Long-Term Morbidity in Patients following Surgical Correction of Adult Spinal Deformity: Results from a Cohort with Minimum 5-Year Follow Up

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INTRODUCTION:
While advances in spinal realignment have shown promising short-term clinical results, the durability of adult spinal deformity (ASD)-corrective surgery remains a clinical challenge. Complications remain a primary concern following deformity correction, and little exists on the incidence of complications beyond two years. This study analyzed complications rates before and after two years following surgery. The purpose of this study was to describe the rate of complications before and after 2-year follow up for patients undergoing surgical correction of adult spinal deformity in a cohort with minimum 5-year data.
METHODS:
Operative ASD patients with complete baseline (BL) and 5-year (5Y) health related quality of life (HRQL) and radiographic data were included. Rates of complications and reoperations by 5Y were reported. Patients who developed proximal junctional kyphosis (PJK) and proximal junctional failure (PJF) also were reported. Paired-sampled means tests analyzed differences in complications, junctional kyphosis, and reoperations before and after 2-year (2Y) follow up. Binary regression analysis assessed complication rates between primary and prior fusion cases adjusting for demographic and surgical characteristics.
RESULTS:
Of 118 patients eligible for 5Y, 99 (83.9%) had complete follow-up data. The majority were female (83%), mean age 54.1 yrs and 10.4 levels fused and 14 undergoing 3-CO. Thirty-three patients had a prior fusion and 66 were primary cases. By 5Y postop the cohort had a complication rate of 70.7%. Twenty-six (26.3%) had a major complication and 25 (25.3%) underwent a reoperation. Thirty-eight (38.4%) developed PJK by 5Y and 4 (4.0%) developed PJF. Patients with a prior fusion did not have increased rates of complications, junctional kyphosis, or reoperations when compared to primary cases, all p>.05. The cohort had a significantly higher rate of complications (42.4% vs. 19.2%), PJK (34.3% vs. 4.0%), and reoperations (19.2% vs. 5.1%) before 2Y, all p<.01. Rates of major complications and PJF were comparable before and after 2Y follow up, both p>.05. The most common complications beyond 2Y were medically related or rod fractures. In a multivariate analysis, patients with a prior fusion were more likely to undergo a reoperation before 2Y than primary patients (OR 5.2 [CI 1.2–21.3], p=.022). This difference subsided beyond 2Y.
DISCUSSION AND CONCLUSION:
While incidence of complications was high before two years, there was a substantial reduction in longer follow up indicating complications after two years are less common. Complications beyond two years were mostly medical issues or implant failures. Patients with a prior fusion appear to have increased odds of undergoing a reoperation within two years of surgery compared to primary cases. This risk did not persist after the two-year follow-up period.

Table 2. Complications total, before and after 2Y follow-up for a cohort of 99 ASD patients

	Total	≤2Y	>2Y	p-value
Any	70 (70.7%)	63 (63.6%)	19 (19.2%)	**<0.001**
Major	25 (25.3%)	24 (24.2%)	4 (4.0%)	**<0.001**
Medical	30 (30.3%)	28 (28.3%)	2 (2.0%)	**<0.001**
Surgical	32 (32.3%)	32 (32.3%)	0 (0.0%)	**<0.001**
Mechanical	19 (19.2%)	15 (15.2%)	5 (5.1%)	**0.018**
Radiographic	10 (10.1%)	8 (8.1%)	2 (2.0%)	0.057
Reoperation	26 (26.3%)	21 (21.2%)	5 (5.1%)	**0.001**

*Bold indicates significant value

Table 3. Proximal junctional kyphosis and failure

	Total	≤2Y	>2Y	P-value
PJK	38 (38.4%)	34 (34.3%)	4 (4.0%)	**<0.001**
PJF	3 (4.0%)	2 (2.0%)	1 (1.0%)	0.566

*Bold indicates significant value

Table 4. Mean demographic and surgical parameters between primary and prior fusion ASD patients

	Primary (n=66)	Prior Fusion (n=33)	p-value
Age	53.1	56.1	0.427
Gender	79%	91%	0.095
BMI	26.2	26.5	0.828
CCI	0.97	1.42	0.169
ASD-mFI	4.7	5.8	0.287
Levels Fused	10.9	9.4	0.142
3CO	5%	33%	**0.002**

*Bold indicates significant value

Table 1. Mean descriptive parameters for a cohort of 99 ASD patients

	Value
Age (yrs.)	54.11
Gender (%F)	83%
BMI (kg/m^2)	26.3
CCI	1.1