



Case report

A case of refractory intraoperative hypotension treated with vasopressin infusion

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Abstract A 56-year-old man, treated with an angiotensin II receptor antagonist for hypertension, presented for placement of a cochlear implant during general anesthesia. Intraoperatively, there was profound hypotension that was resistant to decreasing the anesthetic depth, fluid administration, as well as bolus doses of phenylephrine, ephedrine, and epinephrine. Hypotension was eventually successfully treated with a vasopressin infusion (0.06 U/min). Vasopressin may be a useful agent in such scenarios because its effect is not dependent on either adrenergic or angiotensin receptors, both of which may be affected by angiotensin II receptor antagonists.

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1. Introduction

Hypotension during general anesthesia is generally easily treated by decreasing the depth of anesthesia and the administration of fluid. When needed, catecholamines, including phenylephrine, ephedrine, or epinephrine, are used due to their rapid onset and predictable hemodynamic response. Patients taking angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blocking agents preoperatively have a higher incidence of hypotension, more profound hypotension, and decreased responsiveness to exogenous catecholamines [1,2]. Although there

are data to support the withholding of ACE inhibitors and angiotensin II receptor blocking agents on the morning of surgery so as to lessen the risk of hypotension [3,4], it is not a universally accepted practice. At our institution, patients taking these agents are generally instructed to take their usual morning dose.

We present a patient who had recently been started on an angiotensin II receptor blocking agent, who experienced profound hypotension after induction of general anesthesia. The hypotension was refractory to conventional therapy including fluid administration and pharmacologic treatment with ephedrine, phenylephrine, and epinephrine. The case report emphasizes the potential for refractory hypotension associated with angiotensin II receptor blockers and discusses treatment with vasopressin agonists [1,2,5,6]. We also discuss potential mechanisms to explain the apparent catecholamine resistance in this patient population.

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2. Case report

Review of this patient's hospital records and presentation of this case report were approved by the institutional review board of the University of Missouri, Columbia. The patient was a 56-year-old, 94-kg, 175-cm man, who presented for a cochlear implant for the treatment of hearing loss due to excessive noise exposure. His medical history was positive for hypertension, treated with hydrochlorothiazide 12.5 mg daily and irbesartan, an angiotensin II receptor blocker, 150 mg daily. There was no other history of heart disease. During his initial preoperative evaluation, his blood pressure (BP) was 168/107 mmHg, and he was referred back to his primary care physician (PCP) for better management of the hypertension. During the return visit to his PCP, his BP was 140/88 mmHg, and the irbesartan was increased to 300 mg daily because the patient did not tell the PCP that he had not been taking the 150-mg dose, which had been prescribed previously. This fact was not discovered until after the surgical procedure. On further investigation, it was learned that he had taken the 150-mg dose of irbesartan for only two days before the dose increase. He took the higher dose (300 mg) for 6 days before surgery. On the day of surgery, the

patient was fasted (except for medications) for 6 hours. His BP was 145/98 mmHg in the preoperative holding area. He had taken the usual dose of both hydrochlorothiazide and irbesartan. A peripheral 18-gauge intravenous (IV) cannula was placed on the dorsum of the hand and midazolam 2 mg was administered. The patient was transported to the operating room (OR) where standard ASA monitors (temperature, noninvasive BP, 5-lead continuous electrocardiogram, end-tidal carbon dioxide, pulse oximetry, and precordial stethoscope) were placed. An IV fluid bolus of 500 mL of Ringer's lactate was administered, followed by induction of general anesthesia with fentanyl 50 μ g, lidocaine 100 mg, propofol 250 mg, and succinylcholine 120 mg. Lidocaine was used because of the patient's history of hypertension in an attempt to blunt the response to intubation. Sevoflurane (inspired concentration 2%) was started before direct laryngoscopy and endotracheal intubation. Table 1 lists the subsequent hemodynamic parameters (heart rate and BP) and subsequent therapy. When ephedrine, phenylephrine, and epinephrine failed to increase BP, IV vasopressin (0.4 units) was administered. The dose was increased to 2 U every 10 minutes as it allowed for fewer doses, but BP remained labile, with systolic BP (SBP) ranging from 75 to 115 mmHg.

Table 1 Intraoperative hemodynamic parameters and subsequent therapy

Time after intubation (min)	BP (mmHg)	Heart rate (bpm)	Treatment (IV)	Comment
-1	138/92	72	None	
4	60/40	63	Phn 100 μ g, fluid bolus initiated, inhaled sevoflurane decreased from 2% to 0.5%	Total 4 L of Ringer's lactate given during first 1.5 hrs. Radial pulses were faint but palpable. A different NIBP cuff was placed on right lower extremity, yielding similar results.
7	64/32	65	Phn 200 μ g, Eph 10 mg	
10	80/42	46	Eph 20 mg, EPI 10 μ g	
13	62/42	54	Eph 20 mg, EPI 20 μ g, Phn 200 μ g	
16	65/42	54	Eph 20 mg, EPI 20 μ g, Phn 500 μ g	Patient coughing. BIS < 60 at this time and throughout case.
19	120/54	46	Eph 20 mg, EPI 10 μ g	
21	70/48	65	Phn 200 μ g, ketamine 100 mg	
24	90/54	75	Phn 100 μ g, ketamine 50 mg (two doses separated by 10 min)	Surgical stimulation begins. Patient moving in response to surgical stimulation. BIS 50-56.
45	75/38	55	Phn 100 μ g, Eph 20 mg, ketamine 50 mg (three doses separated by 10 min)	
90	83/35	64	Vasopressin 0.4 units	Propofol (50 μ g/kg/min) and ketamine (3 mg/kg/hr) infusion started.
98	90/54	65	Vasopressin 0.4 units	
104	90/58	64	Vasopressin two units	
107	106/65	72	None	
121	92/61	74	Vasopressin two units every 15 min (5 doses)	
180	98/57	73	Vasopressin infusion at 0.04 U/min	BP maintained without further intervention.
210	88/54	76	Vasopressin infusion increased to 0.06 U/min	Infusion stopped when patient awakened from general anesthesia.

Phn = phenylephrine; NIBP = noninvasive BP; Eph = ephedrine; EPI = epinephrine; BIS = bispectral index.

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