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New onset postoperative atrial fibrillation predicts long-term cardiovascular events after gastrectomy

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Abstract

BACKGROUND: Recent evidence suggests transient postoperative atrial fibrillation leads to future cardiovascular events, even in noncardiac surgery. The long-term effects of postoperative atrial fibrillation in gastrectomy patients are unknown.

METHODS: The Healthcare Cost and Utilization Project State Inpatient Databases identified patients undergoing gastrectomy for malignancy between 2007 and 2010. Patients were matched by propensity scores based on various factors. Adjusted Kaplan-Meier and Cox proportional hazards models assessed the effect of postoperative atrial fibrillation on cardiovascular events.

RESULTS: A higher incidence of cardiovascular events occurred over the 1st year in patients who developed postoperative atrial fibrillation. Cox proportional hazards regression confirmed an increased risk of cardiovascular events in postoperative atrial fibrillation patients.

CONCLUSIONS: Our results demonstrate that patients undergoing gastrectomy for malignancy who develop postoperative atrial fibrillation are at increased risk of cardiovascular events within 1 year. Physicians should be vigilant in assessing postoperative atrial fibrillation, given the increased risk of cardiovascular morbidity.

Atrial fibrillation is the most common reported arrhythmia after surgery. Its development after cardiac surgery has been thoroughly investigated and is well documented throughout the literature. It has a reported incidence of approximately 12% to 40% after coronary artery bypass surgery and even higher after valve replacement surgery, approaching 50% to 60%.[1] In this setting, the development of postoperative atrial fibrillation is associated with increased morbidity and/or mortality, longer hospital

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stay, and higher hospital cost. Given the different etiologic mechanisms of atrial fibrillation after cardiac and noncardiac surgery, additional investigation into the latter is warranted. For this reason, the development of postoperative atrial fibrillation after major noncardiac surgery has garnered increased attention.

The reported incidence of postoperative atrial fibrillation after noncardiac surgery ranges from 3.0% to 12.3%.[2] Similar to cardiac surgery, recent studies have established that the development of postoperative atrial fibrillation after noncardiac surgical procedures is associated with adverse perioperative outcomes, including an increased length of stay, increased healthcare costs, and in-hospital mortality.[2] Atrial fibrillation as a chronic condition confers increased risk of myocardial infarction, stroke, and mortality[3] prompting the need to characterize the long-term effects of postoperative atrial fibrillation in this patient population.

The purpose of this study was to determine if the development of transient postoperative atrial fibrillation after gastrectomy portends higher risk of a long-term cardiovascular event. Although this has been clearly delineated in the cardiac surgery patients, there is a paucity of long-term data in noncardiac surgery patients, specifically, patients undergoing gastrectomy for malignancy. We studied patients with no prior diagnosis of atrial fibrillation and determined whether patients with postoperative atrial fibrillation were at an increased risk of developing stroke and/or acute myocardial infarction compared with a risk-matched cohort of patients who did not develop postoperative atrial fibrillation. We hypothesized that despite similar pre-existing cardiac risk factors, the cohort of patients who developed postoperative atrial fibrillation would experience a higher rate of cardiovascular events up to 1 year after their surgery.

Patients and Methods

We performed a retrospective review using the Health Care Utilization Project State Inpatient Databases, which was developed by the Agency for Healthcare Research and Quality to inform health-related decisions.[4] The Health Care Utilization Project State Inpatient Databases include deidentified, protected, and patient discharge records for all payers, with each state inpatient database unique to its individual state. We used the state inpatient database for Florida and California, including patient data encompassing years 2006 to 2011. As of 2007, diagnoses could be labeled as present on admission, allowing pre-existing conditions to be identified, and differentiated from those arising during the hospitalization.[5] To follow patients longitudinally over multiple hospital admissions, a unique linkage variable is assigned to individual patients within each state inpatient database, allowing for identification of preoperative medical conditions, and complications after the initial surgical hospitalization.[6] Patients of interest were identified using *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) procedure and diagnosis codes.

Patients were included if they were 18 years of age or older and underwent partial or total gastrectomy (ICD-9: 43.5, 43.6, 43.7, 43.8x, 43.9x) for a diagnosis of malignancy (pancreatic (157.xx), esophageal (150.xx), or gastric (151.xx) carcinoma) in either the state of California or Florida between the years of 2007 to 2010. Data from years 2006 and 2011 were included to provide at least 1 year of inpatient hospitalization records for identification of preoperative medical comorbidities, as well as postoperative admissions and complications, respectively.

The diagnosis of atrial fibrillation was identified using ICD-9 codes (427.3x) as previously described[6,7] and further classified as pre-existing atrial fibrillation vs postoperative atrial fibrillation using data from prior inpatient admissions and the presence-on-admission indicator. Patient baseline comorbidities were assessed via linked hospital admission records that occurred before the surgical admission, to identify diagnoses of atrial fibrillation, myocardial infarction, coronary artery disease or angina, and/or cerebral vascular accident, or transient ischemic attack. Additional patient clinical and demographic variables available in the Health Care Utilization Project State Inpatient Databases database were used for analysis, including age at surgery, race, primary insurance type, and chronic conditions of chronic renal failure, obesity, congestive heart failure, valvular heart disease, hypertension, and diabetes mellitus.

The primary outcome of interest was the occurrence of a cardiovascular event diagnosed after gastrectomy within 1 year postoperatively. This composite endpoint of a cardiovascular event was the occurrence of either of 2 established cardiovascular sequelae of atrial fibrillation, myocardial infarction, or cerebrovascular accident.

Patients were excluded if they had a preoperative diagnosis of atrial fibrillation, history of cerebrovascular accident/transient ischemic attack, or history of myocardial infarction/coronary artery disease. Thus, our final cohort comprised all patients who underwent partial or total gastrectomy for malignancy, in Florida or California between 2007 and 2010, without a prior diagnosis of myocardial infarction, coronary artery disease, cerebrovascular accident, and/or transient ischemic attack, or a pre-existing diagnosis of atrial fibrillation.

Propensity score matching was performed to control for patient characteristics and medical comorbidities that may contribute to the composite endpoint. Matching was performed based on patient age as a continuous variable, and categorical variables of sex, race, primary insurance provider, obesity, diabetes, hypertension, congestive heart failure, valvular heart disease, coronary artery disease, chronic renal failure, and peripheral vascular disease. Matching was performed in a one-to-one fashion, caliper of .1, and without replacement.[7] Adequate balance was determined by improvement of standardized percent bias of covariates to 10% or less.[8]

Statistical analysis included independent *t* tests and Chi-square tests to compare baseline patient characteristics in the unmatched postoperative atrial fibrillation/no postoperative atrial fibrillation cohorts. After matching, paired *t* tests and McNemar's test were used to compare