Postoperative Complications in Adult Spinal Deformity Based on Age: Elderly Patients can be Safely Treated with Surgery

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INTRODUCTION:

With an aging population, there has been an increasing need for corrective spinal deformity surgeries in elderly patients in recent years. Historically, older patients have been deemed to be at increased risk for postoperative complications following spinal deformity surgery. Therefore, we aim to determine prevalence of postoperative complications in patients undergoing spinal deformity fusion surgery based on age.

METHODS:

This was a retrospective cohort study that study included 425 patients who underwent multilevel posterior spinal fusion by an experienced single board-certified spine surgeon at one institution between January 1, 2012 and December 31, 2017. The primary outcome evaluated was prevalence of postoperative complications. Short-term complications included 90 days of follow up and long-term complications included follow up minimum of 1 year and up to 6 years. Patients were divided into three groups based on age: less than 60, 60-74, and 75 or older. Chi-squared tests were used for univariate analysis of surgical and patient variables. Postoperative complications were analyzed using multivariable logistic regressions. Complications were analyzed both individually as well as grouped (surgical, medical, and overall complications).

RESULTS:

Patients in the 75 and above age group and 60-74 age group were shown to have increased comorbidities including arrhythmia and coronary artery disease, hypertension, and osteoarthritis compared to the youngest group (under 60). The overall complication rate for all patients was 34.4%. After adjusting for select patient comorbidities and surgical variables there was no difference in surgical and medical postoperative complication rates between the older two groups (60-74 and over 75) when compared to the youngest group (under 60).

DISCUSSION AND CONCLUSION:

Patients over the age of 75 were not shown to have increased rates of surgical or medical complications when compared to younger patient populations. This demonstrates the need to weigh in variables other than chronological age when indicating spinal deformity patients for multilevel spinal fusion surgery. Elderly spinal deformity patients can be safely treated with surgery when appropriately selected.

Table 1. Univariate analysis of patient demographics and comorbidities

Variable	Total	Age < 60	Age 60-74		Age ≥ 75	
	No. (%)	No. (%)	No. (%)	P-Value	No. (%)	P-Value
Total	425	139 (32.7)	225 (52.9)		61 (14.4)	
Male	107 (25.2)	34 (24.5)	54 (24.0)	0.921	19 (31.1)	0.325
Female	318 (74.8)	105 (75.5)	171 (76.0)		42 (68.9)	
Body Mass Index < 18.5	165 (37.2)	63 (40.1)	79 (35.1)	0.185	23 (37.7)	0.923
Body Mass Index: 18.5 - 30	190 (42.9)	66 (42.0)	94 (41.8)		30 (49.2)	
Body Mass Index ≥ 30	88 (19.9)	28 (17.8)	52 (23.1)		8 (13.1)	
Length of Stay: ≤ 5 days	155 (36.7)	66 (42)	71 (34.8)	0.083	18 (29.5)	**0.030**
Length of Stay: 6-7 days	195 (46.2)	62 (39.5)	108 (52.9)		25 (41.0)	
Length of Stay: 8+ days	72 (17.1)	29 (18.5)	25 (12.3)		18 (29.5)	
White	310 (72.9)	94 (67.6)	170 (75.6)	0.410	46 (75.4)	0.981
Nonwhite	10 (2.4)	4 (2.9)	4 (1.8)		2 (3.3)	
Declined to Answer	105 (24.7)	41 (29.5)	51 (22.7)		13 (21.3)	
American Society of Anesthesiology Score: 1 or 2	311 (76.0)	118 (87.4)	157 (73.4)	**0.002**	36 (60.0)	**< 0.001**
American Society of Anesthesiology Score: 3 or 4	98 (24.0)	17 (12.6)	57 (26.6)		24 (40.0)	
Non-smoker	221 (54.0)	75 (56.4)	113 (51.8)	**0.014**	33 (56.9)	0.061
Former Smoker	152 (37.2)	40 (30.1)	89 (40.8)		23 (39.7)	
Smoker	36 (8.8)	18 (13.5)	16 (7.3)		2 (3.4)	
Private insurance	266 (63.2)	110 (79.7)	131 (59.0)	**< 0.001**	25 (41.0)	**< 0.001**
Non-private insurance	155 (36.8)	28 (20.3)	91 (41.0)		36 (59.0)	
Diabetes	38 (9.1)	13 (9.6)	19 (8.6)	0.768	6 (9.8)	0.951
Arrhythmia or Coronary Artery Disease	56 (12.6)	8 (5.1)	37 (16.4)	**0.001**	11 (18.0)	**0.004**
Congestive Heart Failure	4 (0.9)	0 (0.0)	3 (1.3)	0.958	1 (1.6)	0.957
Chronic obstructive pulmonary disease	17 (4.0)	4 (2.9)	10 (4.4)	0.454	3 (4.9)	0.475
Hypertension	196 (46.1)	40 (28.8)	119 (52.9)	**< 0.001**	37 (60.7)	**< 0.001**
Asthma	44 (10.4)	17 (12.2)	25 (11.1)	0.745	2 (3.3)	0.064
Osteopenia or Osteoporosis	53 (12.8)	9 (6.8)	34 (15.3)	**0.020**	10 (16.9)	**0.035**
Hip osteoarthritis	9 (2.1)	1 (0.7)	7 (3.1)	0.166	1 (1.6)	0.558
Knee osteoarthritis	30 (7.1)	2 (1.4)	22 (9.8)	**0.007**	6 (9.8)	0.558

Table 2. Univariate analysis of surgical variables

Variable	Total	Age < 60	Age 60-74		Age ≥ 75	
	No. (%)	No. (%)	No. (%)	P-Value	No. (%)	P-Value
Lumbar fusion	274 (64.5)	88 (63.3)	138 (61.3)	0.706	48 (78.7)	**0.034**
Thoracic Fusion	151 (35.5)	51 (36.7)	87 (38.7)		13 (21.3)	
Levels fused: 2 - 3	160 (36.1)	63 (40.1)	71 (31.6)	0.181	26 (42.6)	0.275
Levels fused: 4 - 5	186 (42.0)	61 (38.9)	97 (43.1)		28 (45.9)	
Levels fused: 6 - 7	58 (13.1)	11 (7.0)	42 (18.7)		5 (8.2)	
Levels fused: ≥ 8	39 (8.8)	22 (14.0)	15 (6.7)		2 (3.3)	
Pelvic Fixation	272 (64.2)	91 (60.5)	141 (62.9)	0.627	40 (65.6)	0.988
OR time, Mean (IQR)	552 (472-608)	557 (470-615)	554 (483-608)		507 (457-587)	0.250
Procedure Time, Mean (IQR)	414 (339-473)	426 (331-475)	422 (353-478)		368 (316-433)	0.228

Table 3. Multivariable logistic regression of grouped complications adjusted for length of stay, American Society of Anesthesiology score, smoking status, arrhythmia/coronary artery disease, hypertension, lumbar vs. thoracic fusion, bone density, number of levels fused, and procedure time.

Variables	Total	Age < 60	Age 60-74		Age ≥ 75	
	No. (%)	No. (%)	No. (%)	P-Value	No. (%)	P-Value
Complication	146 (34.4)	42 (30.2)	87 (38.7)	0.351	17 (27.9)	0.504
Medical complication	39 (9.2)	10 (7.2)	25 (11.1)	0.232	4 (6.6)	0.530
Surgical complication	116 (27.3)	35 (25.2)	68 (30.2)	0.770	13 (21.3)	0.513

Table 4. Multivariable logistic regression of medical complications adjusted for length of stay, American Society of Anesthesiology score, smoking status, arrhythmia/coronary artery disease, hypertension, lumbar vs. thoracic fusion, bone density, number of levels fused, and procedure time.

Variables	Total	Age < 60	Age 60-74		Age ≥ 75	
	No. (%)	No. (%)	No. (%)	P-Value	No. (%)	P-Value
Deep Vein Thrombosis or Pulmonary Embolism	7 (1.6)	4 (2.9)	3 (1.3)	0.268	0 (0.0)	0.963
Pneumonia	4 (0.9)	1 (0.7)	2 (0.9)	0.988	1 (1.6)	0.968
Urinary Tract Infection	4 (0.9)	2 (1.4)	2 (0.9)	0.719	0 (0.0)	0.966
Unplanned intubation	1 (0.2)	1 (0.7)	0 (0.0)	0.900	0 (0.0)	0.952
Cardiac Arrest	0 (0.0)	0 (0.0)	0 (0.0)	.	0 (0.0)	.
Acute kidney injury	7 (1.6)	2 (1.4)	4 (1.8)	0.623	1 (1.6)	0.769
Myocardial infarction	1 (0.2)	0 (0.0)	1 (0.4)	0.953	0 (0.0)	0.973

Table 5. Multivariable logistic regression of surgical complications adjusted for length of stay, American Society of Anesthesiology score, smoking status, arrhythmia/coronary artery disease, hypertension, lumbar vs. thoracic fusion, bone density, number of levels fused, and procedure time.

Variables	Total	Age < 60	Age 60-74		Age ≥ 75	
	No. (%)	No. (%)	No. (%)	P-Value	No. (%)	P-Value
Proximal Junction Collapse	26 (6.1)	9 (6.5)	13 (5.8)	0.962	4 (6.6)	0.520
Readmission	45 (10.6)	14 (10.1)	29 (12.9)	0.167	2 (3.3)	0.425
Rod Fracture	15 (3.5)	5 (3.6)	8 (3.6)	0.688	2 (3.3)	0.699
Sacroiliac Joint Pain	81 (19.1)	25 (18.0)	47 (20.9)	0.993	9 (14.8)	0.673
Wound Dehiscence	10 (2.4)	2 (1.4)	7 (3.1)	0.221	1 (1.6)	0..971
Wound Infection	4 (0.9)	1 (0.7)	2 (0.9)	0.908	1 (1.6)	0.971
Pseudoarthrosis/Non-Union	3 (0.7)	1 (0.7)	2 (0.9)	0.778	0 (0.0)	0.950