

Anterior Cervical Discectomy and Fusion During the COVID-19 Pandemic: Decreased Rate of Nonhome Discharge with Statistically Similar 30-Day Outcomes

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Introduction

- COVID-19 limited hospital operations during its peak
- Orthopaedic surgeons were required to adapt their practices to maintain optimal patient outcomes, despite restricted resources
 - E.g. shifts to outpatient surgeries, shorter hospital stays, higher rates of home discharge
- These changes heavily impacted elective procedures
- Patients with operable degenerative cervical spine disease at particular risk because delays in elective anterior cervical discectomy and fusion (ACDF) have been associated with increased morbidity and mortality
- We aimed to examine whether the pandemic significantly affected operative processes, patient care, and short-term outcomes in those undergoing ACDF

Methods

- Retrospective cohort analysis, ACS National Surgical Quality Improvement Program database
- Eligibility criteria: patients >18 who underwent multilevel ACDF in 2019 or 2020
- Exclusion criteria: preoperative sepsis, wound class >1, disseminated cancer, admission from a nonhome location, diagnosis other than degenerative disease
- Primary outcomes:
 - 30-day readmission, reoperation, and morbidity
 - Operative time (ORT) and length of hospital stay (LOS)
 - Relative value units (RVUs) per-minute and per-case
- Secondary outcomes: rates of non-elective surgery, nonhome discharge, outpatient surgery
- Compared demographic, comorbidity, laboratory, procedural variables between 2019 and 2020 using Chi-Squared, Fisher's exact, or Student's t-tests as appropriate

Results

- 6,491 total patients → 3,495 in 2019 and 2,996 in 2020
- Demographic background, rates of readmission, reoperation, and morbidity, ORT, LOS, RVUs-per-minute and per-case were statistically similar in 2019 and 2020
- Undergoing ACDF in 2020 was an independent predictor of decreased rates of nonhome discharge, $\chi^2(1) = 9.44$, $p = 0.0021$
 - But year of surgery had no significant impact on rates of outpatient or non-elective surgery
- Multivariate analysis → showed that year of surgery was not a significant predictor of any primary outcome

Table 1. Comparison of baseline patient characteristics and procedural factors			
	2019 N (%)	2020 N (%)	<i>p</i> -value
Demographics			
	N=3,495	N=2,996	
Age (years), mean ± SD	57.9 ± 11.0	58.1 ± 10.9	0.294
Female sex	1,780 (50.9%)	1,495 (49.9%)	0.408
Non-white race	522 (16.1%)	449 (16.1%)	0.971
Hispanic ethnicity	213 (6.4%)	183 (6.5%)	0.967
Comorbidities			
BMI, mean ± SD	30.9 ± 6.5	30.7 ± 6.4	0.341
Diabetes mellitus	641 (18.3%)	596 (19.9%)	0.112
Dyspnea	186 (5.3%)	142 (4.7%)	0.286
Functional dependence	51 (1.5%)	30 (1.0%)	0.096
Smoker	763 (21.8%)	669 (22.3%)	0.629
Severe COPD	154 (4.4%)	128 (4.3%)	0.792
Congestive heart failure	18 (0.5%)	13 (0.4%)	0.637
Hypertension requiring medication	1,839 (52.6%)	1,580 (52.7%)	0.924
Chronic steroid use	136 (3.9%)	126 (4.2%)	0.521
Bleeding disorder	32 (0.9%)	37 (1.2%)	0.211
ASA class ≥3	1,746 (50.0%)	1,550 (51.7%)	0.153
Laboratory values			
Creatinine, mean ± SD	0.93 ± 0.48	0.93 ± 0.43	0.978
White cell count, mean ± SD	7.2 ± 2.2	7.3 ± 2.3	0.062
Hematocrit, mean ± SD	41.9 ± 4.1	42.1 ± 4.2	0.021
Platelet count, mean ± SD	252 ± 67	255 ± 69	0.159
Procedural factors			
Nonhome discharge	149 (4.3%)	85 (2.8%)	0.0021 (OR 0.656)
Non-elective or emergency	116 (3.3%)	92 (3.1%)	0.571
Outpatient surgery	1,508 (43.1%)	1,345 (44.9%)	0.158
Bold indicates statistical significance (<i>p</i> <0.05). SD, standard deviation. OR, Odds Ratio. COPD, chronic obstructive pulmonary disease. ASA, American Society of Anesthesiologists.			

Table 2. Unadjusted 30-day and perioperative outcomes of ACDF, performed in 2019 versus 2020			
	2019 <i>N (%)</i>	2020 <i>N (%)</i>	<i>p</i>-value
	N=3,495	N=2,996	
<i>30-day outcomes</i>			
Readmission	89 (2.5%)	78 (2.6%)	0.885
Reoperation	40 (1.1%)	44 (1.5%)	0.249
Morbidity	86 (2.5%)	70 (2.3%)	0.745
<i>Complications</i>			
Superficial SSI	8 (0.2%)	7 (0.2%)	0.968
Deep SSI	1 (0.03%)	2 (0.1%)	0.598 [#]
Organ/Space SSI	2 (0.1%)	3 (0.1%)	0.667 [#]
Wound disruption	3 (0.1%)	4 (0.1%)	0.711 [#]
Pneumonia	14 (0.4%)	17 (0.6%)	0.331
Unplanned intubation	14 (0.4%)	11 (0.4%)	0.828
Pulmonary embolism	7 (0.2%)	4 (0.1%)	0.562 [#]
Ventilator >48 hours	11 (0.3%)	4 (0.1%)	0.194 [#]
Renal insufficiency	1 (0.03%)	2 (0.1%)	0.598 [#]
Urinary tract infection	20 (0.6%)	11 (0.4%)	0.232
Stroke	3 (0.1%)	3 (0.1%)	1.000 [#]
Cardiac arrest requiring CPR	3 (0.1%)	0 (0.0%)	0.254 [#]
Myocardial infarction	4 (0.1%)	2 (0.1%)	0.693 [#]
Transfusion	8 (0.2%)	5 (0.2%)	0.577
Deep venous thrombosis	9 (0.3%)	5 (0.2%)	0.433
Sepsis	10 (0.3%)	4 (0.1%)	0.283 [#]
<i>Perioperative outcomes</i>			
Operative time, mean ± SD	147 ± 65	148 ± 62	0.317
RVUs per minute, mean ± SD	0.40 ± 0.23	0.39 ± 0.22	0.199
RVUs per case, mean ± SD	48.7 ± 13.0	49.0 ± 13.2	0.235
Length of stay, mean ± SD	1.7 ± 2.0	1.6 ± 2.0	0.261
[#] Fishers exact test. Bold values indicate statistical significance (<i>p</i> <0.05). SSI, surgical site infection. CPR, cardiopulmonary resuscitation.			

Table 3. Multivariate analysis of the impact of ACDF operation year 2020 on primary outcomes

<i>30-day outcomes</i>	OR (95% CI)	<i>p</i>-value
Readmission	0.989 (0.717, 1.365)	0.947
Reoperation	1.315 (0.842, 2.056)	0.229
Morbidity	0.969 (0.693, 1.353)	0.852
<i>Perioperative variables</i>	OR (95% CI)	<i>p</i>-value
Length of stay (days)	1.019 (0.955, 1.089)	0.565
<i>Perioperative variables</i>	Coefficient (95% CI)	<i>p</i>-value
RVUs per minute	-0.007 (-0.017, 0.003)	0.155
RVUs per case	<0.001 (-0.325, 0.325)	1.000
Operative time (min)	0.975 (-2.791, 4.740)	0.612

Bold values indicate statistical significance ($p < 0.05$). OR, odds ratio. CI, confidence interval.

Conclusion

- Univariate analysis demonstrated that when undergoing ACDF during the pandemic, odds of discharge to a nonhome location were 65.6% of those in 2019
- Despite this, rates of 30-day readmission, reoperation, morbidity comparable
 - Reveals that home recovery did not present notable complications to rehabilitation process
 - Suggests potential benefit to re-assessing criteria for discharge to rehabilitation facilities
- No significant difference in rate of outpatient surgeries between the two periods
 - Likely due to a shift of ACDF to ambulatory setting even prior to COVID-19