

# ANESTHESIA MANAGEMENT OF A JEHOVAH'S WITNESS PATIENT WITH PHEOCHROMOCYTOMA UNDERGOING OFF PUMP CORONARY ARTERY BYPASS GRAFT SURGERY

## - A Case Report -

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Concomitant coronary artery disease (CAD) and pheochromocytoma are rare. Patients with advanced CAD requiring coronary artery bypass graft (CABG) surgery and clinically active pheochromocytoma present a challenge to anesthesiologists. The risk is much higher if the patient is an anemic Jehovah's Witness because these patients refuse to receive blood or blood products, even when faced with a life-threatening hemorrhage.

To our knowledge, this is the first case to describe the anesthetic management of an anemic Jehovah's Witness patient with pheochromocytoma presenting for off-pump CABG surgery.

## Case Report

A 55-year-old Jehovah's Witness woman with a past medical history of CAD (myocardial infarction twice and circumflex coronary artery stenting one year ago), hypertension, diabetes mellitus, dyslipidemia,

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and pheochromocytoma, was admitted for ST elevation myocardial infarction (leads II, III and aVF) with elevated troponin at 12.1. Cardiac angiography demonstrated left main coronary artery 80% stenosis, left anterior descending coronary artery 85% stenosis and 100% stenosis of nondominant right coronary artery.

Patient also had a newly diagnosed pheochromocytoma. She presented with fluctuating hypertension (92-220 systolic/60-100 diastolic) and MRI showed 3 × 2.5 cm right adrenal mass. Urinary level of norepinephrine and normetanephrine were 1682 µg/dl (normal range 0-1 µg/dl) and 1769 µg/dl (normal range 50-650 µg/dl) respectively. Plasma levels of norepinephrine was 61100 pg/ml (normal range 80-520 p/ml). Epinephrine and dopamine levels were within normal range. An intraaortic balloon pump (IABP) was placed during angiography because patient became hemodynamically unstable. Left ventricular ejection fraction was 20-30% with severe mitral valve insufficiency and distal myocardial segments were severely hypokinetic.

The patient was scheduled for Off Pump coronary artery bypass grafting (CABG) for next day. During preoperative anesthesia evaluation, a decision was made to postpone the surgery for 10 days and prepare the patient by giving alpha and beta blockers to avoid severe hemodynamic changes when she will undergo her Off Pump CABG.

The preoperative preparation included alpha blockade with  $\alpha_1$ -selective antagonist Doxazosin.  $\beta$  Blockade was achieved with Metoprolol several days later to control heart rate and prevent tachycardia. Initially her hemoglobin was 9.0 g/dl. Erythropoietin and ferrous sulfate were started 3 weeks before surgery. Hemoglobin improved to 12.1 g/dl the day before surgery. With medical management the patient became hemodynamically stable and the IABP was discontinued.

After the insertion of one 16 G intravenous cannula, patient was premedicated with 4 mg of midazolam and 150 µg fentanyl intravenously. Arterial line was placed in the right radial artery, and triple-lumen pulmonary artery catheter inserted through the right internal jugular vein to accurately monitor cardiac hemodynamics. Epidural catheter was inserted at T4 and

T5 level. Satisfactory bilateral sensory blockade was achieved by 10 ml of bupivacaine 0.5% loading dose before surgery and maintained during the operation at a constant infusion of 5 ml/h of bupivacaine 0.5%.

Before induction of anesthesia, infusions of norepinephrine, epinephrine, phenylephrine, dopamine, dobutamine were prepared to control acute changes in blood pressure. Anesthesia was induced with 5 µg/kg of fentanyl, 0.2 mg/kg of etomidate, and 0.3 mg/kg of vecuronium and maintained with 0.5-1% isoflurane. Supplemental doses of vecuronium were given for complete muscle relaxation. The lungs were ventilated with 100% oxygen. The hemodynamic variables were recorded continuously. The patient remained stable hemodynamically throughout the surgery, without significant and/or prolonged swings in blood pressure. She underwent off-pump myocardial revascularization with saphenous vein grafts to the left anterior descending and obtuse marginal coronary arteries without any complications. She received 2500 cc in crystalloids. Her urine output was 1080 cc. Her postoperative hemoglobin was 9.7 g/dl and did not receive blood transfusion.

After the operation, the patient was transferred to the intensive care unit. The cardiac output was 3.6 l/min and a systemic vascular resistance of 1253 dyne. s/cm<sup>5</sup> without any vasopressors. Transesophageal echocardiography post surgery demonstrated an ejection fraction of 45% and no wall motion segment defect. The patient was discharged on postoperative day 5 in good condition.

## Discussion

Pheochromocytoma is a rare condition accounting for 0.1% of cases of hypertension. In any surgical procedure on such a patient, the risks of cardiovascular collapse, myocardial infarction, and cerebrovascular accident are significantly elevated. The surgical management of this patient was reported by the surgical team of Dr. Baciewicz. As described, the reasons of a staged procedure for this patient with myocardial revascularization before resection of the pheochromocytoma were based on her acute myocardial

infarction requiring initial treatment. The sternotomy and laparotomy would be risky in a 55-year-old with multiple comorbidities without blood or blood products transfusion<sup>1</sup>.

Phenoxybenzamine has been widely used for the preoperative management of patients with pheochromocytoma despite its adverse side effects. We choose doxazosin because it is as effective as phenoxybenzamine in controlling arterial pressure and heart rate, but causes fewer undesirable side effects both before and after surgery<sup>2</sup>. It was used successfully by Okuno et al<sup>3</sup>. doxazosin selectively blocks postsynaptic  $\alpha_1$ -receptors. It does not produce reflex tachycardia and has a shorter duration of action, thereby permitting more rapid adjustment of dosage and decreasing the duration of postoperative hypotension<sup>4</sup>. Patients pretreated with doxazosin are much less refractory and blood pressure returns sharply to normal levels as soon as consciousness returns and cerebral arousal stimulates the sympathetic nervous system. Such patients require much less fluid loading in the postoperative period and consequently have a significantly lower positive fluid balance in the first three postoperative days compared with patients receiving phenoxybenzamine<sup>5</sup>.

To maximize blood conservation during surgery and avoid hemodilution, off-pump CABG was chosen for our patient. Hypothermia, used routinely during CPB, has also been reported to provoke catecholamine secretion by pheochromocytoma<sup>6</sup>. Severe hypertension and tachyarrhythmias have been reported after cessation of CPB in reported cases of CABG<sup>7,8</sup>. By performing off-pump CABG, the hazardous effects of CPB on pheochromocytoma by inducing changes in systemic vascular resistance and blood pressure, were avoided. With good preoperative preparation and appropriate anesthesia, off-pump CABG can be done safely in a patient with pheochromocytoma with additional benefit of blood conservation<sup>9,10</sup>.

In addition to providing intraoperative and postoperative analgesia, the epidural would also produce a sympathetic blockade, which would obtund swings in blood pressure associated with surges in catecholamine release from the tumor. Epidural anesthesia

has been documented in parturient and nonpregnant patients with pheochromocytoma and sympathetic blockade has reduced catecholamine release during pheochromocytoma removal<sup>11</sup>. The controlled reduction in systemic vascular resistance and postoperative analgesia provided by epidural medication would also be advantageous in the patient with critical myocardial oxygen balance<sup>12</sup>.

In conclusion, this is the first case highlighting successful anesthesia management of off-pump CABG in an anemic Jehovah's Witness patient with pheochromocytoma. The treatment challenges presented by this patient population can be overcome with careful but maybe prolonged preoperative preparation, an appropriate anesthesia management and surgical approach and the use of modern technology. This case proves that complicated coronary artery disease can be safely managed in an anemic Jehovah's Witness patient without resection of pheochromocytoma.

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