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ANESTHESIA FOR RESECTION OF RENIN PRODUCING ADRENAL TUMOR: A CASE REPORT

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ABSTRACT

Background: Renin producing adrenal tumor is extremely rare. We experienced general anesthesia for resection of renin producing adrenal tumor. **Case Report:** A 67 years old female with hypertension had high plasma renin activity and serum aldosterone level with right adrenal tumor. She was scheduled for right adrenalectomy. After insertion of an epidural catheter, an arterial catheter, and a Swan-Ganz catheter, anesthesia was induced with diazepam, fentanyl and vecuronium, and maintained with isoflurane, nitrous oxide, and fentanyl. Diltiazem was infused to control blood pressure. Surgery was done under left lateral position without any complications. She was extubated in the operating room and discharged from high care unit to the ward 2 days later. Serum aldosterone levels decreased to the normal range before tumor removal and plasma renin activity decreased gradually to the normal range in 10 days. Blood pressure had been slightly high after surgery during her stay in the hospital. **Conclusions:** Resection of renin producing adrenal tumor was performed without any complications under general anesthesia with isoflurane, nitrous oxide, and fentanyl plus epidural block using diltiazem for control of blood pressure.

KEYWORDS: Renin producing tumor, general anesthesia, epidural block, diltiazem.

INTRODUCTION

Renin producing tumor is rare, especially extra-renal origin. We experienced anesthesia for resection of renin producing adrenal tumor.

CASE REPORT

A 67 years old female, with 142 cm height and 56 kg body weight, has hypertension. For recent 2 months, her systolic blood pressure has risen to 200 mmHg. The computed tomography (CT) showed right adrenal tumor, which suggested pheochromocytoma. Plasma renin activity (13.6 ng/mL/h) and serum aldosterone level (143.3 pg/mL) were high, but plasma epinephrine and norepinephrine levels were within normal ranges (Table 1).

Table 1. Hormone concentrations

	Normal range	Pre-surgery	Before tumor removal	After tumor removal	10 days after surgery
Epinephrine (ng/mL)	~0.12	0.02	0.03	0.19	<0.01
Norepinephrine (ng/ml)	0.05-0.4	0.29	0.17	0.24	0.36
Renin activity (ng/ml/h)	0.2-2.3	13.6	6.16	3.23	0.66
Aldosterone (pg/ml)	4-82.1	143.3	42.7	38.3	52.4

Therefore, renin producing tumor was suspected. Right adrenalectomy was scheduled. Her preoperative examination such as complete blood count, blood chemistry, chest X-ray, and electrocardiogram (ECG) had no abnormality. She had a history of appendectomy.

She took diazepam 10 mg per os and intramuscular injection of hydroxyzine 25 mg before entering the

operation room. An epidural catheter from Th10-11, an arterial catheter in the left radial artery, a Swan-Ganz catheter in the right internal jugular vein were inserted before anesthesia induction. Anesthesia was induced with diazepam 5 mg and fentanyl 200 µg. Oro-tracheal intubation was performed after vecuronium 8 mg. Anesthesia was maintained with isoflurane, nitrous oxide, and fentanyl (Fig.1). Diltiazem was infused to control blood pressure. Surgery was done under left lateral position without any complications. She was extubated in the operating room and went into the high care unit. She was discharged from high care unit to the ward 2 days later.

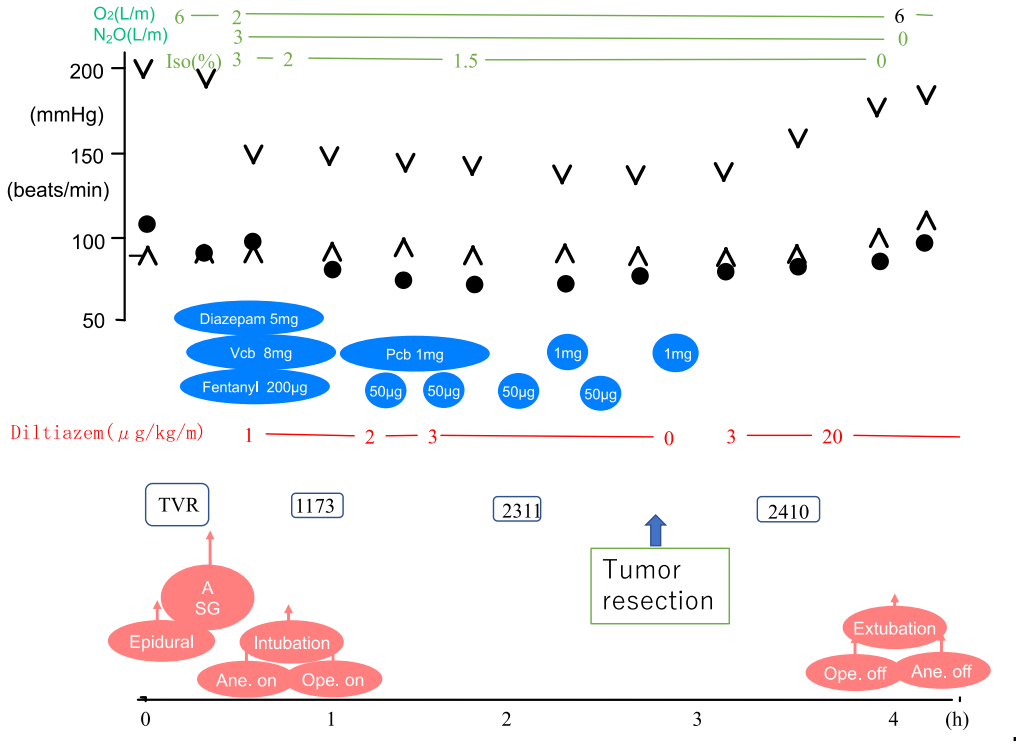

Fig. 1: Anesthesia record N_2O, nitrous oxide; Iso, isoflurane; Vcb, vecuronium; Pcb, pancuronium: TVR, total vascular resistance; A, arterial catheter; SG, Swan-Ganz catheter; Ane. on, anesthesia start; Ope. on, surgery start; Ope. off, surgery finish; Ane. off, anesthesia finish.

Serum aldosterone levels decreased to the normal range before tumor removal and plasma renin activity decreased gradually to the normal range in 10 days (Table 1). Blood pressure had been slightly high after surgery during her stay in the hospital. Histological examination showed adrenal cortical adenoma.

DISCUSSION

In renin producing tumors, juxtaglomerular cell tumor is the most frequent and extra-renal tumor is quite rare. Our case had adrenal tumor, which was extremely rare. In renin producing renal cell cancer, renin activity is high in the blood from renal veins but not high in the peripheral veins.[1] However, our patient showed high renin activity in the peripheral veins. The right adrenal vein connects to the inferior vena cava as well as the right renal vein. Therefore, why our patient had high renin activity in the peripheral vein, while usually not, is not known. However, this high renin activity and adrenal tumor in the CT suggested adrenal renin producing tumor. The patients with renin secreting tumor have hypertension and hypokalemia. Hypertension in patients with extra renal tumor is more severe than that in patients with renal tumor.[2] Systolic blood pressure in our patient was 200 mmHg, but serum potassium level was in the normal range.

During isoflurane anesthesia, plasma renin activity and plasma aldosterone levels in patients from 40 to 59 years increased significantly 90 minutes after anesthesia induction, whereas those in patients over 80 years did not change.[3] Our case was 67 years old, not shown in the data by Kudoh et al.[3] Rapid increase in isoflurane concentration increases plasma renin activity perhaps due to decrease in blood pressure.[4] The renin-angiotensin-aldosterone system is stimulated by decreased renal perfusion pressure and increased renal sympathetic tone.[5] We did not change isoflurane concentration suddenly, therefore, isoflurane might not affect plasma renin activity and plasma aldosterone levels. There have been no reports of the effects of nitrous oxide on renin activity and aldosterone levels. We expect little effects of nitrous oxide. Additional epidural block decelerates hyperaldosteronism during

general anesthesia.[6]

Plasma epinephrine and norepinephrine levels increase during isoflurane anesthesia after nicardipine administration.[7] However, the activity of renin-angiotensin-aldosterone system did not increase by nicardipine administration during isoflurane anesthesia.[8]

During general anesthesia, diltiazem did not affect renin activity,[9] while nifedipine increased renin secretion.[10] The increase in plasma renin activity could be a direct effect of nifedipine on the juxtaglomerular cells.[11] L-type calcium channel blockade can stimulate renin release through a decrease in intracellular calcium.[12]

Diltiazem suppressed sympathetic activity in the hyper-acute stage of subarachnoid hemorrhage.[13] In our case, plasma renin activity and plasma aldosterone levels decreased before tumor resection. These decreases were due to isoflurane, epidural block and diltiazem.

Hypertension by handling the tumor was controlled with short acting agents such as sodium nitroprusside and esmolol,[14] while we used diltiazem. Blood pressure decreased by isolation of the renin producing tumor in the case reported by Nicholson et al.[15] Decreases in blood pressure by ligation of the vein was treated with norepinephrine or angiotensin.[14] We stopped diltiazem infusion after removal of the tumor, and did not need any antihypotensive agents. Later, we need diltiazem again due to increased blood pressure.

After removing renin producing tumor, the blood pressure returned to normal within a few days. Patients who remain hypertensive after removal of renin producing tumor have established renal vascular damage.[16] Our patient had hypertension more than 10 days after surgery, which suggested renal vascular damage. Four weeks later, serum aldosterone and renin levels returned to the normal range in the report by Zabernigg et al.[17] Serum aldosterone levels returned to the normal before removal of the tumor and renin activity returned in 10 days in our patient.

The prognosis of extrarenal renin-secreting tumors is generally poor except for those whose renin activity is low.[18] The final prognosis of our patient was not known, but she survived a month later.

CONCLUSION

We anesthetized a patient with renin producing adrenal tumor without any problems under general anesthesia with isoflurane, nitrous oxide and epidural block additionally using diltiazem for control of blood pressure.

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