

360 Degree Cervical Fixation Revision of Failed Cervical Kyphotic Deformity Fusion

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Case Report

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ABSTRACT

Cervical kyphotic deformity (CKD) associated with cervical spondylotic myelopathy (CSM) is controversy issue in degenerative spine disease. In addition to cord compression, it carries a risk of fusion failure due to progression of the angle and sagittal imbalance. We illustrated a young male patient diagnosed as progressive myelopathy from kyphotic angle. He had posterior decompression with lateral mass fixation that failed after 5 years and mandated 360° fusion. Circumferential fusion should be surgical preferential in patient with angle progression.

INTRODUCTION

Cervical degenerative disease including intervertebral disc, uncovertebral joint and facet joint, ligamentum degeneration including posterior longitudinal ligament and ligamentum flavum can cause cord compression and development of Cervical spondylotic myelopathy (CSM) [1]. Such degenerative changes can lead to progressive changes in cervical angle and development of cervical kyphotic deformity (CKD). There's a debate about surgical management of CKD whether by anterior, posterior and combined procedures [2]. Posterior decompression for multilevel cervical degenerative disc associated with cord compression can be achieved via many approaches, including laminectomy, laminoplasty. Such decompression techniques are associated with less perioperative morbidity [3] but carry the risk of progression of CKD angle and axial neck pain [4]. Anterior cervical discectomy and fusion (ACDF), or anterior corpectomy and fusion (ACF) [5] is another surgical maneuver for cord decompression especially for anterior cord compression by disc or degenerated bone. But, they also had some complication for solid fusion in multilevel degenerative spine disease [6]. In posterior decompression due to its limited nature for controlling progression of cervical angle many evolved techniques have been used in association with laminectomy. These include lateral mass and transpedicular fixation with screw/plate/rod constructs for stabilization of subaxial cervical spine [7]. The combined approaches, known as 360° fusion, can provide good angle correction with adequate cord decompression, however, it is associated with high perioperative morbidity rates ranged from 5 to 69% [8,9] which makes it less common manoeuvre [10]. In this case report we try to illustrate the important of circumferential fixation for multilevel CSM associated with CKD.

CASE PRESENTATION

A 35-year-old male patient, a heavy manual worker, presented with hand weakness and axial neck pain, occipital headache with exaggerated reflexes. Diagnosis was made as CSM. Plain x ray and MRI cervical spine revealed low Cobb's angle with kyphosis and cord compression opposite C4/5. He had surgical posterior cervical laminoplasty from 3rd cervical vertebrae to the 6th cervical vertebrae and lateral mass fixation. The combined manoeuvre in this young man at that time was aiming to prevent progressive neck deformity while preservation of some neck mobility and prevent scar

tissue formation over the cord. The French Door Laminoplasty was done on the left side near the facet; the dispatched lamina was hanged to the muscles and screw head of the lateral mass using Number Zero vecryl to avoid reposition of the dispatched lamina. During posterior fixation, we used lateral mass screws 3.5 mm 4 14 mm (Egy fix[®], Mubarak Industrial Area, Menofia, Egypt). Subaxial fixation included four screws were implanted on the left side (C3, 4, 5, 6) and three screws on the right side (C4, 5, 6) using modified Magerl's technique. During surgery, we had unintended violation of the facet of C2/3. The patient pain improved using VAS from 9 to 6 for hand pain but for neck pain didn't change. Consider function outcome, the patient improved from mJOA score from 13/17 to 15/17 and using Nurick's Classification, he had a stepwise improvement from grade two to one. Cobb's angle had minor improvement from 16 to 14 degree; this finding mostly attributed to not involving C2 transpedicular fixation for fear of motion limitation. During follow up, the patient complain of neck pain persist, and he had local Facet injection with improvement. The patient didn't have intraoperative or postoperative complications. Three years later, the gentleman started a recurrent dull aching neck pain with lowering his vision angle. Patient was prescribed neck collar, medical management, physiotherapy and follow up cervical x-rays antero-posterior and lateral views. Five years after initial surgery, the patient had a recurrence of symptoms with progressive hand weakness and dythesia. MRI cervical showed a cord signal in T2 WI opposite (C3/4??). A surgical plain was decided for 360° fusion. The surgery was aimed to improve the neck pain, neurological deterioration, patient life style, and kyphotic angle. The cervical x-ray showed fused the fifth and sixth cervical vertebrae. Anterior release was done by discectomy C2,3 / C3,4 / C4,5 / C6/7, The Posterior system was revised (Changing the loosened left C4 screw and extending the system to C2 through bilateral Pedicular screws (Medtonic vertex System), to obtain more lordotic angle. Second session was done in a trial of increasing the lordotic curve by inserting cervical cages C2/3, 3/4, 4/5 (MedCraft Company??) and Anterior Plating C2/3/4 (Egy fix[®], Mubarak Industrial Area, Menofia, Egypt). Minimal Blood Loss observed in both sessions. After surgery, patients were immobilized in a cervical collar postoperatively for 6 weeks. The patient neurological condition improved including hand function. The patient improved from mJOA score from 11/17 to 15/17 and grade one using Nurick's classification. He had only severed and persistent neck pain on medical treatment and physiotherapy. Cobb's angle had marked improvement up to 25 degree from the pre-operative measurement **Figures 1 & 2.**



Figure 1. Pre-Op1: X-ray Cervical Spine Lateral View.



Figure 2. Pre-Op2: X-ray Cervical Spine Anteroposterior View.

DISCUSSION

Selection of the surgical approach for the treatment of multi-level CSM remains controversial [11]. The definitive aim of internal cervical spinal fixation is to provide good segmental stability for development of adequate bony fusion. Fusion from anterior plating was reported to range from 47% to 100% [12]. The addition of posterior fixation had been reported up to 97% fusion rate in multilevel CSM with posterior decompression and lateral mass screw/plate fixation [6,11]. Combined approach allows for decompression of spinal canal, sagittal correction, and solid fusion [10]. Using anterior-posterior-anterior sequence for surgery is usually optimal for correction, in addition to decompression, such technique improve kyphotic angle through lengthening the anterior column and shortening the posterior one [2]. In this study, we are able to correct the Cobb's angle 25 degree. In early case, intervention using posterior approach, by lateral mass fusion, it provided less stability which allowed for loosening of screw and re-progression of the angle with cord compression. Adding pedicle screw in C2 offers higher grip with better stability in association with anterior plating [13]. In a study by O'Shaughnessy et al. [14] treated patients with fixed CKD and myelopathy using circumferential spinal osteotomies and instrumented reconstruction; they achieved excellent clinical and radiological outcomes along with maintenance of the correction. They had longer fixation system including lateral mass screws in the subaxial cervical spine, pars/pedicle screws at the level of C2 and pedicle screws or hooks in the thoracic spine. In his series, they used to extended fixation from C2 into the upper thoracic spine together with anterior graft and plate with good result. Circumferential fusion carries the complication of both approach (anterior and posterior) including wound infection, hardware failure, dysphagia, cord injury, etc. [6-10]. But the most annoying complication is the development of adjacent segment disease due to segmental stiffness of multilevel vertebrae. Long-term follow-up studies have established that nearly 30% of patients develop symptomatic spondylosis requiring reoperation at levels immediately above or below the fused segments at an average of 10 years following the index procedure [7]. Surgical high cost, multistep surgery, and longer hospital stay and rehabilitation is another confounding factors that affect surgery decision **Figures 3 & 4.**



Figure 3. Post-Op1: X-ray Cervical Spine Lateral View.



Figure 4. Post-Op2: X-ray Cervical Spine Anteroposterior View.

CONCLUSION

Surgical management of CKD is controversial due to disease progression. Circumferential fusion allows better fusion with correction of sagittal plane in addition to cord decompression. However, due to high incidence of complication rate, every patient with CKD should be evaluated clinically and radiologically for combined surgery to evaluate benefit alongside risk. This case showed us that every patient is unique and need special surgical plan.

CONFLICT OF INTEREST

The authors report no conflicts of interest or funding support.

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