

Etiology of cardiac risk factors and complications after posterior spinal fusion for idiopathic scoliosis in children

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Background

- Posterior spinal fusion (PSF) is performed to correct spinal deformities of idiopathic, neuromuscular, or congenital origin. While PSF is generally safe, cardiac comorbidities may increase the risk of complications.
- In previous studies, cardiac risk factors (CRFs) did not independently contribute to risk of complications after adjustment for patient and procedure characteristics¹. Differences in the risk of complications according to the etiology of cardiac disease are unclear.²
- We used a national registry of pediatric surgical outcomes to evaluate outcomes of PSF according to presence of congenital heart defect (CHD) as compared to cardiomyopathy (CM).

Table 1. Patient and procedure characteristics in children ≤ 18 years undergoing elective isolated posterior spinal fusion in idiopathic scoliosis, according to severity and etiology of cardiac risk factors.

Variable	Cardiac risk factors				P
	None or minor without CHD (N = 6,771)	Minor due to CHD (N = 148)	Major due to CHD (N = 146)	Major due to CM (N = 21)	
	N (%) or mean (SD)	N (%) or mean (SD)	N (%) or mean (SD)	N (%) or mean (SD)	
Any complication	332 (5%)	13 (9%)	16 (11%)	8 (38%)	<0.001
Unplanned readmission	175 (3%)	4 (3%)	10 (7%)	5 (24%)	<0.001
Wound dehiscence	132 (2%)	3 (2%)	3 (2%)	3 (14%)	0.020
SSI	85 (1%)	3 (2%)	4 (3%)	3 (14%)	0.001
Prolonged LOS	48 (1%)	3 (2%)	3 (2%)	2 (10%)	0.001
Mortality	4 (0.1%)	1 (1%)	0	0	0.203
Age (years)	14 (2)	13 (3)	13 (3)	15 (2)	<0.001
Gender					<0.001
Female	5,194 (77%)	110 (74%)	84 (58%)	7 (33%)	
Male	1,577 (23%)	38 (26%)	62 (42%)	14 (67%)	
ASA physical classification ^a					<0.001
1-2	5,651 (84%)	68 (46%)	42 (29%)	5 (24%)	
3-4	1,108 (16%)	80 (54%)	103 (71%)	16 (76%)	

ASA = American Society of Anesthesiologists; CHD = congenital heart defect; CM = cardiomyopathy; LOS = length of stay; SD = standard deviation; SSI = surgical site infection
^aData missing in 13 cases.

Methods

- Elective cases of isolated PSF for idiopathic scoliosis in patients 0-18 years of age were identified in the 2012-2015 National Surgical Quality Improvement Program-Pediatric. During primary data collection, trained coders abstracted CRFs as none, minor (e.g., well-controlled or repaired CHD), or major/severe.
- Using International Classification for Disease-9 codes to determine the etiology of CRF, we classified patients as : (1) No CRF, or minor CRF without CHD; (2) minor CRF due to CHD; (3) major CRF due to CHD; and (4) major CRF due to CM.
- Multivariable logistic regression compared surgical site infection, wound dehiscence, hospital length of stay ≥ 30 days, unplanned readmission, and the presence of any of these complications across the four categories of CRF etiology and severity.

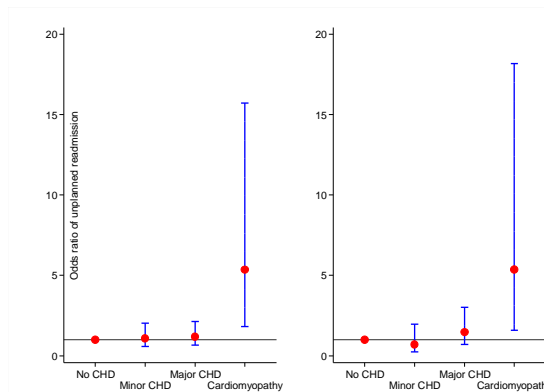


Figure 1. Odds ratios with 95% confidence intervals for any complication and unplanned readmission after elective isolated posterior spinal fusion for idiopathic scoliosis, according to severity and etiology of cardiac risk factors.

Results

- The analysis included 5,395 girls and 1,691 boys, age 14 ± 2 years. Among these, 148 had minor CRF due to CHD, 146 had major CRF due to CHD, and 21 had major CRF due to CM (Table 1).
- Complication rates were higher among patients with CM (38%) than among patients with major CRF due to CHD (11%), minor CRF due to CHD (9%), or other minor or no CRF (5%; Chi-square $p < 0.001$).
- In multivariable analysis (Figure 1), CM remained associated with increased odds of complications compared to no or minor CRF (OR=5.3; 95% CI: 1.8, 15.7; $p = 0.002$), and compared to major CRF due to CHD (OR=4.5; 95% CI: 1.4, 15.0; $p = 0.014$).
- When examining specific complication types, CM predicted greater odds of unplanned readmission.
- In all multivariable analyses, CRFs due to CHD were not associated with increased complication risk.

Discussion

- CM is a rare but significant risk factor for complications after pediatric PSF, primarily due to unplanned readmission.
- CHD does not appear to independently contribute to the risk of complications after this procedure.
- Further research is needed to clarify risk and optimal care of patients with CM undergoing PSF. Patients with CM undergoing this procedure may require care by multidisciplinary teams possessing experience in managing heart failure.

References:

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- Basques BA, Chung SH, Lukasiewicz AM, Webb ML, Samuel AM, Bohl DD, Smith BG, Grauer JN. Predicting Short-term Morbidity in Patients Undergoing Posterior Spinal Fusion for Neuromuscular Scoliosis. *Spine* 2015;40:1910-7.