Surgical Outcome of the Rod Derotation Technique in Adolescent Idiopathic Scoliosis (AIS) Correction

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Purpose: *To evaluate the results of deformity correction in adolescent idiopathic scoliosis (AIS) with spinal column realignment (SmartlinkTM), and determine if it is an effective tool for the deformity correction of adolescent idiopathic scoliosis with a good result.*
Methods: *We retrospectively reviewed 28 AIS patients. All patients underwent posterior spinal fusion and deformity correction using the rod derotation technique. The patients were aged 12-23 years with a mean age of 16.6 years. The average follow-up time was 3 years. The SmartlinkTM was used for the spinal column realignment. The navigator system and nerve integrity monitor (NIM) were used during the operations.*
Results: *No patient had a serious complication. For Lenke type 1, the deformity was corrected in the coronal plane for an average of 87%. In Lenke type 2, the deformity was corrected in the coronal plane for an average of 80% in the main thoracic, and 66.0% in the proximal thoracic. In Lenke type 3, the deformity was corrected in the coronal plane of the main thoracic 80% and thoracolumbar/lumbar 82. In Lenke type 5, the corrected deformity thoracolumbar/lumbar average was 90%. In Lenke type 6, the corrected deformity thoracolumbar/lumbar average was 89%, and the corrected deformity main thoracic average was 87%.*
Conclusion: *The use of the spinal column realignment SmartlinkTM had a good result for the correction of AIS deformities, and it was safe when combined with the O-arm navigator and NIM for nerve monitoring during pedicle screw placement for the correction of AIS deformities.*

Keywords: *AIS, coronal plane, corrective deformity, rod derotation, spinal column realignment, spinal fusion*

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Introduction

Adolescent idiopathic scoliosis (AIS) is a common disease in adolescents aged 11-18 years due to growth spurts and deformities in the coronal, sagittal, and axial plane which contribute to scoliosis, if the curve is more than 10 degrees. The incidence rate is 2.0% to 2.5%[1,2]; only 0.2% require treatment[3] and 0.1% require surgery[4]. When the deformities are between 10– 40 degrees, conservative management with a brace support and muscle-stretching exercises are required. However, if deformities are more than 40 degrees, without a response to bending force, so that the residual Cobb angle is more than 25 degrees, surgical correction should be performed according to the Lenke Classification for AIS.[5]. If surgery is not performed, there will be consequences for overall health and function, such as back pain[6], decreased cardiopulmonary reserve on the concave side, and worst of all, low self-esteem[7].

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The Harrington rod was developed in 1960 to correct deformities, especially in the coronal plane, and it was a favorite for 25 years[8]. However, there are limitations due to broken rods, flatbacks in the sagittal plane, and the chronic complaint of lumbar spine pain. Besides, body casts and body jackets should be done postoperatively 6-12 months in order to strengthen the Harrington rod and prevent a dislodged rod. In 1980, Cotrel- Dubousset[9,10] developed instrumentation with the concept to achieve 3-dimensional correction with rod rotation by changing the lamina hook to the pedicle hook in order to strengthen both the proximal and distal vertebrae. Adding multiple hooks and screws at many levels in order to stop using the external support postoperatively; however, there were many complications following Cotrel- Dubousset instrumentation because 47.5% needed a revised instrument, 25.0% had a postoperative infection, and 20.0% had late-operative site pain. Since then a pedicle screw has been used instead of a pedicular hook at the thoracic spine, which can increase stability and decrease revision from the dislodging of the pedicular hook. And, furthermore, it can correct deformities better.

In 1999, Professor Se-ll Suk[11] tried to correct the problem in the transverse plane with direct vertebral rotation by 3-dimensional deformity correction with segmental pedicle screw fixation, and later in 2010, instruments for the correction of axial plane derotation by extending the pedicle screw or a smart link tool was developed, so that it was easier to rotate the concave side to the same level as a convex side, which can diminish malrotation of a vertebra and decrease rib hump on the convex side.

Methods

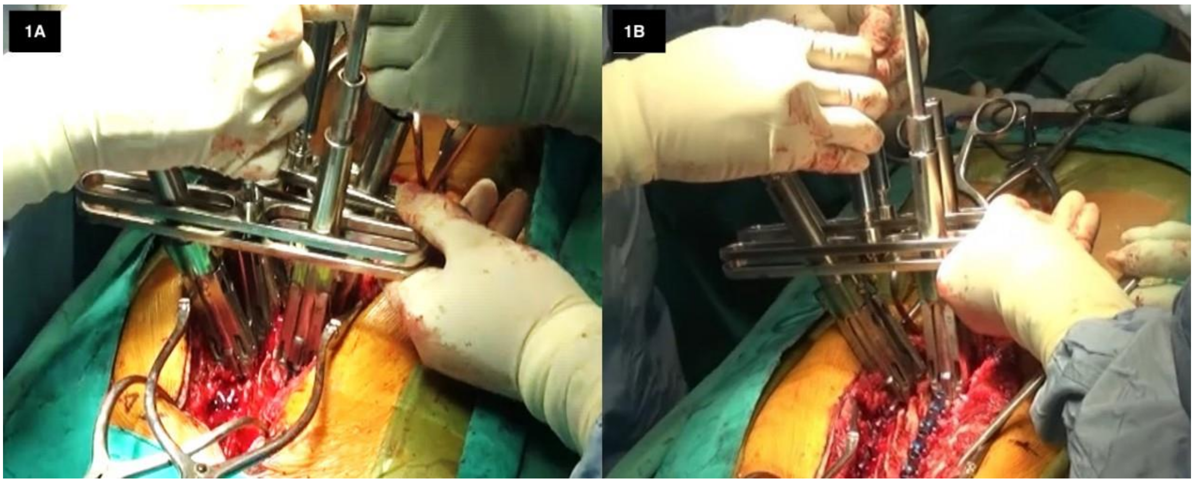
This retrospective study was approved by the Hat Yai Hospital Institutional Review Board. Twenty-eight AIS, aged 12-23 years, underwent spinal column realignment from 2014-2020. Mean age was 16.6 years and the female to male ratio was 13:1, with a follow-up time of 1-6 years, mean 3 years. The instrument used for spinal column realignment was the spinal column realignment system (Smartlink^{TM}) because it can correct segmental derotation, which was added up from coronal and sagittal plane correction, and its technique was easier to use.

All patients underwent physical examination and radiographic scanogram to see the whole spine and additional bending images of both the right and left side. The Lenke classification system was used to divide the patients into 6 groups according to their Lenke type, because we had to plan for a pedicle screw at the Upper Instrument Vertebrae (UIV) and Lower Instrument Vertebrae (LIV).

Nerve monitoring was done intraoperatively by the nerve integrity monitor (NIM) system to monitor nerve conduction so that it would be safe for the patient's spinal cord as the orthopedist has to correct the deformity in 3 dimensions, especially during straightening of the vertebral spine. We did not perform the wake-up test.

After anesthesia, the patient was placed in the prone position. The incision was made and retraction of the paravertebral muscle was done in order to explore the facet joint and transverse process of the thoracic spine; then the pedicle was approached, which was confirmed by the navigator O-arm. In case the pedicle size was smaller than 4.5 mm., we should use the extra pedicle technique that inserts the screw laterally, parallel to the pedicle, and then through the vertebral body using the trocha of the navigator, except in some cases in which the bone is so strong and thus we should use the drill first and then the trocha of the navigator to get through the vertebral body, and then place the pedicle screw in order not to risk spinal cord injury.

Usually, with each turn of the O-arm navigator, it will cover the vertebral body for 5-6 levels, if it is Lenke type 3,4,6; so that UIV would be at T3 and LIV at L3 or L4, in that case, we have to scan the O-arm 3 times. After insertion of all the pedicle screws, a measurement of the rod was made, and the suitable length of the rod was 1.5 - 2.0 cm above the upper screw and below the lowest screw and then the rod was bent to a suitable curve by marking the apical vertebrae position. In the case of Lenke type 1A-1C, the Canter lever technique will be used by inserting the rod and placing the nut loosely, then rotating the rod to the sagittal plane and placing the screw extender, which is an extension from a screw and pushrod to the groove of a screw for the reduction in the coronal and sagittal plane. After that, the extender screw was used to rotate the spinal vertebrae from the concave side to the convex side in the axial plane by loosening the nut of each screw at every level, then tightening the nut at each level after derotation of the vertebrae around the rod (Figure1). This is the process for derotation of the spinal column, which will result in making each spinous process turn in a straight line, and the level of the concave and convex side will be the same, solving the rib hump problem on the convex side.



(1A) (1B)

Fig.1 Extender rod and screw with connector. (1A). The derotation vertebral extender screws were applied for reduction by concave side to convex side (1B).

In cases where there are structural curve abnormalities, 2 or more curves in Lenke type 2,3,4,6, the insertion of the rod and reduction by standard technique (classic) by starting insertion of the rod in the coronal plane and then putting the nut loosely on the screw and rotating the rod in a sagittal plane until it is straight, then tighten the nut so that the distraction force at the screw in the concave side will straighten the vertebra. On the concave side finally, we correct derotation by using an extender screw to rotate the vertebra from the concave side to the convex side in the axial plane for 4-5 levels, according to the scoliotic deformity in each patient until reaching derotation of the spinal column realignment. Inspect that spinous process alignment is in a straight line and the concave side of the vertebra is at the same level as the convex side, and finally check for spinal cord function.

The patient demographic data, physical examination data, and radiographic data were extracted from the electronic hospital database. The scoliosis angle was measure via a picture archiving and communication system (PACS) by pre-operative and 6-week postoperative standing spine radiographic. All of the data was extracted by a spine surgeon who specialized in AIS treatment. The sample size was calculated based on the previous study related to direct vertebral derotation instrumentation in idiopathic scoliosis[12]. Eight patients per group were required to detect a significance level of 0.05, and power was set at 0.2 to detect a difference of preoperative and postoperative coronal Cobb angle.

Results

This study had 28 patients with no complications, such as paralysis, peripheral nerve injury, pneumothorax or surgical site infection. All patients were mobilized with thoracolumbar brace for 3 days postoperatively and then underwent continuous rehabilitation training. The demographic data of the patients after being classified using the Lenke system can be seen in Table 1 – Table 5.

The first group (Table 1), Lenke type 1, had 11 patients with a female to male ratio of 10:1; mean age was 16.8 years. Thoracic kyphosis N: (-) was 9:2. Average coronal angle was 46 degrees before the operation and could be reduced to 6 degrees with 87.0% correction. Sagittal plane was 15 degrees increased to 17 degrees with 13.0% correction. The most UIV was at T3 or T4. The most LIV was at L1 or L2, except Lumbar Mod C may be L3.

In the group of Lenke type 2 (Table 2), there was only one patient, male, aged 17 years. UIV T2 Cobb angle proximal thoracic 30 degrees to 10 degrees was 66.0% corrected. LIV L3 Cobb angle main thoracic 81 degree to 17 degrees was 80.0% corrected.

In a group of Lenke type 3 (Table 3), there were 6 patients, all female with a mean age of 14.3 years. Thoracic kyphosis N:(-) was 5:1. Coronal Cobb angle showed the average main thoracic angle preoperatively was 56 degrees, and the average postoperative angle was 10 degrees with 80.0% correction. The average thoracolumbar/lumbar angle preoperatively was 47 degrees and the average postoperatively was 8 degrees with 82.0% correction. In the sagittal plane, the average main thoracic kyphosis angle preoperatively was 28 degrees and the average postoperatively was 27 degrees with a 3.0% correction. The average thoracolumbar/lumbar angle preoperatively was 39 degrees and the average postoperatively was 40 degrees with a 2.0% correction. UIV started at T3 or T4. LIV started at L4 or L5 when L4 was unstable vertebrae.

This study did not have any patients in the group of Lenke type 4. In the group of Lenke type 5 (Table 4), there were 4 patients. All were female with a mean age of 16 years. Thoracic kyphosis N:(+) was 3:1. The coronal Cobb angle showed the average thoracolumbar/lumbar preoperatively was 44 degrees and the average postoperatively was 4 degrees with 90.0% correction. In the sagittal plane, the average main thoracic kyphosis angle preoperatively was 33 degrees and the average postoperatively was 27 degrees, with 18.0% correction. The average thoracolumbar/lumbar angle preoperatively was 54 degrees and the average postoperatively was 45 degrees with 16.0% correction. UIV started at T5 for 3 cases and T9 for 1 case. LIV started at L4 for 2 cases, L5 for 1 case, and L3 for 1 case.

In the group of Lenke type 6 (Table 5), there were 6 patients; all were female with a mean age of 16.6 years. Thoracic kyphosis N : (-) was 5:1. Average Coronal Cobb angle of the thoracolumbar/lumbar angle preoperatively was 56 degrees and the average postoperatively was 6 degrees with 89.0% correction. The average main thoracic angle preoperatively was 40 degrees and the average postoperatively was 42 degrees with 87.0% correction. In the sagittal plane, the average thoracolumbar/lumbar angle preoperatively was 40 degrees and the average postoperatively was 42 degrees with +10.0% correction. The average main thoracic kyphosis angle preoperatively was 21 degrees and the average postoperatively was 24 degrees with +14% correction. UIV started at T3 for 3 cases and T4 for 3 cases. LIV started at L5 for 3 cases, L4 for 1 case, and L2 for 1 case.

Table 1 The result of derotation technique in patients with AIS (Lenke Type 1).

Coronal cobb angle							Sagittal plane				
Case	**Sex**	**Age (years)**	**Type**	**Pre op**	**Post op**	**correction %**	**Pre op**	**Post op**	**correction %**	**UIV**	**LIV**
1	Male	16	1CN	45^0	10^0	77%	12^0	20^0	66	T_3	L_3
2	Female	16	1A (-)	49^0	10^0	79%	6^0	15^0	150	T_2	L_1
3	Female	13	1BN	70^0	16^0	78%	23^0	23^0	0	T_3	L_2
4	Female	16	1AN	40^0	3^0	92%	15^0	20^0	30	T_3	L_1
5	Female	16	1AN	42^0	4^0	90%	15^0	15^0	0	T_4	L_1
6	Female	15	1BN	42^0	2^0	95%	15^0	12^0	-20	T_3	L_2
7	Female	16	1BN	41^0	5^0	87%	40^0	30^0	-25	T_4	L_2
8	Female	22	1BN	40^0	3^0	92%	14^0	16^0	14	T_3	L_2
9	Female	16	1B (-)	42^0	7^0	83%	7^0	14^0	100	T_4	L_3
10	Female	16	1BN	50^0	6^0	88%	10^0	12^0	20	T_3	L_2
11	Female	23	1B (-)	40^0	2^0	95%	8^0	15^0	-87	T_3	L_1
Total 11 case	Female 10/ Male 1	average 16.8	N: (-) 9: 2	46^0	6^0	87%	15^0	17^0	38%		

Abbreviations: UIV, the upper instrumented vertebra; LIV, the lowest instrumented vertebra;
N:(-), Number of patients; Thoracic sagittal modifier (T5-T12); < 10^0;
1AN, Lenke type 1, Lumber spine modifier A, Thoracic sagittal modifier (T5-T12); 10^0-40^0;
1A (-), Lenke type 1, Lumber spine modifier A, Thoracic sagittal modifier (T5-T12); < 10^0;
1BN, Lenke type 1, Lumber spine modifier B, Thoracic sagittal modifier (T5-T12); 10^0-40^0;
1B (-), Lenke type 1, Lumber spine modifier B, Thoracic sagittal modifier (T5-T12); < 10^0;
1CN, Lenke type 1, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); 10^0-40^0;

Table 2 The result of derotation technique in patients with AIS (Lenke Type 2).

Coronal cobb angle							Sagittal plane				
Case	**Sex**	**Age (years)**	**Type**	**Pre op**	**Post op**	**correction %**	**Pre op**	**Post op**	**correction %**	**UIV**	**LIV**
1	Male	17	2B (+)	PT 30 MT 81	PT 10^0 MT 17	66% 80%	32^0	24^0	-25	T_2	L_3

Abbreviations: UIV, the upper instrumented vertebra; LIV, the lowest instrumented vertebra; PT, Proximal thoracic; MT, Main thoracic; 2B (+), Lenke type 2, Lumber spine modifier B, Thoracic sagittal modifier (T5-T12); > 40^0

Table 3 The result of derotation technique in patients with AIS (Lenke Type 3).

Coronal cobb angle							Sagittal plane				
Case	**Sex**	**Age (years)**	**Type**	**Pre op**	**Post op**	**correction %**	**Pre op**	**Post op**	**correction %**	**UIV**	**LIV**
1	Female	14	3C (-)	MT 48^0 T-L 39^0	MT 5^0 T-L 3^0	90% 92%	MT 6^0 T-L 0	MT 16^0 T-L 23^0	166 230	T_2	L_4
2	Female	13	3CN	MT 60^0 T-L 53^0	MT 15^0 T-L 28^0	75% 47%	MT 34^0 T-L 45^0	MT 32^0 T-L 45^0	5 0	T_3	L_2
3	Female	16	3CN	MT 46^0 T-L 42^0	MT 2^0 T-L 1^0	95% 97%	MT 30^0 T-L 30^0	MT 20^0 T-L 30^0	-33 0	T_3	L_4
4	Female	14	3CN	MT 58^0 T-L 52^0	MT 21^0 T-L 13^0	63% 75%	MT 20^0 T-L 46^0	MT 25^0 T-L 48^0	25 4	T_4	L_4
5	Female	16	3CN	MT 60^0 T-L 45^0	MT 10^0 T-L 2^0	83% 95%	MT 40^0 T-L 58^0	MT 35^0 T-L 50^0	-12 -16	T_4	L_5
6	Female	13	3CN	MT 67^0 T-L 53^0	MT 10^0 T-L 1^0	85% 98%	MT 37^0 T-L 58^0	MT 32^0 T-L 42^0	-18 -23	T_3	L_5
Total 6 case	Female 6/ Male 0	average 14.3	N: (-) 4: 1	MT 56^0 T-L 47^0	MT 10^0 T-L 8^0	82% 82%	MT 28^0 T-L 39^0	MT 27^0 T-L 40^0	-3 2		

Abbreviations: UIV, the upper instrumented vertebra; LIV, the lowest instrumented vertebra; MT, Main thoracic; T-L, thoracolumbar/lumbar;
N: (-), Number of patients; Thoracic sagittal modifier (T5-T12); < 10^0;
3CN, Lenke type 3, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); 10^0-40^0;
3C (-), Lenke type 3, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); < 10^0;

Table 4 The result of derotation technique in patients with AIS (Lenke Type 5).

Coronal cobb angle							Sagittal plane				
Case	**Sex**	**Age (years)**	**Type**	**Pre op**	**Post op**	**correction %**	**Pre op**	**Post op**	**correction %**	**UIV**	**LIV**
1	Female	17	5CN	T-L/ L 50^0	5^0	90%	T-L 53^0 MT 21^0	T-L 40^0 MT 21^0	-24 0	T_5	L_4
2	Female	14	5C (+)	T-L/ L 50^0	5^0	90%	T-L 60^0 MT 55^0	T-L 42^0 MT 30^0	-30 -45	T_5	L_3
3	Female	17	5CN	T-L/ L 40^0	1^0	97%	T-L 51^0 MT 34^0	T-L 46^0 MT 30^0	-10 -11	T_9	L_5
4	Female	16	5CN	T-L/ L 40^0	8^0	80%	T-L 51^0 MT 21^0	T-L 52^0 MT 25^0	2 16	T_5	L_4
Total 4 case	Female 4/ male 0	average 16	N: (+) 3: 1	T-L 44^0	4^0	90%	T-L 54^0 MT 33^0	T-L 45^0 MT 27^0	-16 -18		

Abbreviations: UIV, the upper instrumented vertebra; LIV, the lowest instrumented vertebra; MT, Main thoracic; T-L, thoracolumbar/lumbar;
N: (+), Number of patients; Thoracic sagittal modifier (T5-T12); >40^0;
5CN, Lenke type 5, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); 10^0-40^0;
5C(+), Lenke type 5, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); > 40^0;

Table 5 The result of derotation technique in patients with AIS (Lenke Type 6).

Coronal cobb angle							Sagittal plane				
Case	**Sex**	**Age (years)**	**Dx**	**Pre op**	**Post op**	**correction %**	**Pre op**	**Post op**	**correction %**	**UIV**	**LIV**
1	Female	15	6CN	T-L 42^0 MT 35^0	4^0 9^0	90% 74%	T-L 57^0 MT 40^0	T-L 44^0 MT 30^0	-22 -50	T_3	L_2
2	Female	14	6CN	T-L 52^0 MT 38^0	2^0 1^0	96% 97%	T-L 52^0 MT 13^0	T-L 50^0 MT 13^0	4 0	T_4	L_5
3	Female	22	6CN	T-L 60^0 MT 30^0	5^0 3^0	91% 90%	T-L 32^0 MT 18^0	T-L 35^0 MT 22^0	9 22	T_4	L_5
4	Female	18	6CN	T-L 60^0 MT 52^0	10^0 10^0	83% 80%	T-L 43^0 MT 30^0	T-L 42^0 MT 28^0	4 12	T_4	L_5
5	Female	17	6CN	T-L 50^0 MT 45^0	2^0 3^0	96% 93%	T-L 28^0 MT 18^0	T-L 38^0 MT 26^0	35 44	T_3	L_4
6	Female	14	6C (-)	T-L 70^0 MT 40^0	10^0 2^0	85% 95%	T-L 30^0 MT 8^0	T-L 40^0 MT 22^0	33 75	T_3	L_5
Total 6 case	Female 6/ male 0	Average 16.6	N: (-) 5: 1	T-L 56^0 MT 40^0	6^0 5^0	89% 87%	T-L 40^0 MT 21^0	T-L 42^0 MT 24^0	10 14		

Abbreviations: UIV, the upper instrumented vertebra; LIV, the lowest instrumented vertebra; MT, Main thoracic; T-L, thoracolumbar/lumbar;
N: (-), Number of patients; Thoracic sagittal modifier (T5-T12); <10^0;
6CN, Lenke type 6, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); 10^0-40^0;
6C(-), Lenke type 6, Lumber spine modifier C, Thoracic sagittal modifier (T5-T12); <10^0;

Discussion

From this operation, correction of the deformities in the coronal Cobb angle plane in Lenke type 1, 2, 3 ,5, and 6 were more than 80.0%, especially Lenke type 1 with an average of 87.0%, type 2 with an average of 80.0% for the main thoracic; Lenke type 3 was 82% for the main thoracic and thoracolumbar/lumbar was 82.0%; Lenke type 5 was 90.0% for thoracolumbar/lumbar; Lenke type 6 was 89% for thoracolumbar/lumbar, and 87.0% for the main thoracic. When compared with a previous instrument, for example, the Harrington rod, Cotrel-Dubousset instrumentation and third-generation thoracic pedicle screw, and direct vertebral derotation, according to a report from Samuel Kodonry[12], correction of deformities by direct vertebral derotation is better than other instruments. These results are the same as the results of Suk SI.[13]

The best result of this paper is from the correction by derotation of the vertebrae, which was nearly completed using an extended screw, so that we could rotate the pedicle screw in the axial plane more easily, or rotate the vertebrae around the axial rod counter-clockwise with the deformities in the apical vertebrae and juxta apical vertebrae at levels 4-6 until the spinous process of each vertebra was in a straight line, then we tightened the locking nut so that the correction of the vertebral malrotation was done completely.

Correction in the sagittal plane:

Correction of the deformities can be done by bending the rod. In thoracic kyphosis of Lenke type 1 and 2, which are neutral, bending the rod is neutral too. If it is a hypokyphosis bending rod, it should be more than neutral to 15-20 degrees. But if it is hyperkyphosis, the bending rod should be reduced to 30-40 degrees; however, it should correlate with the lumbar lordosis. The patients with the double major curve, Lenke type 3 and 6, bending of the main thoracic, thoracolumbar/lumbar must be correlated with the lumbar lordosis and should be more than the thoracic kyphosis curve by 10-20 degrees. The bending of the curve, more or less, depends on the preoperative curve. Global balance and lumbosacral balance in the sagittal plane should be considered.

For choosing UIV (upper instrument vertebrae) in Lenke type 1, 3, and 6, we usually choose T3, 4, and 5. However, it depends upon the central sacral vertebral line (CSVL), which the line crosses with the upper stable vertebrae of the main thoracic curve and at which level, except for Lenke type 2, we choose T2 vertebrae and T5 or lower for Lenke type 5.

For choosing LIV (lower instrumentation vertebrae) in Lenke type 1A and 1B, the authors usually choose L1 or L2 level and Lenke type 1C, L3 was suitable; however, selective thoracic fusion was done for L1 or L2, which would be suitable(14). The LIV of Lenke type 3 and 6 should be L4 or L5, except for selective thoracic fusion which was completely done. L2 would be suitable in Lenke type 3. The LIV of Lenke type 5 should be at L4 or L5, which was more stable than most cephalads that intersected with CSVL.

Most of all, patient safety is the most crucial element for two reasons. The first reason: the navigator system inserted the pedicle screw, especially at the upper thoracic region, as the pedicle is smaller than the smallest size of the pedicle screw. The extra pedicle technique was used by approaching the pedicle screw from the lateral side of the pedicle into the vertebral body until a depth of 30 mm, so that there would not be any trauma to the anterior large vessel, or injury to the spinal cord or thoracic root in the apical or juxta apical vertebrae. The pedicle screw was inserted horizontally in the concave side and vertically on the convex side. Navigators could reduce injury to the spinal cord. The last reason is nerve monitoring during the operation, so that if there was a problem in nerve function during a correction, we could decrease deformity correction until the nerve regained normal function.

This study has some limitations. First, this study was a retrospective study. Due to the retrospective nature, this study might have a measurement bias. This study measures the scoliosis angle by one orthopedist. So, there might have an error for measurement if the assessor has not enough experience with measurement techniques. Nevertheless, the orthopedist who performed measurement was an experienced orthopedist who specialized in AIS treatment. Second, this study had a small number of patients in each type of scoliosis. However, the author believes that the data of this study will be beneficial for a further multicenter study.

Conclusion

The rod derotation technique for spinal column realignment using the Smartlink^{TM} navigator and NIM system for correcting adolescent idiopathic scoliosis could achieve good results when combined with a good operative plan and correct surgical technique.

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ผลของการผ่าตัดแก้ไขกระดูกสันหลังคดในวัยรุ่นชนิดไม่ทราบสาเหตุด้วยเทคนิค Rod Derotation

ไพโรจน์ วราชิต, พบ, ประดิษฐ์ แท่นธรรมโรจน์, พบ, จักรพันธ์ ตันตระการสกุล, พบ, เรียมจันทร์ ทองหนู, วงษ์ธวัช เหลี่ยวรุ่งเรือง, พบ

วัตถุประสงค์: *เพื่อประเมินผลลัพธ์ของแก้ไขกระดูกสันหลังคดในวัยรุ่นชนิดไม่ทราบสาเหตุ ด้วยเครื่องมือการปรับแนวกระดูกสันหลัง (Smartlink ™) และพิจารณาว่าเครื่องมือนี้มีประสิทธิภาพในการแก้ไขความผิดปกติของกระดูกสันหลังคดในวัยรุ่นชนิดไม่ทราบสาเหตุ หรือไม่*

วิธีการศึกษา: *ตรวจสอบผู้ป่วยกระดูกสันหลังคดในวัยรุ่นชนิดไม่ทราบสาเหตุ 28 รายย้อนหลัง ผู้ป่วยทุกรายได้รับการผ่าตัดเชื่อมกระดูกสันหลังและการแก้ไขความผิดปกติโดยใช้เทคนิค Rod Derotation ผู้ป่วยมีอายุ 12-23 ปี (เฉลี่ย 16.6 ปี) ระยะเวลาติดตามผลการรักษาเฉลี่ย 3 ปี การผ่าตัดทำโดยใช้เครื่องมือ Smartlink ™ จัดแนวกระดูกสันหลัง ร่วมกับระบบคอมพิวเตอร์นำวิถีและเครื่องมือตรวจสอบความสมบูรณ์ของเส้นประสาท*

ผลการศึกษา: *ไม่มีผู้ป่วยที่มีภาวะแทรกซ้อนร้ายแรงในผู้ป่วยทั้งหมด ผลการแก้ไขความผิดปกติตามการแบ่งประเภทของ Lenke ชนิดที่ 1 พบว่าความผิดปกติได้รับการแก้ไขในระนาบแบ่งหน้าหลังโดยเฉลี่ยร้อยละ 87 ใน Lenke ชนิดที่ 2 ความผิดปกติได้รับการแก้ไขในระนาบแบ่งหน้าหลังโดยเฉลี่ยร้อยละ 80 ในทรวงอกหลักและร้อยละ 66 ในทรวงอกใกล้เคียง ใน Lenke ชนิดที่ 3 ความผิดปกติได้รับการแก้ไขในระนาบแบ่งหน้าหลังของทรวงอกหลักร้อยละ 80 และ thoracolumbar / lumbar ร้อยละ 82 ใน Lenke ชนิดที่ 5 ค่าเฉลี่ยความผิดปกติของทรวงอก / เอวที่ได้รับการแก้ไขร้อยละ 90 ใน Lenke ชนิดที่ 6 ค่าเฉลี่ยความผิดปกติของทรวงอก / เอวที่ได้รับการแก้ไขร้อยละ 89 และค่าเฉลี่ยทรวงอกหลักที่ได้รับการแก้ไขร้อยละ 87*

สรุป: *การใช้การปรับแนวกระดูกสันหลังด้วย Smartlink™ ให้ผลลัพธ์ที่ดีสำหรับการแก้ไขความผิดปกติของกระดูกสันหลังคดในวัยรุ่นชนิดไม่ทราบสาเหตุ และปลอดภัยเมื่อใช้ร่วมกับระบบคอมพิวเตอร์นำวิถีและเครื่องมือตรวจสอบความสมบูรณ์ของเส้นประสาทในระหว่างการใส่สกรูเพื่อแก้ไขความผิดปกติกระดูกสันหลัง*