

## CASE REPORT

# Circumferential fusion for severe post surgical cervical kyphosis

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## ABSTRACT

Cervical kyphosis though a common occurrence after surgery and other conditions like trauma, infections, etc., is usually restricted to around 20-40°. It is more common in children. Angulations of more than 70-80° are exceedingly uncommon and present more treatment challenges. We discuss here the management of a 14-year-old child with a severe postoperative cervical kyphotic angulation of 92°. The child presented 10 months after surgery for a C3-C4 intramedullary cyst with neck deformity and near tetraplegic state. He underwent a combined anterior-posterior approach for correction after a trial of skull traction. Six months after the surgery, the child was ambulatory with almost total correction of the deformity. Surgical correction of postoperative cervical kyphosis usually involves a posterior approach for small angles and an anterior approach for larger angulations. The combined anterior-posterior approach is preferred for severe angulations or for those cases not correctable by a single approach. A purely posterior approach may be the only option for those cases where the anterior approach is impossible.

**Key words:** Cervical kyphosis, circumferential fusion, postoperative

## Introduction

The normal cervical lordotic angle of 15-25° is prone to reversal to a kyphotic angulation whenever there is a loss of stability of the cervical spine, especially following removal of the posterior tension band and associated musculoligamentous structures.

Analysis of biomechanical data indicates that the anterior column provides 36% of the support while 64% is provided by the posterior column. Thus posterior column disruption makes the spine more prone to kyphosis development. This is more in children, where the soft anterior vertebral bodies provide very little resistance to anterior wedging and kyphotic angulation.<sup>[1]</sup> This may be seen following trauma, surgery, tumors, infections, syringomyelia, and spondylotic myelopathy among others. It can be further aggravated

where there is a syrinx or intramedullary tumor which causes segmental muscle weakness by involvement of the anterior horn cells. Bell *et al.*<sup>[2]</sup> have reported 38% incidence of post surgical kyphosis in children. We present here the management of a child with a severe 92° postsurgical cervical kyphosis. Such severe kyphosis is rare as the reported average is around 38°. We could not find any case of post surgical cervical kyphosis exceeding 90° in the literature. The difficulties in management are discussed.

## Case Report

A 14-year-old child presented 10 months after a C3-C4 laminectomy for an intramedullary cyst (Neurenteric cyst) [Figure 1] with complaints of increasing tetraparesis and neck flexion deformity. Imaging revealed severe cervical kyphosis with anterior cord compression and a focal syrinx [Figure 2]. He had only 1-2/5 power in the lower limbs. The measured Cobbs angle (C3-C5) was 92° [Figures 2 and 3]. Sequential skull traction was applied up to 8 kg for 7 days, which resulted in only partial angle correction to 74°. Thereafter, anterior C4-C5 corpectomy was performed. The patient was turned prone and C2, C3-C5, C6 posterior instrumentation was performed after radiologically confirming normal lordotic realignment preoperatively. Pedicle screws (3.5 mm × 24 mm, GESCO make) were inserted at C2 while lateral mass screws (3.5 mm × 12 mm) were inserted at the other levels. C4 lateral mass was not included in the construct because partial facetectomy had already been done. The patient was then placed supine again and

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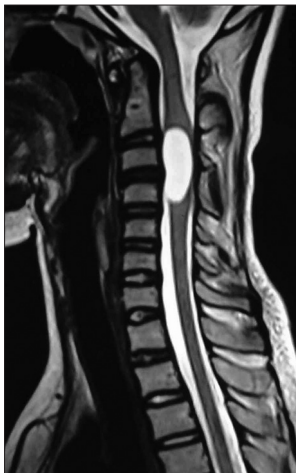
iliac bone grafting and C3-C6 plating (rigid locking screw-plate, Gesco make) was done. Postoperative radiology revealed that the kyphosis had been completely corrected (Cobbs angle 2°) [Figure 4]. Philadelphia collar was applied for 12 weeks.

A 6 month follow-up revealed good fusion with good neurological improvement. The patient was ambulatory with 4+ /5 power in the lower limbs.

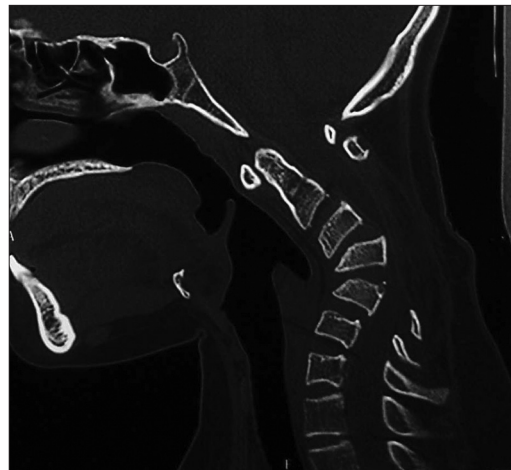
The syrinx was not addressed at the time of correction and a 1-year follow-up magnetic resonance imaging (MRI) is planned to evaluate its status.

## Discussion

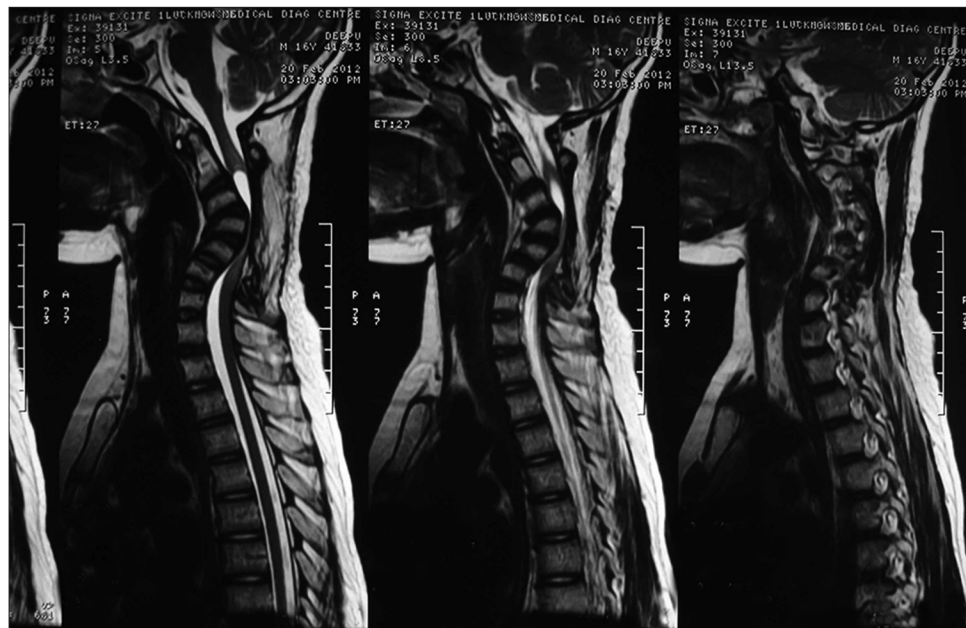
Several studies have described correction techniques for postoperative cervical kyphosis. Three main approaches used are (i) anterior approach with discectomy/corpectomy and plating, (ii) posterior approach with lateral mass/pedicle screw techniques, and (iii) combination of both.<sup>[3,4]</sup> Different authors favor different approaches. Generally, small angles correctable by traction may be addressed posteriorly while larger angles with associated compressive myelopathy require an anterior approach. Severe kyphosis is best addressed by a combined approach, especially when either



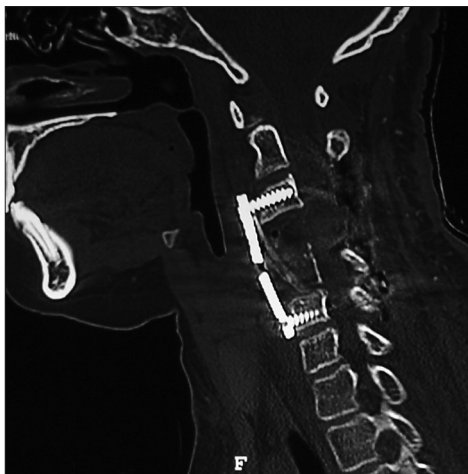
**Figure 1:** Initial preoperative sagittal T2 MRI scans showing the pathology for which the laminectomy was done



**Figure 3:** Preoperative computed tomography scan (bone window). The severe anterior wedging of C4 and C5 with a 92 degree kyphotic angulation is seen



**Figure 2:** Sagittal T2 MRI done before the correction surgery. Post laminectomy, severe kyphosis can be seen with the spinal cord compressed and draped over the kyphotic vertebral bodies



**Figure 4:** Postoperative CT scan (bone window). Correction of the angulation with implant *in situ*

approach alone provides inadequate reduction or fixation.<sup>[5]</sup> Previous studies on surgical correction have reported average kyphosis angles of 26.2° with achieved correction of 23.8°. Very few series have reported an angulation greater than 90°.<sup>[6]</sup> An only-posterior approach has been described for severe fixed kyphosis, where an anterior approach is not possible due to problems with positioning. In our case preoperative traction reduced the deformity by around 20° and hence the anterior approach was the logical initial choice. We added the posterior approach because of the severe kyphosis. Additionally, the young age of the patient

prompted us to add the posterior instrumentation so as to provide a more rigid fixation.

The combined approach has been described as having a better fusion rate at the cost of added neurological deficit, particularly C5 radiculopathy. There was no added morbidity in our case except the increased operative time because of the combined procedure. Adequate fixation and fusion was achieved by 6 months follow-up.

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