

# Post-operative Health Related Quality of Life Assessment in Scoliosis Patients

C Y W Chan, MD, M K Kwan, MS Ortho, L B Saw, MS Ortho, A S Deepak, MS Ortho, C S Chong, MS Ortho, T M Liew\*, C S Lee\* (\*Medical Student)

## SUMMARY

Adolescent Idiopathic Scoliosis is a spinal deformity which affects patients' self image and confidence. Surgery is offered when the curve is more than 50 degrees based on its likelihood of progression. Studies on the radiological outcome of scoliosis correction are abundant. Therefore, it is the objective of this study to evaluate the health related quality of life in scoliosis patients who had undergone surgical correction in University Malaya Medical Center, Kuala Lumpur, Malaysia using Scoliosis Research Society-22 (SRS-22) patient questionnaire. This is a prospective evaluation of SRS-22 scores of thirty eight patients operated in our center over the past five years with a minimum follow up of one year. There were thirty two females and six males. Twenty six (68.4%) were Chinese, eight (21.1%) Malay and four (10.5%) Indian patients. The age of the patients ranged from twelve to twenty eight years, with a mean age of  $18.4 \pm 3.5$ . Based on the King and Moe's classification, sixteen patients had King's 3 curve. The mean pre-operative Cobb angle was  $68.6^\circ$  and post-operative Cobb angle was  $35.8^\circ$ . The average curve correction was 48.5%. The overall score for SRS-22 was 4.2. The SRS-22 scores were highest for the pain domains and lowest for the functional domains. Satisfaction domain scored 4.3. The function domain scored significantly higher in those who have twenty four months or less follow up duration. Curve magnitude and the amount of correction did not significantly alter the SRS scores. In conclusion, patients were satisfied with the outcome of their operation. Although pain was common, the intensity of the pain was minimal. The amount of curve correction did not correlate with the quality of life after operation.

## KEY WORDS:

*Scoliosis surgery, Quality of life, SRS-22*

## INTRODUCTION

Adolescent Idiopathic Scoliosis is a spinal deformity affecting patients at a time when development of self image and confidence enter a crucial stage. Medically, surgical options are offered to patients with curves more than 50 degrees based on natural history studies<sup>1,2</sup>. So, the primary aim of surgical correction is to prevent curve progression<sup>2</sup>. However, cosmesis is also an important motivating factor in making such a decision. Various studies have been done to describe the radiological outcome of scoliosis correction<sup>3,4,5</sup>. This reflects on the advances made in terms of instrumentation and technique of correction. Despite giving the surgeon great satisfaction in knowing how much he/she has been able to correct, to the patients, the quality of life after operation is

probably more important. Therefore, it is the objective of this study to evaluate health related quality of life in scoliosis patients who had undergone surgical correction in University Malaya Medical Center, Kuala Lumpur, Malaysia using the SRS-22 questionnaires.

## MATERIALS AND METHODS

This is a prospective evaluation of post-operative health related quality of life in patients with the diagnosis of Adolescent Idiopathic Scoliosis operated at a single institution from Jan 2001 to December 2005 with a follow up of at least one year duration. Patients who underwent revision surgery, those with congenital scoliosis operated during adolescence and those with definite underlying cause for the scoliosis were excluded from the study. Only those with complete clinical, radiological records and who were contactable for functional evaluation were included.

Radiological data included pre-operative standing anteroposterior and lateral views and these radiographs were repeated post-operatively and during each visit to the clinic. The curves were classified based on King and Moe's classification and the magnitude of the curve was defined by the Cobb angle<sup>6</sup>. Besides these patients were evaluated using the SRS-22 questionnaire during their final clinic visit.

The SRS-22 questionnaire includes five domains. These are the function/activity, pain, self image/appearance, mental health and satisfaction with management domain. The maximum score for each domain is five.

Statistical analysis was done using student t-test to check for significance between the mean scores in the different domains.

## RESULTS

Thirty eight patients were recruited in this study. The mean duration of our follow up was thirty nine months (ranges, 12 to 90 months). There were thirty two females and six males. Twenty six (68.4%) were Chinese, eight (21.1%) Malay and four (10.5%) Indian patients. The age of the patients ranged from twelve to twenty eight years, with a mean age of  $18.4 \pm 3.5$ . When classified using the King and Moe's classification, sixteen patients had King's 3 curves whereas only one patient had King's 4 curves. Seven curves could not be classified under King's classification as they were isolated thoracolumbar /lumbar curves which would fall into Lenke 5C category. The distribution of the curve type is illustrated in Figure 1.

*This article was accepted: 21 May 2008*

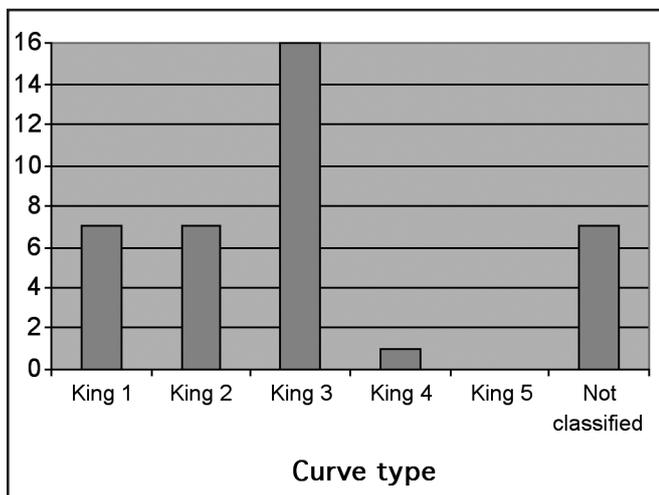
*Corresponding Author: Chris Chan Yin Wei, Department of Orthopaedic Surgery, University Malaya Medical Centre, 50603 Kuala Lumpur  
Email: chrnat01@yahoo.com*

**Table I: Values for thoracic, lumbar and major Cobb angle, both preoperatively and postoperatively**

	n	Mean ± SD	Range
Preoperative thoracic Cobb's angle (°)	31	68.1 ± 23.4	32 – 123
Postoperative thoracic Cobb's angle (°)	31	39.5 ± 18.17	14 – 100
Preoperative lumbar Cobb's angle (°)	23	59.4 ± 17.99	32 – 106
Postoperative lumbar Cobb's angle (°)	23	27 ± 14.43	7 – 63
Preoperative major Cobb's angle (°)	38	68.6 ± 20.17	42 – 123
Postoperative major Cobb's angle (°)	38	35.8 ± 19.19	7 – 100
Percentage of correction in major Cobb's angle (%)	38	48.5	0 – 86

**Table II: Overall SRS-22 scores and scores for each of the five domains**

SRS-22 Domain	Mean ± SD	Range
Function/Activity	3.8 ± 0.52	2.8 – 5
Pain	4.4 ± 0.51	3.2 – 5
Self-image/Appearance	3.9 ± 0.69	2.8 – 5
Mental Health	4.3 ± 0.75	3 – 5
Satisfaction with management	4.3 ± 0.79	1.4 – 5
Overall score	4.2 ± 0.37	3.4 – 4.9



**Fig. 1:** Distribution of patients according to curve type.

The mean preoperative Cobb angle was 68.6° and post operative Cobb angle was 35.8° (Table I). The average curve correction was 48.5%. Twenty three patients were corrected using polyaxial pedicle screw system and thirteen patients using hybrid instrumentation. Two patients underwent open anterior instrumentation to improve the flexibility of their curve.

The SRS-22 domain scores are shown in Table II. The overall score for SRS-22 is 4.2 ± 0.37. Pain domain has the highest scores (4.4 ± 0.51). The function domain scored the lowest (3.8 ± 0.52). Nevertheless, patients were generally satisfied with the treatment with the average domain value of 4.3.

Using the SRS-22 questionnaire, we found no significant difference in the overall scores between patients with pre-operative Cobb angle of 75 degrees with those with pre-operative Cobb angle more than 75 degrees. We tested the significance in the difference in scores of patients who obtained more than fifty percent correction and those who had less correction than that and found that the amount of correction also did not correlate with the scores. The

function domain scored significantly higher in SRS-22 for those who had twenty four months or less follow up duration.

**DISCUSSION**

In general, operative management of Adolescent Idiopathic Scoliosis is offered to patients with curves more than 50 degrees based on natural history studies<sup>1,2</sup>. This is to halt curve progression and to prevent respiratory complications in later life. Even up to now, most would agree with this guideline.

However, instrumentation for scoliosis surgery has progressed much. Correction by distraction using the Harrington rod had quickly evolved to usage of segmental correction using hooks<sup>7</sup>. The introduction of pedicle screws into the fold prompted many surgeons to switch to this newer method of instrumentation<sup>8</sup>. It offers control of all three columns of the spine without encroaching into the spinal canal. Its use was started in the lumbar spine. After anatomical and cadaveric studies showed that even the thoracic spine can accommodate pedicle screws, most surgeons nowadays use pedicle screw system as the method of instrumentation in scoliosis correction<sup>9,10,11</sup>. Evidence of its superiority in terms of its correction capability is also abundant in the literatures<sup>8,12,13,14</sup>.

Despite this, a patient's perception of success is not only defined by the amount of surgical correction. Functional outcome, symptom relief, improvement in self image and overall satisfaction probably are more pertinent. These are the components included in the SRS-22 questionnaire assessment. The SRS-22 questionnaire is a modification of the SRS-24 questionnaire which was introduced by Haher et al in 1999<sup>15</sup>. White *et al* in 1999 found that there was lack of internal consistency in the function-activity domain. They attributed this to question 10 and 11 which they thought correlated better with the pain domain. They also found that among the three questions in the Satisfaction with Management domain, question 23 had low consistency<sup>16</sup>. Following this study, Asher et al in 2000 further refined the SRS-24 questionnaire<sup>17</sup>. The SRS-22 questionnaire underwent

extensive validation in several papers which showed its reliability, concurrent validity, discriminant validity and sensitivity to change<sup>18, 19, 20, 21</sup>. The SRS-22 questionnaire was also shown to correlate well with the SF-36 questionnaire<sup>22</sup>. Turkish and Spanish versions of this questionnaire have also been validated<sup>23, 24</sup>.

Our results showed that the function domain in the SRS-22 questionnaire scored the lowest with a mean score of  $3.8 \pm 0.52$ . This shows that function wise, patients who had been operated for scoliosis felt that they are not able to perform optimally even after one year post correction. This finding is shared by Crawford et al and Newton *et al*, whose patients also scored the lowest in the post-operative function domain using the SRS-24 questionnaire<sup>25, 26</sup>. One surprising finding is that patients with follow-up of two years or less had significantly higher function scores in the SRS-22 questionnaire. This could indicate that the post-operative restriction in function actually plateaus off at two years follow up and subsequently the degenerative process makes the patients less active.

Pain among scoliosis patients is quite common. Helenius et al in their review of 78 patients who had undergone Harrington instrumentation noted that up to 13% of patients had back pain<sup>27</sup>. Remes et al compared outcome of Cotrel Dubosset instrumentation and Universal Spine System system and found a higher incidence of back pain in patients who had undergone Cotrel Dubosset instrumentation<sup>28</sup>. The domain that has the highest score in the SRS-22 questionnaire is the pain domain. It shows that most patients in our population who had undergone scoliosis correction had minimal pain and did not require any analgesics.

Satisfaction in general was good among our patients. This finding is similar to most reports<sup>20,25, 26,29</sup>. However, no difference was found between the scores of those with curves more than seventy five degrees and those with less severe curves pre-operatively. We also found that the amount of correction did not correlate with satisfaction scores.

Our study has several weaknesses. We were not able to include all patients with more than one year follow up as some of them had changes in contact addresses. We also did not have pre-operative scores for comparison to see whether the operation resulted in any improvements in the score.

## CONCLUSION

Our patients were generally satisfied with their life as well as the outcome of the operation. However, our results showed that even after one year post-correction, their function score was still lower than other domains. Despite many reports concurring that pain was common, the severity of pain actually did not affect our patients much and they were able to tolerate it without any analgesics. Correction rate did not correlate with satisfaction scores.

## REFERENCES

- Weinstein SL. Idiopathic scoliosis: natural history. *Spine* 1986; 11(8): 780-3.
- Ascani E, Bartolozzi P, Logroscino CA, Marchetti PG, Ponte A, Savini R, *et al*. Natural history of untreated idiopathic scoliosis after skeletal maturity. *Spine* 1986; 11(8): 784-9.

- Liljenqvist UR, Halm HFH, Link TM. Pedicle screw instrumentation of the thoracic spine in idiopathic scoliosis. *Spine* 1997; 22(19): 2239-45.
- Kim YJ, Lenke LG, Bridwell KH, Cho YS, Riew KD. Free hand pedicle screw placement in the thoracic spine: is it safe? *Spine* 2004; 29(3): 333-42.
- Kim YJ, Lenke LG, Kim J, Bridwell KH, Cho SK *et al*. Comparative analysis of pedicle screw versus hybrid instrumentation in posterior spinal fusion of adolescent idiopathic scoliosis. *Spine* 2006; 31(3): 291-8.
- King HA, Moe JH, David SB, Winter RB. The selection of fusion levels in thoracic idiopathic scoliosis. *J Bone Joint Surg* 1983; 65-A(9): 1302-13.
- Harrington PR. Treatment of scoliosis: correction and internal fixation by spine instrumentation. *J Bone Joint Surg (A)* 1962; 44: 591-610.
- Dobbs MB, Lenke LG, Kim YJ, Kamath G, Peelle MW *et al*. Selective posterior thoracic fusions for adolescent idiopathic scoliosis: comparison of hooks versus pedicle screws. *Spine* 2006; 31(20): 2400-4.
- Panjabi MM, Takata K, Goel V, Federico D, Oxland T *et al*. Thoracic human vertebrae: quantitative three-dimensional anatomy. *Spine* 1991; 16(8): 888-901.
- Scoles PV, Linton AE, Latimer B, Levy ME, Digiovanni BF. Vertebral body and posterior element morphology: the normal spine in middle life. *Spine* 1988; 13(10): 1082-6.
- Vaccaro AR, Rizzolo SJ, Allardyce TJ, Ramsey M, Salvo J *et al*. Placement of pedicle screws in the thoracic spine. Part 1: morphometric analysis of the thoracic vertebrae. *J Bone Joint Surg* 1995; 77-A(8): 1193-9.
- Dobbs MB, Lenke LG, Kim YJ, Luhmann SJ, Bridwell KH. Anterior/posterior spinal instrumentation versus posterior instrumentation alone for the treatment of adolescent idiopathic scoliotic curves more than 90°. *Spine* 2006; 31(20): 2386-91.
- Luhmann SJ, Lenke LG, Kim YJ, Bridwell KH, Schootman M. Thoracic adolescent idiopathic scoliosis curves between 70° and 100°: is anterior release necessary? *Spine* 2005; 30(18): 2061-7.
- Suk S, Lee CK, Kim W, Chung Y, Park Y. Segmental pedicle screw fixation in the treatment of thoracic idiopathic scoliosis. *Spine* 1995; 20: 1399-405.
- Haheer TR, Gorup JM, Shin TM, Homel P, Merola AA, Grogan DP *et al*. Results of the scoliosis research society instrument for evaluation of surgical outcome in adolescent idiopathic scoliosis. *Spine* 1999; 24(14): 1435-40.
- White SF, Asher MA, Lai SM, Burton DC. Patients' perceptions of overall function, pain, and appearance after primary instrumentation and fusion for idiopathic scoliosis. *Spine* 1999; 24(16): 1693-700.
- Asher MA, Lai SM, Burton DC. Further development and validation of the scoliosis research society (SRS) outcomes instrument. *Spine* 2000; 25(18): 2381-86.
- Asher MA, Lai SM, Burton DC *et al*. The reliability and concurrent validity of the Scoliosis Research Society-22 patient questionnaire for idiopathic scoliosis. *Spine* 2003; 28: 63-9.
- Berven S, Deviren V, Demir-Deviren S, Hu SS, Bradford DS *et al*. Studies in the modified scoliosis research society outcomes instrument in adults: validation, reliability, and discrimination capacity. *Spine* 2003; 28(18): 2164-9.
- Asher M, Lai SM, Burton DC, Manna BJ. Discrimination validity of the scoliosis research society-22 patient questionnaire: relationship to idiopathic scoliosis curve pattern and curve size. *Spine* 2003 Jan 1; 28(1): 74-7.
- Asher M, Lai SM, Burton D, Manna B. Scoliosis research society-22 patient questionnaire: responsiveness to change associated with surgical treatment. *Spine* 2003; 28(1): 70-3.
- Lai SM, Asher M, Burton D. Estimating srs-22 quality of life measures with sf-36. Application in idiopathic scoliosis. *Spine* 2006; 31(4): 473-8.
- Bago J, Climet J, Ey A *et al*. The spanish version of the srs-22 patient questionnaire for idiopathic scoliosis: transcultural adaptation and reliability analysis. *Spine* 2004; 29: 1676-80.
- Alanay A, Cil A, Berk H *et al*. Reliability and validity of adapted turkish version of scoliosis research society-22 (srs-22) questionnaire. *Spine* 2005; 30: 2464-8.
- Crawford JR, Izatt MT, Adam CJ, Labrom RD, Askin GN. A prospective assessment of SRS-24 scores after endoscopic anterior instrumentation for scoliosis. *Spine* 2006; 31(21): E817-22.
- Newton PO, Parent S, Marks M, Pawelek J. Prospective evaluation of 50 consecutive scoliosis patients surgically treated with thoracoscopic anterior instrumentation. *Spine* 2005; 30(17): S100-9.
- Helenius I, Remes V, Yrjonen T, Ylikoski M, Schlenzka D, Helenius M *et al*. Comparison of long-term functional and radiologic outcomes after Harrington instrumentation and spondylosis in adolescent idiopathic scoliosis: a review of 78 patients. *Spine* 2002; 27(2): 176-80.
- Remes V, Helenius I, Schlenzka D, Yrjonen T, Ylikoski M, Poussa M. Cotrel-dubosset or universal spine system instrumentation in adolescent idiopathic scoliosis: comparison of midterm clinical, functional, and radiologic outcomes. *Spine* 2004; 29(18): 2024-30.
- Merola AA, Haheer TR, Brkaric M, Panagopoulos G, Mathur S, Kohani O *et al*. A multicenter study of the outcomes of the surgical treatment of adolescent idiopathic scoliosis using the scoliosis research society (SRS) outcome instrument. *Spine* 2002; 27(18): 2046-51.