

Post-operative refractory hypotension and diuresis in a case of bilateral pheochromocytoma

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ABSTRACT

Pheochromocytomas are relatively uncommon tumors, with prevalence of 0.3-0.95% in autopsy series. Patients with pheochromocytomas have a potentially curable cause of hypertension. Following surgical removal of pheochromocytoma 80% of patients are expected to become normotensive. Persistent post-operative hypertension may be due to residual tumor, metastatic disease or intra-operative injury to the renal artery or the kidney. Around 20% of patients will remain hypertensive without biochemical evidence of residual tumor; however, due to associated essential hypertension or due to acquired renovascular changes. We present a rare case of refractory hypotension in a post-operative case of bilateral pheochromocytoma.

Key words: Diuresis, pheochromocytoma, post-operative hypotension

INTRODUCTION

Pheochromocytomas are rare catecholamine producing tumor (incidence is 1.55-2.1/million populations/year). These tumors arise in chromaffin cells of neuroectodermal origin, found anywhere in the sympathoadrenal system. It is associated commonly with multiple endocrine adenoma type IIa and IIb, neurofibromatosis and Von Hippel-Lindau syndrome. It has also been associated with hypercalcitonemia and thyroid C-cell hyperplasia and pancreatic islet cell tumor.

Pheochromocytoma release large amounts of catecholamine adrenaline (CCA), noradrenaline and dopamine, various peptides and ectopic hormones. There is no direct correlation between the concentration of free circulating CCA and the associated hemodynamic effects, due to the down regulation

of the adrenergic receptors. 10% of these tumors are bilateral, extra-adrenal, malignant and familial (rule of 10). The classical symptoms of pheochromocytoma are headaches, hypertension, palpitations and episodic sweating. The tumor size affects symptomatology; patients with tumors less than 30 g usually present with more symptoms and are diagnosed early as more CCA is released into circulation because of decreased storage and metabolizing capacity. Tumors greater than 250 g have increased storage and metabolizing capacity and therefore release less CCA but more metabolites.

The hallmark of hemodynamics is an increase in systemic vascular resistance. The perioperative morbidity and mortality in an unexpected emergency situation is quoted to be 50%, but less than 2% in planned surgery. Introduction of alpha-adrenoceptor blocking agents has markedly reduced perioperative mortality.

CASE REPORT

A 24-year-old female incidentally diagnosed with bilateral pheochromocytoma later revealed history of paroxysmal episodes of sweating, palpitation and hypertension with no history of diabetes or other endocrine disorders.

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Computed tomography revealed bilateral suprarenal masses with chole-lithiasis. Magnetic resonance imaging revealed right sided suprarenal space occupying lesion (SOL) was 7.4 cm × 6.7 cm, left sided suprarenal SOL measured 8.9 cm × 8.1 cm.

Pre-operative optimization was done with tablet prazosin. Tablet metoprolol was added later on. Roizen's criteria^[1] was fulfilled in 2 weeks and patient was brought to the operating room with morning dose of anti-hypertensives and lorazepam.

After removal of both tumors, hypotension was managed with fluid, nor adrenaline, phenylephrine infusion. Hypotension was persistent and was treated with vasopressin infusion.

Patient was monitored in post-operative care unit. At 2nd post-operative hour capillary blood glucose (CBG) was 50 mg% and was treated with 25% dextrose. After about 30 min patient was again hypoglycemic and diuresis started (urine output 200 ml/h). 25% dextrose infusion in 5% dextrose was started. Diuresis continued with low blood pressure (BP) (mean BP ≈ 55-60 mmHg with all vasopressors). Hydrocortisone infusion was started at the rate of 10 mg/h and fludrocortisone tablet 100 mcg was given sublingually. Mean BP improved and CBG was also stable but diuresis was continued. There was persistent hyponatremia and hypokalemia. At 48 h post-operatively vasopressors could be stopped and hydrocortisone was gradually reduced and later replaced with oral hydrocortisone and fludrocortisone. The diuretic phase was persistent for 16-17 post-operative day and patient was treated with calculated fluid and electrolytes until the diuretic phase was improved. The diagnosis of pheochromocytoma was confirmed by histopathology. High power field microscopy showed tumour cells arranged in well-defined nest (Zellballen) surrounded by a delicate fibro-vascular stroma [Figure 1].

Patient was discharged with proper advice of lifelong steroid supplement and intermittent follow-ups at endocrine outpatient department. Patient had uneventful recovery and until now enjoying a good health with corticosteroids and fludrocortisones replacement.

DISCUSSION

Main objective of preparation is to obtain optimal α adrenergic blockade with adequate hydration. The value of pre-operative α blockade has not been subject to any randomized studies, but the mortality of patients undergoing surgery has dropped from 50% to <6% since α receptor blockade was introduced.^[2]

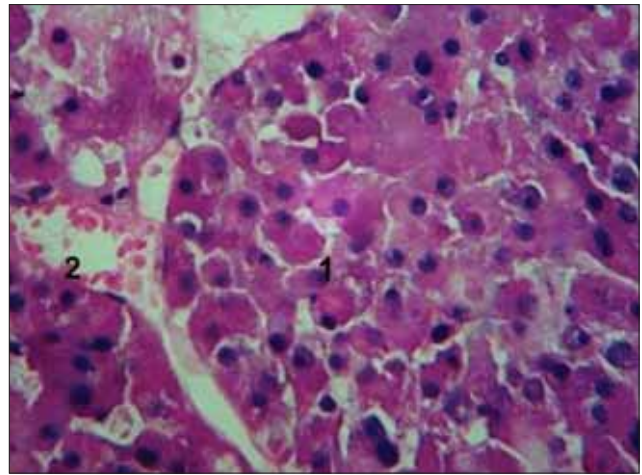


Figure 1: High power field microscopy showing tumour cell arranged in well-defined nest (Zellballen) (1) surrounded by a delicate fibro-vascular stroma (2) The cells vary considerably in size and shape and have a finely granular basophilic to amphophilic cytoplasm. Nuclei are round to oval in shape and have prominent nucleoli

Non-selective and irreversible α blocker like phenoxybenzamine has the advantage of more complete block of adrenergic surges during tumor manipulation, but produces prolonged post-operative hypotension. Hence short acting and selective α blocker like prazosin can be used, which incompletely blocks surge effect, but less tachycardia and less chance of post-operative hypotension make it a logical choice. Other drugs used are β blocker if required and calcium channel blocker and angiotensin-converting-enzyme inhibitor.

Goals of anesthetic management should aim at providing optimal surgical conditions and suppressing the response to endotracheal intubation, surgical stimulation, tumor handling and devascularization. General anesthesia combined with regional anesthesia is a preferred technique.^[3]

Drugs causing histamine release and tachycardia are to be avoided. Benzodiazepine is a good anxiolytic. Opioids like fentanyl, sufentanil etc., are preferred over morphine. Atropine is better avoided. Thiopentone and propofol are both rational choices for induction. Succinylcholine is better avoided as it can raise BP by squeezing the tumor with fasciculations. Vecuronium is of choice as it maintains stable hemodynamics. Rocuronium and cisatracurium can also be other options. Regarding inhalational agent isoflurane is a good choice as it does not sensitize the myocardium to catecholamines like halothane or enflurane. Sevoflurane may prove a better option.

Despite pre-operative α blockade almost all patients demonstrate hemodynamic disturbances during tumor manipulation. Tumor manipulation can result in blood levels of catecholamines up to 200,000-1,000,000 pg/ml (the pressor response to intubation in a normal patient can

produce an increase to 200-2000 pg/ml).^[4] The response to this huge surge should be anticipated and treated to avoid myocardial dysfunction.

Ligation of adrenal veins causes a sudden drop in BP due to fall in plasma catecholamine concentration. This post-operative hypotension usually responds to fluid therapy and may require vasoconstrictor to counteract the vasoplegia caused by α blockers and down-regulation of adrenergic receptors.^[5] In our case morning dose of prazosin was given as it has short half-life (2-3 h) and hypotension was most likely because of downregulation of adrenoceptors. Vasopressin has been used in a couple of similar scenarios after pheochromocytoma resection.^[6-8] It has been hypothesized that chronic elevation of catecholamines suppress vasopressin synthesis and after removal of tumor the acute crisis of this hormone makes vessels unresponsive to catecholamines.

After removal of the tumor the pancreatic beta cell suppression disappears and insulin levels increase. The previous lipolysis and glycogenolysis is no longer present both due to removal of the tumor and α blockade.^[9] Hypoglycemia with associated encephalopathy may occur and the residual adrenergic blockade may mask valuable symptoms and signs.^[10] Therefore the blood glucose level is monitored closely in the early post-operative period and intra-operatively glucose containing intravenous replacement fluids are started at the time of tumor removal.

Post-operative diuresis as happened in this case can be due to mineralocorticoid deficiency. This hormone acts in the distal tubule of kidney and causes sodium and water retention. Acute absence of this hormone after bilateral adrenalectomy may have initiated the diuresis due to inability of sodium absorption. Normalization of urine output after hydrocortisone infusion and fludrocortisone tablet given sublingually substantiate this hypothesis. Hydrocortisone replacement may be done by intermittent (6-8 hourly) injections but better plasma level in acute stress is maintained by infusion of 10 mg/h. Large doses like 100-200 mg hydrocortisone gives adequate mineralocorticoid activity and supplementary mineralocorticoid is superfluous.^[11] Another explanation behind this could be: Plasma human atrial natriuretic peptide and brain natriuretic peptide (BNP), which may be elevated in response to the high BP pre-operatively continued to be elevated post-operatively and resulted

in polyuria.^[12] The level of NTpro-BNP was found to be normal (78 pg/ml), because of its very short half-life.

CONCLUSION

We conclude that post-operative refractory hypotension in pheochromocytoma is a rare situation, which is to be kept in mind and needs intensive care by oncologists, intensivists and surgeons.

REFERENCES

1. Roizen MF. Anaesthetic implications of concurrent diseases. In: Miller RD, editor. *Anaesthesia*. 7th ed. New York: Churchill Livingstone; 2010. p. 1084-5.
2. Stoelting RK, Dierdorf SF. *Endocrine diseases. Anesthesia and Co-Existing Disease*. 5th ed. Philadelphia: Churchill Livingstone; 2009. p. 388-93
3. Prys-Roberts C. Pheochromocytoma: Recent progress in its management. *Br J Anaesth* 2000;85:44-57.
4. Goutam PI, Kaul TK. Pheochromocytoma: Anaesthetic consideration. *J Anaesthesiol Clin Pharmacol* 2002;18:232-47.
5. Desmots JM, le Houelleur J, Remond P, Duvaldestin P. Anaesthetic management of patients with pheochromocytoma. A review of 102 cases. *Br J Anaesth* 1977;49:991-8.
6. Tan SG, Koay CK, Chan ST. The use of vasopressin to treat catecholamine-resistant hypotension after pheochromocytoma removal. *Anaesth Intensive Care* 2002;30:477-80.
7. Augoustides JG, Abrams M, Berkowitz D, Fraker D. Vasopressin for hemodynamic rescue in catecholamine-resistant vasoplegic shock after resection of massive pheochromocytoma. *Anesthesiology* 2004;101:1022-4.
8. Roth JV. Use of vasopressin bolus and infusion to treat catecholamine-resistant hypotension during pheochromocytoma resection. *Anesthesiology* 2007;106:883-4.
9. Hull CJ. Pheochromocytoma. Diagnosis, preoperative preparation and anaesthetic management. *Br J Anaesth* 1986;58:1453-68.
10. Channa AB, Mofti AB, Taylor GW, Mekki MO, Sheikh MH. Hypoglycaemic encephalopathy following surgery on pheochromocytoma. *Anaesthesia* 1987;42:1298-301.
11. Williams GH, Dluhy RG. *Disorders of the adrenal cortex*. Harrison's Internal Medicine. 17th ed., The McGrawHill: New York; 2008. p. 2247-69.
12. Tobe M, Ito K, Umeda S, Sato A, Adaniya N, Tanaka Y, *et al.* Severe polyuria after the resection of adrenal pheochromocytoma. *Int J UROL* 2010;17:1004-7

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