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Case Report

Anaesthetic Management for Pheochromocytoma Surgery: A Never Ending Challenge

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ABSTRACT

Pheochromocytoma is a challenging case for any anesthesiologist and a team approach is required throughout the perioperative period to prevent anticipated difficulties and best manage any unforeseen complications that develop. We discuss successful management of certain unique challenges, like multifocal arrhythmias and surgical rebleed during transport, during pheochromocytoma surgery in an adult, in addition to the usual perioperative problems.

Introduction

Pheochromocytoma is a catecholamine secreting tumour [1] most commonly seen in the adrenal gland for which adrenalectomy is the primary line of treatment. The classical symptoms are headache, palpitations, and sweating with 90 percent having associated hypertension [2]. Complications anticipated during surgery include hypertension (HTN), hypotension, arrhythmias, myocardial infarction, cardiac failure, and cerebrovascular accident [3]. We report the successful management of a case of pheochromocytoma who underwent surgery and experienced unusual intraoperative complications.

Case Report

A 47 year old lady presented with abdominal pain and palpitations for 3 months. She was diagnosed with noradrenaline secreting pheochromocytoma after a series of investigations including Computed Tomography (CT) abdomen, urinary metanephrines and M-iodobenzylguanidine scan. Preoperatively, she was optimised with prazosin and propranolol, had baseline heart rate (HR) 86/min and blood pressure (BP) 110/76 mmHg with normal 12-lead electrocardiography (ECG) and 2D-Echocardiography. She was planned for an open adrenalectomy as CT Abdomen revealed a large 8.8x8.1cm sized highly vascular tumour with multiple feeding vessels as shown in (Figure 1).

She was premedicated with oral alprazolam and antihypertensives the night before and morning of surgery. The operation theatre was prepared with adequate infusion pumps, resuscitation equipment, fluid warmers, drugs etc. Two large bore intravenous (IV) cannulas were secured after attaching the ASA standard monitors, and IV midazolam administered. Intra-arterial invasive BP monitoring was initiated and a lumbar epidural catheter was placed. A balanced anaesthesia technique using IV fentanyl, propofol, vecuronium and lignocaine resulted in a smooth induction of anaesthesia

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with minimal pressor response. A central venous pressure (CVP), Bispectral Index, and neuromuscular monitoring were established additionally.

The presence of multiple venous and arterial collaterals between inferior vena cava (IVC), aorta and the tumour caused prolonged tumour handling and bleeding. We were confronted with multiple hypertensive episodes during surgical tumour handling leading upto 100% increase in BP from baseline values, managed using nitroglycerin, sodium-nitroprusside and magnesium sulphate infusions, and esmolol boluses. During these episodes, rate and rhythm disturbances ranging from bradycardia, second degree atrioventricular (AV) block type-I and multifocal junctional rhythms were encountered. Both sinus and junctional bradycardia were noticed with HR going as low as 39/minute during sudden high peaks of BP, as shown in Figure 2. These arrhythmias reverted with HTN control and did not require rate enhancing measures. Goal of mean arterial pressure (MAP) was 80-140 mmHg, and hourly urinary output was monitored with a goal of 50ml/hr. IV hydrocortisone was given prior to clamping of adrenal veins.

The post-clamping reduction in BP, despite crystalloid bolus of 2 litres prior to clamping, was caused by a drop in catecholamines along with continuous bleeding of 4.2 litres as a result of tumour's high vascularity and adhesions to the IVC. This led to CVP drop from 11mmHg to 4mmHg, fall in BP to >40% from baseline, necessitating blood transfusions, IV fluid resuscitation, and inotropic support, using noradrenaline, vasopressin and adrenaline infusions. After hemostasis was accomplished, inotropic requirement was reduced and the patient was transferred to intensive care unit (ICU) for elective ventilation under the direct supervision of the consultant surgeon and anesthesiologist. During the process of transfer to ICU bed, sudden tachycardia of 140 bpm from 70 bpm was noticed and simultaneously 500ml of blood observed in the abdominal drain. The drain was clamped and the patient immediately returned to OT for re-exploration while maintaining fluid resuscitation and inotropic support. On reopening abdomen, collected blood as well as fresh bleeding amounting to 1.5 litres was observed and hemostasis achieved. Blood products were further administered and the patient was returned to the ICU.

On the first postoperative day (POD) inotropes could be tapered off. She was extubated on POD2, sent to ward on POD4 and discharged on POD8 with no evidence of hypoperfusion damage.

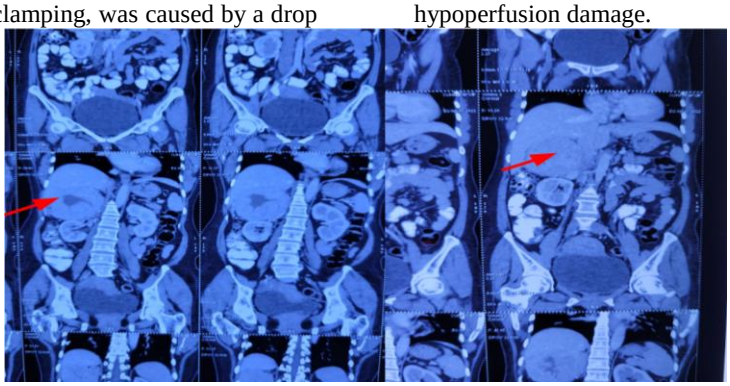

Figure1- CT Abdomen of Pheochromocytoma

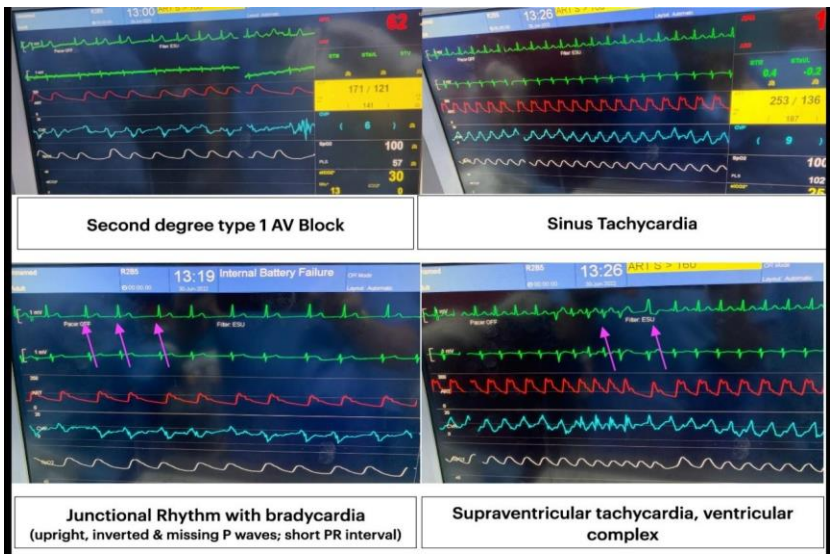

Figure 2- Various arrhythmias encountered during pheochromocytoma surgery

Discussion

A wide range of hemodynamic disturbances are encountered during pheochromocytoma surgery, however, in the present case some unusual complications including multiple arrhythmias and post-operative rebleed were encountered and managed successfully.

One-fifth of the patients undergoing pheochromocytoma surgery exhibit pre-operative arrhythmias [4] varying from sinus tachycardia, supraventricular, ventricular, and broad complex tachycardias, nodal rhythms, Wolff-Parkinson White syndrome, atrial and ventricular fibrillation, Torsade de pointes, and asystole [5]. During and between hypertensive emergencies, reflex bradycardia, AV dissociation, bigeminy, right bundle branch block, sick sinus syndrome, and nodal escape rhythms have also been reported, possibly due to increased vagal tone [6]. Rate and rhythm disturbances should be expected during tumour handling, and we should be vigilant about the surgical steps with frequent communication between surgical and anaesthesia teams, constant ECG, and beat-to-beat invasive BP monitoring. Pheochromocytoma handling leads to catecholamine release into the systemic circulation causing rapid hemodynamic changes and arrhythmias. An exaggerated HTN response causes vagal stimulation manifesting as bradycardia along with an array of dysrhythmias. Controlling HTN resolves most of these arrhythmias and antiarrhythmics are rarely required provided other causes like perioperative myocardial ischemia and electrolyte disturbances are ruled out [7].

Patients who have undergone pheochromocytoma removal do not tolerate further insults like surgical bleed due to their severe hemodynamic disturbances, massive fluid shifts and low catecholamine reserve. In our patient, shifting the patient from transport trolley to ICU bed may have caused dislodgement of a vascular clip, leading to an impending hemodynamic collapse. A swift judgement to re-explore, continued intensive monitoring, fluid resuscitation and an immediate decision of re-exploration is prudent for a better outcome. This early diagnosis of a re-bleed, resolution of logistical problems, and avoidance of delays, that are typical in after-hours emergency cases, were made possible by hypervigilance during shifting while providing Level 3 care [8] in the presence of a senior surgeon and anesthesiologist.

Conclusion

Numerous rate and rhythm abnormalities take place during pheochromocytoma excision and antiarrhythmic drugs should be administered only in exceptional circumstances, the main focus remaining treating the cause i.e. BP management.

A vigilant watch during the procedure as well as shifting of the patient post-operatively, effective blood pressure management utilising antihypertensive and inotropic infusions, the surgeons' gentle and steady manipulation of the tumour, and maintaining normovolemia, all contribute to successful management of patient’s outcome.

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