CT scan the same patient.

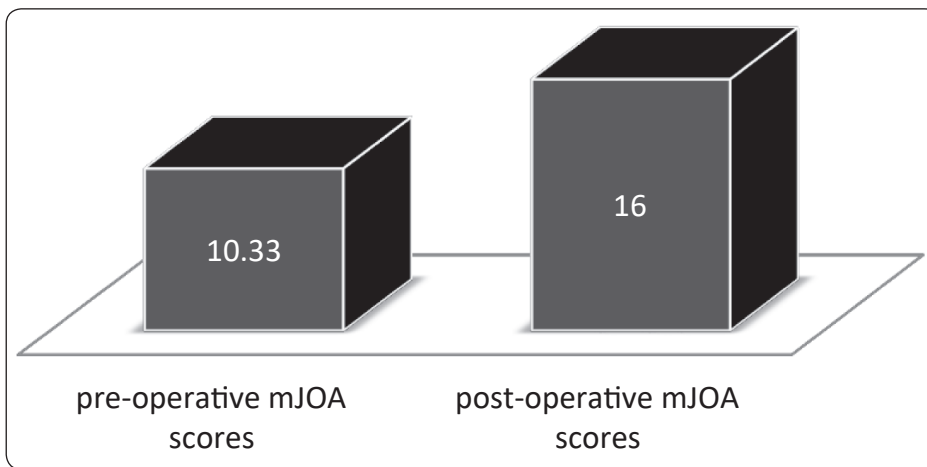


Figure 6.
Bar diagram showing changes of the mean of Japanese Orthopedic Association Score pre-operatively and post-operatively.

Discussion

Concerning the anterior approach (median corpectomy and fusion and multilevel cervical discectomies and fusion) ; The risk of graft-site complications has been reported to be as high as 18%. This is significant enough to prompt many surgeons to perform discectomies without fusion or to use allografts.¹⁴ One of the main complications associated with the loss of a motion segment is the adjacent segment disease, the incidence for which has been quoted from 25 to 81% in various long-term studies.^{3,4,6}

In our study male to female ratio was 1:1, age ranged between 40 and 60 years with an average of 51 years. The average duration of symptoms was 11.7 months (range 6- 18 months) and the most common symptom beside radicular pain (100%) was neck pain (100%).

In our study, the mean pre-operative mJOA score of patients was 10.33 ± 1.11 while the mean 6-month post-operative mJOA score was 16 ± 1.47 . There was statistically significant improvement in the mean post-operative mJOA score in such patients as compared to the mean pre-operative mJOA score. Ten patients (83,33%) had excellent and good outcome, 6 of them (50%) had excellent outcome, 4 (33.33%) had good outcome and two (16.67%) patient

had a fair outcome. The mean recovery rate was 68.5% and no patients had poor outcome according to the modified Japanese Orthopedic Association (mJOA) scoring system and no patients had stabilization.

George et al,⁵ described the technique of multilevel oblique corpectomies without fusion in the treatment of cervical spondylotic myelopathy . They reported improvement in 82% of the patients, worsening in 8%, and stabilization in 10%.

Miyazaki and Kirita,¹² 1986 described 155 patients with cervical spondylotic myelopathy (CSM) who underwent multilevel laminectomy. They reported an improvement in Japanese Orthopaedic Association outcome scale for 82% of patients at a mean follow up of one year. Eleven percent reported worsening symptoms and 7% remained the same.

Kato et al,⁹ described the mJOA outcome in 44 patients with CSM who underwent laminectomy. There was 44.2% recovery rate at 1 year that decreased to 43% at 5 years and 33% at 10 years. There was a 47% rate of postoperative kyphosis.

Song et al,¹³ was described the mJOA outcome in 40 patients with multilevel cervical spondylotic myelopathy that was divided into two groups; Group A (N=25) underwent anterior

cervical discectomy and fusion and group B (N=15) underwent anterior cervical corpectomy and fusion. The mean mJOA score for group A increased from 11.1 to 14.1, while the mean mJOA score for group B increased from 11.4 to 14.9 3 months postoperatively. For group A, the recovery rate was 56.7% and group B, the recovery rate was 60.1%.

In our study, lack of complications like recurrent laryngeal nerve palsy and the vertebral artery injury prove the benefits of the current technique. But strict selection criteria and direct access to the offending lesions are some of the factors contributing to good outcome in our study.

The mean follow up period in our study was 16.15 months, in which we have noticed no recurrences, instability, kyphosis progression, vertebral body collapse or adjacent level disease as measured by dynamic flexion and extension views.

Conclusion

Oblique corpectomy is a good alternative to conventional median corpectomy and fusion in selected cases for the treatment of unilateral multilevel spondylotic radiculopathy and myelopathy. There was statistically significant improvement in the post-operative mJOA score in comparison to the pre-operative. By avoiding the use of implants and fusion in oblique corpectomy, the procedure is cost effective with no fusion-related complications particularly adjacent segment disease.

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الملخص العربي

التوسيع الميكروسكوبي الأمامي المائل للفقرة العنقية لعلاج الأمراض التنكسية لل فقرات العنقية السفلية الضاغطة على النخاع الشوكي وعلى جذور الأعصاب العنقية من جانب واحد

البيانات الخلفية: التوسيع الميكروسكوبي الأمامي المائل للفقرة العنقية يتضمن إزالة مباشرة للانضغاط الواقع على النخاع الشوكي وجذور الاعصاب محافظا تشريحيا على وحدة حركة العمود الفقري مع تقليل حدوث الامراض التنكسية الى القطع المجاورة .

الغرض: دراسة تقييم وسلامة ومضاعفات التوسيع الامامي المائل للفقرة العنقية لإزالة الضغط عن النخاع و جذور الأعصاب العنقية.

تصميم الدراسة: هذه دراسة مستقبلية للتقييم الكلينيكي للتوسيع الميكروسكوبي الأمامي المائل للفقرة العنقية لإزالة الضغط عن النخاع و جذور الأعصاب العنقية.

المرضي و الطرق: شملت الدراسة ١٢ مريضا متوسط اعمارهم ٥١ عاما وتم التدخل الجراحي ما بين اكتوبر ٢٠١٣ الى نوفمبر ٢٠١٥. وقد كان متوسط فترة المتابعة للحالات ستة عشر شهرا ونصف ولم تحدث أية مضاعفات أثناء فترة المتابعة وقد تم استنباط النتائج النهائية للحالات بعد اثني عشر شهراً من إجراء الجراحة.

النتائج: وقد كانت النتائج النهائية كالآتي: حالات ممتازة : ٥٠٪, حالات جيدة: ٣٣,٣٣٪, حالات متوسطة: ١٦,٦٧٪, حالات ضعيفة: لا يوجد.

الاستنتاج: التوسيع الميكروسكوبي الأمامي المائل للفقرة العنقية هو علاج جراحي فعال وآمن لإزالة الضغط عن جذور الأعصاب العنقية من جانب واحد والنخاع الشوكي على مستوي واحد أو أكثر كما أنها تحقق نتائج نهائية مقاربه لنتائج التدخل الجراحي الأمامي مع تثبيت الفقرات مع تجنب بعض مضاعفات الأخير.