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Case Report

Anesthetic Challenges in a Rare Case of Lower Thoracic Prevertebral Functional Paraganglioma Excision under Combined Epidural and General Anesthesia: A Case Report

Alagiri Sneha, Rajesh Mane, Chaitanya A. Kamat*

Department of Anaesthesiology, Jawaharlal Nehru Medical College, KLE Academy of Higher Education and Research, Belagavi, Karnataka, India.

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ABSTRACT

The incidence of paraganglioma has been reported between 2-8 cases per million people yearly. Thoracic functional Paragangliomas accounts for 15-20% of pheochromocytomas derived from chromaffin cells and secretes catecholamines. It has high mortality rate challenging anaesthetic management. Undiagnosed paraganglioma have an extremely high mortality rate up to 60%. The present report is a case of successful management of functional paraganglioma excision at the level of T9-T11 feeding from the descending aorta. A 71-year-old male with lower thoracic functional paraganglioma was posted for excision. Pre-anaesthetic evaluation, revealed history of Ischemic Heart Disease, Hypertension and PTCA 1month prior and intake of regular cardiac medication preoperatively, along with regular medications of Tab Propranolol 10mg and Tab Bisoprolol 2.5mg. PR was 84 bpm and BP was 140/90 mmHg in a supine position and 90/60 mmHg on standing. Echocardiography indicated EF 50% with borderline LV function. Epidural and General Anaesthesia was administered. Continuous roller coaster fluctuations in haemodynamics for intraoperative period of 8hrs, risk challenges calibrated by continuous vasopressor and vasodilation infusions. Extubation and post-operative period were uneventful. Careful perioperative management, including preoperative cardiovascular stabilization and intraoperative hemodynamic monitoring, is crucial in functional paraganglioma cases to prevent mortality and complications.

Introduction

Pheochromocytomas and paragangliomas (PPGLs) are rare tumors originating from the chromaffin tissue of the neuroectoderm [1]. The high levels of catecholamine are a serious threat to the lives of patients, and the size of PPGLs is positively correlated with the secretion levels of catecholamine [2]. Meanwhile, the levels of catecholamine are positively correlated with the maximum systolic blood pressure, which can reach the peak when the tumor is detected during the operation [2].

Most patients with these tumors are diagnosed with acute stress cardiomyopathy or acute coronary syndrome due to abnormally high catecholamine levels [1].

Anesthesia for surgical resection, which is the ultimate treatment for PPGLs, is associated with a significant risk of mortality and morbidity. PPGLs require careful preoperative preparation and perioperative management. The most important considerations are the regulation of hypertension, correction of intravascular volume depletion, management of arrhythmia, improvement of cardiac function, correction of electrolyte disturbances and acid–base balance, and improvement of hyperglycemia [3].

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*Corresponding author.
E-mail address: drchaitanya12@gmail.com

Case Report

A 71-year-old male presented with a functional paraganglioma of size 2.2 x 2.4 x 3.9 cm in the right prevertebral space at the level of the T9-T11 vertebral body. He was a known case of hypertension for 2 years, ischemic heart disease (post-PTCA) for 1 month, and was managed on a regimen of Tab Propranolol and Tab Bisoprolol.

Preoperative evaluation

The patient's preoperative evaluation revealed a pulse rate of 84 bpm, a blood pressure of 140/90 mmHg in supine, and a blood pressure of 90/60 mmHg in a standing position. ECG indicated left ventricular hypertrophy. 2D-ECHO revealed post-PTCA with inferior wall akinesia, concentric LVH, mild MR, and trivial AR. Patient hemoglobin (Hb) was 10.3 m/dL. Blood counts and basic metabolic investigations were normal.

He had normal serum normetanephrine levels and normal metanephrine levels. Vanillylmandelic acid was elevated (VMA) (16.34mg; normal range: 1.6-7.3mg). CT Abdomen Pelvis showed a heterogeneously avidly enhancing mass lesion in the pre-vertebral space on the right side at the level of the D9, D10, and D11 vertebral bodies with feeding arteries from the posterior intercostal vessels at that level, suggestive of paraganglioma. HRCT thorax showed fibroatelectatic bands involving the lateral segment of the right middle lobe and the postero-basal segment of the left lower lobe.

Preoperative optimization

Pre-operative hemodynamic optimization was done with Tab Propranolol, Tab Bisoprolol, and Tab Ticagrelol, which was stopped 7 days before surgery and switched over to bridging therapy (unfractionated heparin 4000 units subcutaneous TDS), which was stopped 6 hours prior to surgery. Tab Alprazolam 0.25mg was given the night before the surgery.

Anesthetic management

In the pre-operative room, RL was started in an 18 G intravenous (IV) catheter on the left upper limb. IV Midazolam 1mg + Fentanyl 50 mcg was given. The patient was shifted to the operation theater and connected to a multiparameter monitor, including pulse oximetry, ECG, and NIBP. Baseline heart rate was 96 bpm, and blood pressure was 90/60 mmHg.

Combined epidural and general anesthesia with continuous intra-arterial blood pressure monitoring and central venous catheterization was planned.

An 18G epidural catheter was placed at the L1-L2 level. IV Midazolam 1mg + Fentanyl 50 mcg was given. General anesthesia was induced with IV thiopentone 250 mg, and neuromuscular blockade was achieved with IV vecuronium 8 mg, followed by endotracheal intubation with an 8.5mm ID cuffed ETT and fixed at 22 cm after confirming B/L equal AE and square waveforms on $EtCO_2$. Maintained with O_2 + air and an intermittent dose of IV vecuronium 0.1 mg/kg. A 20G arterial line was secured in the right radial artery. A 7 Fr triple lumen CVC was also placed in the Rt IJV under USG guidance. Analgesia was provided by continuous intraoperative epidural infusion of 0.125% bupivacaine & IV paracetamol 1 g infusion.

Intraoperative hemodynamic fluctuations were high but managed with infusions of IV Inj. NTG, Inj. Labetalol, and Inj. Noradrenaline, varying between 196/94 mmHg and 75/70 mmHg (Figure 1).

Intraoperative arrhythmias were noted. Premature Ventricular Contractions (PVCs) were treated with preservative-free Lignocaine 60mg IV. A blood pressure rise was noticed during central line catheterization and handling and was managed with IV infusion of Inj. NTG and Inj. Labetalol. Hypotension was evident after excision of the tumor and was managed with IV infusion of Inj. Noradrenaline, adequate crystalloid, and one unit of PCV was also transfused intraoperatively. Towards the end of the surgery, Inj. Noradrenaline was tapered. After reversal of neuromuscular blockade, the patient was extubated.

Postoperative care

The patient's BP was normal in the immediate postoperative period without the need of any antihypertensive medication. He was discharged in stable condition on postoperative day 5. He remained asymptomatic and normotensive during his follow-up visits.

Discussion

This case emphasizes the multifaceted complexity of anesthetic management during the resection of functional paraganglioma, particularly in a high-risk patient with ischemic heart disease (IHD). Functional paragangliomas, characterized by catecholamine release, induce severe perioperative challenges due to their significant effects on cardiovascular physiology, including episodic hypertension, tachyarrhythmias, and hemodynamic instability. The uniqueness of this case rests in the successful utilization of both epidural and general anesthesia, achieving greater hemodynamic stability and reducing stress responses compared to conventional approaches.

Comparisons with other cases reveal varying strategies and approaches. The tumor in this patient, measuring 2.2 x 2.4 x 3.9 cm, was smaller than the large retroperitoneal tumor reported by Wang et al. (10.6 x 10.6 x 12.8 cm), yet both cases had similar risks of intraoperative hemodynamic crises [4]. In contrast, Han et al.'s case involved an incidentaloma discovered during surgery, presenting immediate diagnostic and management challenges [5]. Balasubramanian et al.'s case involved a younger patient with a peri-renal paraganglioma, underscoring the importance of timely diagnosis and preoperative preparation to prevent crises [6]. These comparisons reveal that while tumor size and location

influence symptoms, meticulous perioperative planning remains critical to ensuring patient safety.

Figure 1- Rollercoaster fluctuations in blood pressure

Preoperative optimization was a key factor in this case's success. Beta-blockers, specifically propranolol and bisoprolol, were used to effectively control blood pressure and heart rate, ensuring cardiovascular stability before surgery. This approach aligns with Balasubramanian et al.'s case, where a combination of alpha- and beta-blockers was employed to mitigate risks from catecholamine surges [6]. Conversely, Wang et al. highlighted the importance of multidisciplinary preoperative preparation, addressing coexisting cardiac dysfunction and hyperglycemia [4]. While Wang et al. required a prolonged optimization period due to the giant tumor's physiological effects, our case benefited from a targeted yet effective beta-blockade regimen.

The use of combined epidural and general anesthesia offered distinct advantages over general anesthesia alone, as observed in other studies. Epidural anesthesia provided superior hemodynamic control by attenuating stress responses to surgical manipulation, while general anesthesia ensured adequate airway management and ventilation. Together, they enabled precise control over hemodynamic fluctuations, a major intraoperative challenge. Blood pressure variations during tumor manipulation ranged from 196/94 mmHg to 75/70 mmHg. These fluctuations were effectively managed using vasodilators (nitroglycerin, labetalol) and vasopressors (noradrenaline), underscoring the importance of continuous hemodynamic monitoring and prompt management. By contrast, Han et al. relied on calcium channel blockers and deepened anesthesia, while Wang et al. used nitroprusside and phentolamine for intraoperative blood pressure stabilization [4-5]. The proactive use of epidural anesthesia in this case may have contributed to smoother hemodynamic control, reducing the reliance on high-dose vasoactive agents.

Postoperative management further demonstrated the advantages of a multidisciplinary approach. The abrupt cessation of catecholamine secretion following tumor removal often leads to severe hypotension, as seen in Han et al. and Wang et al. [4-5]. Both cases required prolonged vasopressor support and volume replacement to maintain hemodynamic stability. In contrast, our patient exhibited stable blood pressure postoperatively without the need for antihypertensive medications, reflecting effective intraoperative volume management and controlled extubation. The absence of significant postoperative complications in this case also stands in contrast to Wang et al.'s case, where severe systemic edema required aggressive diuresis and intensive care monitoring [4].

A notable consideration in this case was the patient's dual pathology—functional paraganglioma and IHD—which added complexity. Catecholamine surges could have exacerbated myocardial ischemia and impaired left ventricular function. The patient's borderline ejection fraction (50%) necessitated careful anesthetic planning to minimize cardiac stress. This was effectively managed through beta-blockade, judicious use of vasopressors and vasodilators, and the inclusion of epidural anesthesia to blunt sympathetic responses. In contrast, Wang et al.'s case involved catecholamine cardiomyopathy, which significantly influenced perioperative management, highlighting the need for adaptability in complex scenarios [4].

The importance of individualized perioperative strategies cannot be overstated. This case highlights the necessity of tailoring anesthetic techniques to a patient's unique risk profile. While similar cases relied solely on general anesthesia, the addition of epidural anesthesia in this case provided an additional layer of hemodynamic control, potentially reducing the severity of blood pressure fluctuations and minimizing the need for high-dose vasoactive agents. Furthermore, the absence of major postoperative complications underscores the value of comprehensive preoperative preparation and dynamic intraoperative management.

Conclusion

This case emphasizes the importance of understanding functional paraganglioma physiology for optimal perioperative management, hemodynamic changes, pharmacology, and preventing mortality due to hypertension.

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