ISSN: 03875547
Volume 46, Issue 02, February, 2023

Short Term Result of Posterior Correction Surgery of Scoliosis using Low Density Pedicle Screw Instrumentation In BPJS Era

Edwin Yosua Silitonga[1], Otman Siregar[1], Pranajaya Dharma Kadar[1], Heru Rahmadhany[1], Benny[1]

Department of Orthopaedic and Traumatology, Faculty of Medicine University of Sumatera Utara Haji Adam Malik Hospital Medan

Keywords:
AIS, pedicle screw, low density pedicle screw, scoliosis correction

ABSTRACT

Adolescent idiopathic scoliosis (AIS) is a complex 3D deformity of the spine. Its prevalence is between 2% and 3% in the general population. Correction scoliosis using low density (LD) screw constructs can provide similar radiographic and clinical outcomes Therefore, whether LD or high density (HD) screw constructs are better for AIS patients remains a subject of debate. In BPJS era at Adam Malik hospital, there's a restriction of using implant like pedicle screw in spine case operation because cost of disease and procedure operation was too high rather than budget of the patient that BPJS provide, so usually low density screw constructs was using for correction scoliosis procedure at that situation. Four patients AIS with variety of Lenke type was underwent correction scoliosis procedure with 3 patients AIS type I and 1 patient AIS type V underwent procedure with low density screw construct (<1.6 screws per level). All of the patients underwent x-ray after the operation and x ray follow up after 1 year operation, to compare cobb angle and sagittal modifier after operation and 1 year post operation. Four patients with variation of Lenke type with correction procedure with low density (LD) screw constructs show that the follow up of cobb angle and sagittal parameter after post operation and 1 year post operation that same measurement. With clinical function of the patient and quality life of the patient was increase significantly. The use of low density pedicle screw construct (LD) in correction scoliosis procedure for AIS patient in Haji Adam Malik hospital has the same result in cobb angle and saggital modifier in after the operation and 1 year post operation.

1. INTRODUCTION

Adolescent idiopathic scoliosis (AIS) is a complex 3D deformity of the spine. Its prevalence is between 2% and 3% in the general population, with almost 10% of patients requiring some form of treatment, but only about 0.1% requiring surgery. In addition to the cosmetic aspect of the deformity, more severe curves are often accompanied by psychosocial distress, including restricted social life, lower rates of marriage and higher divorce, fewer children per marriage, increased psychiatric consultations, higher rates of eating disorders and suicide, and physical problems such as increased back pain, cardiorespiratory dysfunction proportional to the

severity of the curve, and an increased risk of cor pulmonale and death with curves of >100° [1], [4]. Surgical treatment can lead to improvement in self-confidence, self-image, cosmetic and life satisfaction, and back pain. Thoracic curves of > 50° and the lumbar component of a double major curve will progress into adult life, especially those with more apical rotation [5], [6].

Thoracolumbar curves do not affect pulmonary function but produce marked cosmetic deformity and increasing, although not disabling, back pain, often associated with a translatory shift of the vertebrae and a tendency to progress over time, often continuing after the end of spinal growth. Surgical treatment of these curves when they reach 50o is therefore justified [2], [3]. The aim of surgery in the treatment of AIS is to improve cosmesis and function with low complication rates and few long-term implications. This has been made possible by a better understanding of the biomechanics, improvements in surgical techniques and the design of instrumentation.

Pedicle screw construct systems have been increasingly popular for treating patients with spinal deformities, and a significant correlation between the implant density and major curve correction has been reported [7-10]. However, substantial research has shown that low density (LD) screw constructs can provide similar radiographic and clinical outcomes [12], [13]. Therefore, whether LD or high density (HD) screw constructs are better for AIS patients remains a subject of debate. Previous studies have demonstrated that thoracic pedicle screw constructs could further improve the correction of spinal deformities compared with traditional hook and hybrid constructs [6]. However, the use of fewer pedicle screws indicated a reduction of hospital expenses and risk of neurologic complications. If neurological complications or spinal cord injuries occur, the consequences could be disastrous.

In the UK overweight and corpulence related sick wellbeing in 2014/15, cost £6.1 billion which surpasses the financing for the police, fire administration, and legal framework consolidated [13]. The yearly expense of emergency clinic inpatient care for diabetes inconveniences is assessed at somewhere in the range of £1800 and £2500 per understanding; yearly outpatient costs somewhere in the range of £300 and £370 per persistent and the expense of drug to treat confusions of diabetes is around 3-4 times the expense of the meds to treat the condition. This is prompting a complete diabetes use of around £14 billion or £1.5 million for each hour [14]. The UK is additionally falling behind in future for diabetic patients contrasted with other created countries [15]. At present, around 90% of grown-ups determined to have T2DM are overweight or hefty [16]. Most st of this individual and societal expense is considered conceivably preventable; the most significant guidance is drug adherence and keeping up a solid eating routine. Be that as it may, contention stays with respect to what may establish a solid eating regimen.

The Purpose of this case series was to show short term result of posterior correction surgery of scoliosis using low density pedicle screw instrumentation in BPJS era.

2. Case Report

Case 1

A patient, female 13-years-old, was admitted to hospital with chief complaint tilted on the back. It's been started since 2 years ago. History of trauma was not found. The tilted of the back was increasing in rapid progress since last year. Initially patient did not complaint about pain on the back but since last month she felt pain on the back and getting tired easily. Patient was still able to maintain her daily activity despite having some pain. The pain increased when patient tilting to the right. There is no radiating in pain. Defecation and micturition normal. The patient had menarche at 11 years old. She was a first child of three siblings. Other

ISSN: 03875547
Volume 46, Issue 02, February, 2023

siblings don't have similar condition. History of fever, Night sweat, loss of body weight, prolong cough was not found. Patient went to USU Hospital before referred to Orthopedic Clinic in Adam Malik Hospital for further evaluation. From physical examination was found right angulation of the back, there is a asymmetric shoulder level, asymmetric body arm distance, symmetrical pelvic obliquity. From Adam forward bending test, hump was found. In motoric and sensory examination was normal, there is no deficit neurologic. Patient underwent radiologic examination such as Thoracolumbal with AP, lateral and right-left bending view and pelvic AP view at Adam Malik hospital. From radiologic examination revealed cobb's angel at major thoracic (Th 5-12) was 51o, with right-bending view was 56o, lumbal modifier type B and sagittal modifier was 8o (-). From x-ray pelvic AP view was found risser 3. Laboratory examination was in normal limit. Patient was diagnosed with Adolescent Idiopathic Scoliosis Lenke Classification type I, Lumbar Modifier B with Sagittal Modifier (-). Patient underwent correction scoliosis procedure on December 2019 at Adam Malik hospital using Low Density pedicle screw. The use of the pedicle screw was 9 screws, with 2 screws at Th4-5, two screws at Th8, two screws at Th11, one screw at L1, and two screws at L3. Duration operation was 3.5 hour and blood loss was 300 cc. Haemodynamic patient was stable at pre-operation, during operation, and after operation. Patient was discharged from hospital 3 days after operation with wound after operation was good and there is no discharge or pus. Patient was educated for not take a heavy exercise or activities, not allowed to bow, squat for 1 month and control next 6 months and 1 year for x-ray.

Figure 1 Clinical Features

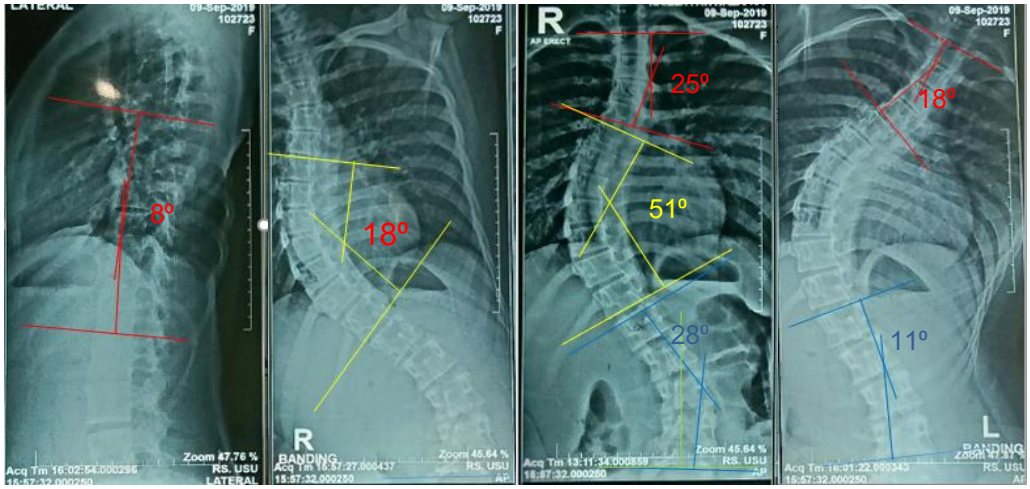


Figure 2 Radiological Examination Before Operation

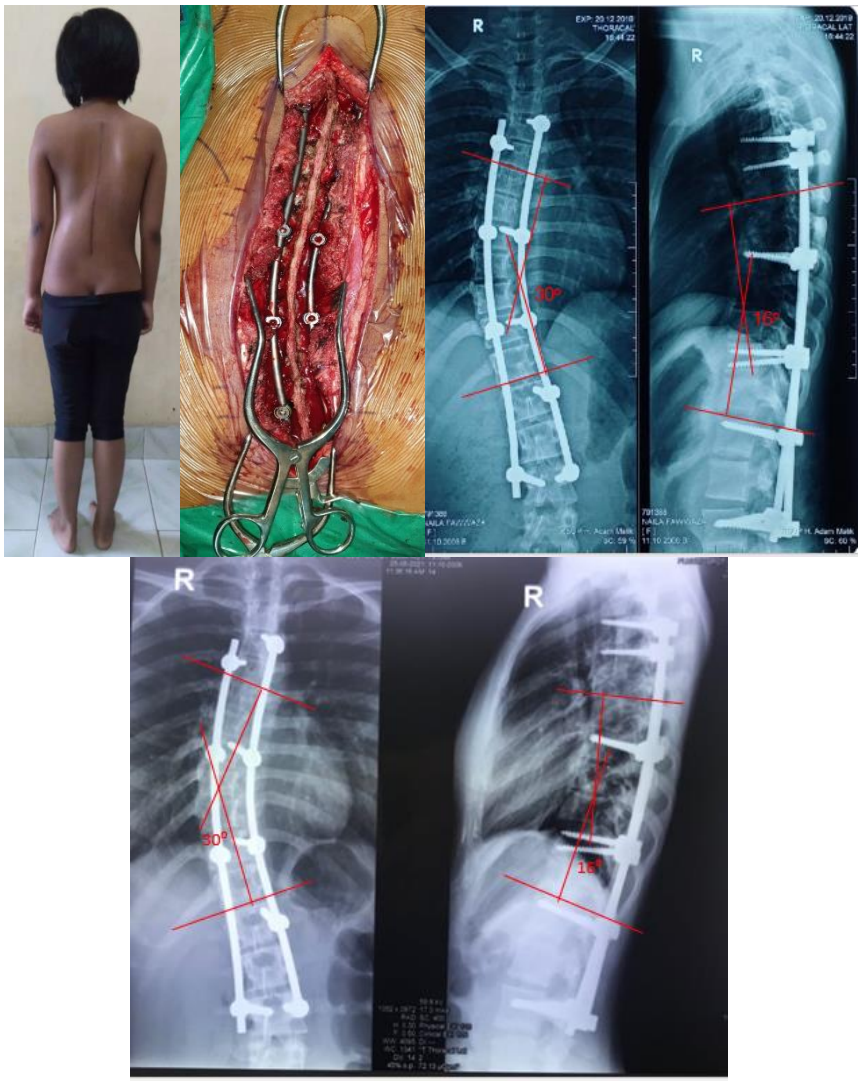


Figure 4 Radiological Examination and Clinical Feature After 1 Year Post Operation

Case 2

D, a 13-years-old female was admitted to hospital with chief complaint tilted on the back. It's been started since 2 years ago. History of trauma was not found. The tilted of the back was increasing in rapid progress since last year. Initially patient did not complaint about pain on the back but since last month she felt pain on the back and getting tired easily. Patient was still able to maintain her daily activity despite having some pain.

ISSN: 03875547
Volume 46, Issue 02, February, 2023

The pain increased when patient tilting to the right. There is no radiating in pain. Defecation and micturition normal. The patient had menarche at 12 years old. She was a second child of three siblings. Other siblings don't have similiar condition. Patient didn't has any congenital malformation since birth. History of fever, Night sweat, lost of body weight, prolong cough was not found. Patient went to Orthopedic Clinic in Adam Malik Hospital for further evaluation.

From physical examination was found right angulation of the back, there's a asymetric shoulder level, asymetric body arm distance, symetrical pelvic obliquity. From Adam forward bending test, hump was found. In motoric and sensoric examination was normal, there's no deficit neurologis.

Figure 5 Clinical Features

Patient underwent radiologic examination such as Thoracolumbal with AP, lateral and right-left bending view and pelvic AP view at Adam Malik hospital. From radiologic examination revealed cobb's angel at major thoracic (Th 5- 12) was 53^{o} , with right-bending view was 32^{o}, lumbal modifier type A and sagittal modifier was 30^{o} (N). From x-ray pelvic AP view was found risser 3. Laboratory examination was in normal limit. Patient was diagnosed with Adolescent Idiopathic Scoliosis Lenke Classification type I, Lumbar Modifier A with Sagittal Modifier (N).

Patient underwent correction scoliosis procedure on July 2020 at Adam Malik hospital using Low Density pedicle screw. The use of the pedicle screw was 9 screws, with 1 screw at Th4, 1 screw at Th5, 2 screws at Th8, 2 screws at Th11, 1 screw at L1 and 2 screws at L3. Duration operation was 2.5 hour and blood loss was 150 cc. Haemodynamic patient was stable at pre-operation, during operation and after operation. Patient was discharged from hospital 3 days after operation with wound after operation was good and there's no discharge or pus. Patient was educated for not take a heavy exercise or activities, not allowed to bow, squat for 1 month and control next 6 months and 1 year for x-ray.

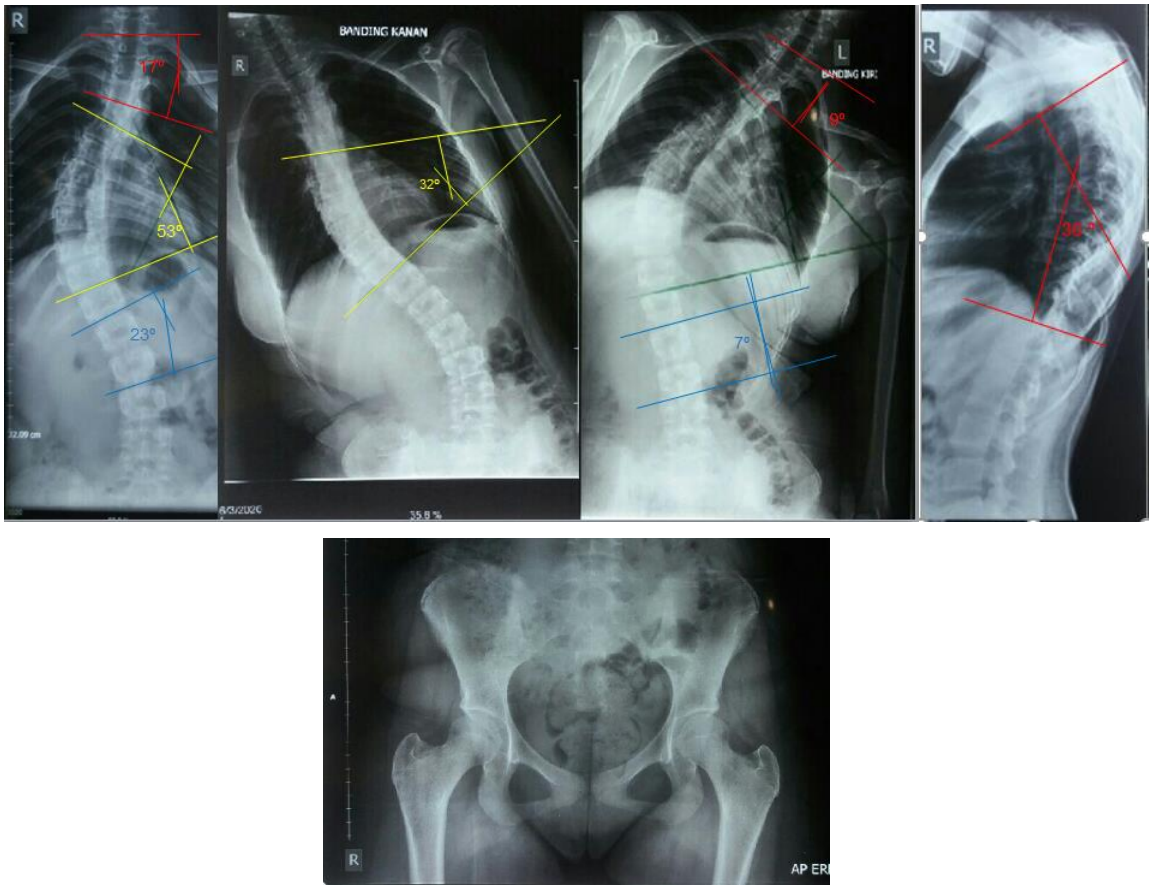


Figure 6 Radiological Examination Before Operation

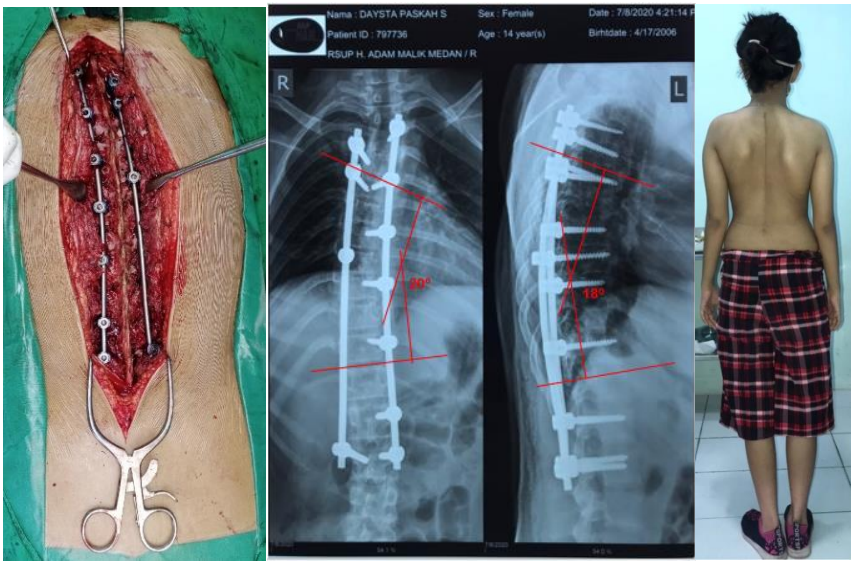


Figure 7 Durante Operation and Radiological Examination Post Operation

ISSN: 03875547
Volume 46, Issue 02, February, 2023

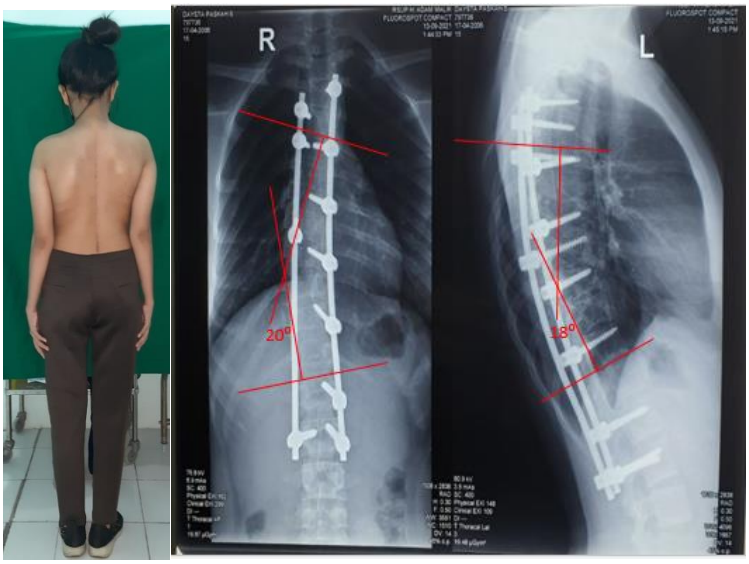


Figure 8 Radiological Examination and Clinical Feature 1 Year Post Operation

Case 3

K, a 13-years-old female was admitted to hospital with chief complaint tilted on the back. It's been started since 1 years ago. History of trauma was not found. The tilted of the back was increasing in rapid progress since 6 months ago. Initially patient did not complaint about pain on the back but since last month she felt pain on the back and getting tired easily. Patient was still able to maintain her daily activity despite having some pain. The pain increased when patient tilting to the right. There is no radiating in pain. Defecation and micturition normal. The patient had menarche at 13 years old. Patient didn't has any congenital malformation since birth. History of fever, Night sweat, lost of body weight, prolong cough was not found. Patient went to Orthopedic Clinic in Adam Malik Hospital for further evaluation.

From physical examination was found right angulation of the back, there's a asymetric shoulder level, asymetric body arm distance, symetrical pelvic obliquity. From Adam forward bending test, hump was found. In motoric and sensoric examination was normal, there's no deficit neurologis.

Patient underwent radiologic examination such as Thoracolumbal with AP, lateral and right-left bending view and pelvic AP view at Adam Malik hospital. From radiologic examination revealed cobb's angel at major thoracic (Th 5- 12) was 74^{o} , with right-bending view was 58^{o}, lumbal modifier type B and sagittal modifier was 23^{o} (N). From x-ray pelvic AP view was found risser 3. Laboratory examination was in normal limit. Patient was diagnosed with Adolescent Idiopathic Scoliosis Lenke Classification type I, Lumbar Modifier B with Sagittal Modifier (N).

Patient underwent correction scoliosis procedure on July 2020 at Adam Malik hospital using Low Density pedicle screw. The use of the pedicle screw was 11 screws, with 2 screws at Th3, 1 screw at Th5, 1 screw at Th6, 1 screw at Th7, 1 screw at Th8, 1 screw at Th9, 1 screw at Th11, 1 screw at L1 and 2 screws at L3. Duration operation was 3 hours and blood loss was 300 cc. Haemodynamic patient was stable at pre-operation, during operation and after operation. Patient was discharged from hospital 3 days after operation with wound after operation was good and there's no discharge or pus. Patient was educated for not take a heavy exercise or activities, not allowed to bow, squat for 1 month and control next 6 months and 1 year for x ray.

Figure 9 Clinical Features

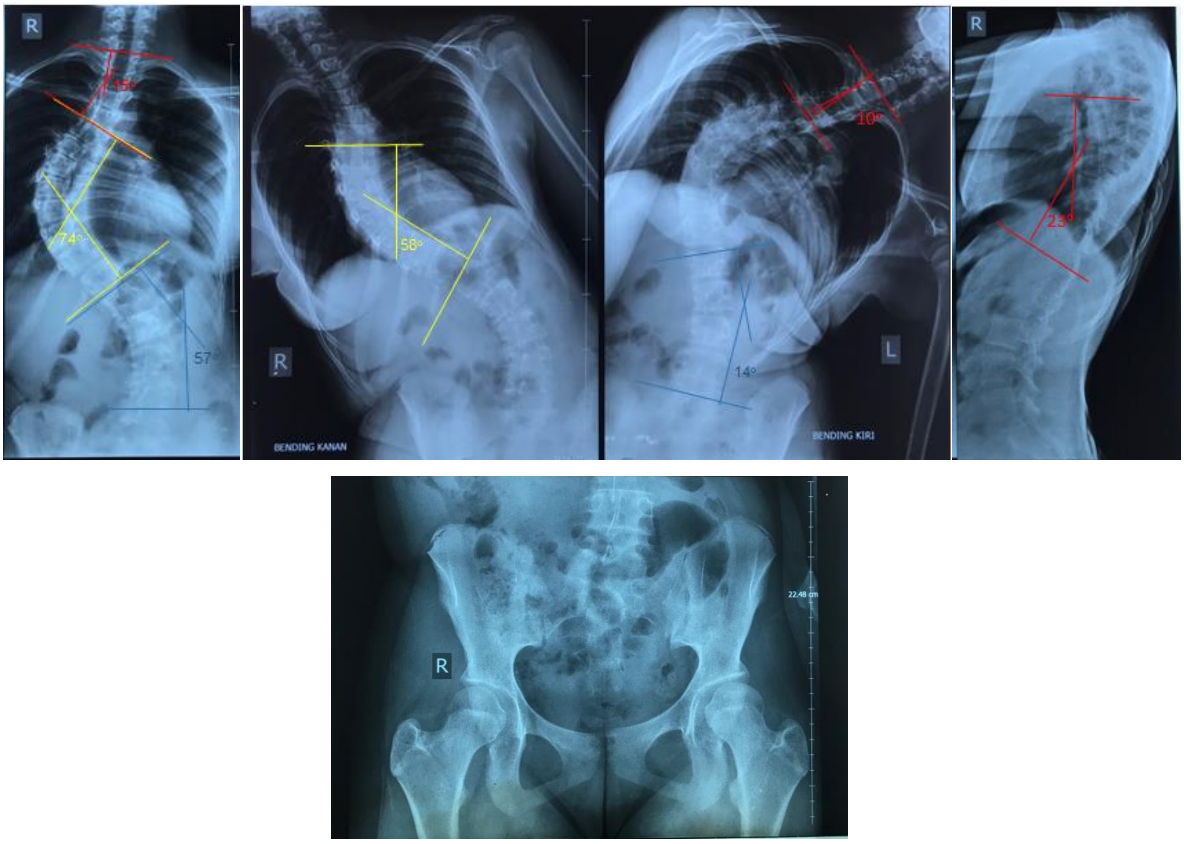


Figure 10 Radiological Examination Before Operation

ISSN: 03875547
Volume 46, Issue 02, February, 2023

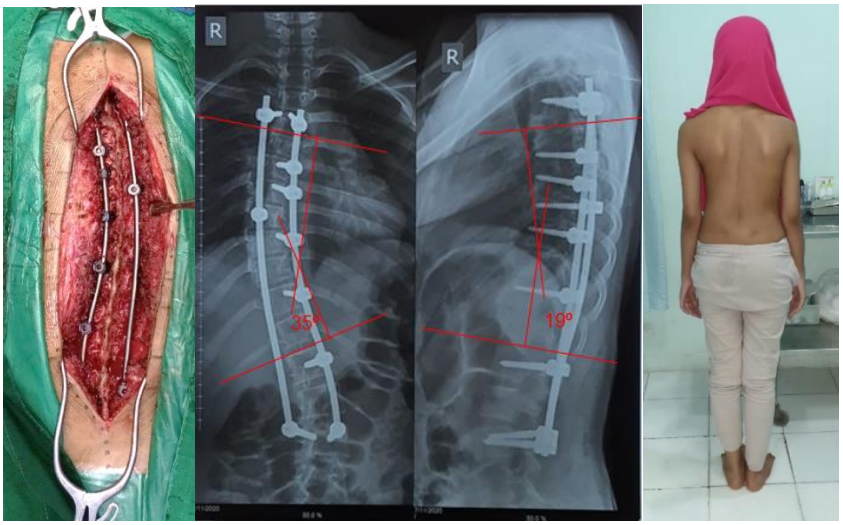


Figure 11 Durante Operation and Radiological Examination Post Operation

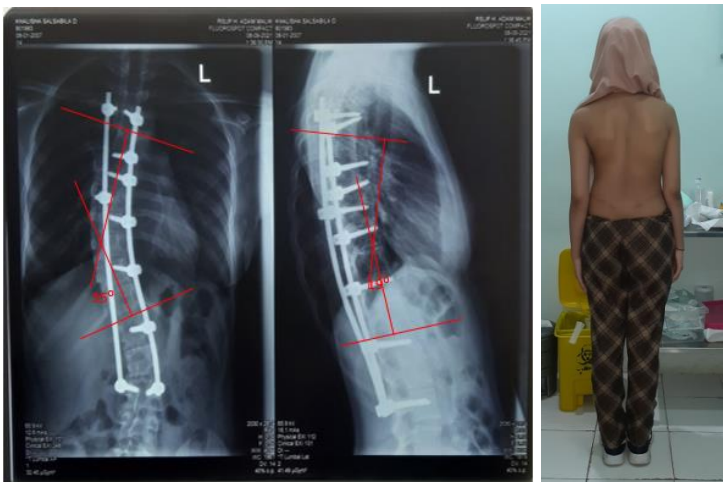


Figure 12 Radiological Examination and Clinical Feature 1 Year Post Operation

Case 4

A, a 20-years-old female was admitted to hospital with chief complaint tilted on the back. It's been started since 7 years ago. History of trauma was not found. The tilted of the back was increasing in rapid progress since 1 year ago. Initially patient did not complaint about pain on the back but since 3 months before she felt pain on the back and getting tired easily. Patient was still able to maintain her daily activity despite having some pain. The pain increased when patient tilting to the right. There is no radiating in pain. Defecation and micturition normal. The patient had menarche at 11 years old. She was a second child of four siblings. Other siblings don't have similiar condition. Patient didn't has any congenital malformation since birth. History of fever, Night sweat, lost of body weight, prolong cough was not found. Patient went to Orthopedic Clinic in Adam Malik Hospital for further evaluation.

From physical examination was found right angulation of the back, there's a asymetric shoulder level, asymetric body arm distance, asymetrical pelvic obliquity. From Adam forward bending test, hump was found. In motoric and sensoric examination was normal, there's no deficit neurologis.

Patient underwent radiologic examination such as Thoracolumbal with AP, lateral and right-left bending view and pelvic AP view at Adam Malik hospital. From radiologic examination revealed cobb's angel at major

curve in main Thoracic (Th4-Th10) was 35º with right-bending view was 23º and Thoracolumbar (Th11-L5) was 52º , with right-bending view was 40º, lumbal modifier type C and sagittal modifier was 36º (N). From x-ray pelvic AP view was found risser 5. Laboratory examination was in normal limit. Patient was diagnosed with Adolescent Idiopathic Scoliosis Lenke Classification type V, Lumbar Modifier C with Sagittal Modifier (N).

Patient underwent correction scoliosis procedure on July 2020 at Adam Malik hospital using Low Density pedicle screw. The use of the pedicle screw was 10 screws, with 2 screws at Th7, 1 screw at Th9, 1 screw at Th11, 2 screws at Th12, 1 screw at L2, 2 screws at L3. Duration operation was 3 hours and blood loss was 240 cc. Haemodynamic patient was stable at pre-operation, during operation and after operation. Patient was discharged from hospital 3 days after operation with wound after operation was good and there's no discharge or pus. Patient was educated for not take a heavy exercise or activities, not allowed to bow, squat for 1 month and control next 6 months and 1 year for x ray.

Figure 13 Clinical Features

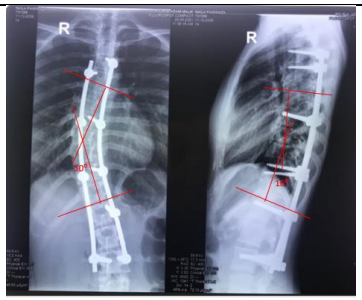
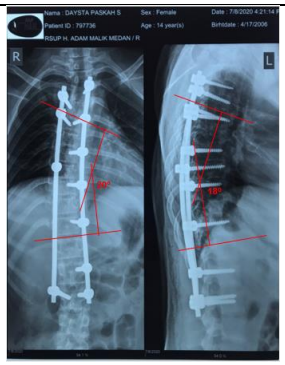
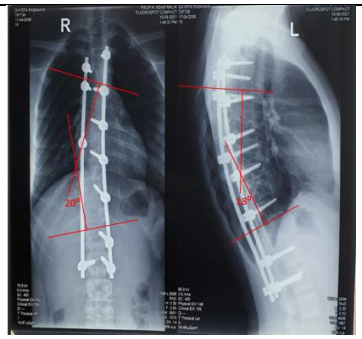
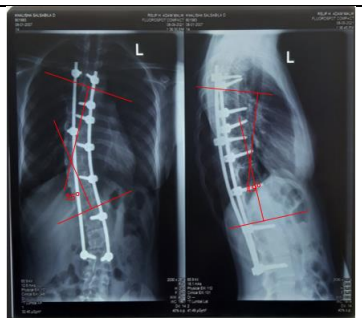
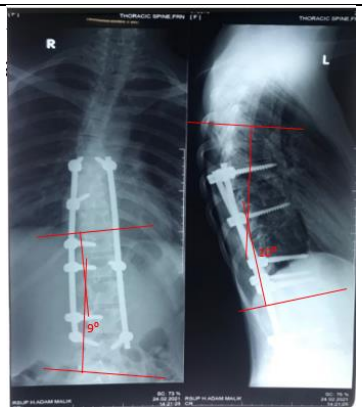
ISSN: 03875547
Volume 46, Issue 02, February, 2023

Figure 14 Radiological Examination Before Operation

Figure 15 Durante Operation and Radiological Examination Post Operation

Figure 16 Radiological Examination and Clinical Feature 1 Year Post Operation

RESULTS

Case	X ray Post op	Cobb angle/ Saggital Modifier	X ray 1 year Post op	Cobb angle/ Saggital Modifier
Case 1		Cobb angle: 30º Saggital modifier: 16º		Cobb angle: 30º Saggital modifier: 16º
Case 2		Cobb angle: 20º Saggital modifier: 18º		Cobb angle: 20º Saggital modifier: 18º
Case 3		Cobb angle: 35º Saggital modifier: 19º		Cobb angle: 35º Saggital modifier: 19º
Case 4		Cobb angle: 9 Saggital modifier: 10º		Cobb angle: 9º Saggital modifier: 10º

The result of these 4 cases, after 1 year post operation x ray, we found that the cobb angle and sagittal modifier for 4 cases was same as before. So, the use of low density pedicle screw in AIS has a same result in cob angle parameter for 1 year post operation than after the operation.

3. Discussion

Pedicle screw construct systems have been increasingly popular for treating patients with spinal deformities, and a significant correlation between the implant density and major curve correction has been reported. However, substantial research has shown that low density (LD) screw constructs can provide similar radiographic and clinical outcomes. Therefore, whether LD or high density (HD) screw constructs are better for AIS patients remains a subject of debate. 7,8 In 4 cases presented above, 4 patients with variation of Lenke type with correction procedure with low density (LD) screw constructs show that the follow up of cobb angle and saggital parameter after post operation and 1 year post operation that same. With clinical function of the patient and quality life of the patient was increase significantly. In BPJS era at Adam Malik hospital, there's a restriction of using implant like pedicle screw in spine case operation because cost of disease and procedure operation was too high rather than budget of the patient that BPJS provide. So, we usually do the low density screw constructs for the case correction scoliosis in Adam Malik hospital.

4. Conclusion

The use of low density pedicle screw construct (LD) in correction scoliosis procedure for AIS patient in Haji Adam Malik hospital has the same result in cobb angle and saggital modifier in after the operation and 1 year post operation, with increasing of clinical function and quality of life of the patient.

5. References

[1] Freidel, K., Petermann, F., Reichel, D. et al. (2002). Quality of life in women with idiopathic scoliosis. Spine (Phila Pa 1976),27, pp.E87-E91.

[2] Andersen, M., Christensen, S.B., Thomsen, K. (2006). Outcome at 10 years after treatment for adolescent idiopathic scoliosis. Spine (Phila Pa 1976), 31, pp.350–354.

[3] Weinstein, S.L., Dolan, L.A., Spratt, K.F. et al. (2003). Health and function of patients with untreated idiopathic scoliosis: a 50-year natural history study. JAMA, 289, p.559–567.

[4] Asher, M.A., Burton, D.C. (2006). Adolescent idiopathic scoliosis: natural history and long term treatment effects. Scoliosis, 1, p.2.

[5] Zhang, J., He, D., Gao, J. et al. (2011). Changes in life satisfaction and self-esteem in patients with adolescent idiopathic scoliosis with and without surgical intervention. Spine (Phila Pa 1976), 36, p.741–745.

[6] Landman, Z., Oswald, T., Sanders, J., Diab, M. (2011). Spinal Deformity Study Group. Prevalence and predictors of pain in surgical treatment of adolescent idiopathic scoliosis. Spine (Phila Pa 1976), 36, p.825–829.

[7] Cheng, I., Kim, Y., Gupta, M.C., Bridwell, K.H., Hurford, R.K., Lee, S.S., Theerajunyaporn, T., Lenke, L.G. (2005). Apical sublaminar wires versus pedicle screws–which provides better results for surgical correction of adolescent idiopathic scoliosis? Spine, 30(18), pp.2104–12.

[8] Kuklo, T.R., Potter, B.K., Jr, P.D., Lenke, L.G. (2005). Monaxial versus multiaxial thoracic pedicle screws in the correction of adolescent idiopathic scoliosis. Spine, 30(18), p.2113–20.