
Spinal Fusion for Lenke Types Adolescent Idiopathic Scoliosis: A Case Report

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Abstract

A rare case of treatment and determine the Lenke type 5C adolescent idiopathic scoliosis in terms of Cobb angle correction and coronal balance after selective posterior segmental spinal instrumentation with pedicle screws. This retrospective cohort study was conducted in Department of Orthopedic and Spine Surgery. Selective spinal fusion with pedicle screws for Lenke type 5C adolescent idiopathic scoliosis were reviewed. Preoperative radiographs were evaluated for Cobb angle of lumbar or thoracolumbar curve as well as sagittal and lumbar modifier on anteroposterior and lateral standing films. The curve correction, implant density, number of segments fused, and coronal balance was assessed on post operative radiographs.

Keywords: Adolescent idiopathic scoliosis; Cobb angle; Lenke type 5C; Pedicle

Introduction

Idiopathic scoliosis is lateral deviation of the spine more than 10 degrees with no definite a etiology unlike congenital, neuromuscular and syndromic types [1]. Adolescent idiopathic scoliosis (AIS) accounts for about 85% of idiopathic scoliosis [2]. Lenke type 5C is characterized by a single major structural curve in thoracolumbar or lumbar spine accompanied by two non-structural minor curves [3]. It has been reported that more than 50% of patients with Lenke type 5 AIS with curve of more than 40 degrees showed progression after the age of 20 years [4]. Therefore, surgery is indicated for progressive curve of more than 40 in Lenke 5C AIS [5]. Both clinically and radiologically Lenke 5C AIS is associated with global coronal imbalance [4,5]. Selection of appropriate proximal and distal level of fusion has a direct impact on radiological outcomes in terms of curve correction and coronal balance [6].

Various treatment options for AIS are exercise, brace, and surgery [7]. Surgical options for Lenke 5 AIS are divided into anterior and posterior corrections utilizing different approaches [8]. With single rod-screw system through anterior approach excellent curve correction can be achieved with short fusion mass [9]. However, disadvantages associated with anterior approach are poor derotation, junctional kyphosis and implant breakage [10]. Due to excellent pull-out strength of the pedicle screws, posterior approach provides excellent curve correction as well as better derotation [11].

The objective of our study was to determine short term radiological outcomes of Lenke type 5C adolescent idiopathic scoliosis in terms of Cobb angle correction and coronal balance after selective posterior segmental spinal instrumentation with pedicle screws.

Case Report

Methods:

We conducted this retrospective cohort study in Department of Orthopedic and Spine Surgery. Selective spinal fusion with pedicle screws for Lenke type 5C adolescent idiopathic scoliosis were reviewed. Patients of either gender or all ages with Lenke type 5C AIS with complete record of minimum of one year follow up were included in our study.

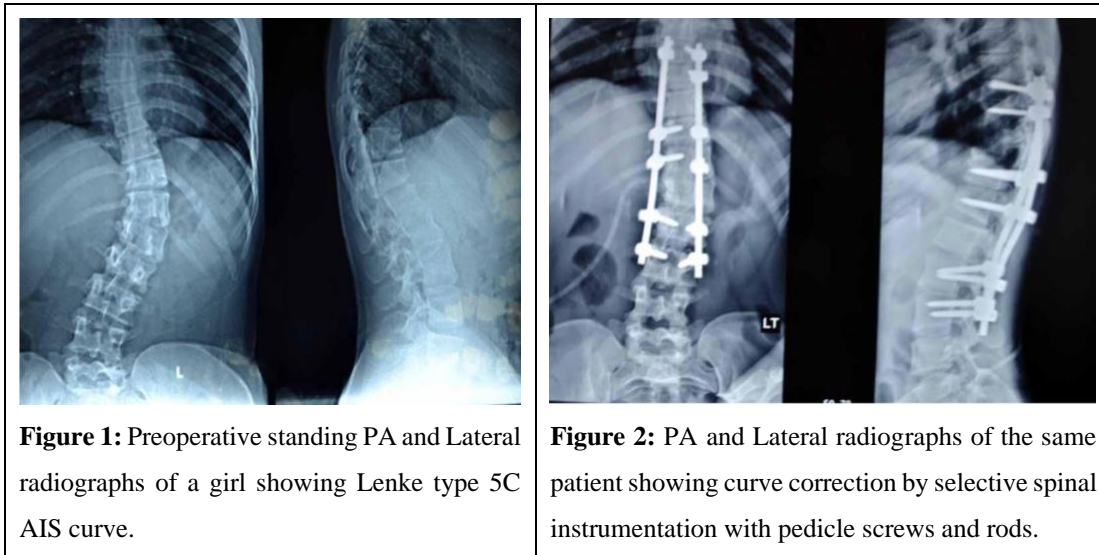
All patients with congenital or neurological scoliosis and those having history of spinal surgery, trauma and infections were excluded. The study protocols were approved by the Ethical Committee of our hospital. Radiological evaluation included calculation of the pre-operative and post-operative Cobb angle on standing posteroanterior (PA) radiographs, implant density, coronal balance, sagittal and lumbar modifier on standing posteroanterior and lateral views and fulcrum views. Curve flexibility was assessed by fulcrum bending radiographs which were taken by placing patient in lateral decubitus position over appropriate padded cylinder [12]. Coronal balance was measured in millimeters from C7 plumb line and central sacral vertical line (CSVL) on postoperative standing posteroanterior radiographs. A value >20 millimeters was taken as imbalance.

Operative Procedure:

The medical record revealed that all operations were done by single spinal deformity correction surgeon using identical technique. The operative notes indicated that all procedures were done in prone position on radiolucent table under controlled hypotensive anesthesia. Somatosensory evoked potential and motor evoked potential (Intraoperative neuromonitoring) was used during the procedure. Midline incision was given over the spinous processes and subperiosteal dissection was done to expose the pedicles and transverse processes. All pedicle screws were passed by free hand technique and confirmed by intraoperative imaging.

Two levels each at upper and lower end of fusion mass were instrumented bilaterally followed by instrumentation of one vertebrae at apex on convex side and two adjacent vertebrae on concave side. Facet joints and spinous process was excised to provide raw area as well as autogenous bone graft for spinal fusion. Upper end vertebrae (UEV) were neutral and lower end vertebrae (LEV) were stable.

However final decision was dependent on intra operative alignment of disc below LEV. If a level disc was achieved instrumentation was stopped at LEV otherwise instrumentation was extended to one level below. Pre-contoured rob was placed to correct the coronal and sagittal balance. Residual deformity was corrected by distracting the concave side and compressing the convex side of deformity. Rotational deformity was corrected by rod derotation method. There was no neurological complications or screw misplacement postoperatively (Figure 1 and 2) Single drain was placed in subfascial area which was removed on first postoperative day and patient was mobilized.



Discussion

This retrospective Cohort of 34 patients with Lenke type 5C treated by selective posterior segmental spinal fusion showed that excellent coronal correction and balance can be achieved with limited number of pedicle screws thus minimizing cost and time of procedure as well as pedicle screw related complications. The primary goal of surgical treatment of scoliosis is to achieve coronal and sagittal alignment as well as correcting the deformity and saving motion segments. There is strong relationship between postoperative coronal balance and preoperative and postoperative lower instrumented vertebrae.

Our study had few limitations such as small number of patients and retrospective nature of our study design. Moreover, we did not evaluate patient reported outcomes, procedure time, blood loss and relationship between upper and lower instrumented vertebrae and coronal balance. We, therefore, suggest further studies to address all these.

Conclusion

Near normal Cobb angle correction and coronal balance was achieved in all patients of Lenke type 5C adolescent idiopathic scoliosis treated with posterior segmental spinal instrumentation utilizing pedicle screws. High flexibility of Lenke type 5 AIS curve makes it unique from other curves. As a result, excellent correction of curve and coronal balance can be achieved with limited numbers of anchors thus minimizing cost, procedure time and blood loss.

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