THE SURGICAL TREATMENT OF SEVERE IDIOPATHIC SCOLIOSIS BY CDI

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33 cases of severe idiopathic scoliosis (over 80 degrees) have been treated by CD Instrumentation in our clinic during the period between April 1990 and June 1993. 13 patients were male, 20 were female. Age varied from 9 to 17 years with an average of 13.8 years. Follow up varied from 7 months to 39 months with a mean of 23 months.

Combined anterior and posterior surgery performed in all cases. In 26 cases anterior and posterior procedures were performed in different sessions, in 7 cases were in one session. Among patients operated in two sessions, 14 received halo-femoral traction in between the two operations.

The average frontal Cobb angle of the curve was 98.4° (80° to 120°). Mean postoperative Cobb measurement was 51.7° (22° to 88°). The mean postoperative correction rate was ~47.4 (%25 to %76). Mean preoperative frontal balance deviation of 2.2 cm improved to 0.6 cm postoperatively.

Some neglected cases of idiopathic scoliosis can present with a curve over 80 degrees. The surgical therapy in these cases has some difficulties, such as requirement for anterior release in case of rigid curve, difficulties in the surgical technique together with requirements for modifications in instrumentation. Limited correction rate, postoperative pulmonary complications due to compromised pulmonary functions are other problems. Complications including pseudoarthrosis or neurologic deficits are more common than those seen in the other types.

In this study, we evaluated our cases with rigid curves over 80 degrees, who had surgical treatment.

PATIENTS AND METHOD

33 patients with frontal Cobb angle over 80 degrees (13 male- 20 female) surgically treated between 1990-1993. Mean age was 13.8 years (9-17). Mean follow-up was 23 months (7-39). Mean Cobb angle was 98.4° (80°-120°).

Classification of curves according to the localization are as follows: Thoracic in 21 cases, Thoracolumbar in 5 cases, Thoracic-lumbar combined in 7 cases.

Combined anterior and posterior surgery performed in all cases. In 26 cases anterior and posterior procedures are performed in different sessions, In 7 cases these procedures are performed in one session (fig. 1). Among patients operated in two sessions, 14 received halo-femoral traction in between the operations. The mean time between two stages was 11 days.

In all cases CDI was used. In 26 cases tripple rod system was used.

RESULTS

We achieved a postoperative correction rate of 47.4% in our cases and there was no significant correction in cases other than two cases with hook dislocation.

Radiographic results of the cases are summarized in table 1 and table 2.

There was one postoperative infection (3%) which

Table 1. Radiological data of the patients.

	Preoperative	Postoperative	Follow-up
Cobb angle	98.4° (80-120°)	51.7° (22°-88°)	55.3° (24°-93°)
Balance (C7-Mid.line.)	2.2 cm	0.6 cm	0.5 cm
Loss of correction			4.4° (2°-7°)

Table 2. Correction rates in the frontal plane

Average correction rate:	47.4% (25%-76%)
One-session procedure:	48.4%
Two-session procedure:	46.0%
Preop. halo-traction (+):	50.6%
Preop. halo-traction (-):	42.8%

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healed with medical treatment. In one case neurologic deficit (monoplegia) developed and later she fully recovered. There were dislocations of distal hooks in two cases (6%) who required revision and fusion was extended 1 level distally. There was no pseudoartrosis. Atelectasis developed in two cases and they were treated with pulmonary support.

DISCUSSION

Most idiopathic curves which require surgical treatment can usually be treated by posterior fusion and instrumentation only, before the patient reaches adult age (1, 2, 12). However, some neglected cases may present with severe, rigid curves over 80°. In these cases, posterior procedure only will not suffice as surgical treatment. Anterior surgery will have to be added in order to obtain a better correction and a more stable fusion. Previous studies have shown more pseudarthrosis and implant failure with posterior fusions in severe curves than with combined procedures (1, 2, 5, 11, 12, 16).

There are severe structural changes both in the spine and in the thoracic wall in these kind of curves. The length of the convex side is increased and the length of the concave side is decreased. Anterior discectomy allows both shortening of the convex side and more distraction at the concave side. Moreover, with procedures on the costotransversal joints and the ribs, we can achieve a better correction of the scoliosis and a cosmetically better appearance (15).

Some authors suggest that anterior instrumentation should be used along with anterior discectomy especially in lumbar curves (1, 8). However, we think that anterior instrumentation has no place in these cases because posterior fusion will have to be added so as to avoid the risk of pseudorarthrosis and changes in the facet joints prevent correction. We, therefore, can say that posterior fusion following anterior discectomy and fusion has become the standard method of surgical treatment in cases with severe, rigid curves.

Spinal ischemia, which can especially occun at the thoracic area where spinal circulation is at risk, is the most important subject that requires great care during anterior discectomy. As a result of this, neurologic deficit leading to paraplegia is not rarely seen (4). THerefore, discs should be removed with great care and saving as many segmental arteries as possible. When only disc excision is done during anterior procedures, protection of the vessels is technically not problematic since segmental arteries are at the level of the corpus. Still, protection of the vessels at the concave side is of vital importance when segmentary vessels have to be ligated. Furthermore, there is a higher risk of neurologic deficit due to tension during the correction of scoliosis with distraction because of adaptive changes in the spinal cord (4, 6, 14). We should, therefore, try to achieve a well-balanced spine with partial correction, avoiding overdistraction during posterior instrumentation. The only case with neurologic deficit occured after anterior discectomy, in our series. We think that the cause is distortion of spinal circulation in this case.

It is definite that pulmonary functions are poor in cases with severe curves. We should keep in mind that thoracotomy will further worsen the situation and necessary arrangements should be done for pulmonary support in the postoperative period (7, 9, 10).

Intraoperative blood loss has been minimized with the use of hypotensive anesthesia and autotransfusion recently. Owing to these, combined procedures can be done under same anesthesia. There are distinct advantages of one-stage surgery in cases with severe curves. One of these is that the patient will not have to be confined to bed between two stages. This remarkably facilitates pulmonary physiotherapy in these cases with already poor pulmonary function. The other advantage is avoidance of skin problems which increases the risk of postoperative infection during recumbency in these patient with deformation of the thoracic wall. The most important advantage is shortening of hospitalization time. Because of these advantages, we preferred one-stage surgery in our last cases. We achieved similar rates of correction with one-stage and two-stage surgeries, 48% and 46% respectively.

The period between two stages is suggested not to increase 10 days when two-stage procedures are performed. When exceeded, the effect of the previous release progressively decreases. Use of halofemoral traction between the stages is controversial. We achieved 50% correction in patients who had traction and 42.8% correction in patients who did not have traction. This shows that traction has a positive effect on correction.

We may encounter important problems during the instrumentation of cases with severe curves. Derotation maneuver for the correction of the curve can not usually be done with CDI. Here, distraction with short and long rods in the concave side of the curve and transverse traction between rods will allow sufficient correction. It is possible to increase the correction and stability with this triple rod system in 26 of our cases and double rod system was possible in 7 cases.

One of the complications in the surgical treatment of cases with severe curves is development of pseudoarthrosis and implant failure. There was no pseudoarthrosis in our cases, only 2 cases had dislocated hooks and required revision. We think that this succesful result is due to strict adherence to the fusion technique and good stability that can be achieved with CDI.

Severe thoracic deformation is another problem in these cases. These problems can be overcome to some degree by release of the costotransversal joints in the convex side and removal of 5 or 6 ribs.

CONCLUSION

In the treatment of rigid and severe scoliotic curves, 50% correction rate and a well-balanced spine can be obtained by posterior fusion with CDI following anterior discectomy and fusion.

Regarding the correction rates, there is no significant difference between cases operated in one session and those operated in two sessions.

In two-session operated cases, application of a halo-traction between the two operations improved correction rates.

In one-session operated cases, immediate mobilization can be achieved, hospitalization time and pulmonary complications can be decreased.

A more desirable cosmetic appearance can be achieved with the addition of thoracoplasty.

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