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## Anesthetic management by combined spinal and epidural anesthesia for a case of ectopic bladder pheochromocytoma

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### Abstract

**Background:** We report a safe anesthetic management of a patient with preoperatively diagnosed ectopic pheochromocytoma who underwent bladder tumor resection with combined spinal subarachnoid anesthesia and epidural anesthesia (CSEA).

**Case presentation:** The patient was an 85-year-old male, 152 cm in height and weighing 65 kg. The patient was admitted to our hospital with a complaint of anemia. Ectopic pheochromocytoma was suspected because of the different shape of the tumor and increased serum noradrenaline. Due to complications of interstitial pneumonia, we planned to perform CSEA for this case. When surgical manipulation was applied to the bladder, a sudden increase in blood pressure above systolic pressure of 200mmHg was observed, and nicardipine 1 mg was administered. Afterwards, the surgery was completed without any major circulatory changes and postoperative course was uneventful.

**Conclusion:** In patients with appropriate preoperative diagnosis and blood pressure control, spinal anesthesia or CSEA may be an alternative for ectopic pheochromocytoma in the bladder.

**Keywords:** Bladder tumor, combined spinal and epidural anesthesia, pheochromocytoma

### Introduction

Most pheochromocytomas are primarily located in the adrenal gland. They produce catecholamines and present with various symptoms associated with excessive catecholamine secretion. Surgical resection is usually performed under general anesthesia, and careful perioperative management is required. Ectopic pheochromocytoma arising outside the adrenal gland is often undiagnosed prior to surgery and is often detected as abnormal intraoperative hypertension [1]. Herein, we report the safe anesthetic management of a patient with preoperatively diagnosed ectopic pheochromocytoma who underwent bladder tumor resection with combined spinal and epidural anesthesia (CSEA).

### Case presentation

The patient was an 85-year-old man, 152 cm in height and weighing 65 kg. The patient was admitted to the internal medicine department of our hospital with a complaint of anemia. Computed tomography (CT) of the abdomen indicated a bladder tumor, and the patient was referred to the Department of Urology. Ectopic pheochromocytoma was suspected because the tumor was different in shape from typical bladder tumors. Serum catecholamine levels were assessed, and high blood noradrenaline (1404 pg/mL (normal range, 100-450 pg/mL) was detected. Therefore, partial cystectomy was scheduled with the diagnosis of ectopic pheochromocytoma.

The patient had a history of interstitial pneumonia, and preoperative respiratory function tests showed obstructive pulmonary dysfunction with a forced expiratory volume in one-second of 57%. Blood sialylated carbohydrate antigen level was 756 U/mL (normal range, less than 500 U/mL) and lung surfactant protein D level was 131 ng/ml (normal range, less than 110 ng/mL), which were high and consistent with the diagnosis of interstitial pneumonia. The respiratory medicine department requested that general anesthesia be avoided during surgery to prevent exacerbation of interstitial pneumonia.

Before surgery, the patient was taking amlodipine 2.5 mg/day for the treatment of hypertension. In addition,  $\alpha$ -receptor antagonist doxazosin 0.5 mg/day was initiated 40 days before surgery, and the dose was increased every 10 days to 4 mg/day before surgery.

Preoperative echocardiography revealed an ejection fraction of 70%. Pheochromocytoma is usually performed under general anesthesia; however, in this case, due to complications of interstitial pneumonia, it was planned to perform CSEA.

Oral medication was discontinued on the day of surgery. Premedication was not administered.

After the patient entered the operating room, ECG, non-blood pressure measurement, and pulse oximeter monitoring were initiated (Figure). His blood pressure was 181/54 mmHg, heart rate was 57 beats/min, and SpO<sub>2</sub> was 99%. Monitoring of the estimated continuous cardiac output (esCCO) (Nihon Kohden) was initiated. A catheter was inserted into the left radial artery and arterial pressure measurement was started (Figure). Blood gas analysis before induction of anesthesia revealed hypoxemia with a PaO<sub>2</sub> of 68 mmHg and PaCO<sub>2</sub> of 34 mmHg. Next, a central venous catheter was inserted via the right subclavian vein. The patient was placed in a lateral decubitus position. After local infiltration anesthesia with 3 mL of 1% lidocaine, an epidural needle (18G) was inserted between the 11<sup>th</sup> and 12<sup>th</sup> thoracic vertebrae through the paramedian approach, and the catheter was inserted into the epidural space. Next, a spinal anesthesia needle (25G) was inserted between the third and fourth lumbar vertebrae using the paramedian approach, and 4 mL of 0.5% bupivacaine was administered into the subarachnoid space.

After anesthesia, the patient was placed in the supine position, and the operation was started after confirming that analgesia was obtained up to the upper umbilicus. Dexmedetomidine was started at 0.6 µg/kg/hour, and oxygen 2 L/min was administered by face mask. At the start of the surgery, blood pressure was 104/40 mmHg, heart rate was 57 bpm, and SpO<sub>2</sub> was 99%. After the start of surgery, both the blood pressure and heart rate were stable. When the abdomen was opened and surgical manipulation was applied to the bladder, a sudden increase in blood pressure above a systolic pressure of 200 mmHg was observed, and nicardipine 1 mg was administered intravenously twice. Dexmedetomidine was discontinued prior to tumor resection.

After partial cystectomy, the patient's blood pressure was stable. As the patient complained of wound pain at the time of abdominal closure, 5 mL 0.25% levobupivacaine and 100 µg fentanyl were administered in the epidural space. In addition, 1000 mg of intravenous acetaminophen was administered. The operative time was 95 min. After the surgery, the epidural catheter was removed and the patient was carefully monitored in the intensive care unit for changes in blood pressure and heart rate, but there were no significant changes. Pathological examination of the excised specimen revealed pheochromocytoma.

## Discussion

The anesthetic management of pheochromocytomas is often challenging. This is because excessive catecholamine secretion results in abnormal hypertension during surgery,

and circulatory collapse due to cessation of catecholamine secretion occurs after tumor resection.

Ectopic pheochromocytomas occurring outside the adrenal gland account for approximately 10% of all pheochromocytomas [2]. They are often undiagnosed preoperatively and can result in abnormal hypertension at the time of tumor resection.

Lim *et al.* reported a case of abnormal hypertension during transurethral resection of a tumor under spinal anesthesia [1]. The operation was terminated and the tumor was operated again under general anesthesia after the diagnosis of pheochromocytoma.

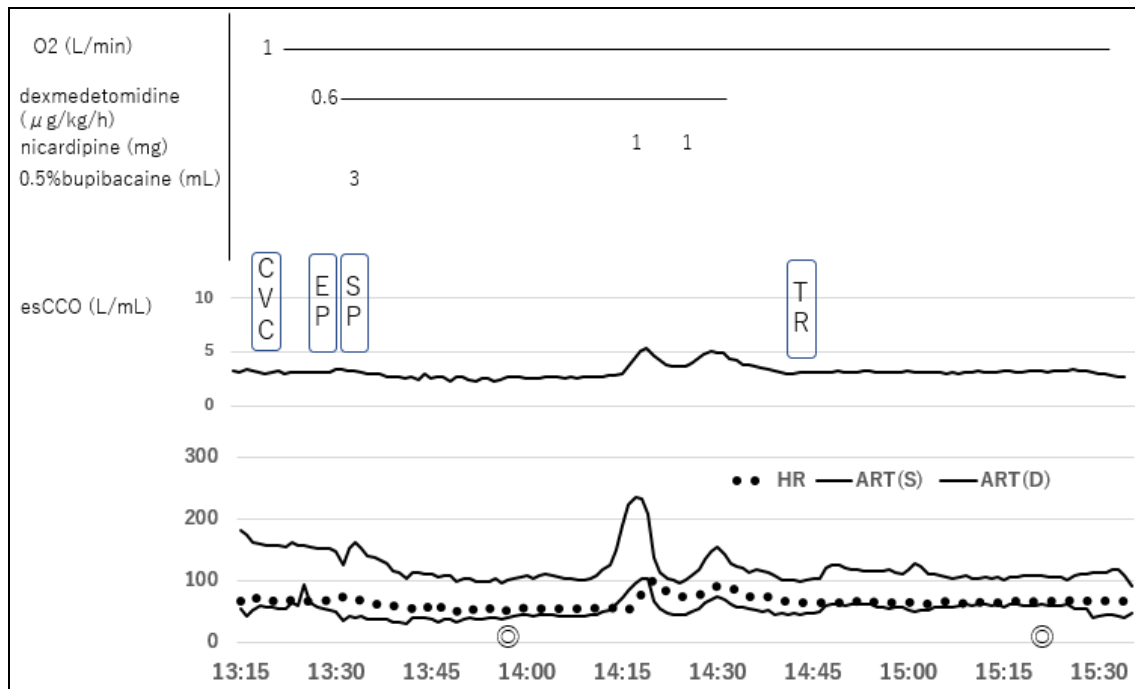
In the perioperative management of pheochromocytoma, preoperative drug therapy with  $\alpha$ -receptor antagonist is effective in reducing perioperative hypertension [3]. Therefore, patients with pheochromocytoma who are not diagnosed before surgery and are suspected of having pheochromocytoma due to abnormal intraoperative hypertension are at a high risk. In the present case, pheochromocytoma was suspected on preoperative CT imaging and endocrine examination, and surgery was scheduled after drug treatment; therefore, perioperative management could be performed without major problems.

Surgery for pheochromocytoma is usually performed under general anesthesia [3]. This is because the tumor is located in the adrenal gland in the upper abdomen, which makes it difficult to perform surgery under spinal subarachnoid anesthesia, and because of the marked decrease in blood pressure after tumor resection.

In this patient, CSEA was selected as an anesthetic method because of the presence of interstitial pneumonia. This was because a partial cystectomy was performed through an incision in the lower abdomen, which could be performed under spinal arachnoid anesthesia. The patient was administered an  $\alpha$ -receptor antagonist preoperatively, and it was considered that severe hypotension would be prevented after tumor resection. The patient's blood pressure was abnormally elevated twice during the operative period; however, it could be controlled with only a bolus doses of nicardipine, and there was no postoperative decrease in blood pressure.

Epidural anesthesia was useful for analgesia during the closure of abdominal wounds, but was not used postoperatively because of the risk of hypotension due to excessive peripheral vasodilation. Morphine was not administered because of obstructive ventilatory impairment and only a small amount of fentanyl was administered epidurally. Pain control was adequate because the surgery was completed through a small incision in the lower abdomen.

In addition to arterial blood pressure monitoring, esCCO was used as a cardiovascular monitor in this case. The esCCO is a technique used to estimate cardiac output from a pulse oximeter and an electrocardiogram [4]. In this case, esCCO showed increased values simultaneously with elevated blood pressure due to bladder manipulation and was useful for monitoring circulatory dynamics.



**Fig 1:** Anesthesia record

### Conclusions

To the best of our knowledge, there have been no reports on anesthetic management of pheochromocytoma tumor resection using CSEA. In patients with appropriate preoperative control with an  $\alpha$ -receptor antagonist, spinal anesthesia or CSEA may be an alternative for bladder ectopic pheochromocytoma.

### Abbreviations

CSEA: combined spinal and epidural anesthesia, CT: computed tomography, esCCO: estimated continuous cardiac output

**HR:** heart rate(bpm), **ART(s):** systolic arterial pressure, **ART(D):** diastolic arterial pressure, **CVC:** insertion of central venous catheter, **EP:** epidural anesthesia, **SP:** spinal anesthesia, **TR:** bladder tumor resection, **⊙**start and end of surgery

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### Authors' contributions

Yasuhiro Morimoto Takuto Tomokage contributed to the anesthetic management. Yasuhiro Morimoto wrote this manuscript. Manabu Yoshimura conducted the literature review. All authors have read and approved the final version of the manuscript.

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### Availability of data and materials

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### Consent for publication

Written informed consent was obtained from the patient for publication of this case report.

### Competing interests

The authors do not have any conflicts of interest regarding the content of this paper.

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