

Morbidity and Mortality Associated With Operative Management of Traumatic C2 Fractures in Octogenarians

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Introduction

The management of axis fractures and particularly of odontoid fractures in the elderly remains controversial. As a greater segment of the U.S. population lives past 80, it is becoming increasingly evident that published morbidity and mortality profiles of C2 fractures in younger cohorts (55+) are not applicable to octogenarians. There is a need for further study in this specific population.

Methods

Using the National Sample Program (NSP) of the National Trauma Data Bank (NTDB), we performed a retrospective analysis of patients with age = 80 years and traumatic C2 fracture. Demographics and the outcome endpoints of mortality, hospital length of stay (LOS), and discharge disposition are described.

Descriptive Variable	Overall (N=3847)	Nonsurgery (N=3449)	Surgery (N=398)	Sig. (P)
Age				0.069
Mean (SD)	84.5 (2.8)	84.5 (2.8)	84.2 (2.7)	
Gender				<0.001
Male	1432 (37.0%)	1236 (35.8%)	187 (47.0%)	
Female	2434 (63.0%)	2213 (64.2%)	211 (53.0%)	
Race				0.319
White	3482 (90.5%)	3120 (90.5%)	362 (91.0%)	
Black	79 (2.1%)	67 (1.9%)	12 (3.0%)	
Asian	36 (0.9%)	32 (0.9%)	4 (1.0%)	
Other/Unknown	250 (6.5%)	230 (6.7%)	20 (5.0%)	
CCI				0.721
Mean (SD)	0.53 (1.00)	0.53 (1.00)	0.51 (0.98)	
Insurance				0.891
Medicare/Medicaid/Gov't	2049 (53.3%)	1833 (53.1%)	216 (54.3%)	
Private/Commercial	481 (12.5%)	436 (12.6%)	45 (11.3%)	
Self-Pay/Other	196 (5.1%)	175 (5.1%)	21 (5.3%)	
Unknown	1121 (29.1%)	1005 (29.1%)	116 (29.1%)	
Mechanism				<0.001
Fall	2851 (74.1%)	2503 (72.6%) [a]	348 (87.4%) [b]	
MVA	660 (17.2%)	627 (18.2%) [a]	33 (8.3%) [b]	
PVA	28 (0.7%)	26 (0.8%) [a]	2 (0.5%) [a]	
Other	76 (2.0%)	68 (2.0%) [a]	8 (2.0%) [a]	
Unknown	232 (6.0%)	225 (6.5%) [a]	7 (1.8%) [b]	
ISS				<0.001
Mean (SD)	9.55 (7.99)	9.73 (8.07)	8.01 (7.08)	
ED Disposition				<0.001
Floor	1543 (40.1%)	1367 (39.6%) [a]	176 (44.2%) [a]	
Telemetry	524 (13.6%)	499 (14.5%) [a]	25 (6.3%) [b]	
Intensive Care Unit	1432 (37.2%)	1270 (36.8%) [a]	162 (40.7%) [a]	
Operating Room	87 (2.3%)	79 (2.3%) [a]	8 (2.0%) [a]	
Other	73 (1.9%)	69 (2.0%) [a]	4 (1.0%) [a]	
Unknown	188 (4.9%)	165 (4.8%) [a]	23 (5.8%) [a]	

Demographic and Injury Characteristics in Octogenarians with Traumatic C2 Fractures by Surgery Cohort

Predictor	B [95% CI]	Sig. (P)
Gender		0.001
Male	Reference	
Female	-0.98 [-1.57 to -0.39]	
Charlson Comorbidity Index		0.027
Per-unit	0.33 [0.04 to 0.62]	
Insurance		0.136
Medicare/Medicaid/Gov't	Reference	
Private/Commercial	-0.77 [-1.70 to 0.17]	0.108
Self-Pay/Other	-0.86 [-2.24 to 0.51]	0.217
Unknown	-0.64 [-1.29 to 0.02]	0.056
Mechanism		<0.001
Fall	Reference	
MVA	2.11 [1.26 to 2.95]	<0.001
PVA	7.55 [4.19 to 10.91]	<0.001
Other	-1.27 [-3.33 to 0.79]	0.227
Unknown	1.67 [0.43 to 2.91]	0.009
ISS Group		<0.001
0 to 8	Reference	
9 to 15	1.48 [0.72 to 2.23]	<0.001
16 to 24	4.16 [3.27 to 5.05]	<0.001
25 to 75	5.89 [4.54 to 7.24]	<0.001
Unknown	2.89 [1.44 to 4.34]	<0.001
Management		<0.001
Nonsurgery	Reference	
Surgery	5.68 [4.74 to 6.61]	

Length of Hospital Stay in Octogenarians with Traumatic C2 Fractures

Results

This data represents 17,702 incidents nationally. Operative management was associated with increased risk of pneumonia (10.1% vs. 5.9%, p<0.001), acute respiratory distress syndrome (6.0% vs. 2.3%, p<0.001), and decubitus ulcer (4.8% vs. 1.3%, p<0.001). Inpatient mortality was 12.8% and was not significantly different between non-operative and operative cohorts (non-operative 13%; operative 10.3%; p=0.120). Overall hospital LOS was 8.31 ± 9.32 days (non-operative 7.78 ± 9.21; operative 12.86 ± 9.07; p<0.001) and showed an adjusted mean increase of 5.68 days with operative management (95% CI [4.74-6.61]). Of patients who survived to discharge, 26% returned home (non-operative 26.8%; operative: 18.8%; OR 0.59, 95% CI [0.44-0.78]).

Inpatient Complications	Overall (N=3847)	Nonsurgery (N=3449)	Surgery (N=398)	Sig. (P)
Any Complication	1038 (27.0%)	888 (25.7%)	150 (37.7%)	<0.001
Acute Kidney Injury	18 (0.5%)	14 (0.4%)	4 (1.0%)	0.097
Acute Renal Failure	73 (1.9%)	63 (1.8%)	10 (2.5%)	0.342
ARDS	104 (2.7%)	80 (2.3%)	24 (6.0%)	<0.001
Cardiac Arrest	103 (2.7%)	89 (2.6%)	14 (3.5%)	0.273
Cerebrovascular Accident	15 (0.4%)	13 (0.4%)	2 (0.5%)	0.663
Coagulopathy	10 (0.3%)	9 (0.3%)	1 (0.3%)	0.999
Decubitus Ulcer	65 (1.7%)	46 (1.3%)	19 (4.8%)	<0.001
Deep Venous Thrombosis	62 (1.6%)	51 (1.5%)	11 (2.8%)	0.054
Myocardial Infarction	42 (1.1%)	34 (1.0%)	8 (2.0%)	0.063
Pneumonia	242 (6.3%)	202 (5.9%)	40 (10.1%)	0.001
Pulmonary Embolism	20 (0.5%)	16 (0.5%)	4 (1.0%)	0.155
Sepsis	34 (0.9%)	29 (0.8%)	5 (1.3%)	0.402
Surgical Site Infection	8 (0.2%)	7 (0.2%)	1 (0.3%)	0.583
Unplanned Intubation	54 (1.4%)	44 (1.3%)	10 (2.5%)	0.047
Unplanned Return to ICU	19 (0.5%)	16 (0.5%)	3 (0.8%)	0.435
Urinary Tract Infection	125 (3.2%)	104 (3.0%)	21 (5.3%)	0.016
Other	453 (11.8%)	394 (11.4%)	59 (14.8%)	0.046

Inpatient Complications in Octogenarians with Traumatic C2 Fractures

Predictor	OR [95% CI]	Sig. (P)
Gender		0.015
Male	Reference	
Female	0.82 [0.69-0.96]	
Charlson Comorbidity Index		0.003
Per-unit	0.87 [0.80-0.96]	
Insurance		0.325
Medicare/Medicaid/Gov't	Reference	
Private/Commercial	1.14 [0.88-1.47]	0.324
Self-Pay/Other	0.75 [0.50-1.13]	0.166
Unknown	1.02 [0.85-1.23]	0.811
Mechanism		<0.001
Fall	Reference	
MVA	1.66 [1.31-2.12]	<0.001
PVA	2.93 [1.07-8.02]	0.037
Other	2.19 [1.29-3.72]	0.004
Unknown	1.39 [0.97-1.99]	0.076
ISS Group		<0.001
0 to 8	Reference	
9 to 15	0.54 [0.43-0.67]	<0.001
16 to 24	0.31 [0.24-0.42]	<0.001
25 to 75	0.10 [0.04-0.22]	<0.001
Unknown	0.34 [0.20-0.58]	<0.001
Management		<0.001
Nonsurgery	Reference	
Surgery	0.59 [0.44-0.78]	

Discharge Disposition in Octogenarians with Traumatic C2 Fractures

Conclusions

The present study confirms that operative management of traumatic C2 fractures in octogenarians does not significantly affect inpatient mortality and increases the rate of discharge to institutionalized care. Patients undergoing surgery are more likely to require longer hospitalization and suffer higher rates of medical complications during their stay.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the morbidity associated with operative management of C2 fractures in those aged 80 or older; 2) Identify common inpatient complications and points of emphasis of post-operative care in octogenarians with cervical fixation; 3) To describe in better detail the risks and benefits of cervical fixation in octogenarians with traumatic C2 fractures