

Pedicular Screw Instrumentation Outcome in Posterior Spinal Fusion of Adolescent Idiopathic Scoliosis

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Abstract: *Scoliosis affects young and growing age population mostly in age of 10–16 years, having prevalence of 10–15% in literature and 90% of patients have idiopathic adolescence scoliosis. Our study will assess the curve correction by posterior spinal fusion technique the results of which if found comparable as in literature using different techniques. To find out the outcome in instrumentation related to pedicular screw in posterior spinal fusion in idiopathic adolescent scoliosis to improve the Cobb angle. 42 sufferers had been observed. After inclusion, a detailed clinical history was noted with general physical and systemic examination. Radiographs and MRI of the total spine had been performed. The point of intersection of vertical line was taken as preoperative Cobb angle. Deformity was categorized as moderate or severe based on Cobb angle on PA view. 14 years was mean age with standard deviation 3.26. 42% sufferers were male while 58% sufferers were female. 65% patients had corrected outcome on the other hand, 35% patients had not corrected outcome. Our study concludes that pedicular screw instrumentation had 65% corrected outcome in posterior spinal fusion in idiopathic adolescent scoliosis in terms of improvement in Cobb angle.*

Key Words: Outcome, Pedicular Screw Instrumentation, Posterior Spinal Fusion, Idiopathic Adolescent Scoliosis, Cobb Angle

Introduction

Scoliosis affects young and growing age population mostly in age of 10–16 years, having prevalence of 10–15% in literature and 90% of patients have idiopathic adolescence scoliosis. Almost acceptable threshold for surgical cure is primary curve with Cobb angle greater than 45 in adolescent idiopathic scoliosis¹.

Various techniques and approaches have been in practice anterior approach was introduced by

Dwyer and Schafer². Anterior accessment had been considered the best in the fixing of coronal plane. Anterior invasive technique had been remained the most important choice with shorter fusion levels. On the other hand, the adverse use of the anterior approach were the bad and unsatisfactory de-rotation, kyphosis tendency, reduce quality of pulmonary action, and greater implant breakage rate³.

A dominant approach for surgical correction was posterior instrumentation. It has been

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remained beneficial for adolescent idiopathic scoliosis victims. This technique was used by a scientist, Harrington for spine deformity. It was a good step towards orthopedic surgery. A latest third instrumental generation was Cotrel-Dubousset system which consists of segmental lamina grapple hooks as well as double rods which were cross linked. Pedicle screws formed the fourth instrumental generation⁴. The greater damages of the technique were neurological harm, malposition, expenses and long operation time. The main reason in surgical operation of idiopathic scoliosis is deformity alteration on the coronal, axial and sagittal planes with an adequate fixation fusion and minor complexity rate. There are different kinds of posterior instrumentation systems. Multisegment fixation systems are the most reliable system⁵. These systems were used for surgical correction of adolescent idiopathic scoliosis nowadays and helpful in correction of deformity in coronal, axial and sagittal planes^{7,8}. The average postoperative Cobb angle (deformity correction measure) in using different techniques mentioned above is 24.7 (4-60) in literature⁹. Preoperative computed tomography, fluoroscopy and navigation system are the imaging techniques which were recommended by many authors for the use of pedicle screws to lessen the complications of neurovascular system¹⁰. This technique improved complete pedicle insertion and helped in decreasing the irradiation and operating time¹¹. In a study on 56 sufferers, 14 were male and 42 were female patients with adolescent idiopathic scoliosis, Hassan khani et al noted an average correction of 40+/-10 degrees in 60% to 70% of patients on immediate postoperative radiographs using standard posterior instrumentation technique¹². Coronal correction had been focused by the scholars and they obtained different results¹³. Moreover, sagittal correction had brought more attention for thoracic and junctional kyphosis¹⁴. By the use of posterior instrumentation technique, 40° is average postoperative Cobb angle for flexible curves and 30° for stiff curves in approximately 70% victims¹⁵.

Objective

To find out the outcome in instrumentation related to screw in posterior spinal fusion in idiopathic adolescent scoliosis to improve the Cobb angle.

Material and Methods

- Sample was selected. Male victims having age 14-18 years with idiopathic adolescent scoliosis having Cobb angle 40 degrees or more on PA plain radiograph.
- Female patients having age 12-16 Years with idiopathic adolescent scoliosis having Cobb angle 40 degrees or more on PA plain radiograph.

A detailed clinical history had been taken. MRI and radiograph of the complete spine had been done. General physical and systematic examination had been followed. Pre-operative Cobb angle was calculated on poster anterior plain radiograph by location upper end and lower end vertebrae and drawing line perpendicular to the line of both vertebrae. The point of intersection of vertical line was taken as preoperative Cobb angle. Deformity was categorized as moderate or severe based on Cobb angle on PA view. For curve correction, classical derotation method was used. After arthrodesis, was brought about vasectomy, bone graft and decortications. By joining two pre contoured 5.5mm titanium rods with three transverse connectors, a frame was attained. The frame was protected to distal and proximal portions. The deformity obstruction had been begun to distal and proximal order in the centre of curve. Force was put to the uncorrected curve system. During operation, all victims had wake up test. Then standing posteroanterior and lateral radiograph of the spine was taken after operation on 5th day of operation and calculate postoperative curve correction by same method as used in preoperative calculation taking same vertebrae as upper end and lower end. A Postoperative reduction of Cobb angle of 20 degrees or more as compared to preoperative Cobb angle was regarded as correction. If the postoperative Cobb

angle reduction as compared to preoperative value was less than 20 degrees, the outcome was regarded as not corrected. SPSS version 17 was used for analyzing the data. . Quantitative variables like age, COBB angle, BMI was analyzed by Mean along with S D. For qualitative variables, percentage and frequencies were calculated.

Deformity severity, Cobb angle, and final outcome were stratified among age, sex BMI and type of deformity whether stiff or flexible to see effect modifications of these on acceptable outcome. Then chi square test was applied. All the results were presented on tables and graphs.

Results

Distribution of age among 42 victims had been noted as 29(69%) sufferers were in age range 12-15 years and 13(31%) sufferers were in age range 16-18 years (table 1).

14 years was mean age with standard deviation 3.26.among 42 sufferers, gender distribution was analyzed as 18 (42%) sufferers were male and 24(58%) sufferers were female (table 2).

Status of BMI distribution among 42 patients was analyzed as 27(65%) patients

had BMI 20 Kg/m² and 15(35%) patients had BMI >20 Kg/m². Mean BMI was 20 Kg/m² with SD 4.71. (Table No 3.)

Curve severity among 42 patients was analyzed as 37(88%) patients had moderate deformity while 5(12%) patients had severe deformity. (as shown in Table No 4)

Type of deformity among 42 patients was analyzed as 8(20%) patients had stiff deformity while 34(80%) patients had flexible deformity. (as shown in Table No 5)

Status of Cobb Angle among 42 patients was analyzed as 15(35%) patients had Cobb Angle <20 degree while 27(65%) patients had Cobb Angle >20 degree. (as shown in Table No 6)

Outcome among 42 patients was analyzed as 27(65%) patients had corrected outcome while 15(35%) patients had not corrected outcome. (as shown in Table No 7)

Stratification of outcome with respect to age, gender, BMI and type of deformity is given in table no 8, 9, 10, 11.

Table 1. Age Distribution n=42

Age	Frequency	Percentage
12-15 years	29	69%
16-18 years	13	31%
Total	42	100%

Table 2. Gender Distribution n=42

Gender	Frequency	Percentage
Male	18	42%
Female	24	58%
Total	42	100%

Mean BMI was 20 Kg/m² with SD 4.71

Table 3. Status of Bmi (n= 42)

Bmi	Frequency	Percentage
20 Kg/m ²	27	65%
>20 Kg/m ²	15	35%
Total	42	100%

Table 4. Curve Severity (n= 42)

Curve Severity	Frequency	Percentage
Moderate Deformity	37	88%
Severe Deformity	5	12%
Total	42	100%

Table 5. Type of Deformity (n= 42)

Type of Deformity	Frequency	Percentage
Stiff	8	20%
Flexible	34	80%
Total	42	100%

Table 6. Cobb Angle (n= 42)

Cobb Angle	Frequency	Percentage
< 20 degree	15	35%
20 degree	27	65%
Total	42	100%

Table 7. Out Come (n= 42)

Out Come	Frequency	Percentage
Corrected	27	65%
Not Corrected	15	35%
Total	42	100%

Table 8. Stratification of Out Come W.R.T Age Distribution (n= 42)

Out Come	12-15 years	16-18 years	Total
Corrected	19	8	27
Not Corrected	10	5	15
Total	29	13	42

0.8035 was P value (Chi Square test)

Table 9. Stratification of Out Come W.R.T Gender Distribution (n= 42)

Out Come	Male	Female	Total
Corrected	11	16	27
Not Corrected	7	8	15
Total	18	24	42

(0.7100 was P value (Chi Square test)

Table 10. Stratification of Out Come W.R.T Bmi Distribution (n= 42)

Out Come	20 kg/m ²	>20 kg/m ²	Total
Corrected	18	9	27
Not corrected	9	6	15
Total	27	15	42

0.6657 was P value (Chi Square test)

Table 11. Stratification of Out Come W.R.T Type of Deformity

Out Come	Stiff	Flexible	Total
Corrected	5	22	27
Not Corrected	3	12	15
Total	8	34	42

0.9067 was P value (Chi Square test)

Discussion

Scoliosis affects young and growing age population mostly in age of 10–16 years, having prevalence of 10-15% in literature and 90% of patients have idiopathic adolescence scoliosis. Primary curve with Cobb angle greater than 45° is threshold for surgical curve.

14 years is the mean age of the patients with standard deviation 3.26. Male patients were 42%. On the other hand, 58% patients were female. More over 65% patients had corrected outcome while 35% patients had not corrected outcome.

Hassankhani EG¹⁶ study showed that 56 patients (42 female 14 male) with adolescent idiopathic scoliosis, more over the average correction of 40+/-10 degrees in 60% to 70% of patients on immediate postoperative radiographs

using standard posterior instrumentation technique⁽¹⁶⁾.

In one study, thoracic curve of 56 15° was gone down to 24 17° and lumbar curve of 43 14° was gone down to 23 6°. Before operation, thoracic kyphosis of 37 13° and lumbar lordosis of 33 13° were replaced to 27 13° and 42 21° respectively⁽¹⁷⁾.

Another study has shown the result in which 58.35° was mean Cobb's angle which was gone down to 23.45°. It signifies a mean correction of 59.57%.⁽¹⁸⁾.

Conclusion

The study brings to close that pedicular screw instrumentation had 65% corrected outcome in posterior spinal fusion in idiopathic adolescent scoliosis in terms of improvement in Cobb angle.

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