The Laryngoscope
Lippincott Williams & Wilkins, Inc.

Incidence of Serious Complications After Uvulopalatopharyngoplasty

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Objectives: **Uvulopalatopharyngoplasty (UPPP) is the most common surgical treatment for obstructive sleep apnea (OSA). Anatomic and physiologic abnormalities associated with OSA can make perioperative management difficult. Only single-site case series provide current estimates of the incidence of perioperative complications, with a pooled crude serious complication rate of 3.5% and a crude mortality rate of 0.4%. The primary objective of this study was to calculate the incidence of perioperative morbidity and mortality in a large, multisite cohort of UPPP patients.** ***Study Design:*** **Prospective cohort study of adults undergoing inpatient UPPP with or without other concurrent procedures** ***Methods:*** **The serious complication and 30-day mortality rates were calculated from the Department of Veterans Affairs (VA) National Surgical Quality Improvement Program database of prospectively collected outcomes of all VA inpatient surgeries nationally 1991 to 2001. Serious complications were defined by 15 specific life-threatening complications. Deaths were captured whether the patient was in the hospital or discharged.** ***Results:*** **Veteran patients (n = 3130) had a mean age of 50 years and were predominantly male (97%). The serious nonfatal complication rate was 1.5% (47/3,130) (95% confidence interval [CI] 1.1%, 1.9%). The 30-day mortality rate was 0.2% (7/3130) (95% CI 0.1%, 0.4%). There was no significant effect of year of surgery or patient age on the risk of serious complication or death.** ***Conclusion:*** **The incidence of serious nonfatal complications and 30-day mortality after UPPP are 1.5% and 0.2%, respectively, in a large cohort of UPPP patients at veteran hospitals.** ***Key Words:*** **obstructive sleep apnea, complications, mortality, palate surgery, uvulopalatopharyngoplasty, veterans, VA.**

Laryngoscope, **114:450–453, 2004**

INTRODUCTION

Uvulopalatopharyngoplasty (UPPP) is the most common operation performed for obstructive sleep apnea (OSA). The anatomic and physiologic abnormalities associated with OSA pose independent risks of complication in the intraoperative and perioperative periods.[1–4] Fear of postoperative edema further raises the concern for perioperative complications. Although rare, airway obstruction leading to respiratory arrest and reintubation or emergent tracheotomy most commonly occurs within hours of surgery.[1,2] OSA patients may be especially vulnerable to myocardial infarction after surgery because of the association between OSA and cardiovascular disease.[3,4] Finally, patients undergoing UPPP, particularly those undergoing concurrent tonsillectomy, are at risk for postoperative hemorrhage.

Nevertheless, serious perioperative complications appear to be uncommon (Table I). However, all published data come from single-site case series with a limited number of patients.[5–10] It is difficult to estimate rates accurately with these small studies of rare events. For example, the first three studies[5–7] suggest a mortality rate of 1% to 2%, whereas the last three[8–10] argue that there is no real mortality risk. There is a similar limitation on the estimates of the incidence of serious complications, and the figures for the more recent studies are lower as well. By pooling these case series, the crude mortality rate appears to be 0.4% (4/977) and the serious complication rate 3.5% (34/977). However, the contributing case series vary widely on the definition of complication, period of evaluation, and setting for surgery.

Presented at the 106th Annual Meeting of the Triological Society, Nashville, Tennessee, May 4, 2003.

The views expressed in this article are those of the authors and do not necessarily represent the views of the Health Services Research and Development Service of the Veterans Health Administration, Department of Veterans Affairs.

Supported by a Seattle Veterans Affairs Epidemiology Research and Information Center pilot grant. Dr. Weaver was supported by the Robert Wood Johnson Clinical Scholars Program during project development. Dr. Yueh is supported by a Career Development Award (CD-98318) from the Health Services Research and Development Service of the Veterans Health Administration, Department of Veterans Affairs.

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Editor's Note: This Manuscript was accepted for publication August 1, 2003.

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TABLE I.
Reported Incidences of Serious Complications and Death after Uvulopalatopharyngoplasty.

		Deaths		Serious Complications Other than Death (%)	
	n	n	%	n	%
Harmon et al., 1989[5]	126	2	1.6	11	8.7
Esclamado et al., 1989[6]	135	1	0.7	8	5.9
Haavisto and Suonpaa, 1994[7]	101	1	1.0	9	8.9
Riley et al., 1997[8]	162	0	0.0	3	1.9
Terris et al., 1998[9]	106	0	0.0	1	0.9
Mickelson and Hakim, 1998[10]	347	0	0.0	2	0.6
Pooled crude estimate	977	4	0.4	34	3.5

The purpose of this study was to calculate the 30-day incidence of serious complications and mortality in a large, multisite cohort of UPPP patients.

METHODS

Subjects

This is a prospective cohort study of all patients undergoing UPPP, defined by Current Procedural Terminology (CPT) code 42145 or 42299, at any Veterans Affairs (VA) medical center in the United States from 1991 to 2001. Patients were excluded (n = 61) if they had concomitant neck dissection or ablative surgery, which are indicators of oncologic resection.

Data

The VA National Surgical Quality Improvement Program (NSQIP) prospectively collects 30-day complication and mortality data on all patients having inpatient surgery at any VA medical center in the United States.[11] At each VA medical center, trained nurse reviewers prospectively collect these data as well as demographic, preoperative, and operative data. The full details of the NSQIP have been described previously.[11] These data are managed at the VA NSQIP Coordinating Center, currently in Denver, CO.

The primary outcome of interest was the incidence of serious 30-day perioperative complications, including death. Fifteen specific life-threatening complications were identified. These outcomes were grouped according to system: death; respiratory, including reintubation, pneumonia, prolonged ventilation (>48 hours), emergent tracheotomy, or pulmonary edema; cardiovascular, including cardiac arrest, myocardial infarction, cerebrovascular accident, or pulmonary embolism; and other complications, including hemorrhage greater than 4 units of packed erythrocytes, coma, wound infection, systemic sepsis, deep venous thrombosis, or renal failure. No patients in the cohort suffered the last two complications listed.

Analyses

Overall incidence of 30-day complication was calculated as the number of patients with at least one complication per UPPP performed. Rates were calculated for each system (e.g., number of patients with a respiratory complication per UPPP performed) and for specific complications. Ninety-five percent confidence intervals (95% CI) were calculated. Rates were also stratified by year of surgery and patient age (10-year categories). The associations between rates of complication or death and year of surgery or patient age were tested with the chi-square test for trend. Odds ratios approximate risk ratios (RR), also known as relative risk, because the odds of complication are less than 10%. RR are reported with 95% CI. This cohort has greater than 80% power to detect a 2.5-fold difference in the complication rate between split samples (by year or age) of the cohort, at the 0.05 (two-sided) significance level. $P < 0.05$ was considered statistically significant.

RESULTS

There were 3,130 patients with a procedure code for UPPP, after exclusion of oncology patients as described above. The mean age was 49.8 ± 10.8 years. Ninety-seven percent of the patients were males, and 30.6% were current smokers. Table II summarizes concomitant procedures performed with UPPP.

The overall incidence of 30-day serious complications (including death) was 1.6% (51/3130). Table III presents the incidences of death as well as grouped and individual serious nonfatal complications. Respiratory complications composed the largest subcategory, occurring in 1.1% of all cases. Some patients suffered multiple complications. The total number of serious nonfatal complications was 58, occurring in 47 patients. The total number of all serious

TABLE II.
Additional Upper Airway Procedures Performed in Conjunction with Uvulopalatopharyngoplasty.

Concomitant Procedure	Percent of Subjects
Tonsillectomy	36
Septoplasty	38
Turbinate procedure	22
Mandible/genioglossus advancement	2
Rhinoplasty	1
Hyoid suspension	<1
At least one additional procedure (not counting tonsillectomy)	50
At least one additional procedure (including tonsillectomy)	68

TABLE III.
Incidence of Serious Complications and Death in Uvulopalatopharyngoplasty Cohort (n = 3,130).

Complication	n	Rate (%)	95% Confidence Interval (%)
Death	7	0.2	(0.1, 0.4)
Serious complication other than death	47	1.5	(1.1, 1.9)
Respiratory complication	33	1.1	(0.7, 1.4)
Reintubation	17	0.5	
Emergent tracheotomy	7	0.2	
Mechanical ventilation > 48 hours	6	0.2	
Pneumonia	11	0.4	
Cardiovascular complication	8	0.3	(0.1, 0.4)
Hemorrhage	9	0.3	(0.1, 0.5)

Some patients experienced more than one complication.

complications (including death) was 65, occurring in 51 patients.

Table IV presents the incidence of serious nonfatal complications and death by year. Overall, there was no significant effect of year of surgery on the rate of nonfatal complications (RR 0.95; 95% CI 0.84, 1.08; $P = .43$) or death (RR 1.30; 95% CI 0.88, 1.93; $P = .19$). The first sixth of the cohort (n = 516, years 1991–1995) appeared to experience a greater rate of nonfatal complications (2.3% vs. 1.3%, $P = .10$) but a lesser rate of mortality (0.00% vs. 0.03%, $P = .61$) compared with the latter five sixths of the cohort. However, these differences are not significant, and these subgroups were categorized to maximize the differences after reviewing the data.

The outcomes are presented according to patient age group in Table V. There was no systematic relationship between patient age group and either nonfatal complication rate (RR 1.05; 95% CI 0.81, 1.36; $P = .71$) or mortality rate (RR 1.29; 95% CI 0.67, 2.51; $P = .45$)

TABLE V.
Incidence of Serious Complications and Death by Age Group.

		Serious Complication Other than Death		Death	
Age	Patients	n	%	n	%
<29	99	0	0.0	0	0.0
30–39	414	8	1.9	1	0.2
40–49	1051	17	1.6	2	0.2
50–59	979	9	0.9	1	0.1
60–69	454	12	2.6	3	0.7
70+	133	1	0.8	0	0.0
Total	3,130	47	1.5	7	0.2

DISCUSSION

This study provides the largest and first multisite cohort of UPPP patients examined for this purpose. The rate of acute serious complications, including death, after UPPP is low. This study agrees with earlier published reports in this regard. Because the incidence of complications is low, the cohort examined in this study offers certain advantages because of its large size and inclusion of multiple institutions and surgeons. One of these advantages is a more accurate estimate of the complication rates, and our figures are roughly half the pooled estimates from the published literature.

The previous literature suggested a trend toward declining complication rates, if only because the more recently published studies present lower rates. Our results indicate that the incidences of complication and death did not fall significantly over the time period of 1991 and 2001 in VA medical centers. In the early experience of this time period, there may have been a slightly higher risk of complications; however, there was no systematic change over time. It is possible that earlier reports of serious complications[5,6] may have led to heightened vigilance at the inception of this cohort. Overall, both the rates of complication and death in this analysis were closer to those reported in the articles published more recently than those published earlier.

TABLE IV.
Incidence of Serious Complications and Death by Year.

		Serious Complications Other than Death		Death	
Year	Patients	n	%	n	%
1991	11	0	0.0	0	0.0
1992	51	1	2.0	0	0.0
1993	69	1	1.4	0	0.0
1994	158	4	2.5	0	0.0
1995	226	6	2.7	0	0.0
1996	374	5	1.3	1	0.3
1997	416	4	1.0	1	0.2
1998	445	5	1.1	1	0.2
1999	450	8	1.8	0	0.0
2000	539	8	1.5	2	0.4
2001	391	5	1.3	2	0.5
Total	3,130	47	1.5	7	0.2

OSA disease severity has been implicated as a risk factor for complications after UPPP.[6,10] OSA severity corresponds to anatomic and physiologic abnormalities as well as the tendency to perform multiple simultaneous procedures, all of which may increase the risk of complication. The NSQIP data do not contain information on disease severity itself. However, additional work in progress includes a nested case-control analysis with chart review to evaluate these relationships.

There are certain limitations to this study. The use of the NSQIP database restricts the evaluation to variables contained within it. In addition, we depend on correct CPT coding for palate surgery as well as the accuracy in capturing and documenting complications. This data set has the advantage of being a prospective collection of data specifically designed to measure perioperative complications, our primary outcome variable. These prospective data are probably more accurate than retrospective or administrative data.

Postoperative observation in an intensive care unit setting may allow closer monitoring compared with a traditional surgical nursing ward, although this issue has never been systematically addressed. The database does not collect information regarding the site of postoperative care or postoperative management protocols, and their effect cannot be addressed specifically. In addition, the database is limited to inpatient surgeries, and thus, outpatient UPPP procedures are not captured. Although these outpatients are presumably at low risk for complications, the fact that they are discharged and not monitored in the hospital may increase their risk. It is difficult to clearly determine whether the inclusion of outpatient surgeries would raise or lower the estimates presented here.

Finally, VA patients tend to have greater comorbidity and perioperative risk factors, so the estimates of compli-

cation rates may be somewhat higher than for non-VA patients. However, this cohort has several features that improve the generalizability of the results: its large size and inclusion of patients from multiple surgeons from multiple institutions over a span of 10 years.

CONCLUSION

The incidence of 30-day serious (life-threatening) complications and mortality after UPPP are 1.5% and 0.2%, respectively, in a large cohort of UPPP patients at veteran hospitals. These low rates are consistent with previous reports of smaller case series from the literature.

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