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Case Report

Perioperative Management of Severe Hypertension during Laparoscopic Surgery for Pheochromocytoma

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Abstract

Phaeochromocytoma is a catecholamine-secreting vascular tumour that is derived from chromaffin cell. Lethal cardiovascular complications, such as serious hypertension, myocardial infarction and aortic dissection, may occur because of uncontrolled catecholamine release. Each stage of anaesthesia management has vital importance because of this destructive catecholamine secretion that may occur during induction, perioperative stage and surgical manipulation. In this study, we report regarding the preoperative preparation and severe, persistent hypertension attack management with a combination of α-adrenergic blockade, β-adrenergic blockade, sodium nitroprusside and remifentanil in a patient who underwent laparoscopic surgery for phaeochromocytoma.

Keywords: Phaeochromocytoma, hypertension, anaesthesia

Introduction

Pheochromocytoma is a vascular tumour that derives in chromaffin tissue (the most common adrenal medulla) and produces catecholamine. Symptoms vary according to the secreted catecholamine levels, such as those of norepinephrine, adrenaline and/or dopamine, but most commonly involve hypertension, headaches, palpitations and sweating (1). Depending on uncontrolled catecholamine secretion, fatal cardiovascular complications, such as severe hypertension, myocardial infarction, heart failure, cardiomyopathy and aortic dissection, may develop (2). Becuase this excessive catecholamine secretion can have devastating effects during induction in the perioperative period and during surgical manipulation, every stage of anaesthesia management is of vital importance.

In this presentation, we aimed to direct the preoperative preparation against a perioperative violent and persistent hypertension attack through a combination of α-adrenergic blockage and β-adrenergic blockage, sodium nitroprusside and remifentanil in the patient for whom laparoscopic pheochromocytoma resection was planned.

Case Presentation

Laparoscopic resection was planned for a 33-year-old male patient, 85 kg, because of a right adrenal mass (5×3.5 cm). Written informed consent was obtained from the patient to present this case in the present scientific article. The patient had complaints of hypertension, sweating and headache in his history for more than a year. Surgical preparation was made preoperatively using an α-adrenergic receptor blockade (doxazosin) and calcium channel blocker (amlodipine) for 2 weeks. Standard monitoring was performed in the operating room: arterial blood pressure (BP) was measured as 130/65 mmHg and the heart rate (HR) as 86 beats min^{-1}. A cannula was placed in the left radial artery, and invasive arterial pressure monitoring was performed. The period after induction was maintained with 2.5 mg kg^{-1} propofol, 2 μg kg^{-1} fentanyl and 0.5 mg kg^{-1} rocuronium; anaesthesia maintenance was provided with 2%–2.5% of sevoflurane, 50% O_2–50% air and 0.5–1 μg kg^{-1} remifentanil infusion. A central venous catheter was placed in the internal jugular vein with ultrasound guidance. BP rose to 180/100 mmHg immediately after induction. BP kept under control using intravenous (iv) sodium nitroprusside (0.5–10 μg kg min^{-1}). However, with the onset of laparoscopic procedures, BP started to become unstable (BP 200/105 mmHg) again and HR rose to 115 beats min^{-1}. The infusion dose of nitroprusside and remifentanil was raised, and haemodynamic stability was achieved by applying three ampoules of iv prazosin and esmolol 0.5 mg kg^{-1} and, 1 min later, 50–200 mg kg min^{-1}. After the tumour excision, antihypertensive agents were discontinued and the remifentanil dose was reduced.

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The patient whose HR and BP remained stable was extubated without any problems.

Discussion

The main goal of preoperative preparation is to regulate the BP, HR, heart rhythm and blood volume in patients with pheochromocytoma. There is no consensus on choosing an optimal pharmacological agent or on the application period of this agent in preoperative preparation. Non-selective α-antagonist phenoxybenzamin is one agent that is used conventionally. The use of selective and short-acting α-antagonist agents (prazosin, terazosin and doxazosin) is also increasing (3, 4). In addition, β-blockers may be required for the treatment of tachyarrhythmia caused by catecholamines or α-blockers. Because of the beneficial effect on the coronary spasm associated with catecholamines, the use of calcium channel blockers is also reported (5). It was shown that the preoperative application of non-selective α-blockers for 14–21 days and the selective and short-acting α-blockers for 72 h provided adequate haemodynamic stability (6). In our patient, doxazosin and amlodipine (calcium channel blocker) were used for 2 weeks and preoperative haemodynamic stability was achieved.

For the management of hypertension that may occur because of anaesthesia induction, oropharyngeal intubation and catecholamine secretion in the perioperative period, short-acting agents, such as nicardipine (calcium channel blocker), esmolol (β-blocker), phentolamine, sodium nitroprusside, fenoldopam, remifentanil, magnesium sulphate and occasionally adenosine or prostaglandin E1, are preferred (4, 7, 8). Although remifentanil is able to block the stress response to intubation and surgical incision in patients undergoing adrenocortical tumour resection and to provide haemodynamic stability, it is associated with significant cardiovascular depression after anaesthesia induction, and it is insufficient to prevent haemodynamic changes associated with the increase in catecholamine levels during tumour manipulation in patients with pheochromocytoma (8). In our case, in the management of hypertension in the perioperative period, sodium nitroprusside, remifentanil, prazosin and esmolol infusions were used by titration, and haemodynamic stability was provided.

Laparoscopic adrenalectomy performed in pheochromocytoma surgery provides several advantages, such as less intraoperative bleeding, earlier start of postoperative oral feeding, earlier discharge from hospital and less postoperative pain, but surgery may take longer and open surgery can be started. CO_2 pneumoperitoneum created in laparoscopic adrenalectomy may cause haemodynamic changes, such as catecholamine release, pre-load reduction, an increase in afterload, tachycardia, hypertension and ventilation changes such as hypercapnia and intrathoracic pressure increases (9). The probable reason for the secretion of catecholamines without major surgical stimulation and visceral dissection in pheochromocytoma is the mechanical effect of pneumoperitoneum. It was reported that catecholamine secretion at a significant level occurred during dissection and manipulation in laparoscopic adrenalectomy. It is still controversial whether the laparoscopic intervention causes more or less catecholamine release or haemodynamic changes compared to open surgery (4). Laparoscopic adrenalectomy was performed in our patient. Haemodynamic instability started with the application of pneumoperitoneum, and may be due to the increase in catecholamine release. This unstable haemodynamic status was able to be restored by combining sodium nitroprusside and remifentanil infusion with prazosin and esmolol. No serious haemodynamic problems occurred at the stage of tumour resection.

Conclusion

In pheochromocytoma surgery, a variety of antihypertensive agents can be used with different anaesthetic and surgical techniques, but the main objective in these cases is to provide haemodynamic stability using fast and short-acting agents. Anaesthesiologists should be alert against pathological effects of stress response of the pheochromocytoma, pneumoperitoneum and endotracheal intubation. The combined use of multiple short-acting agents by being titrated (sodium nitroprusside, remifentanil and esmolol prazosin) in the perioperative management of hypertension may be useful.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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