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Original Contribution

Anesthetic management and outcomes for patients with pulmonary hypertension and intracardiac shunts and Eisenmenger syndrome: a review of institutional experience☆,☆☆

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Abstract

Study Objective: To propose a set of recommendations for the perioperative management of patients with Eisenmenger syndrome and similar physiology, based on 20 years of experience at a single institution.

Design: Retrospective study of institutional outcomes of Eisenmenger syndrome patients and patients with balanced or fixed right-to-left intracardiac shunts with pulmonary hypertension undergoing noncardiac surgery.

Setting: Single center, university-affiliated hospital.

Measurements: Measurements included data from patients with Eisenmenger syndrome or similar physiology, shunt direction, right ventricular systolic pressure, congestive heart failure classification, noncardiac surgery, type of anesthesia, echocardiographic and catheterization data, mortality within 30 days of surgery, choice of monitoring, and vasopressor use.

Main Results: 33 patients with Eisenmenger syndrome or similar physiology undergoing 53 general, regional and/or monitored anesthetic procedures were identified. Significant systemic arterial hypotension occurred in 14 individuals (26%) and oxygen desaturation in 9 (17%) patients. Administration of an intravenous (IV) vasopressor agent during induction significantly decreased the incidence of hypotension. The type of IV induction agent did not influence hemodynamic alterations, though patients who received propofol experienced a trend towards increased hypotension (83% of pts) when a vasopressor was not used.

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Inhalational induction, regardless of vasopressor use, was more likely to result in hypotension (60% of pts). The 30-day mortality was 3.8% (two pts). Both patients had minor elective procedures with monitored anesthesia care (MAC).

Conclusions: Hypotension is more common in patients with Eisenmenger syndrome and similar physiology when a vasopressor is not used during the peri-induction period, regardless of induction agent. Etomidate tended to have better hemodynamic stability than other induction agents. The use of a vasopressor is recommended. We present general recommendations for anesthesiologists and strongly recommend use of a vasopressor before or during induction to reduce hypotension along with complete avoidance of inhalational induction. Further, MAC anesthesia has been associated with perioperative and 30-day mortality.

1. Introduction

Patients with congenital heart disease are living into adulthood. Consequently, anesthesiologists are encountering an increasing number of adults with congenital heart disease (CHD) who present for noncardiac surgery [1,3]. Eisenmenger syndrome and patients whose physiology mimics Eisenmenger syndrome (balanced or fixed intracardiac shunts with concomitant pulmonary hypertension) present a unique set of challenges to the anesthesiologist, with reported mortality rates reaching 20% to 30% [3,4]. While many of these patients have a simple intracardiac shunt, such as an atrial (ASD) or ventricular septal defect (VSD), the sequelae of long-standing, uncorrected lesions may result in significant patient morbidity and elevations in pulmonary vascular resistance (PVR) due to chronic volume overload [4,5]. Pathologic changes from uncorrected intracardiac shunts result in severe and irreversible pulmonary hypertension, right ventricular (RV) failure, and reversal of shunt flow from left-to-right to right-to-left [5]. In patients with ASD, it is debatable whether the diagnosis of Eisenmenger syndrome is warranted, as pulmonary hypertension may develop from the shunt itself or from genetic influences on the pulmonary vasculature [6]. However, the clinical presentation and concerning physiologic changes in this subset of patients is similar to patients with Eisenmenger syndrome.

There is a paucity of outcomes studies or management guidelines for patients with Eisenmenger syndrome in the perioperative period. Data on patients with Eisenmenger syndrome and similar physiology, who presented for noncardiac surgery over the last 20 years at our institution (1991-2011), were reviewed.

2. Materials and methods

The study was approved by the Vanderbilt Institutional Review Board. A retrospective study of patients within the Adult Congenital Heart Disease (CHD) database who had undergone anesthetic management from 1991-2011 were reviewed. Patients were all 18 years of age or older at the time of their procedure. While cardiac surgical procedures were excluded, other cardiac procedures such as cardiac catheterization, pacemaker implantation/revision, transesophageal echocardiogram (TEE), and cardioversion were included if an anesthesiologist was involved. In an attempt to further refine the patient population obtained, a search through the Perioperative Data Warehouse, which contains all completed records from the Vanderbilt Perioperative Information Management System (VPIMS), was performed. All anesthetics for which a patient was listed as having Eisenmenger's or Eisenmenger syndrome, or in which there was any mention of Eisenmenger syndrome from a variety of spellings and ICD-9 codes, either in the preoperative, intraoperative, postoperative, or attending-specific notes, were identified. The search was then cross-referenced against those records of patients who were already known from the Adult CHD database to remove inclusion of the same procedure/patient more than once. Because the VPIMS anesthetic charting system has been in use only since 2000, those patients who underwent procedures before 2000 were identified by the adult CHD database with review of paper anesthetic records. The identified patient charts were then thoroughly reviewed for a diagnosis of Eisenmenger syndrome or having a balanced or fixed right-to-left intracardiac shunt with pulmonary hypertension and physiology similar to Eisenmenger syndrome.

A review of the anesthetic and perioperative outcomes was then performed. Those patients or anesthetics for which a diagnosis was not supported or chart information was either missing or unavailable were excluded from analysis. Further information included New York Heart Association (NYHA) functional class, pulmonary artery (PA) pressures as estimated by the right ventricular systolic pressure (RVSP), recent catheterization or echocardiogram, intraoperative vasopressor use, monitoring, cardiac arrhythmias, blood loss and fluids, postoperative mechanical ventilation, unplanned intensive care unit (ICU) admissions, and perioperative deaths (within 30 days). Hypotension and hypoxia were defined as a > 20% decrease in systolic blood pressure (SBP) and a > 5% decrease from baseline vitals obtained the day of surgery, respectively. Postoperative records, hospital course, and readmissions were reviewed for 30 days following each anesthetic to assess perioperative morbidity and/or mortality.

Statistical analysis was performed using the Fisher's Exact test or the Free-Halton extension of the Fisher's Exact test, as appropriate. A P-value < 0.05 denoted statistical significance of data.