

Factors Associated with Adverse Events Following Repair for Skull Base Cerebrospinal Fluid Leakage from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP)

Andrew Karl Rock MHS MS; Matthew Thomas Carr; Charles Frederick Opalak MPH, MD; Kathryn Workman; William C.

Broaddus MD

Department of Neurosurgery, Virginia Commonwealth University, 417 North 11th Street, Sixth Floor, P.O. Box 980631, Richmond, VA 23219-0631, USA

Introduction

-Spontaneous and iatrogenic skull base cerebrospinal fluid (CSF) leakage are highly morbid conditions requiring neurosurgical intervention for repair
 -Current literature has not investigated the rate of postoperative complications following craniotomy and secondary repair for CSF leakage
 -Our objective was to utilize the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) to characterize 30-day postoperative complications following CSF leak repair

Methods

-Patients who underwent craniotomy (CPT code: 62100) or secondary repair for CSF leakage (CPT codes: 61618, 61619) were extracted from the 2005-2015 ACS-NSQIP
 -The prevalence of 30-day postoperative complications was estimated
 -Multivariable logistic regression modeling was used to identify demographic, comorbid, and perioperative characteristics associated with any morbidity, severe (Clavien IV) complications, and mortality

Results

-Within 634 cases, the prevalence of complications were:
 -Any morbidity (28.08%)
 -Severe complications (10.73%)
 -Mortality (4.10%)
 -The three most common complications were:
 -Transfusion within 72 hours (11.51%)
 -Reoperation (8.99%)
 -Prolonged ventilation >24 hours (8.20%)

Table 1: Prevalence of postoperative complications following skull base cerebrospinal fluid (CSF) leak repair

	Repair of CSF Leak (n=634)
Composite Complications	
Any Morbidity	178 (28.08)
Clavien IV	68 (10.73)
Individual Complications	
Superficial Incisional SSI	7 (1.10)
Deep Incisional SSI	7 (1.10)
Organ Space SSI	9 (1.42)
Wound Dehiscence	2 (0.32)
Urinary Tract Infection	19 (3.00)
Sepsis	12 (1.89)
Septic Shock	4 (0.63)
Pneumonia	25 (3.94)
Unplanned Intubation	23 (3.63)
On Ventilator >48 hours	52 (8.20)
Pulmonary Embolism	6 (0.95)
Deep Vein Thrombosis	19 (3.00)
Cardiac Arrest	0 (0.00)
Myocardial Infarction	1 (0.16)
Renal Insufficiency	1 (0.16)
Acute Renal Failure	3 (0.47)
CVA/Stroke	23 (3.63)
Transfusion	73 (11.51)
Reoperation	57 (8.99)
Mortality	26 (4.10)

Table 2: Predictors of postoperative complications following skull base cerebrospinal fluid (CSF) leak repair

Variable	Any Morbidity		Clavien IV Complication		Mortality	
	OR (95% CI)	P-Value	OR (95% CI)	P-Value	OR (95% CI)	P-Value
Age						
< 65	1.00 (Reference)		1.00 (Reference)		1.00 (Reference)	
> 65	1.98 (1.28-3.06)	0.002	2.72 (1.43-5.16)	0.002	1.78 (0.61-5.16)	0.29
Female	1.18 (0.79-1.75)	0.42	0.76 (0.42-1.36)	0.35	0.75 (0.29-1.94)	0.56
Race						
White	1.00 (Reference)		1.00 (Reference)		1.00 (Reference)	
Other	0.82 (0.53-1.28)	0.39	0.89 (0.46-1.74)	0.74	0.38 (0.12-1.21)	0.10
BMI						
Normal-Underweight	1.00 (Reference)		1.00 (Reference)		1.00 (Reference)	
Overweight	0.95 (0.56-1.58)	0.83	0.98 (0.44-2.18)	0.96	0.48 (0.13-1.73)	0.26
Obese	0.81 (0.50-1.32)	0.40	1.04 (0.50-2.17)	0.92	0.34 (0.09-1.23)	0.10
Tobacco Use	0.64 (0.38-1.06)	0.08	1.19 (0.59-2.40)	0.62	1.56 (0.54-4.53)	0.41
Diabetes	0.75 (0.42-1.32)	0.32	0.68 (0.29-1.57)	0.36	1.36 (0.40-4.67)	0.62
Dyspnea	0.87 (0.34-2.19)	0.77	0.19 (0.02-1.68)	0.14	1.29 (0.16-10.35)	0.81
Dependent Functional Status	3.93 (1.89-8.15)	<.001	3.34 (1.32-8.43)	0.01	5.35 (1.61-17.81)	0.006
COPD	1.26 (0.47-3.39)	0.65	2.09 (0.52-8.37)	0.30	0.27 (0.02-3.98)	0.34
Hypertension	1.51 (1.00-2.29)	0.05	1.47 (0.79-2.75)	0.22	2.16 (0.70-6.70)	0.18
Disseminated Cancer	0.84 (0.41-1.69)	0.62	0.08 (0.01-0.74)	0.03	4.50 (1.29-15.72)	0.02
Steroid Use	1.41 (0.73-2.72)	0.30	1.11 (0.38-3.25)	0.85	0.38 (0.05-2.86)	0.35
Preoperative Sepsis	2.93 (1.11-7.73)	0.03	1.29 (0.38-4.45)	0.68	0.40 (0.07-2.25)	0.30
ASA Class IV/V	2.33 (1.23-4.44)	0.01	3.59 (1.60-8.08)	0.002	6.32 (2.00-19.95)	0.002
Emergency Surgery	3.71 (1.79-7.67)	<.001	5.20 (2.02-13.41)	0.001	11.72 (3.33-41.33)	<.001
Transfer Status Other than Home	0.84 (0.43-1.62)	0.59	1.08 (0.46-2.58)	0.85	0.62 (0.17-2.20)	0.46
Wound Class II-IV	1.13 (0.64-2.02)	0.67	0.83 (0.32-2.11)	0.69	0.66 (0.11-4.04)	0.65
Duration of Surgery (hrs)	1.26 (1.17-1.37)	<.001	1.25 (1.13-1.39)	<.001	1.07 (0.87-1.30)	0.52
AUC	0.75		0.82		0.91	

Results continued

-In multivariable logistic regression analysis, there were three predictors that were significant for each of the outcomes of interest:
 -Dependent functional status
 -ASA class III-V
 -Emergent surgery
 -Other predictors included age, disseminated cancer, preoperative sepsis, and duration of surgery

Conclusions

-Surgery for skull base CSF leak repair has a risk of at least one non-fatal complication in over 1 in 4 patients and mortality in 1 in 25 patients
 -The authors found that increasing age, dependent functional status, disseminated cancer, preoperative sepsis, higher ASA classification, emergent surgery, and duration of surgery were associated with increased risk for postoperative complications following skull base CSF leak repair