



Comparison of Best vs Worst Clinical Outcomes for Adult Spinal Deformity (ASD) Surgery: A Prospective, Multi-Center Assessment with Minimum 2-Yr Follow-Up

Justin S. Smith MD PhD; Christopher I. Shaffrey MD, FACS; Virginie Lafage PhD; Frank Schwab MD, PhD; Themistocles Protopsaltis MD; Eric Klineberg MD; Munish Gupta MD; Justin K Scheer BS; Richard A. Hostin MD; Kai-Ming G. Fu MD PhD; Alex Soroceanu; Robert Hart MD; Douglas C. Burton MD; Shay Bess MD; Christopher P. Ames MD



Introduction

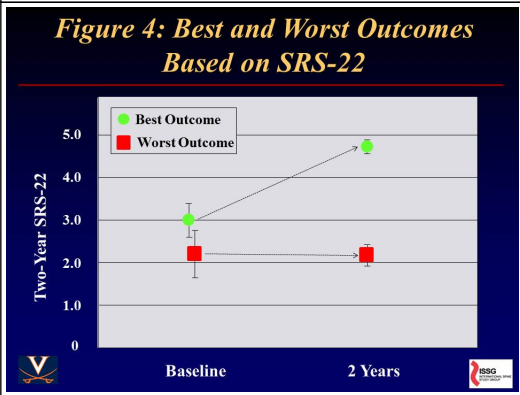
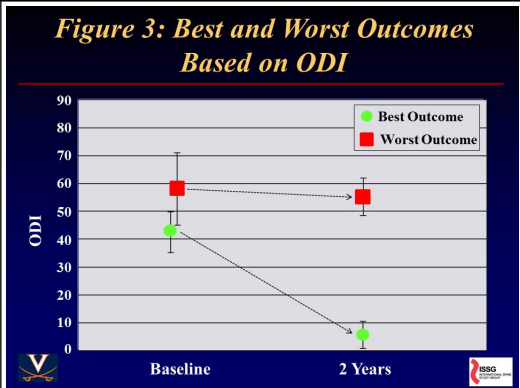
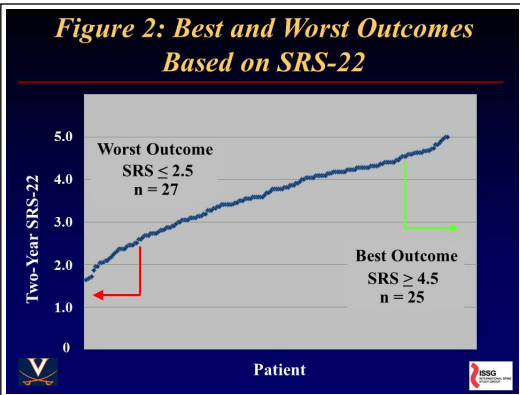
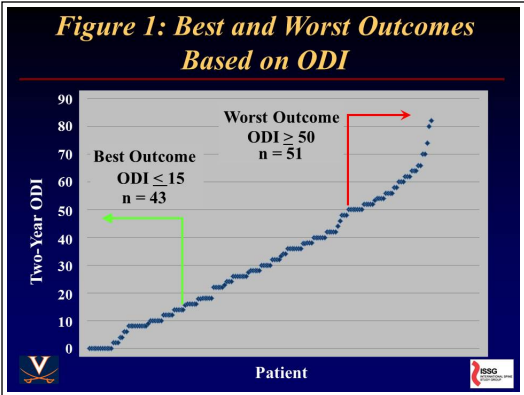
Average clinical outcomes are improved with surgery for selected ASD patients, but these outcomes span a broad range. Our objective was to compare ASD patients with best vs worst clinical outcomes to identify distinguishing factors.

Methods

Multicenter, prospective study of consecutive ASD patients treated operatively. Inclusion criteria included: age>18yr, ASD and min 2yr follow-up. Best vs worst outcomes patients were compared separately based on SRS-22 and ODI. Only those with BL SRS-22<3.5 or ODI>30 were included to minimize floor effect. Best and worst outcomes were defined for SRS-22 (>4.5 and <2.5) and ODI (<15 and >50).

Results

Of 227 patients, 187 had SRS-22<3.5 (25 best and 27 worst outcomes) and 162 had ODI>30 (43 best and 51 worst outcomes) (Fig 1-4). Based on ODI, compared with best outcomes patients, those with worst outcomes had greater BL ODI (p<0.001),



greater BL BMI (p=0.002), higher prevalence of BL depression (p<0.028), greater BL SVA (p=0.016), higher complication rate (p=0.02) and greater 2yr SVA (p<0.001) and PI-LL mismatch (p=0.042) (Fig 5). The

Figure 5: Factors Distinguishing Between Best and Worst Outcomes for Adult Scoliosis Surgery

Oswestry Disability Index	Worst	Best	p-value
Univariate Analysis			
Pre-operative / Operative			
Depression/anxiety (%)	43	21	0.028
Mean back pain score (SD)	8.3 (1.6)	7.2 (1.9)	0.003
Mean body mass index (SD)	30 (6)	26 (5)	0.002
SVA > +5 cm (%)	69	37	0.009
Major complication (%)	65	30	0.001
Follow-up			
Mean leg pain score (SD)	4.8 (3.1)	1.2 (2.2)	<0.001
Mean back pain score (SD)	6.2 (2.9)	1.5 (1.7)	<0.001
Mean PI-LL mismatch (SD)	9 (14)	3 (15)	0.042
SVA > +5 cm (%)	61	37	0.062

Figure 6: Factors Distinguishing Between Best and Worst Outcomes for Adult Scoliosis Surgery

Oswestry Disability Index	OR	95% CI	p-value
Multivariate Analysis			
Baseline body mass index	0.893	0.803 – 0.993	0.037
Follow-up SVA	0.987	0.976 – 0.997	0.014
Baseline ODI	0.914	0.872 – 0.959	<0.001

best-fit multivariate model for ODI included BL ODI (p<0.001), 2yr SVA (p=0.014) and BL BMI (p=0.037) (Fig 6). Based on SRS-22, compared with best outcomes patients, those with worst outcomes had greater BL SRS-22 (p<0.0001), higher prevalence of BL depression (p<0.001), greater comorbidities (p=0.012), greater prevalence of prior surgery (p=0.007), higher complication rate (p=0.012) and worse BL deformity (SVA [p=0.045], PI-LL mismatch [p=0.034]) (Fig 7). The best-fit multivariate model for SRS-22 included BL SRS-22 (p=0.033), BL depression (p=0.012) and complications (p=0.030) (Fig 8).

Figure 7: Factors Distinguishing Between Best and Worst Outcomes for Adult Scoliosis Surgery

Scoliosis Research Society (SRS)-22	Worst	Best	p-value
Univariate Analysis			
Pre-operative / Operative			
Depression/anxiety (%)	67	8	<0.001
Mean back pain score (SD)	8.2 (1.8)	6.7 (2.0)	0.006
Prior spine surgery (%)	67	28	0.007
Mean ASA grade (SD)	2.6 (0.6)	2.0 (0.8)	0.004
Mean PI-LL mismatch (SD)	23 (25)	9 (18)	0.034
Minor or major complication (%)	89	56	0.012
Follow-up			
Mean back pain score (SD)	7.3 (2.8)	0.6 (1.3)	<0.001
Mean leg pain score (SD)	4.3 (3.5)	0.7 (1.5)	<0.001

Figure 8: Factors Distinguishing Between Best and Worst Outcomes for Adult Scoliosis Surgery

Scoliosis Research Society (SRS)-22	OR	95% CI	p-value
Multivariate Analysis			
Baseline depression	0.081	0.010 – 0.651	0.018
Minor or major complication	9.012	1.166 – 69.628	0.035
Baseline SRS-22	10.641	1.760 – 64.335	0.010

Conclusions

Factors distinguishing best vs worst outcomes for ASD surgery included several patient factors (BL depression, BMI, comorbidities and disability), as well as residual deformity (2yr SVA) and complications. These findings suggest factors that may warrant further attention in order to achieve optimal surgical outcomes for ASD.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) identify the factors distinguishing between the best and worst outcomes