Razavi Int J Med. 2015 January; 2(4): e23878. DOI: 10.30483/rijm.2014.118380

Published online 2014 December 27. **Research Article**

Clinical Outcomes of Surgery in Young Patients With Spinal Deformity

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Received: September 24, 2014; **Revised:** October 23, 2014; **Accepted:** October 25, 2014

Background: Major spinal deformity can cause many adverse effects on the patients, body and soul leading to pain, decreased ability to do activity in daily living, and also depression.

Objectives: The present study aims to assess the quality of life among patients undergoing surgical treatment for spinal deformity, using SRS-30 questionnaire.

Patients and Methods: We retrospectively evaluated 48 young patients (26 females, 22 males) with major spinal deformity underwent definite surgical correction in our orthopedic department from August 2009 to August 2012. The mean age and follow-up period were 16.2 ± 2.8 years and 38.4 ± 8.8 months, respectively. Demographic characteristics were extracted from the medical records and SRS-30 questionnaire fulfilled pre-operatively and at the last follow-up visit. We used statistical package for social sciences (SPSS) version 13.0 for statistical analysis.

Results: Frequency of underlying diseases was congenital scoliosis in 22 (45.8%), idiopathic scoliosis 20 (41.7%), and Scheuermann's kyphosis 6 (12.5%). Pain and function were relatively unchanged while surgery could significantly improve patient's self-image, psychology, and satisfaction. Total SRS-30 score was also improved ($P < 0.001$). Patients' age, sex, body mass index, educational status, or type of deformity did not correlate significantly with satisfaction or total SRS-30 score.

Conclusions: Surgical treatment of spinal deformity in the young regardless of the type of disease, can lead to significant improvements in health-related quality of life, as shown by self-image, psychology, and satisfaction in SRS-30 domain scores. Demographic data including sex, age, weight, height, and education were not correlated with the outcome.

Keywords: Surgery; Satisfaction; Questionnaire

1. Background

Major spinal deformity including scoliosis and kyphosis can cause many adverse effects on the patients, body and soul leading to pain, decreased ability to do activity in daily living, and depression (1, 2). Current surgical treatment attempts to achieve a balanced fusion mass on the pelvis. With continuous advances in spinal instrumentation, operative techniques and tactics, treatment of spinal deformities is also growing. Previously, authors mainly focused on radiological findings to evaluate the results of spinal surgery in correction of major deformities and cited the amount of curve correction or fusion mass consolidation as criteria for successful treatment, but later it was found that functional status is more valuable in predicting the outcome (2-4).

From 1990 onwards, the authors usually assessed surgical outcomes of spinal deformities by both objective and subjective variables (2, 4-8) and a variety of quality of life surveys were invented (2, 9-12). These questionnaires can be divided into two categories: those focused on specific diseases (e.g. scoliosis research society (SRS) (2)) and those used to evaluate overall health status regardless of the specific disease (like short form-36) (13). SRS-30 is the latest survey of patient, discriminating outcomes using questions divided into five domains evaluating function/activity, pain, self-image (appearance), mental health, and satisfaction with management. This questionnaire has been proven to be reliable, valid, and sensitive to change (2, 14, 15) and it has been used in several studies to evaluate pre- and post-operative outcomes in patients with spinal deformities (6, 9, 15-17).

2. Objectives

The present study aims to conduct a retrospective assessment of quality of life among patients undergoing surgical treatment for spinal deformity, using the most recent instrument, and the SRS-30 questionnaire.

3. Patients and Methods

After local institutional review board approval (registration No 910492), we retrospectively evaluated outcome of surgical treatment in young patients with major spinal deformity underwent definite surgical correction in our orthopedic department, Imam Reza Hospital from Au-

gust 2009 to August 2012. Inclusion criteria were the patients with major spinal deformity (scoliosis and kyphosis) and presence of complete demographic and SRS-30 data at pre-operative baseline and two years after surgery. We excluded those patients with less than two years of follow-up, the patients treated with growing rod or other surgeries required intermittent later modifications (like vertical expandable prosthetic titanium rod, staple epiphysiodesis, etc.), and those patients more than 30 years of age. Surgical technique consisted of deformity correction, spinal fusion associated with segmental pedicular screw and rod instrumentation (Figure 1).

Demographic data were extracted from medical records. The SRS-30 questionnaire was used as our outcome measurement tool. The patients had routinely completed the SRS-30 questionnaire at pre-operative era and after surgery, this questionnaire was completed and recorded annually. This questionnaire consists of thirty questions which are divided into the following five categories: Pain, Activity, Appearance, mental health, and satisfaction with the treatment (each question specifies one division). Total SRS score can also be calculated and higher scores indicate better clinical status. In order to assess a change over the time in SRS-30, pre-operative score was subtracted from 1-year and 2-year scores. All questions were given a score from 1 to 5, with '5' being the optimum status and '4' being arbitrarily defined as a "good" score and '1' means 'the worst' score (5). Each domain was analyzed using the mean normalized score. A positive score indicates improvement; whereas, a decrease in the score shows that the individuals' condition has worsened.

3.1. Statistical Analysis

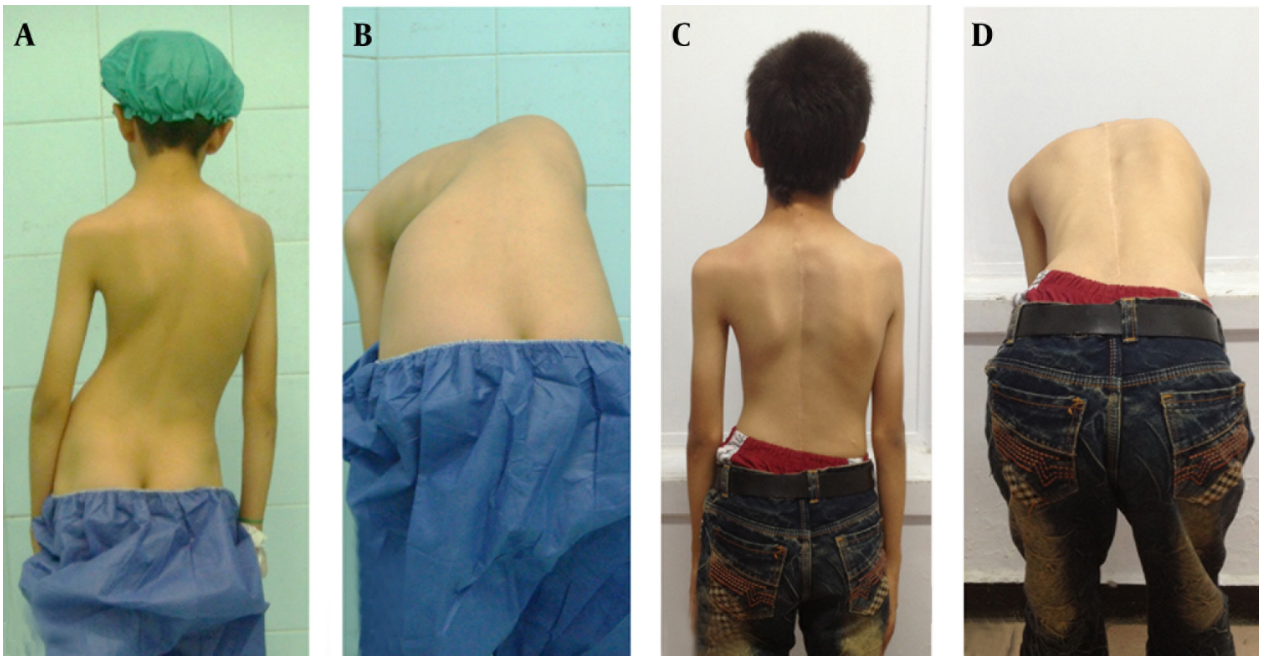
In this study, after collecting data, we entered them in SPSS (Statistical Package for Social Sciences, Chicago, IL-version 13.0) software. Pearson product-moment correlation coefficient was used to measure the linear correlation (dependence) between interval variables and Spearman's rank correlation coefficient for statistical dependence between discrete variables. We also used t-test for comparison of quality-of-life scores between pre- and post-operative periods. Significance was set at P value of 0.05 for all tests.

4. Results

We finally evaluated 48 patients (26 females, 54.2%, and 22 males, 45.8%). The mean age of the patients was 16.2 ± 2.8 (ranged; 9-27). The mean value of height and weight of the patients was 162 ± 5.5 (ranged; 149-171 centimeters), and 65 ± 5.3 (53-75) kilograms, respectively. The underlying etiology of the deformity was depicted in Table 1.

The SRS questionnaire scores in pre-operative and last post-operative visit were shown in Table 2. The mean follow-up period was 38.4 ± 8.8 (ranged; 24-60) months. According to paired t-test, patient's self-image, psychology, and satisfaction were significantly improved. No patients had significant back pain in pre- or post-operative era throughout the follow-up period.

Figure 1. An 11-Year-Old Boy Presented With Congenital Scoliosis



A, B, C and D show his post-operative views 29 months after spinal surgery. Trunk imbalance and thoracic hump were both corrected significantly created much more pleasant appearance.

Relevant statistical analysis showed that the pre-operative patients' age, sex and BMI did not correlate significantly with satisfaction or total SRS-30 scaling (BMI; r = 0.115, P = 0.426, age; r = 0.183, P = 0.203, sex; P = 0.841). We could also find no relationship between type of deformity and patient's satisfaction or SRS-30 total scale.

Table 1. Frequency of Underlying Diseases in Our Treated Patients [a]

Etiology	Results
Congenital scoliosis	22 (45.8)
Idiopathic scoliosis	20 (41.7)
Scheuermann's kyphosis	6 (12.5)

[a] Data are presented No. (%).

Table 2. Improvement in SRS-30 Scores With Surgical Treatment [a]

SRS-30	Before Surgery	2 Years After Surgery	P Value
Function	3.6 ± 0.7	3.8 ± 0.8	0.321
Pain	4.3 ± 0.8	4.4 ± 0.7	0.525
Self-image	2.9 ± 1.1	3.8 ± 0.9	< 0.001
Psychology	3.6 ± 0.7	4.2 ± 0.8	< 0.001
Satisfaction	2.6 ± 0.6	4.4 ± 0.6	< 0.001
Total	3.4 ± 0.5	4 ± 0.7	< 0.001

[a] Data are presented as Mean ± SD.

5. Discussion

SRS outcome instrument was first designed by Haher et al. (2). They found a high reliability of correlation between domains and consistent differences in the domains. After that, Asher et al. introduced the modified SRS outcomes instrument (9, 16) and nowadays, SRS-30 is the most recent and common questionnaire used throughout the word for assessing these patients. Our study conducted a quality-of-life survey in order to evaluate the treatment impact on young patients with major spinal deformity. Ninety-five percent confidence intervals around these means were reported. Analysis of the self-image domain of SRS-30 in our study showed that spinal surgery could significantly improve it. This finding is consistent with the results of the previous studies (5, 6, 15, 18-20). Bridwell et al. evaluated parents' and patients' expectations and worries regarding scoliosis surgery and showed that parents' were higher (21). Both parents and patients declared that the greatest concern and expectation were neurologic deficit and reducing future pain and disability, respectively. These authors showed that looking better and feeling better about one's self were rated as the second most important expectation of them.

Roberts et al. demonstrated that sex has no role in the outcome of the surgery using the SRS-30 (22). Our study also concluded that gender is not correlated with the patient satisfaction and the outcome is equal between male and female population. Our study also failed to show an association between age and outcome of surgery. Conversely, Marks et al. and Dorward et al. concluded that surgical outcome is significantly better in the younger group of patients (23, 24). We should emphasize that we had already excluded those patients aged more than thirty and our patients consisted of both congenital and idiopathic cases, while these two studies conducted on only congenital scoliosis cases.

In the study we conducted, no patient reported debilitating lower back pain and took analgesic medications for pain before or after surgery, and we agree with most of the studies that back pain after scoliosis surgery is often mild and does not produce disability in most patients (25-28). It should be noted that our patients' follow-up was relatively short, while several studies have reported 15-45 % rate for low back pain after successful fusion for idiopathic scoliosis at long-term follow-up (27, 29, 30). Our results were also unable to show any improvement in activity or function. Danielsson and Nachemson also described that surgically treated patients with adolescent idiopathic scoliosis showed no change in activity and function (26). We consider this is due to the well baseline functioning and pain status in our patients which surgery had little effect on the results, maintaining these two domains relatively unchanged.

However, our study does have some limitations. First, we have a relatively small number of included patients comparing to other studies (22, 24, 25, 31), but according to the statistical analysis done before this study, number of cases included is fairly reliable. Second, the follow-up time was still relatively short. The indication for surgery in major spinal deformity in the young is to prevent future deterioration of the curve and ensuing impairment of quality of life, not an immediate improvement in the quality of life. Therefore, maybe, there is no significant change in the quality of life in the relative short-term outcome. Third, the Cobb angle measurements of the major deformity, and pre-operative SRS scores correlation with post-operative radiographic measures were not elucidated. Our preliminarily study, to some extent, could still indicate that surgical correction of spinal deformities can have positive effects on the quality-of-life of our patients. Lastly, this study did not have any control cases (adolescents without spinal deformities) with SRS data collected at similar time points. A larger controlled analysis is required to eliminate such potential defects.

In conclusion, the results show that surgical treatment of spinal deformity in the young regardless of the type of disease, can lead to significant improvements in health-related quality of life, as shown by self-image, psychology, and satisfaction in SRS-30 domain scores. Demographic data including sex, age, weight, height, and education were not correlated with the outcome.

Acknowledgements

We thank Dr. Shahrzad Ariamanesh for English editing. The results described in this paper were part of a medical student thesis.

Authors' Contributions

Farzad Omidi Kashani: has made substantial contributions to conception and design of the manuscript. Ebrahim Ghayem Hasankhani: has been involved in drafting the manuscript, participated in the sequence alignment. Aslan Baradaran: has made substantial contributions to acquisition of data from literature. Navid Baghban: has had substantial role in preparing and revising the manuscript.

Funding/Support

This study was supported by Research Council of Mashhad University of Medical Sciences, Mashhad, Iran (Registration No. 910492, approved date: 09.28. 2011).

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