Timing of Cervical Fusion Surgery Does Not Affect Perioperative Outcomes in a Propensity Score-Matched Cohort

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Introduction

Considerable controversy exists regarding the timing of surgery for acute cervical spine fractures. Previous studies have been mainly single-institution cases series, therefore, limited by the capabilities of individual centers and surgeons.

Methods

A total of 1,893 patients with surgically-treated cervical fractures with or without spinal cord injury were identified by ICD-9 code in the 2003 to 2008 California State Inpatient Database. Patients were sorted as having early surgery (within 72 hours) versus late surgery (beyond 72 hours). Propensity-score matching (PSM) was used to match early and late surgery patients on age, comorbidity, and trauma severity score. Perioperative outcomes, mortality and resource utilization were assessed. Multivariate logistic regression determined whether timing of surgery predicted perioperative complications after controlling for other factors. These data were repeated and confirmed with a 24 hour time point cut off for early surgery.

Outcomes of PSM Matched Cohort

	Overall	Treated Within 72 Hours	Treated Beyond 72 Hours	P-Value
In-Hospital Complications (%)	25.6	23.8	27.4	0.1379
Cardiac	2.0	1.4	2.5	0.1573
Infection	2.1	1.7	2.4	0.4280
Neuro	0.5	0.2	0.8	0.2176
Pulmonary	19.3	18.9	19.8	0.6689
Renal	3.3	2.2	4.3	0.0390 *
VTE	5.1	4.6	5.6	0.4414
Wound	3.4	3.0	3.8	0.5353
In-Hospital Mortality (%)	2.9	3.3	2.5	0.4041
Non-Routine Discharge (%)	52.8	50.7	54.8	0.1426
Length of Stay, Mean (days)	12.7	10.1	15.2	< 0.0001 *
Total Charges, Mean ($)	209,541	191,902	227,425	0.0013 *

Patient Characteristics of PSM-Matched Cohort

	Overall Cases	Overall (%)	Treated Within 72 Hours Cases	Treated Within 72 Hours (%)	Treated Beyond 72 Hours Cases	Treated Beyond 72 Hours (%)	P-Value
Overall	1,262	(100)	631	(100)	631	(100)	
Admitted from ED							0.5557
Yes	953	(75.5)	481	(76.2)	472	(74.8)	
No	309	(24.5)	150	(23.8)	159	(25.2)	
Age							0.6331
Under 65	840	(66.6)	424	(67.2)	416	(65.9)	
65 and Older	422	(33.4)	207	(32.8)	215	(34.1)	
Elixhauser Comorbidity Group							0.9533
Zero	407	(32.3)	206	(32.7)	201	(31.9)	
One	344	(27.3)	174	(27.6)	170	(26.9)	
Two	222	(17.6)	107	(17.0)	115	(18.2)	
Three	137	(10.9)	66	(10.5)	71	(11.3)	
Four or More	152	(12.0)	78	(12.4)	74	(11.7)	
Expected Payer							0.8712
Private	437	(34.6)	218	(34.6)	219	(34.7)	
Medicare	405	(32.1)	199	(31.5)	206	(32.7)	
Other including Medicaid	420	(33.3)	214	(33.9)	206	(32.7)	
Race/Ethnicity							0.9749
Asian or Pacific Islander	37	(2.9)	17	(2.7)	20	(3.2)	
Black	79	(6.3)	38	(6.0)	41	(6.5)	
Hispanic	201	(15.9)	102	(16.2)	99	(15.7)	
White	859	(68.1)	428	(67.8)	431	(68.3)	
Other[a]	26	(2.1)	14	(2.2)	12	(1.9)	
Unknown	60	(4.8)	32	(5.1)	28	(4.4)	
Sex							0.3245
Female	404	(32.1)	210	(33.4)	194	(30.8)	
Male	855	(67.9)	419	(66.6)	436	(69.2)	
ICISS-Based Probability of Death[b]	6.0%	[0, 83]	5.8%	[0, 47]	6.3%	[0, 83]	0.2960

[a]Includes Native Americans
[b]Presented as mean [min, max]

Conclusions

In a large administrative database study, timing of surgery following cervical fracture was not found to be a significant predictor of perioperative complications, discharge status, or mortality. Delayed surgery was associated with longer hospital stays and greater healthcare resource utilization.

Results

66% of patients were operated on within 72 hours of admission. Delayed surgery was associated with older age, increased comorbidities and trauma severity. After PSM, there were no significant known pre-operative differences among the 1,262 patients in the matched cohorts. No statistically significant differences were found between the early and delayed surgery group for in-hospital complication rate (24% vs. 27%), non-routine discharge status (51% vs. 55%), or mortality (3.3% vs. 2.5%). This was confirmed on multivariate analysis. Length of stay (10 days vs. 15 days) and hospital charges ($191,902 v. $227,425) were significantly less in the early surgery group (p <0.002). Repeating the above analysis using a cutoff time of 24 hours for early vs. delayed surgery resulted in the same results.

Learning Objectives

Early surgery for cervical fractures is associated with equivalent outcomes, but decreased expenditures.