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Anesthetic Management for Patients With Pheochromocytoma : Series of Three Cases

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1. Abstract

1.1. Background. This study describes a case series that addresses the complex anesthetic management of adrenalectomy for patients with pheochromocytoma. It is a rare tumor, originating in the chromaffin cells of the adrenal medulla and a catecholamine-secreting agent, whose most common triad of symptoms is headache, sweating and tachycardia.

1.2. Cases: The first case corresponds to a 47-year-old woman with a history of three acute myocardial infarctions with a lesion located unilaterally in the left adrenal gland. After adrenal removal and due to persistence of hypertension, it was necessary to perform a left nephrectomy. The second case describes the conduction of a multimodal and opioid-free anesthesia of a 26-year-old female patient with dilated cardiomyopathy who underwent video laparoscopic right adrenalectomy The first report involves the case of a 14-year-old male patient with von Hippel-Lindau Syndrome, who underwent bilateral open adrenalectomy. All three cases were successfully preoperatively prepared and operated on and were discharged home between the 5th and 6th day compensated and without physiological changes. No genetic study of the three patients was performed. Continuous epidural anesthesia was performed in two patients, without hypotension and need for vasopressor.

1.3. Conclusion: In this pathology, it is essential to emphasize the extreme importance of the multidisciplinary approaches carried out in the three cases. We can affirm affirm that the favorable outcomes were only possible thanks to a great joint effort and judicious for monitoring the Endocrinology and Pediatrics services and for the coordinated relationship between the anesthetic and surgical teams, which were essential for obtaining hospital discharge in the first six days after surgery.

2. Introduction

Pheochromocytomas and paragangliomas are neural crest cell tumors that are intimately associated with the production and release of catecholamines being diagnosed by measurement of metanephrine and methoxytyramine [1]. The classic triad of ephidrosis, palpitations and the headache has a reported sensitivity of 89% and specificity of 67% for pheochromocytoma and in the presence of hypertension it changes to 91% and 94%, respectively [2].

Pheochromocytomas are tumors of neuroendocrine origin, derived from chromaffin cells in the adrenal medulla that produce and secrete catecholamines (especially norepinephrine and epinephrine), with the same genetic predisposition [3]. Pheochromocytomas occurs most frequently in individuals aged 40-50 years, with a slight predilection in females (55.2%) than men (44.8%), also occurring in children [4]. Early diagnosis and intervention are important for the successful management of pheochromocytoma in adults and children. Complete surgical resection remains the most effective treatment for pheochromocytoma. This three cases report aims to describe the

clinical presentation, management and outcome of phechromocytomas in developing in a Cancer hospital in Brazil.

3. Case Report

3.1. Case 1

Female patient, 47 years old, 80 kg, ASA II, without allergies. She has had arterial hypertension for 15 years, using losartan 50 mg every 12 hours. She had three previous episodes of acute myocardial infarction with hard-to-control hypertensive peak at 32, 38, and 40 years. On ultrasound examination, she presented normal ventricular systolic function and a 12-lead electrocardiogram without alterations. Diagnosed with pheochromocytoma, with a lesion located unilaterally in the left adrenal gland, measuring 4.5 x 4.2 cm. Due to social problems, it was difficult to carry out outpatient treatment, and preoperative preparation was carried out with the patient admitted to the hospital using alpha-1 blocker doxazocin, in progressive doses up to a dose of 8 mg/day for 7 days. During the preoperative period, the patient had blood pressure around 140x90 mmHg, without standing and with heart rate around 70 beats per minute.

At OR, she was monitored with electrocardiogram (ECG), non-invasive blood pressure (NIBP), pulse oximetry, and bispectral index (BIS). At that time, the patient had BP = 150x90 mmHg and HR = 70 bpm, and a peripheral vein was punctured in the left upper limb with a 16G catheter. Three mg of midazolam and 50 μg fentanyl were injected for puncture of the epidural space between T8 and T9 with the passage of a catheter cephalad. Afterwards, anesthetic induction was performed with 200 μg fentanyl, 100 mg lidocaine, 120 mg propofol and 100 mg rocuronium. There was no hypertensive peak during orotracheal intubation under direct laryngoscopy, and anesthesia was maintained with 1 CAM sevoflurane. Ultrasonography-guided right internal jugular vein puncture and right radial artery puncture were performed to monitor blood pressure.

The surgery began, and during the manipulation of the tumor, the patient presented a sudden hypertensive peak with MAP of 160 mmHg and tachycardia with 100 bpm. Infusions of sodium nitroprusside were started at a dose between 5 and 10 μg/kg/min, esmolol at a dose between 100 and 150 μg/kg/min and dexmedetomidine 0.5 μg/kg/h in a continuous infusion pump, administered magnesium sulphate 2 g in 100 ml of 0.9% saline solution, and epidural 2% lidocaine 5 ml, achieving normalization of BP. During surgery, there were three more hypertensive peaks with a maximum MAP of 190mmHg, which were controlled with the titration of the aforementioned infusions, and 2 mg phentolamine bolus on the three occasions.

After tumor removal, there was no reduction in BP. There were unsuccessful attempts to reduce infusion doses, with hypertensive peaks occurring at each attempt. The surgical team was notified and the radiological image was re-evaluated. They chose to proceed with left nephrectomy due to kidney damage that could correspond to pheochromocytoma, with a gradual decrease in BP, until it stabilized at 120x70mmHg. All infusions were suspended and there was no need for norephinefrine infusion. Morphine 2 mg and 0.2% ropivacaine 10 ml were injected through the epidural catheter for postoperative analgesia.

The patient was referred to the ICU awake, hemodynamically stable without vasoactives drugs, spontaneously ventilating in room air, with BP around 120x80 mmHg, without hypertensive peaks or tachycardia. Twenty-four hours after the operation, 0.2% 10 ml ropivacaine and 1 mg morphine were injected epidurally, with no further analgesia being necessary in the following days. She was discharged from the hospital on the fifth postoperative day. The anatomy pathological study of the second kidney lesion showed a second pheochromocytoma.

3.2. Case 2

Female patient, 26 years old, 58 kg, 155 cm, ASA II, diagnosed with pheochromocytoma after investigation of dilated cardiomyopathy and difficult to control arterial hypertension. Diagnosis was made by abdominal tomography with a lesion measuring 5.4 x 4.0 x 2.8 cm in the right adrenal with intense contrast uptake, scintigraphy with anomalous radiotracer uptake and elevated urinary normetanephrine. The patient was prepared for surgery by the Endocrinology Service, with the following medications: doxazosin, losartan, hydrochlorothiazide, amlodipine, bisoprolol and clonidine. Surgical treatment was indicated and in the OR, monitoring, venoclysis and catheterization of the right radial artery were performed to measure invasive blood pressure and oxy-hemodynamic monitoring with the EV1000–Flotrac system. Immediately, continuous infusion of dexmedetomidine (loading dose 1 μg/kg in 10 minutes and maintenance 0.5 μg/kg/h), lidocaine 100 mg and magnesium sulfate 1 g, followed by passage lumbar epidural catheter (L2–L3). The induction was performed with 100 mg lidocaine, 150 mg propofol, 70 mg rocuronium and 60 mg esmolol, without the patient had hemodynamic changes after direct laryngoscopy.

After intubation, ultrasound-guided right internal jugular vein was punctured and 10 ml of 0.5% ropivacaine was injected into the epidural catheter, obtaining sensory block at T4 level for video laparoscopy). During the tumor manipulation, the patient presented hypertensive peaks controlled with continuous infusion of dexmedetomidine, esmolol and sodium nitroprusside, the use of phentolamine was not necessary. The surgery lasted approximately 2 hours and, at the end of it, 6 ml of 0.2% ropivacaine were injected via an epidural catheter, being sent to the extubated ICU, eupneic in room air, hemodynamically stable without amines or hypotensive drugs and no pain complaints. The patient was discharged to the ward on the third postoperative day and to residence on the sixth day after surgery. The epidural catheter was removed on the second day of the postoperative period.

3.3. Case 3

Male patient, white, 14 years old, 62 kg, 168 cm, ASA II, with di-

agnosis of bilateral pheochromocytoma associated with Von Hippel-Lindau syndrome after investigation of headache, sweating and hypertension. Presenting lesions measuring 5.6 x 4.9 cm on the left and 1.6 x 1.5 cm on the right. Complementary exams did not show any changes. Preoperative preparation was performed by the service of and patient Endocrinology, with doxazosin, losartan and atenolol. Surgical treatment was indicated and referred to OR and after monitoring and venoclysis, continuous infusion of dexmedetomidine was started (loading dose 1 μg/kg in 10 minutes and maintenance 0.5 μg/kg/min), 2 g of magnesium sulfate and hydrocortisone 100 mg. Induction was performed with 200 μg fentanyl, 200 mg lidocaine, 30 mg esmolol, 170 mg propofol and 50 mg rocuronium, without the patient presenting with tachycardia or hypertension after direct laryngoscopy.

After intubation, thoracic epidural puncture (T9-T10) was performed and a catheter was inserted, with 8 ml of 0.5% ropivacaine injected. The sensory block that remained in the segment between T6 and T12 was evaluated. Deep venous puncture of the right internal jugular vein was performed with ultrasonography, catheterization of the right radial artery for measuring invasive blood pressure and oxy-hemodynamic monitoring with LiDCO Rapid system. Released for surgery and during tumor manipulation, the patient presented episodes of intense pressure lability, requiring alternate infusions of sodium nitroprusside and noradrenaline, as well as intravenous bolus of phentolamine 2 mg and esmolol 30 mg. The surgery lasted approximately 4 hours and, at the end, 8 ml of 0.3% ropivacaine and 2 mg morphine were injected via an epidural catheter. The patient was referred to the ICU extubated, eupneic on room air, hemodynamically stable without amines or hypotensive and without pain complaints, being discharged to the ward after removal of the epidural catheter in the second postoperative day and discharge home on the fifth day after surgery.

4. Discussion

We studied three cases of pheochromocytoma. Case 1 occurred in a 47-year-old woman, with hypertension for 15 years and a history of three myocardial infarctions, left adrenal pheochromocytoma. Case 2 occurred in a 26-year-old woman with a history of arterial hypertension and dilated cardiomyopathy and a tumor in the right adrenal. Case 3 occurred in a 14-year-old male child with diagnosis of bilateral pheochromocytoma associated with Von Hippel-Lindau syndrome after investigation of headache, sweating and hypertension. All three cases were successfully preoperatively prepared and operated on and were discharged home between the 5th and 6th day compensated and without physiological changes. No genetic study of the three patients was performed.

Pheochromocytoma is a rare tumor, and its incidence is estimated in one to two cases per 100,000 adults. The 2014 Endocrine Society Clinical Practice Guidelines state an overall pheochromocytoma prevalence of 0.2-0.6% in patients with hypertension [5]. Occur in approximately 0.1% of the hypertensive population, being an important cause of severe arterial hypertension correctable. Surgical treatment represents the only definitive treatment for pheochromocytoma and can be performed openly, as in Case 1 and 3 or video laparoscopic, as in Case 2.

Preoperative preparation is important to increase safety during surgery and reduce the number of perioperative complications [6]. The effect of catecholamines, norepinephrine (NE) and epinephrine (E), is brought about by their action on various sympathetic receptors, alpha and beta. In case 1, the preparation was carried out in the hospital with an alpha-1 blocker in progressive doses until blood pressure was controlled. In case 2, the patient was prepared for surgery by the Endocrinology Service, with the following medications: doxazosin, losartan, hydrochlorothiazide, anlodipine, bisoprolol and clonidine, with excellent blood pressure control. In case 3, a 14-year-old child, preoperative preparation was performed by the service of an Endocrinology Service, with doxazosin, losartan and atenolol, and control of changes in blood pressure, headache, and sweating. In all three cases, the preparation was satisfactory, with hemodynamic stability. Complementary exams were requested and were within the normal range. In the patient who reported three acute myocardial infarctions, investigation with echocardiography and electrocardiogram was within normal limits.

In a prospective nonrandomized study, the result of preoperative preparation with phenoxybenzamine (PBZ) and prazosin (PRZ) was compared in terms of perioperative hemodynamic changes, showed that PBZ was found superior to PRZ in having fewer intraoperative hemodynamic fluctuations [7]. Pheochromocytomas and sympathetic extra-adrenal paragangliomas almost all produce, store, metabolize, and secrete catecholamines or their metabolites. Recent studies have found that approximately 20% of head and neck paragangliomas also produce significant amounts of catecholamines [8]. One of our case also had a renal pheochromocytoma, requiring a left nephrectomy. The periods of greatest risk for patients with pheochromocytoma to present a hypertensive crisis during anesthesia and surgery are anesthetic induction, laryngoscopy, orotracheal intubation, pneumoperitoneum and manipulation of the adrenal gland. During these moments, catecholamine release can be induced [9]. During laryngoscopy and tracheal intubation, none of the three cases showed cardio circulatory changes. However, during the manipulation of the tumor, all three cases had manifestations of hypertension, requiring immediate treatment. Epidural block can also be used to help hemodynamic control, in addition to postoperative analgesia, but it must be used with caution and paying attention to the risk of aggravating possible hypotension after tumor excision [10]. Cases 2 and 3 were associated with continuous epidural block with lidocaine and ropivacaine in order to ensure analgesia, but there was no hypotension, with no need for vasopressor throughout the hospital stay.

5. Conclusion

Pheochromocytoma is a rare tumor, being an important cause of correctable severe high blood pressure. Surgical treatment is the conduct definitive therapy and can be performed by open or video laparoscopic route. Anesthesia and surgical procedure have great potential for complications, requiring preoperative preparation and perioperative intensive care. An important reduction in complications in these patients is linked to adequate preoperative pressure control, adequate use of hypotensive drugs during surgery, and strict hemodynamic control of the patient and intensive postoperative care. All these approaches were rigorously used in the three patients. In this pathology, it is essential to emphasize the extreme importance of the multidisciplinary approaches carried out in the three cases. We can affirm affirm that the favorable outcomes were only possible thanks to a great joint effort and judicious for monitoring the Endocrinology and Pediatrics services and for the coordinated relationship between the anesthetic and surgical teams, which were essential for obtaining hospital discharge in the first six days after surgery.

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No

7. Conflict of Interest

The author declares that there is no conflict of Interest.

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