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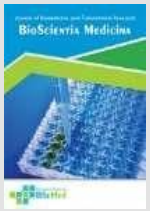

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Combined General Anesthesia with Epidural Analgesia as a Modality for Adrenal Teratoma Resection in Patients with Coronary Arterial Disease

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A B S T R A C T

Background: Adrenalectomy in patients with coronary arterial disease poses a significant challenge requiring good preoperative evaluation, perioperative hemodynamic control, and a detailed and careful anesthetic strategy. Teratomas are benign tumors that develop from pluripotent cells with two or more germ cell layers. Teratomas can develop in the ovaries and testes. Retroperitoneal teratoma, particularly adrenal teratoma, is rare. Indications for adrenal gland surgery include hormonal secretory tumors and non-hormonal secretory tumors. **Case presentation:** A 66-year-old man complained of discomfort in the right upper abdomen. From the results of the CT scan, an adrenal teratoma was obtained, and an adrenalectomy operation was planned. The patient underwent adrenalectomy with general anesthesia. Induction was carried out with propofol titrating doses of 100-150 mg until the patient was hypnotized and intubated with Atracurium 30 mg IV. The patient underwent an arterial line and CVC with ultrasound guiding during surgery. **Conclusion:** Anesthetic techniques should aim to maintain a myocardial oxygen supply that is greater than required to avoid ischemia. It is necessary to control perioperative hypertension, hyperglycemia, hypokalemia, and blood cortisol levels and maintain the balance of myocardial oxygen supply.

1. Introduction

Teratomas are rare tumors that originate from totipotent cells that can come from any one of the three germ cells—the ectoderm, mesoderm, and endoderm—or from more than one of them. The incidence of teratoma, a rare neoplasm, is 0.9 per 100,000 people. Adrenalectomy is indicated in cases of suspected malignancy or malignant tumors, as well as non-functioning tumors that carry a risk of becoming malignant and functional adrenal tumors.[1,2]

Perioperative cardiovascular events, including myocardial infarction, heart failure, and mortality, are more common in patients with ischemic heart disease undergoing noncardiac surgery.[3] We present the case of an adult male with an adrenal teratoma with comorbid coronary arterial disease with a history of Primary PCI 5 stent.

2. Case Presentation

A 66-year-old man arrived with a history of right lower abdominal discomfort. There was no family history of familial syndromes or history that would have suggested adrenal dysfunction. His functional workup for the adrenal glands was also within normal limits, and he was found to be normotensive upon physical examination. An abdomen CT scan enhanced

by contrast material showed a 10.5 cm x 9.,7 cm heterogeneous mass in the right adrenal, with minimal cystic areas, fat, and calcifications. As a result, a differential diagnosis of adrenal teratoma. Resection by surgery was scheduled.

Figure 1. Abdominal CT scan with contrast.

He had a history of angina and had 5 stents in 2002, 2005, and 2019. The patient currently routinely takes rosuvastatin 10 mg every 24 hours PO and clopidogrel 75 mg every 24 hours (last taken 5 days before surgery), Amlodipine 10 mg, and Candesartan 16 mg. Upon physical examination, we found that the patient's weight was 65 kg with a height of 170 cm. The patient's GCS is E4 V5 M6 with blood pressure 155/90 mmHg, heart rate 88 beats per minute, SpO_2 98% room air. Other physical examinations were found to be within normal limits. All laboratory tests, including the hemostasis function and adrenal function test, were within normal limits. This patient had been assessed for physical status ASA III.

Under general anesthesia and epidural analgesia, the patient had an adrenalectomy. Atracurium 30 mg IV was used for intubation, and an epidural catheter was inserted at the L1–L2 level with a loading dose of Bupivacaine Plain 0.125% volume 12 mL given 4-6 ml at intervals of 3-5 minutes. The induction process involved titrating a dose of Propofol until the patient was hypnotized. This patient received additional medication, including Ondancetron 8 mg IV and Tranexamic Acid 1000 mg IV, along with the implantation of an arterial line and CVC with ultrasound guidance during the procedure.

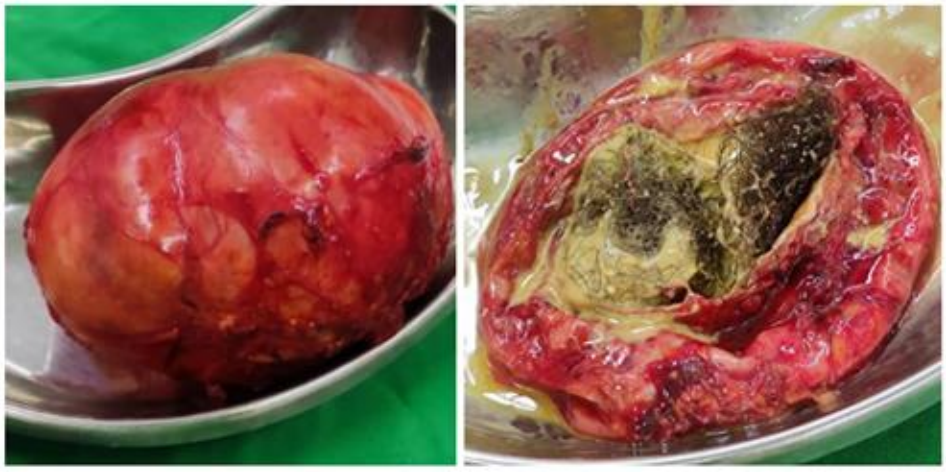
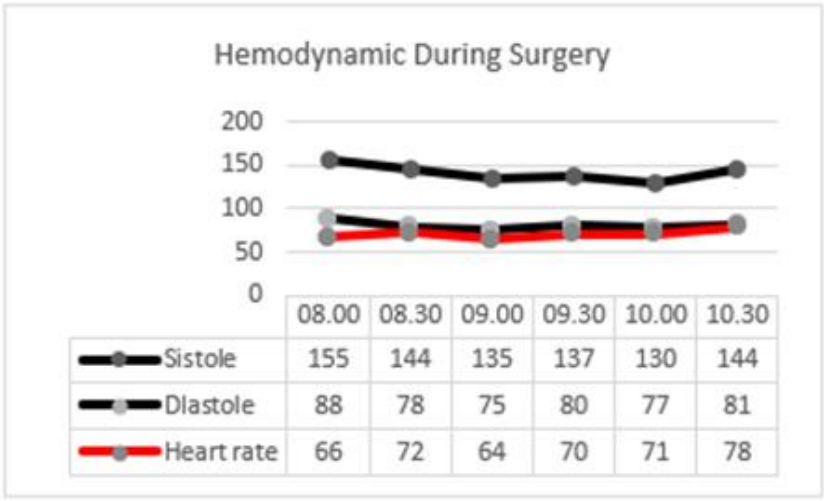


Figure 2. Teratoma tumor containing hair.

During the procedure, the patient had a CVC and an arterial line placed under ultrasound guidance. There were 400 milliliters of bleeding during the procedure. During the procedure, the patient did not receive a blood transfusion. The patient's hemodynamics were stable throughout the two-hour and thirty-minute procedure, with blood pressure variations of 141–154/75–91 mmHg and heart rate fluctuations of 77–91 beats per minute.



	08.00	08.30	09.00	09.30	10.00	10.30
Sistole	155	144	135	137	130	144
Diastole	88	78	75	80	77	81
Heart rate	66	72	64	70	71	78

Figure 3. Hemodynamic during surgery.

Following the procedure, we observe the patient in the recovery area. With an NRS score of 0/10, the patient did not report any pain. We gave the analgesic intermittent epidural bupivacaine 0.125 percent + morphine 1 mg volume 12 mL per hour, paracetamol 1000 mg every 8 hours IV, and Ibuprofen 400 mg every 8 hours intraorally for postoperative pain management, resulting in a moving NRS score of 2/10. Hemodynamic stability was preserved, and there did not seem to be any anesthesia-related complications for the patient. On the 4th day of treatment, the patient was discharged from the hospital.

3. Discussion

Teratoma is a type of dermoid cyst that is well differentiated and replicates an organ structure. Teratomas often occur in gonad tissue. However, the inferior mediastinum, retroperitoneum,

sacrococcygeal area, brain, and gastrointestinal tract may also be affected. The ability of germ cell migration causes teratomas to occur in several places.[1] Adrenal glands are located superior to the kidneys and consist of two endocrine organs: the inner adrenal medulla and the outer adrenal cortex. The adrenal cortex and medulla have different embryological origins. The medullary part consists of chromaffin cells that originate from the ectodermal cells of the neural crest. The cortex is of mesodermal origin. The adrenal glands are densely vascularized, the arterial blood supply reaching them from branches of the renal and phrenic arteries and the aorta. The medulla receives blood rich in corticosteroids from the cortex; it regulates the synthesis of the enzyme that converts norepinephrine to epinephrine. Venous drainage is via a single adrenal vein to the renal vein on the left and the inferior vena cava on the right. The adrenal medulla is a modified sympathetic ganglion that comprises 30% of the adrenal gland. Preganglionic, cholinergic, and sympathetic nerve fibers innervate it greatly. About 90% of cells secrete epinephrine, while the rest secrete norepinephrine. It is not clear which types of cells secrete dopamine. Medullary tissue is also located in extra-adrenal sites along the course of the abdominal aorta. The adrenal cortex is responsible for the secretion of three classes of steroids: glucocorticoids, mineralocorticoids, and androgens (sex hormones). Glucocorticoids influence carbohydrate, fat, and protein metabolism and are important in mediating responses to fasting and stress. Mineralocorticoids are essential for electrolyte and fluid balance. Histologically, the adrenal cortex consists of three distinct layers: (i) the outer zona glomerulosa, (ii) the middle fasciculate zone, which is the largest layer, and (iii) the inner reticular zone. The cells of all three zones secrete corticosterone, but the enzyme responsible for aldosterone production occurs only in the zona glomerulosa. The enzymatic mechanisms for synthesizing cortisol (hydrocortisone) and androgens exist mainly in two internal zones.[4]

Adrenal teratoma is a very rare form of teratoma. The main signs and symptoms are a palpable mass in the stomach, abdominal pain, anorexia, nausea, vomiting, and hematuria. Often, teratomas are detected incidentally by imaging studies. Pheochromocytoma has a high rate of morbidity and mortality, and because of its unpredictable course, screening for the condition is required in all cases. In as many as 15% of cases, there are no symptoms whatsoever.[1] One of the challenges of anesthesia in these patients is having a history of primary PCI 5 stents in 2002, 2005, and 2019. The patient currently routinely takes rosuvastatin 10 mg every 24 hours PO and clopidogrel 75 mg every 24 hours (last taken 5 days before surgery), Amlodipine 10 mg, and Candesartan 16 mg. It has never been easy to manage anesthesia in patients with cardiac comorbidities who had non-cardiac surgery. The primary goal of anesthetic management of patients with comorbid CAD undergoing non-cardiac surgery is to avoid myocardial ischemia and MI. This is by avoiding factors that disrupt the myocardial oxygen supply-demand balance.[5,6]

Factors that reduce myocardial oxygen supply are decreased coronary blood flow, tachycardia, hypotension, increased preload, hypoxia, coronary artery spasm, decreased oxygen content and availability, anemia, hypoxemia, etc. Factors that increase oxygen demand are tachycardia, increased wall tension, increased afterload (hypertension), and increased myocardial contractility.[5,6] Catecholamines are stored by the adrenal gland and released into the bloodstream through sympathetic nervous system activation. Adrenal gland surgery may stimulate catecholamines, which could lead to an intraoperative hypertensive crisis.[7]

All anesthetic techniques should aim to maintain a greater myocardial oxygen supply than demand to avoid ischemia. The most important thing in general anesthesia in these cases is to avoid tachycardia and extreme blood pressure, both of which affect the balance between oxygen supply and demand.[5,8] A patient's hemodynamics are continuously monitored by arterial pressure monitors. When it comes to making prompt clinical decisions and intervening in

the treatment of critically ill patients, this information is invaluable. Since the arterial pressure wave and the cardiac cycle coincide, analyzing the arterial pressure wave can help the physician better understand how the patient's heart is functioning.[6]

In order to reduce the risk of a perioperative major adverse cardiac event (MACE), there is ongoing debate regarding the appropriate timing of noncardiac surgery, as well as the necessity of ongoing chronic antiplatelet therapy for coronary artery stents.[9] This patient underwent an adrenalectomy, which was carried out under general anesthesia. Intubation was successful quickly, and no hypoxia occurred in the patient intraoperatively. Administration of epidural anesthesia with bupivacaine 0.125% and morphine 1 mg per hour is given as pain management. Aggressive pain treatment, early mobilization, control of hypertension and hyperglycemia, and finally, monitoring of postoperative cortisol levels are important and must be handled by the anesthesiologist. In conclusion, perioperative control of hypertension, hyperglycemia, hypokalemia, and blood cortisol levels is the role of the anesthesiologist caring for these patients.

4. Conclusion

Anesthetic techniques should aim to maintain a myocardial oxygen supply that is greater than required to avoid ischemia. It is necessary to control perioperative hypertension, hyperglycemia, hypokalemia, and blood cortisol levels and maintain the balance of myocardial oxygen supply. A patient's hemodynamics are continuously monitored by arterial pressure monitors during the surgery. The patient's hemodynamics were stable.

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