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International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Post laminoplasty cervical kyphosis—Case report



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ARTICLE INFO

Article history:

Received 17 October 2013

Received in revised form

14 September 2014

Accepted 15 September 2014

Available online 5 October 2014

Keywords:

Kyphosis

Cervical myelopathy

Cervical laminectomy

ABSTRACT

INTRODUCTION: Cervical kyphosis is a progressive cervical sagittal plane deformity that may cause a reduction in the ability to look horizontally, breathing and swallowing difficulties, sense of thoracic oppression and social isolation. Moreover, cervical kyphosis can cause myelopathy due to a direct compression by osteo-articular structures on the spinal cord or to a transitory ischaemic injury. The treatment of choice is surgery. The goals of surgery are: nervous structures decompression, cervical and global sagittal balance correction and vertebral stabilization and fusion.

PRESENTATION OF CASE: In October 2008 a 35 years old woman underwent surgical removal of a cervical-bulbar ependymoma with C1–C5 laminectomy and a C2–C5 laminoplasty. Five months after surgery, the patient developed a kyphotic posture, with intense neck and scapular girdle pain. The patients had a flexible cervical kyphosis. Therefore, we decided to perform an anterior surgical approach. We performed a corpectomy C4–C5 in order to achieve the anterior decompression; we placed a titanium expansion mesh.

DISCUSSION: Cervical kyphosis can be flexible or fixed. Some authors have reported the use of anterior surgery only for flexible cervical kyphosis as discectomy and corpectomy. This approach is useful for anterior column load sharing however it is not required for deformity correction.

CONCLUSION: The anterior approach is a good surgical option in flexible cervical kyphosis. It is of primary importance the sagittal alignment of the cervical spine in order to decompress the nervous structures and to guarantee a long-term stability.

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1. Introduction

Cervical kyphosis is a cervical sagittal plane deformity that may cause severe disability. Different treatment options can be considered by surgeons.^{1–3}

There are several causes of cervical kyphosis: trauma, degenerative and rheumatoid disease, tumours, post-laminoplasty instability. This deformity is the consequence of the impairment of both the anterior and posterior elements of the cervical spine. Multilevel disc degeneration, tumours or infections seeping and destroying vertebral bodies, pseudoarthrosis following previous anterior surgery approaches cause impairment of anterior elements.^{1–6} In the posterior spine, the main injuries are due to the interruptions of the posterior tension band consisting in laminae, articular facets, muscles and ligaments, caused by traumatic and degenerative conditions, and surgical treatments.^{1,4,7,8} Symptoms in patients affected by cervical kyphosis are due to structural

deformity and spinal cord compression. The pain is related to the articular facet and disc degeneration and to the overstress of the posterior elements supporting the head.^{7,8}

The head of patients with cervical kyphosis, in the neutral position, is flexed with the chin slightly tucked on the chest, this can cause a reduction in the ability to look horizontally, breathing and swallowing difficulties, sense of thoracic oppression and social isolation.

Neurological examination and neuroimaging, in particular MRI, may show neural structures, spinal cord and roots compression. The myelopathy may be due to a direct compression by osteo-articular structures on the spinal cord, or even to a transitory ischaemic injury.^{4,6}

Cervical kyphosis is a progressive deformity, surgical treatment is the option of choice. The goals of the surgical procedure are: nervous structures decompression, cervical and global sagittal balance correction and vertebral stabilization and fusion. A complete pre-operative planning is useful to state the levels of decompression and fusion and the right surgical approach.^{1,4}

Cervical laminectomy is a well-documented iatrogenic cause of cervical kyphosis.^{11–13} In the last years, the literature suggested that laminotomy with laminoplasty may reduce this complication, even if the results are still controversial.^{11,14–18}

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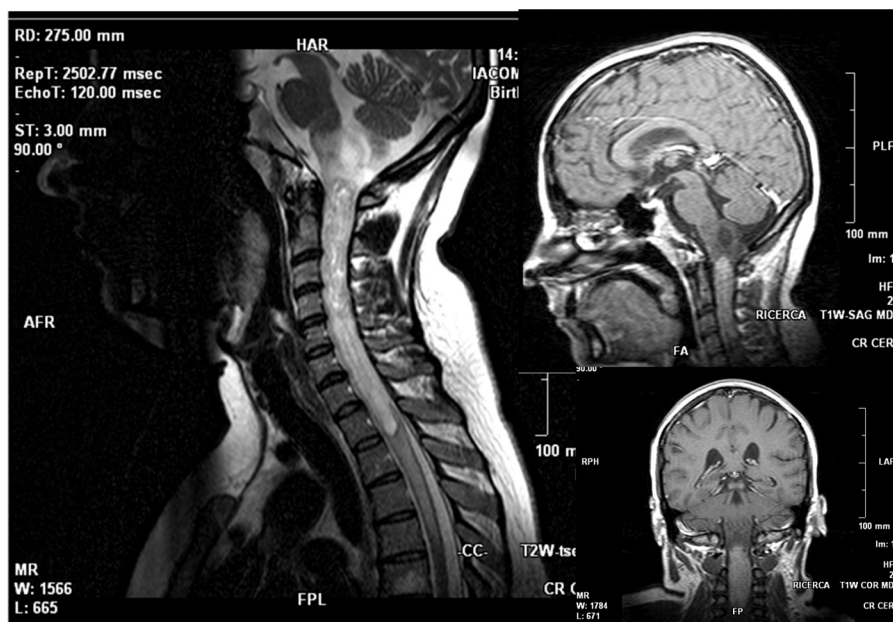


Fig. 1. Preoperative MRI shows cervico-bulbar ependymoma.

We present the case of a 35 years old woman with a severe post-surgical cervical kyphosis, who underwent anterior approach alone, achieving a reduction of the kyphosis and a good long term stability.

2. Case presentation

A 35 years old woman underwent surgical removal of a cervical-bulbar ependymoma in October 2008 (Fig. 1). The surgical procedure included a C1–C5 laminectomy, the lesion removal, and a C2–C5 laminoplasty. Five months after surgery, the patient developed a kyphotic posture, with intense neck and scapular girdle pain (Fig. 2).

The neurological examination showed ataxia, four limbs hyper-reflexia, bilateral hypoesthesia of the first three fingers and impaired prehension of the right hand. Standard and flexo-extension cervical XR confirmed the severe kyphosis (Cervical Spine Angle = 52.5°), centred on C3 and C4 (Fig. 3). Spinal cord compression was showed by CT (Fig. 4) and MRI on C3–C4 and C4–C5.

Preoperatively, the patient underwent X-ray in the supine position and positioning a pillow under her shoulder (in prevision of a traction). The study showed a good reduction of the kyphosis, for the mobility in C3–C4 (Cervical Spine Angle 27.9°). Therefore, we decided not to perform the traction and to proceed with the anterior surgical approach using intraoperative neurophysiological monitoring SEP, PEM and EMG.

The patient was positioned with neck hyperextension, checking the correct reduction of the kyphosis by intraoperatively fluoroscopy. We performed a left anterior retropharyngeal approach, and a corpectomy C4–C5 in order to achieve the anterior decompression; we placed a titanium expansion mesh. Postoperative XR (Fig. 5) and CT showed good reduction of the kyphosis (Fig. 6). The 3 and 6 (Fig. 7) months after surgery controls were good too (Cervical Spine Angle 8.4°). The walking and the hyperreflexia improved, while the sensitive and the strength right hand deficit did not show a significant improvement, probably due to the first intervention of the removal the ependymoma.

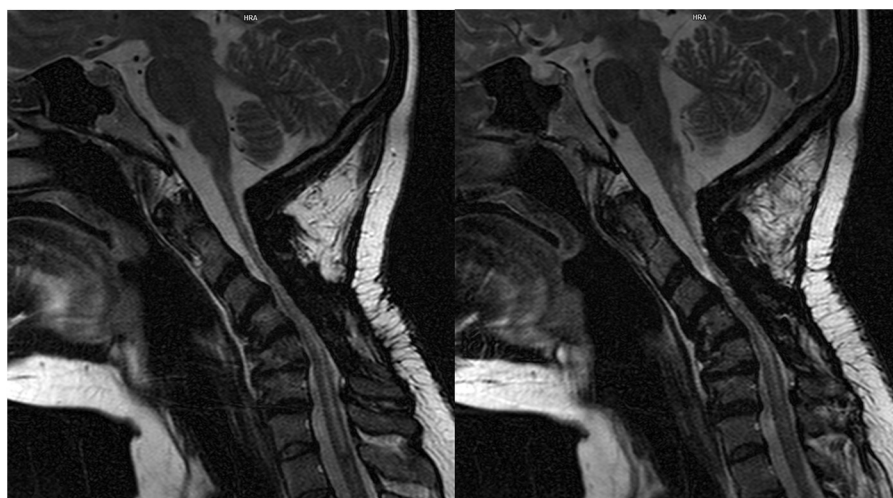


Fig. 2. Postoperative MRI that shows kyphosis developed five months after surgical procedure.

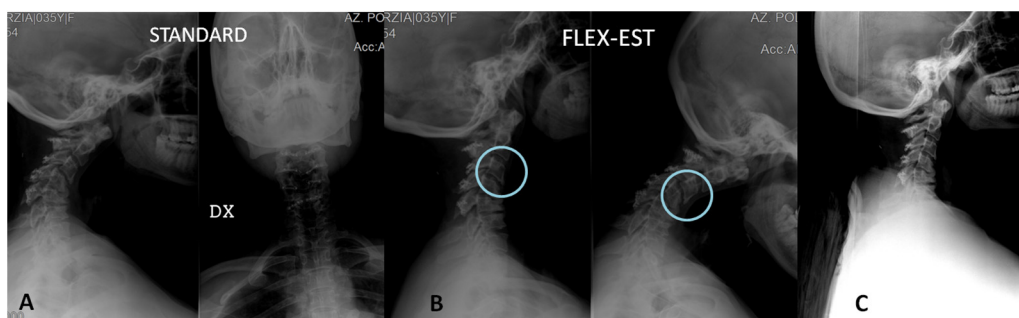


Fig. 3. (A) Standard, (B) flexo-extension and (C) supine cervical XR that shows the severe kyphosis (Cervical Spine Angle = 52.5°).



Fig. 4. Cervical CT shows spinal cord compression C3–C4 and C4–C5.

3. Discussion

Cervical kyphosis can be classified into two different groups: type 1 (flexible cervical kyphosis) and type 2 (fixed cervical kyphosis). The treatment for flexible cervical kyphosis (type 1) posturally reducible is usually a posterior stabilization with fusion to guarantee the stability of the cervical spine.^{1,4} Alternatively, some authors have reported the use of anterior only surgery for flexible cervical kyphosis as discectomy and corpectomy. This approach is useful for anterior column load sharing however it is not required for deformity correction. Fixed cervical kyphosis characterized by postural rigidity needs circumferential approach.^{5,9,10}

In case of a physiological cervical lordosis, the forces of the axial load is transmitted posteriorly to the C2 and C7 vertebral bodies, so that the share ratio of the axial load is inferior on the anterior spine despite on the posterior one. Otherwise, losing the physiological lordosis the axial load moves forward and the share ratio on the anterior spine gradually increases. The increment of these forces produce the progressive deformity. In the patients affected by cervical kyphosis the spinal cord is displaced anteriorly to the vertebral canal so that it is “stretched” at the level of the apex of the kyphotic curve.

The progression of the deformity increases the spinal cord stress causing a chronic ischaemic condition due to the crushing of small vessels tributaries of the bone, as reported by Breig and El-Nadi.¹⁹ This is responsible for the spinal cord suffering, and in the long term of the myelomalacia and spinal cord atrophy. In order to achieve the nervous structures decompression, the anterior approach is fundamental, combined or not with a posterior approach to ensure greater stability.¹¹

The aim of the surgery is then the decompression of the nervous structures, the correction of the cervical and global sagittal balance and the stabilization with fusion.

Anterior approach only has been suggested in flexible cervical kyphosis performing multiple discectomy or corpectomy with fusion, reaching good results for the decompression, stability and a great correction of the sagittal deformity. The restoration of the cervical lordosis optimizes the recovery of spinal cord function and ensures long-term stability.¹¹

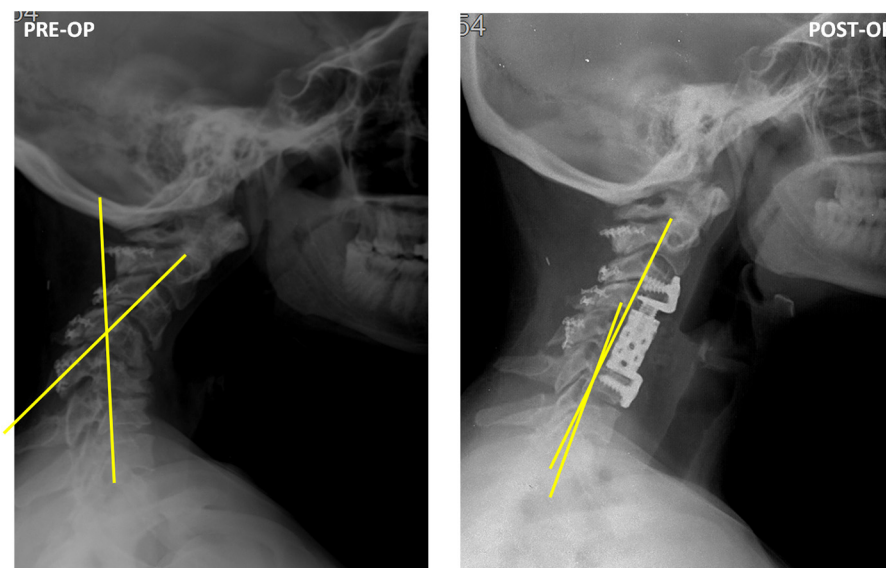


Fig. 5. Preoperative and postoperative XR that shows reduction of the kyphosis.

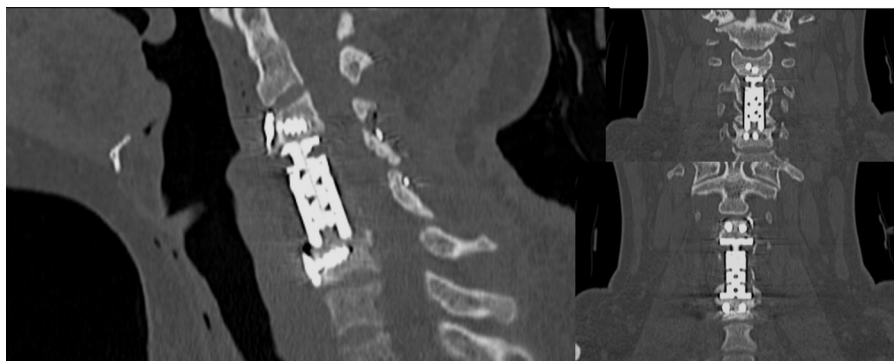


Fig. 6. Postoperative CT showed good reduction of the kyphosis.

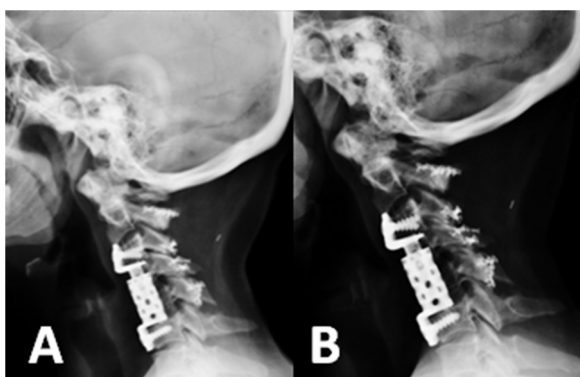


Fig. 7. XR at (A) 3 and (B) 6 months after surgery (Cervical Spine Angle 8.4°).

In our case the choice of the laminotomy/laminoplasty was based on the young age of the patient, the physiological cervical lordosis and the absence of preoperatively signs of spinal instability. In the light of the subsequent onset of kyphosis deformity, a critical analysis of the case has led us to hypothesize the possible causes of failure. Removal of listings on C2, muscle atrophy and loss of the physiological tension-band, loss of elasticity of the ligaments interspinous at the end of laminotomy.

In our case, the choice to perform an anterior approach only has been suggested by the reduction of the kyphosis in extension. The presence of the laminoplasty did not prevent the deformity progression, notwithstanding guaranteed a moderate posterior tension-band, avoiding the posterior approach. We decided to perform a double corpectomy with placement of an expansion mesh in order to obtain a greater recovery in degrees of cervical lordosis and because of the marked vertebral bodies degeneration that did not allow us to access to the disc spaces to perform discectomies. The post-operative radiological controls showed good reduction of the deformity on the sagittal plane, and stability of the surgical correction also.

4. Conclusions

The anterior approach is a good surgical option in flexible cervical kyphosis. Our case shows how the anterior approach, even in the presence of a post-laminoplasty kyphosis caused by surgical alteration of the posterior elements, represents a good choice of treatment in term of sagittal alignment and long term stability. This procedures allowed us to maintain laminoplasty and to avoid circumferential approach. It is of primary importance the sagittal alignment of the cervical spine in order to decompress the nervous structures and to guarantee a long-term stability. Also of great importance are the neurophysiological monitoring of SEP,

PEM and EMG to prevent the neurological complications during the procedure, and the immobilization with Philadelphia brace to help fusion.

Conflict of interest

None.

Funding

No sponsors were involved.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editor in chief of this journal on request.

Author contributions

Demo Eugenio Dugoni: contributed to data collection and data analysis.

Cristina Mancarella: contributed to write the manuscript.

Alessandro Landi: contributed to data analysis.

Roberto Tarantino and Andrea G Ruggeri: performed the surgical procedure.

Roberto Delfini: was the supervisor and performed the surgical procedure.

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