

Perioperative Management of a Patient with a Nonsurgical Pheochromocytoma: Anesthetic Implications (Case Report)

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Abstract

Case Report

Patients with nonsurgical malignant pheochromocytoma are at risk for major hemodynamic instability during periods of stress, including the perioperative period. Unpredictable changes in catecholamine levels are observed in these patients who are candidates for surgery other than adrenal tumor resection, which may lead to hemodynamic instability. For this reason, adequate preoperative preparation of patients with pheochromocytoma is considered as the mainstay of anesthetic management. This case report describes the perioperative management of a patient with a malignant pheochromocytoma who was to undergo a hemiarthroplasty following a left femoral neck fracture.

Keywords: Malignant Pheochromocytoma, Perioperative management, Anesthetic implications, Case report.

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INTRODUCTION

A pheochromocytoma is a tumor derived from chromaffin cells in the adrenal medulla. It's a biochemically active catecholamine secreting tumor. Perioperative management of a patient with a malignant pheochromocytoma is a great challenge because of the extremely sensitive blood pressure profile to plasma concentrations of released catecholamines.

A case report is presented of a patient with a known malignant pheochromocytoma, who was to undergo a hemiarthroplasty following a left femoral neck fracture.

CASE REPORT

A 60-year-old man sustained a mechanical fall that resulted in left femoral neck fracture on sound bone. His past medical history includes hypertension (treated with angiotensin receptor blockers monotherapy) and diabetes (managed with insulin therapy). One year prior to his presentation, a 100 × 80 mm right adrenal mass with effective liver and pulmonary metastases were detected on a thoraco-abdominal computed tomography (CT) scan. Further workup done at that time revealed elevated urine normetanephrines (109.92 μmol/24 hours) and elevated plasma catecholamines (norepinephrine = 24500 pmol.l⁻¹ and dopamine = 3136 pmol.l⁻¹) consistent with a diagnosis of pheochromocytoma. Decision taken following a multidisciplinary consultation meeting, the

patient was put on Lanreotide (somatostatin analogue) given the non-operable metastatic nature of his malignant secretory pheochromocytoma.

Due to the significant morbidity associated with untreated hip fractures, the patient was to undergo a hemiarthroplasty. The preanesthetic evaluation found a well patient with an ECOG/WHO score of 1. The clinical Lee score was estimated at 1 with preserved functional capacities (>4MET). Blood pressure levels varied around 170/90 mmHg. The electrocardiogram revealed atrial fibrillation with normocardial ventricular response. A transthoracic echocardiogram was therefore requested, showing homogeneous myocardial contractility with a preserved ventricular ejection fraction. The rest of the clinical examination did not find any criteria for difficult intubation. All of the preoperative biological tests came back without abnormalities.

Consequently, the patient was started on Terazosin (alpha-blocker) which was administered in a dosage of 2 mg per day. He was in suitable condition for anesthesia and surgery by the fifth day following admission. On the morning of surgery, the patient received his regular oral medications.

Prior to induction of anesthesia, the patient's blood pressure was 220/100 mmHg with a heart rate of 92 bpm. Capillary blood glucose was 161 mg.dl⁻¹. Because of the lability of the blood pressure profile,

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intraoperative monitoring included an electrocardioscope, a pulse oximeter and invasive blood pressure monitoring through a left radial arterial catheter. The preoperative preparation also included the installation of a left internal jugular venous line and a bladder catheter for a close monitoring of the diuresis.

The patient was premedicated with midazolam 2 mg i.v. Anesthesia was induced with 60 mg of lidocaine, 300 µg of fentanyl, 200 mg of propofol and 0.6 mg.Kg⁻¹ of rocuronium, and was maintained by sevoflurane. During the 45 minutes of surgery, the patient's systolic blood pressure ranged between 120 – 220 mmHg and diastolic blood pressure between 58 –

100 mmHg, requiring placement of Nicardipine by syringe pump. His heart rate ranged from 80 – 92 bpm (Fig. 1). There was no evidence of rhythm disorders on cardiac monitoring. The patient was extubated without any complications, and transferred to the intensive care unit in satisfactory condition.

The post-operations were simple. On the first day following surgery, the patient was transferred to the trauma-orthopedic department after optimization of hemodynamic parameters, weaning from Nicardipine and gradual reintroduction of alpha-blockers. He was allowed to ambulate on the third day following surgery, and was discharged on the fifth day.

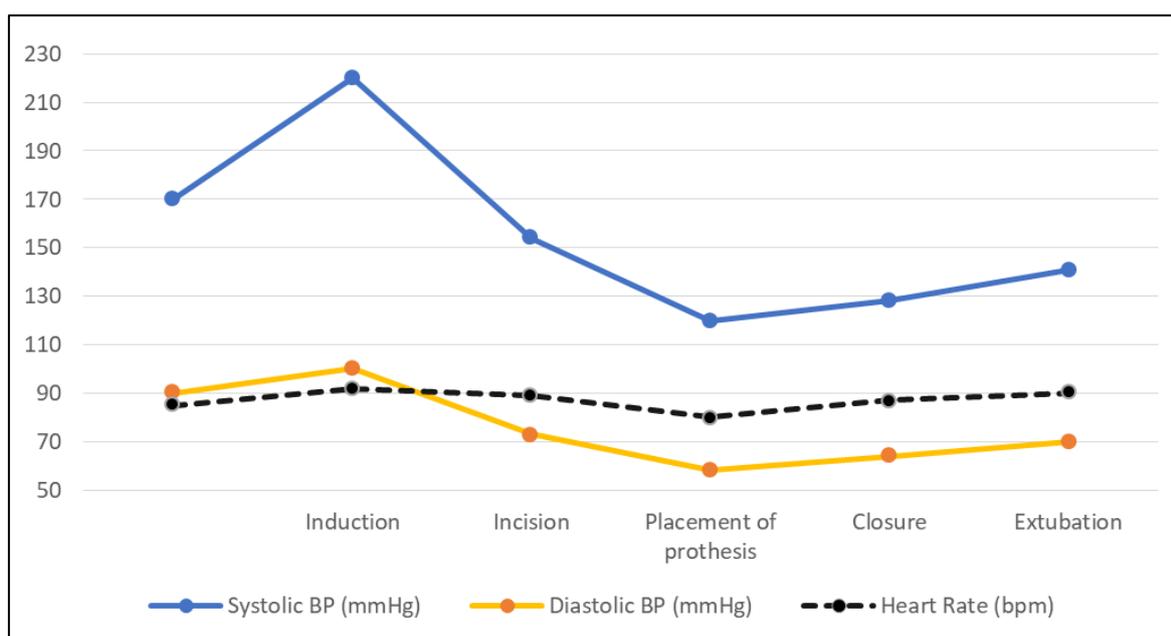


Fig. 1: Intraoperative blood pressure profile

DISCUSSION

Pheochromocytoma is a tumor developed from chromaffin cells of the adrenal medulla or other sympathetic ganglia and secreting variable amounts of catecholamines [1]. The symptoms are mainly due to the release of catecholamines or their metabolites in the body [2]. These are essentially the classic triad of "sweating, palpitations and headache" [3] in addition to other usual signs such as hypertension, orthostatic hypotension, nausea, weight loss, constipation, flushing, fever and pallor. Prolonged exposure to increased concentrations of catecholamines can lead to dilated cardiomyopathy, ventricular failure, arrhythmia, or even ischemic stroke [2].

Many studies have investigated the perioperative management of pheochromocytoma. However, these studies only included patients undergoing resection of pheochromocytoma. Similarly to the case we describe, the literature reports few cases related to the management of patients already diagnosed

with pheochromocytoma who are candidates for other operative procedures [4, 5].

Two major challenges were illustrated by this case. The first was the preoperative management of hypertension. The second challenge was the anticipation of significant hemodynamic alterations that may occur unexpectedly during the procedure.

The management of the patient starts with the pre-anesthetic consultation. In addition to the usual objectives related to the pre-anesthesia consultation to identify the risk factors of postoperative complications, the specific objectives are [6]:

- Control of blood pressure.
- Control of cardiac rhythm and arrhythmia.
- Optimization and evaluation of cardiac function.
- Maintenance of homeostasis: Glycemic control and electrolyte disorders.

Paraclinical examinations, guided by the clinic, include at least a blood count, a coagulation test, a blood ionogram, a creatinine and urea measurement and an electrocardiogram. A pre-operative echocardiogram is also indicated to look for the presence and extent of cardiomyopathy.

Various drugs have been used to achieve the optimal status prior to surgical intervention. International recommendations call for preoperative treatment with alpha-blockers 7 to 14 days before surgery. In our case, this period was reduced to 4 days due to the urgent surgical indication for a femoral neck fracture. The treatment should be introduced in a gradually increasing dose gradually according to blood pressure. The objective is to block alpha-adrenergic receptors in order to limit hemodynamic instability [6].

Phenoxybenzamine is a non-selective α blocker and is considered the main stay of perioperative control. Doxazosin, prazosin and tetrazosine are also used. They can produce profound hypotension due to uninhibited reuptake of norepinephrine and its inhibition at postsynaptic α_1 receptors [2].

Calcium channel antagonists can be used preoperatively. International recommendations suggest their use in case of moderate symptomatology, or severe orthostatic severe orthostatic hypotension under alpha-blockers [6]. Beta-blockers should never be used as first-line therapy without prior blockade. Their use is recommended following successful α blockade because of worsened hypertensive episodes when used as monotherapy. Propranolol is the most widely used agent [7].

In 1983, Roizen proposed the Roizen criteria to assess for adequate alpha receptors blockade [8]:

- No blood pressure > 160/90mmHg should be evident for 24 h before surgery.
- For patients with orthostatic hypotension, readings > 80/45 mmHg should be present.
- No ST-T changes is present in electrocardiogram for at least 1 week.
- No more than one premature ventricular contraction for every 5 min.

The anesthetic management and monitoring during surgery depends upon the extent of surgical approach. The monitoring includes continuous electrocardiogram, pulse oximeter, capnograph, temperature and urine output [2]. Bloody BP monitoring is usual and the arterial catheter is placed under local anesthesia before anesthetic induction. A central venous approach in addition to large bore peripheral venous lines may be discussed depending on the case. Throughout the procedure, careful and close monitoring of blood glucose levels is recommended [6].

The main anesthetic issue is the maintenance of hemodynamic stability. Anesthesia induction and tracheal intubation must be smooth [2] and guided by [6]:

- Avoidance of drugs inducing catecholamine release.
- Strict control of anesthetic or surgical maneuvers inducing catecholamine release (anesthetic induction, tracheal intubation, surgical incision [1].

Almost any induction agent can be used safely. Propofol is preferred for its vasodilatory effect. Etomidate is also recommended because of its cardiovascular stability. The use of any drugs that increase sympathetic tone or may precipitate a hypertensive crisis, such as ketamine and ephedrine, should be avoided [2]. Myorelaxation with succinylcholine is not recommended. Muscle relaxation with rocuronium and total intravenous anesthesia with propofol and remifentanyl are preferred and appear to be the strategy of choice in this context [6].

Concerning inhalation agents, Sevoflurane is preferred because of its cardio-stability and lack of arrhythmogenic potential. Isoflurane lowers peripheral vascular resistance and blood pressure, so can be used. Halothane (arrhythmia potential) and desflurane (sympathetic stimulation) are not preferred [2].

The preferred drugs for perioperative hemodynamic management are those with a rapid onset of action and short half-life. For the management of hypertension, vasodilators are the drugs of choice. Nicardipine (calcium channel antagonist) is the most commonly used. To control tachyarrhythmias, beta-blockers are the drugs of choice [6].

Traditionally, systematic prolonged postoperative monitoring in a continuous care or intensive care unit has been recommended. Particular attention should be paid to the patient's analgesia [7], to the balance of hydroelectrolytic disorders, to BP and glycemia. The antihypertensive treatment must also be adapted [6].

CONCLUSION

Perioperative management of a patient with pheochromocytoma is a great challenge because of the extremely sensitive blood pressure profile to plasma concentrations of released catecholamines. It requires comprehensive preoperative evaluation and optimization as well as meticulous intraoperative management. The postoperative period requires vigilance to prevent any untoward complications.

CONFLICTS OF INTEREST

The authors declare that they have no competing interest.

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