



## Case Report

# Anaesthesiologist's perspective of laparoscopic adrenalectomy - A case report with current concepts in management

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## ABSTRACT

Pheochromocytoma is a rare tumor of adrenal gland, treatable, curable cause of hypertension and may lead to premature death if not treated early. Medical management by multidisciplinary team is essential for hemodynamic stability during the perioperative period. General anaesthesia with thoracic epidural block offers adequate stress control as hemodynamic fluctuations are quite common and significant during induction, peritoneal insufflation and tumor manipulation. Newer modalities of diagnosis, short acting drugs to control hypertension, vigilant anaesthetic management with beat to beat monitoring of hemodynamics significantly improves patient's safety. Laparoscopic mobilisation of the adrenal helps in minimal manipulation of the tumour and thus minimising the resultant catecholamine surge. However, hypotension upon ligation of adrenal vein is inevitable. Noradrenaline (NA) remains the vasopressor of choice which has to be continued post operatively. A thorough pre-anaesthetic evaluation, preparation and execution with a multimodal analgesic pain management in a high dependency unit aid in early ambulation and discharge of the patient.

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## 1. Introduction

Pheochromocytoma (PCC) is a catecholamine secreting neuroendocrine tumour of chromaffin tissue arising from the sympathoadrenal system.<sup>1</sup> Its annual incidence is 1.5 - 2.1 per million population out of which 50% goes undiagnosed. Both sexes are equally affected with an increased prevalence in third- fifth decades of life which are responsible for less than 0.1% of all cases of hypertension in adults.<sup>1</sup> 80% of them arise from adrenal medulla, most common extra-adrenal site being organ of Zuckercandyl near the aortic bifurcation, the rest occurring around the area of neck and thorax.<sup>1</sup> Hypertension and headache are the commonest signs and symptoms which are accompanied by triad of palpitation, sweating palms, anxiety.<sup>2</sup> It can be associated

with MEN 2a and 2b, Von Recklinghausen's disease, Von Hippel Lindau syndrome. If the catecholamine release is uncontrolled, it can result in malignant hypertension leading to cerebrovascular accident and myocardial infarction which can lead to premature death. Open surgical excision even in a well-controlled PCC significant hemodynamic fluctuations during the perioperative period which is a great challenge to the anaesthesiologist. Here we report a case with a recent review of literature on laparoscopic adrenalectomy of a pharmacologically well controlled PCC with minimal hemodynamic fluctuations resulting in early ambulation and discharge of the patient.

## 2. Case History

A 29 year old staff nurse presented to us with significant weight loss, lower abdominal pain and generalised

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tiredness since 3 months. History revealed frequent episode of chest discomfort, palpitation and syncope requiring hospitalization and on examination she had warm peripheries, sweaty palms, heart rate (HR) 146 beats per minute (bpm) regular at rest, non invasive blood pressure (NIBP) 170/98 mmHg in the sitting posture with no postural variation. Her BMI was 18.4 kg/m<sup>2</sup> and a normal airway. On evaluation, routine blood investigation were normal, CECT abdomen showed a well defined mass of 4 x .6 x 2.7 cm in the region of left adrenal gland, PET CT showed increased uptake in the left adrenal gland at L1-2 level, specific investigations like 24hour(hrs) urine metanephrine 356.6 microgram (normal 25-312), urine nor adrenaline (NA) was 5059.3 mcg/ 24hrs (normal<90mcg /24hrs), urine adrenaline 65.1mcg/24hrs (normal <20mcg/24hrs) and serum vanilylmandelic acid 14.6 (normal 1-11mg/24hrs) all suggestive of PCC. She was advised to undergo surgery and was started on anti-hypertensives since two months with tablet prazosin 10 mg BD, metoprolol 100 mcg TDS, amlodipine 10 mg BD and telmisartan 40 mg OD by a team of cardiologist and endocrinologist. ECG showed sinus tachycardia, no ST-T changes, Q-T prolongation. Her 2D ECHO revealed EF 76%, mild concentric LVH, no regional wall motion abnormality, good LV systolic function and stage 1 diastolic dysfunction.

An informed written consent was taken; our main anaesthetic goal was to keep her stress, hemodynamic fluctuations and hypotension following the ligation of adrenal vein to a minimum. Plan of anaesthesia was balanced general anaesthesia along with thoracic epidural. Standard ASA monitors were placed; baseline HR was 130 bpm, regular, NIBP 150/80 mm Hg. Following a thoracic epidural catheter at T10 – 11 interspace for perioperative analgesia, right radial artery was cannulated for hemodynamic monitoring, all under local anaesthesia. Following preoxygenation, midazolam 0.02mg/kg, fentanyl 2mcg/kg given IV and preloaded with about 750 ml of Ringer lactate fluid. Lidocaine 1.5mg/kg, propofol 3mg/kg in titrated doses, esmolol 25mg (0.5 mg/kg) given to control HR and vecuronium 0.1mg/kg for muscle relaxation. Trachea intubated with 7mm cuffed endotracheal tube (ETT) and anaesthesia maintained with 50% oxygen in air with sevoflurane to achieve an end tidal Sevo 2-3%. Right internal jugular vein cannulated ultrasound, repositioned the wire by pulling out a little and reloaded was attained only after a bolus of the catheter.

Patient had stable hemodynamics during induction, peritoneal insufflation, transperitoneal laparoscopic mobilization and resection of left adrenal. Patient was positioned right lateral with kidney bridge, intra abdominal pressure maintained less than 15 mm of Hg, and respiratory rate was kept at 15 to 17 /mt to maintain an end-tidal CO<sub>2</sub> of 40 to 45 mm of Hg. However, immediately after the left adrenal vein ligation, patient had severe hypotension

and BP dropped to 60/40 mm of Hg transiently, but mean arterial pressure was maintained above 60 mmHg by titrated doses of NA infusion and fluid bolus. Patient continued to be hemodynamically stable with normal arterial blood gas analysis following resection. Surgery lasted for approximately 180/mt 118 bpm epidural 3-5ml/hour according to hemodynamics for 72 hours. Epidural bolus of 5 ml 0.2% ropivacaine was given at the start of the procedure to minimize the stress of peritoneal insufflation. Lower limb stockings were post-operative

### 3. Discussion

Anesthesia for PCC is always challenging in terms of perioperative hemodynamic control.<sup>3</sup> Most tumors predominantly secrete NA (80-85%) and though a 24 hour urine metanephrine and catecholamine is a useful screening test, the most sensitive test in patients with classical symptoms and high risk category is plasma free metanephrine. A plasma free nor metanephrine higher than 400 pg/ml and or a metanephrine level higher than 220 pg/ml confirms the diagnosis. It can be excluded if nor metanephrine and metanephrine levels are less than 112 and 61 pg/ml respectively. A glucagon stimulation test is said to be the safest and most specific provocative test. MRI is advantageous over CT in detecting small tumors and for better delineation without radiation exposure. Meta iodo benzyl guanidine (MIBG) scintigraphy and PET CT are additional tools if available. Clonidine test to suppress plasma catecholamine levels in PCC and the provocative tests with histamine or tyramine has only historical importance now.

Early multidisciplinary management for hypertension, diabetes and cardiac dysfunction are essential for best outcome. Alpha blockade is the mainstay of medical management as it helps to control BP, increase the intravascular volume, prevention of hypertensive episodes, reduces myocardial dysfunction and allows desensitization of adrenergic receptors. Overall it takes care of myocardial performance and protection from adverse effect of catecholamines. Prazosin is a pure alpha 1 competitive blocker with pharmacological half life of three it was shown that laparoscopic excision and Urapidil infusion limited the hypertensive and hypotensive peaks during surgery. If tachycardia (>120/mt) exists after alpha blockade, a beta blocker is added but avoid a non selective beta blocker prior to alpha blockade to avoid unopposed alpha effects leading to hypertensive crisis

After adequate alpha blockade clinically, Roizen's criteria help to assess optimal control of PCC which we achieved in our patient like BP reading consistently less than 160/90 mmHg, presence of orthostatic hypotension (not less than 80/50 mm of Hg), ECG free of ST-T changes, no more than one premature ventricular contraction every 5 minutes and absence of nasal congestion.<sup>1</sup>

Perioperative goals include avoidance of drugs or manoeuvres which produce catecholamine surge or potentiates its action, to maintain cardiovascular stability and hemodynamics with short acting drugs during tumour resection.<sup>4,5</sup> Any form of stress including induction, pneumoperitoneum, tumour handling should be under good anaesthetic depth and laparoscopic mobilization minimises the tumour manipulation and unwanted catecholamine release.<sup>6</sup> Hypotension upon ligation of adrenal vein can be catastrophic if not anticipated and managed, an invasive arterial BP would suffice in most cases but if underlying cardiac dysfunction exists, a perioperative TEE can be a useful guide. Laparoscopic approach is preferred by most surgeons especially if tumor size is below 5 cms.

Drugs causing histamine release, atropine, succinylcholine, atracurium are to be avoided. Sodium nitroprusside a direct vasodilator is the agent of choice to manage hypertensive crisis. Phentolamine and nitroglycerine are alternatives but can cause unwanted tachycardia. Labetalol is advantageous in epinephrine secreting tumors because of its predominant beta action. Esmolol, Amiodarone, Adenosine can be used if dysrhythmias occur. Preloading if tolerated can attenuate hypotension upon ligation of adrenal vein. Vasopressors and inotropes are needed to bring back the hemodynamics. NA is the preferred one and has to be tapered and stopped in 2-3 days. Residual alpha blockade, tumor venous ligation, blood loss, epidural administration and increased anesthetic depth are other factors that contribute to hypotension. Advantage of an alpha blocker which limits hypotension gains importance in this context. A reduced level of plasma catecholamine can lead to insulin release and hypoglycemia post-operatively. Corticosteroid supplementation is needed if a bilateral adrenalectomy is planned. Hypertension which can be persistent can occur post-operatively which has to be addressed to rule out extrarenal location of PCC.

Advantages offered by laparoscopic adrenalectomy are minimally invasive, less tumor manipulation, early mobilization, reduced intraoperative blood loss and less postoperative analgesic requirement. Carboperitoneum created increases intra-abdominal pressure and sympathetic stimulation resulting in hypertensive crisis and arrhythmias, fluctuations in HR and BP are due to large size of the tumor and activity of catecholamine secretion on manipulation.<sup>7,8</sup> Robot-assisted adrenalectomy, a recent addition to the surgical armamentarium, overcomes the limitations of laparoscopic surgery by providing a three-dimensional magnified view, better ergonomics, control of the camera and multi-articulated instruments using Endowrist technology to the surgeons.<sup>9</sup> Higher cost and longer operating times are its main limitations which made it less popular. Postoperative hypotension is one of the most common complication and in severe cases can lead to cardiac arrest.<sup>10</sup> Patients has to be managed in surgical ICU

for optimum patient care, early mobilization and discharge.

#### 4. Conclusion

Laparoscopic Adrenalectomy for PCC though remain challenging to the anaesthesiologists despite advent of newer drugs, monitoring standards and ICU care, has definitely reduced morbidity and mortality to a great extent by a better understanding of the disease and pharmacology. A multidisciplinary preoperative preparation, good anaesthetic plan and its proper execution can lead to a successful outcome.

#### 5. Source of Funding

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#### 6. Conflict of Interest

None.

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