National Trends in Surgery for Sinonasal Malignancy and the Effect of Hospital Volume on Short Term Outcomes

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Abstract

Objective/Hypothesis: Sinonasal carcinomas are a collection of highly morbid neoplasms originating from the nasopharynx and sinuses. Over the last two decades, an aggressive combination of surgery, radiation, and chemotherapy has been used to treat sinonasal malignancies. We sought to characterize the trends in initial management of sinonasal malignancy and the impact on hospital volume on the surgical care and outcomes.

Study Design: Retrospective cross-sectional study.

Methods: We performed a retrospective cohort study with times trends of patients admitted for surgical resection of sinonasal malignancy in the National Inpatient Sample (NIS) between 1988 and 2009. Subset analysis was performed on patient cohorts with skull base involvement, orbit or maxillary involvement, or requiring radical neck dissection. Patient characteristics as well as hospital attributes were correlated with patient morbidity and mortality.

Results: Over the course of 22 years, we identified 3850 cases of sinonasal surgery patients from 1214 hospitals. 30 (0.8%) cases resulted in death and 572 (14.9%) cases had surgical complications. Greater patient age was associated with higher morbidity and mortality. Complicated cases requiring neck dissection, had skull base or orbital involvement had higher rates of complications but were not associated with higher mortality. High volume hospitals were associated with higher complication rates, but this trend was associated with overrepresentation of complicated cases with skull base involvement, orbital involvement, and neck dissection.

Conclusions: This study reflects changing trends in the epidemiology and primary management of sinonasal cancer. High-volume centers more frequently have complicated cases.

**Introduction**

Cancers arising from the paranasal sinuses are rare but highly morbid collection of epithelial cell origin. The majority of paranasal malignancies are squamous cell carcinomas, although a wide range of other tumors can originate from the sinonasal cavities, and exhibit early local invasion and uncommon lymph node or distant metastases. Primary treatment of sinonasal cancers typically involve surgical resection and postoperative radiotherapy, although there is a high incidence of local recurrence.

Given the low incidence and heterogenous histology of sinonasal cancers, there are no randomized trials for the treatment of these cancers. With limited individual institution experience with sinonasal cancer, we seek to examine contemporary patterns of sinonasal cancer surgery. In this study, we investigate the surgical outcomes of patients of patients with primary sinonasal cancer surgery through analysis of a national inpatient database, and evaluate the impact of hospital volume on short term outcomes.

**Materials and Methods**

**Data Source**

A retrospective cross-sectional analysis of patients who underwent surgical resection of primary cancer of nasal cavities and accessory sinus was performed using data from the National Inpatient Sample (NIS) from the Healthcare Cost and Utilization Project, Agency for Healthcare Research and Quality. The NIS is the largest database of all-payer inpatient discharge information, sampling approximately 20% of all nonfederal US hospitals and including approximately 9 million hospital admissions each year. Each NIS entry includes all diagnosis and procedure codes of activity during the patient’s hospitalization at the time of discharge as well as patient demographics, hospital characteristics, and short-term complications of the hospitalization.

**Data Extraction**

All available data from 1988 through 2009 were queried and patients admitted for primary head and neck cancer with a primary procedure of surgical resection in the maxillary, frontal, ethmoid, or sphenoid sinuses were identified. Potentially higher risk surgeries were identified by orbital or skull base involvement as well as surgeries requiring neck dissection. Incidences of in-hospital mortality as well perioperative morbidity such as post-operative infections, cardiopulmonary complications, hemorrhagic complications, nerve palsies, and deep vein thrombosis were identified.

The total number of hospitalizations was plotted annually from 1988 to 2009 and hospital volume was also assessed for each hospital in the database. The slope of the line of best fit, R-squared values, and F-test values were calculated for each plot, and each plot was examined for significant trends using a generalized linear model. Hospital level data was stratified by hospital caseload to compare hospitals that perform on average more than 5 procedures per year and hospitals that perform less than 5 such procedures per year. The Pearson chi-square test was used to analyze differences in low-volume and high-volume hospitals as well as differences in complication rates.

**LOOK AT MENIGITIS, CSF leak, trismus,**

**Results**

We identified 3850 cases of sinonasal surgery between 1988 and 2009 (Figure 1). Patients had a mean age of 61 years old and stayed on average 6.8 days in the hospital.

14.9% of patients had complications and 0.8% of hospitalizations resulted in mortality. Cardiopulmonary complications, including pulmonary collapse and myocardial infarctions, and infectious causes, most commonly urinary tract infections and site infection, accounted for 41.5% and 25.7% respectively of all complications. Hemorrhagic complications requiring transfusion were also present in 16.1% of cases with complications. Cases requiring neck dissection, had orbital or maxillary sinus involvement, or had skull base involvement had higher rates of morbidity and mortality. 24.4% of such high risk surgeries had complications, compared to 11.3% of cases without such extranasal involvement.

We identified 32 hospitals which averaged more than 5 cases per year and accounted for 28% (1097) of all sinonasal surgery cases. These hospitals were more represented in high risk cases – accounting for 32.4% of cases requiring neck dissection, 44.9% of cases with orbital involvement, and 45.7% of cases with skull base involvement.

**Discussion**

<http://www.uptodate.com/contents/paranasal-sinus-cancer?source=search_result&search=sinonasal+cancer&selectedTitle=1%7E150>

<http://onlinelibrary.wiley.com/doi/10.1002/lary.22447/full>