A Combination of Patient-Related Factors and Surgical Parameters Distinguishes Best and Worst Outcomes of ASD Surgery

Written by Toni Rizzo

To date, evidence suggests that surgical treatment can improve pain and disability in adults with symptomatic scoliosis. However, these studies are based on averages across large groups of patients, and not all surgically treated patients achieve average or above-average outcomes. The reasons that some adults with scoliosis markedly improve with surgery, while others fail to improve, are not clear. Comparison of patients at extremes of outcome measures might provide insights into factors affecting outcomes. The objective of this prospective study presented by Justin S. Smith, MD, PhD, University of Virginia Health System, Charlottesville, Virginia, USA, was to compare best vs worst clinical outcomes in patients with adult spinal deformity (ASD) following surgical treatment.

The patients (n = 227) were recruited from the International Spine Study Group (ISSG) multicenter database for ASD. At baseline and follow-up, the patients completed health-related quality-of-life measures, including the Scoliosis Research Society–22 (SRS-22) questionnaire, Oswestry Disability Index (ODI), SF-36 physical and mental components, and back and leg pain numeric ratings. Included patients had a primary diagnosis of ASD (aged > 18 years) and were part of the ISSG operative treatment group.

At 2-year postoperative follow-up, the patients had significant improvements from baseline in mean leg pain score (4.2 vs 2.4; $P < .001$), mean back pain score (7.0 vs 2.3; $P < .001$), mean ODI (41 vs 25; $P < .001$), and mean SRS-22 (2.9 vs 3.7; $P < .001$). Other improvements included mean coronal balance, sagittal balance, maximum Cobb angle, pelvic tilt, and pelvic incidence–lumbar lordosis (PI-LL) mismatch ($P < .001$ for all).

Based on the ODI, the best 2-year outcome was defined as ODI ≤ 15 (n = 43) and the worst, ODI ≥ 50 (n = 51). Based on the SRS-22, the worst outcome was defined as SRS-22 ≤ 2.5 (n = 27) and the best, SRS-22 ≥ 4.5 (n = 25).

On univariate analysis, baseline factors distinguishing the best and worst outcomes based on the ODI were diagnosis of depression ($P = .028$), back pain score ($P = .003$), body mass index (BMI; $P = .002$), sagittal vertical access (SVA) > 5 cm ($P = .009$), and occurrence of ≥ 1 major complications ($P = .001$). Distinguishing factors at follow-up were leg pain score ($P < .001$), back pain score ($P < .001$), PI-LL mismatch ($P = .042$), and SVA > 5 cm ($P = .062$).

The baseline factors distinguishing the best and worst outcomes based on the SRS-22 were diagnosis of depression ($P < .001$), back pain score ($P = .006$), prior spine surgery ($P = .007$), American Society of Anesthesiologists grade ($P = .004$), and occurrence of ≥ 1 minor or major complication ($P = .034$). Distinguishing factors at follow-up were leg pain score ($P < .001$) and back pain score ($P < .001$).

On multivariate analysis, distinguishing factors for best and worst outcomes based on ODI were baseline BMI, ODI, and follow-up SVA. Distinguishing factors for best and worst outcomes based on SRS-22 scores were baseline depression, minor or major complication, and baseline SRS-22 (Table 1).

Table 2 shows the factors distinguishing the best and worst outcomes in the ISSG database as compared with the Spinal Deformity Study Group (SDSG) database.

Factors distinguishing best and worst outcomes of surgery for ASD were primarily patient related, such as obesity, depression, pain severity, and comorbidities, based on the ISSG and SDSG. However, the ISSG data also suggest that in addition to patient factors, residual spinopelvic malalignment (PI-LL mismatch) and occurrence of major complications are distinguishing factors.

Peer-Reviewed
Highlights From the
North American Spine Society Annual Meeting
November 12–15, 2014
San Francisco, CA, USA

Table 1. Multivariate Analysis of Factors Distinguishing Best and Worst Outcomes on the ODI and SRS-22

Distinguishing Factors	OR (95% CI)	*P* Value
ODI		
Baseline BMI	0.893 (0.803 to 0.993)	.037
Follow-up SVA	0.987 (0.976 to 0.997)	.014
Baseline ODI	0.914 (0.872 to 0.959)	< .001
SRS-22		
Baseline depression	0.081 (0.010 to 0.651)	.018
Minor or major complication	9.012 (1.166 to 69.628)	.035
Baseline SRS-22	10.641 (1.760 to 64.335)	.010

BMI, body mass index; ODI, Oswestry Disability Index; SRS-22, Scoliosis Research Society Questionnaire–22; SVA, sagittal vertical access.

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Table 2. Factors Distinguishing Best and Worst Outcomes for ASD Surgery

ISSG	SDSG
Preoperative/operative	
Depression/anxiety	Depression/anxiety
Mean BMI	Mean BMI
Mean back pain score	Mean back pain score
Mean leg pain score	Mean leg pain score
SVA > 5 cm	Age
Comorbidities	Smoking
Prior spine surgery	
Major complication	
Follow-up	
Mean back pain score	Mean back pain score
Mean leg pain score	Mean leg pain score
PI-LL mismatch	

ASD, adult spinal deformity; BMI, body mass index; ISSG, International Spine Study Group; PI-LL, pelvic incidence–lumbar lordosis; SDSG, Spinal Deformity Study Group; SVA, sagittal vertical access.

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Significant Improvement in ASD With Operative vs Nonoperative Treatment

Written by Toni Rizzo

Evidence to date suggests that surgical treatment can improve pain and disability in adults with symptomatic spinal deformity. However, most previous studies were small, retrospective series without direct comparisons with nonoperative treatment approaches. The aim of this study, Outcomes of Operative and Nonoperative Treatment for Adult Spinal Deformity (ASD): A Prospective, Multicenter Matched and Unmatched Cohort Assessment with Minimum Two-Year Follow-up [Smith JS et al. *Spine*. 2014], presented by Justin S. Smith, MD, PhD, University of Virginia Health System, Charlottesville, Virginia, USA, was to compare minimum 2-year outcomes for operative and nonoperative treatment for ASD in a prospective population, using both matched and unmatched cohorts.

The patients (n = 689) were recruited from a multicenter database for ASD through the International Spine Study Group. They were classified as operative (n = 286) or nonoperative (n = 403) based on the initial management approach. At baseline and follow-up, the patients completed health-related quality of life (HRQOL) measures, including the Scoliosis Research Society Questionnaire-22 (SRS-22), Oswestry Disability Index (ODI), Short Form-36 Health Survey (SF-36) physical component score (PCS), and measures of back and leg pain.

Included patients (aged > 18 years) had a diagnosis of ASD and at least one of the following: coronal Cobb angle ≥ 20°, sagittal vertical access > 5 cm, pelvic tilt ≥ 25°, and thoracic kyphosis ≥ 60°. Outcomes were compared within and between surgical and nonsurgical groups using unmatched and propensity-matched cohorts. The propensity-matched cohort was matched according to baseline ODI, SRS-22, leg pain score, pelvic incidence-lumbar lordosis (PI-LL) mismatch, and maximum thoracolumbar/lumbar Cobb angle.

At baseline, patients in the operative group (n = 246) had significantly worse HRQOL measures ($P < .001$) and mean body mass index ($P = .003$) compared with those in the nonoperative group (n = 223). The operative group also had significantly worse mean coronal balance ($P < .001$), sagittal balance ($P < .001$), pelvic tilt ($P = .002$), and PI-LL ($P < .001$) at baseline.

At a minimum 2-year follow-up, for unmatched outcomes, patients in the operative group (n = 246) had significant improvements from baseline in ODI ($P < .001$), SF-36 score ($P < .001$), SRS-22 score ($P < .001$), numeric