JURNAL KOMPLIKASI ANESTESI
E-ISSN 2354-6514
VOLUME 11 NOMOR 3, AGUSTUS 2024

LAPORAN KASUS

Management of Anesthesia in Patients With Adrenal Tumors Accompanied by Cushing's Syndrome

Roufisma Abdi Pratama[1], Ruli Herman[1]

[1] *Departemen Anestesi dan Perawatan Intensif, Fakultas Kedokteran, Universitas Padjadjaran, Bandung, Indonesia*

*Corresponden author : fk@unpad.ac.id

Article Citation : Roufisma Abdi Pratama, Ruli Herman. Management Of Anesthesia In Patients With Adrenal Tumors Accompanied By Cushing's Syndrome. Jurnal Komplikasi Anestesi 11(3)-2024.

ABSTRAK

Tumor kelenjar adrenal dengan prevalensi sekitar 532/100.000 yang merupakan neoplasma jinak yang berasal dari korteks adrenal. Kondisi ini meningkatkan produksi kortikosteroid dan aldosteron yang mengakibatkan komplikasi seperti hipertensi, hiperglikemi, hingga cushing sindrom. Seorang perempuan 29 tahun dengan keluhan wajah bengkak, rambut rontok, perut membesar, dan mudah memar pada ekstremitas, dikonsultasikan untuk tindakan adrenalektomi. Pada pasien dilakukan tindakan anestesi umum. Intra-operatif pasien didapatkan hemodinamik stabil. Pasca operasi pasien dirawat di ruangan ICU. Kontrol perioperatif hipertensi, hiperglikemi, hipokalemi, dan kortisol sebagai akibat dari reseksi adrenal menjadi peran anestesiologis pada pasien dengan tumor kelenjar adrenal yang disertai dengan cushing sindrom.

Kata kunci: Anestesi, edema paru akut, preeklampsia, obesitas, sectio caesarea

ABSTRACT

Adrenal gland tumors with a prevalence of about 532/100,000 which are benign neoplasms originating in the adrenal cortex. This condition increases the production of corticosteroids and aldosterone, which results in complications such as hypertension, hyperglycemia, and Cushing's syndrome. A 29-year-old woman with complaints of swollen face, hair loss, enlarged belly, and easy bruising of the extremities was consulted for adrenalectomy in patients who performed general anesthesia measures. Intraoperatively, patients are obtained hemodynamically stable. After surgery, the patient is treated in the ICU room. Perioperative control of hypertension, hyperglycemia, hypokalemia, and cortisol as a result of adrenal resection becomes an anesthesiological role in patients with adrenal gland tumors accompanied by Cushing's syndrome.

Kata kunci: Anesthesia, acute pulmonary edema, preeclampsia, obesity, sectio caesarea

Background

An adrenal tumor refers to a mass or growth of cells that develops in one or both adrenal glands. The adrenal glands are small glands located in the kidneys. Each adrenal gland consists of two parts, namely the cortex and medulla, which function to produce endocrine hormones. The adrenal glands play an important role in producing hormones that regulate various bodily functions, including metabolism, blood pressure, and stress response [1]. Smoking, obesity, high blood pressure, diabetes, a family history of kidney cancer, and having undergone hemodialysis for a long time are risk factors for adrenal gland tumors [2].

This case report discusses patients with bilateral adrenal tumor cT1N1M0 (paraaorta) accompanied by Cushing's syndrome and hypertension heart disease. The problems obtained in this patient are hypertension, swollen face, and hepatomegaly. A good understanding by the anesthesiologist is needed regarding pathophysiology, complications, assessment of disease severity, related to the selection of anesthesia techniques, intraoperative to postoperative monitoring.

Case Description

Identity

a. **Name** : **Mrs. R**
b. **No. RM** : **oooooxxxx**
c. **Age** : **29 years old**

Anamnesis

A woman, 29 years old with complaints of swollen face since 2 months. Patients complain of hair loss, enlarged abdomen accompanied by reddish lines since 2 months ago. The patient claimed to bruise easily on all four extremities. The patient has a history of hypertension since 2 years ago and said he did not routinely take antihypertensive drugs. Patients receive therapy:

1) Amlodipine 1x10mg orally
2) Spironolactone 1x100mg orally
3) $CaCO_3$ 3x500mg oral
4) Calcitriol 2x0.5mg orally
5) Mecobalamin 3x500mg orally
6) Carvidelol 1x6.25mg orally
7) MST 2x10mg orally

Physical Examination

General circumstances : Compos Mentis

Awareness	: GCS E4. M6. V5
Weight	: 70 kg
Height	: 160 cm
IMT	: 27.3 kg/m2
Blood pressure	: 112/70 mmHg
Pulse	: 70 times per minute
Respiration	: 20 times per minute
SaO2	: 97% with free air
Head	: anemic conjunctiva -/-, icteric sclera (-) round pupil isochorus diameter 3 mm/3 mm, RC +/+
Neck	: good neck mobility
Thorax	: symmetrical shapes and motions
Lung	: VBS left = right, wheezing (-/-), ronkhi (-/)
Heart	: Regular 1&2 heart sounds, murmur (-), gallop (-)
Abdominal	: convex, striae (+)
Limb	: Warm acral, CRT < 2 seconds

Supporting Examination

Table 1. Preoperative Laboratory (Appendix 1.)
Picture 1. Thoracic X-ray (Appendix 2.)

Impression:

a. No intrapulmonary metastases appear.
b. Cardiomegaly.

Echocardiography

a. La dilation
b. LVH (+) concentric with type 1 diastolic dysfunction

c. Global & segmental systolic function normal, EF 54% (tei)
d. Valves within normal limits
e. Normal ivc rv contractility 1.2 cm, minimal pericardial effusion collapse

Whole Abdominal Ultrasound

a. Hepatomegaly with suspected intrahepatal metastases.
b. Solid mass without calcification in suprarenal bilateral > suggestive adrenal mass.
c. Medullary bilateral renal nephrocalcinosis.
d. Bilateral pleural effusion.
e. There does not appear to be an enlargement of the paraaortic KGB.
f. Current ultrasound does not appear ascites.
g. Ultrasound of the gallbladder, pancreas, spleen and urinary vesicles currently does not show abnormalities.

CT Scan of Abdomen to Adrenal with Contrast

a. Hepatomegaly
b. Inhomogeneous solid lesions in bilateral suprarenal ? Suggestive of adrenal mass dd/ Adrenal myelolipoma dd/ adrenal adenoma
c. Medullary nephrocalcinosis type III bilateral kidney
d. Pleural effusion with right compression atelectasis
e. Scanning of the gallbladder, spleen, pancreas, urinary vesicles, uterus and rectum did not show abnormalities.

MSCT scan of the abdomen until the pelvis axial cut thickness 0.6 mm. Coronal and sagittal reconstructions made 0.9 mm thick. Scanning using oral contrast, I.V, and rectal spring.

Scanning area :

a. Hepar: Kissing type, flat surface, homogeneous density, no visible mass. The portal vein is not dilated. The hepatic vein is not dilated. The intrahepatal biliary duct is not dilated. There is no visible collection of liquid around it.
b. Gallbladder: size does not enlarge, walls do not thicken, regular. There is no visible mass/stone. The extrahepatal biliary duct is not dilated.
c. Spleen: Size not enlarged, density homogeneous, Vein lienalis not dilated. There is no visible collection of liquid around it.
d. Pancreas: Size is not enlarged, density is homogeneous, pancreatic ducts are not dilated.
e. Gaster: Size does not enlarge. Walls are not thickened, regular. There is no visible mass. There is no apparent contrast extravasation.
f. Intestinal tract: The wall is not thickened, regular, does not appear dilated in the small intestine, caecum, colon ascendens, colon transverse, colon descendants, and colon sigmoid. There is no apparent contrast extravasation.
g. Right kidney: The size is not enlarged, the structure of the parenchyma is homogeneous, the pelvocalises system is not dilated. Multiple hyperdense lesions appear to be small that fill the entire medulla of the right kidney.
h. Left kidney: The size is not enlarged, the parenchyma structure is homogeneous, the pelvocalises system is not dilated. Multiple hyperdense lesions appear to be small that fill the entire medulla of the left kidney.
i. Inhomogeneous isodens lesions, firm borders, irregular edges, measuring 2.00 x 1.72 x 2.66 cm in the right suprarenal and measuring lk. 2.46 x 2.32 x 1.44 cm in the left suprarenal. Post contras scanning provides inhomogeneous enhancement. (HU pre : 67 posts : 130)
j. Hypodense shadow with ring enhancement in bilateral paraaorta
k. Urinary vesicles: Fully filled, walls not thickened, regular, no stone/mass visible. It

appears that there is a catheter balloon inside.

l. Uterus &; Adnexa: Size is not enlarged, density is homogeneous.
m. Rectum: Normal position, wall not thickened, prerectal fat normal.
n. Scanned thorax: Appears regular edge hypodense lesion in the right lower hemithorak with hyperdense, bronchogram(+) water in its anterior image

Assessment

a. Bilateral adrenal tumor cT1N1Mo (paraaorta) + Cushing's syndrome + Hypertension heart disease
b. ASA III

Planning

a. Preoperative 6-hour fasting
b. Fluid maintenance 70 cc / hour
c. Intraoperative blood preparation
d. Preparation of vasoactive drugs
e. Plan with general anesthesia
f. Intensive prep post op room
g. Preparation of betablocker drugs

Induction: Operative

a. Anesthesia technique : GA
b. Patient positioned head up, Preoxygenation with O2 100%,
c. Induction will be done using Fentanyl 150 µg, Propofol 150 mg, atracurium 35 mg and intubated with ETT non-spiral no 7 maintenance anesthesia with Sevoflurane 1-2 vol%. O2 : N2O
d. Close monitoring of fluids and bleeding
e. Communication with the operator for tumor removal and make sure all personnel are ready before induction

Postoperative

a. Observation in the ICU postoperative room
b. Analgetic Fentanyl 35 mcg/hour

Results And Discussion

Adrenal Tumors

Adrenal tumors are benign neoplasms originating in the adrenal cortex. Can be categorized as nonsecreting or nonfunctional suffering from about 4-7% of the world's population over 40 years or with a prevalence of around 532 cases / 100,000 population[3]. Adenomas with mild hormonal secretion or less likely to secrete secretions are less likely to cause symptoms. However, adenomas that exhibit significant hormonal activity are often accompanied by typical symptoms such as Cushing's syndrome, primary hyperaldosteronism, or hyperandrogenism. Examination of adrenal tumors requires a comprehensive approach involving imaging and hormonal examination. Small tumors that are not hormonally active generally require routine follow-up examinations without immediate intervention. Adrenalectomy is the therapy of choice for hormonally active adenomas [4].

When a mass is detected in the adrenal glands, it is important to distinguish between benign and malignant masses as well as functional and nonfunctional masses. Adrenocortical carcinoma and pheochromocytoma represent potentially malignant masses that can occur in the adrenal glands. Although these tumors may exhibit hormonal activity, they differ from adenomas in their ability to expand and metastasize outside the adrenal glands, potentially leading to metastasis. Meanwhile, adrenal tumors do not have the potential to become malignant. Tumors that do not produce hormones (nonfunctional) and are small in size do not require additional therapy. However, when adenomas produce adrenal cortex hormones, it often involves cortisol or aldosterone. Excess cortisol production can be classified based on the amount of hormone produced and the associated symptoms. Adenomas that produce cortisol-related systemic symptoms are considered typical symptoms of Cushing's syndrome [4,5]. Another impact that occurs from

tumors that produce or increase aldosterone and cortisol. Increased risk of cardiovascular events, such as myocardial infarction, heart failure, and stroke increases. Also, there is an increased risk of metabolic complications such as glucose intolerance that leads to diabetes and hypertension [6].

Cushing's Syndrome

About 2% to 15% of adrenal tumors produce cortisol. Elevated cortisol levels or hypercortisolism can cause Cushing's syndrome, which is characterized by symptoms such as weight gain and deposition of adipose tissue around the face, neck, or back, hypertension, easy bruising, amenorrhea, hirsutism, acne, muscle weakness, diabetes, and mood changes[7].

There are 2 types of causes of Cushing's syndrome, namely those caused by abnormalities in the pituitary gland and abnormalities in the adrenal glands. In patients there is a known solid mass without calcification in the bilateral suprarenal which indicates a mass in the adrenals. Treatment that is generally done in this condition is adrenalectomy. Laparoscopic bilateral adrenalectomy modality therapy is usually a treatment option because it is a relatively safe procedure[8].

Hypertension

Hypertension is a condition of systolic blood pressure ≥ 130 mmHg or diastolic ≥ 80 mHg. About 80 – 95% are essential hypertension or there is no specific cause. This condition is generally without symptoms and often goes unnoticed, so it can cause other morbidities such as congestive heart failure, left ventricular enlargement, stroke, kidney failure, or even death [9]. Basic Health Research Data (Riskesdas) 2013 shows the prevalence of hypertension at the age of ≥ 18 years in Indonesia reached 25.8%, which was diagnosed by health workers and / or had a history of taking medication only 9.5%, indicating that most cases of hypertension in the community have not been diagnosed and reached by the health care team [10].

Risk factors for hypertension associated with lifestyle include obesity or overweight, smoking habits, diets high in sodium and fat, lack of fiber consumption, lack of physical activity and consuming alcohol [11]. It is known that the patient is obese with a BMI of 27.3 kg / m^2 This indicates risk factors for hypertension in patients. Patients are also known not to take hypertension drugs regularly which can eventually aggravate the condition of hypertension in patients.

Anesthesia Consideration in Adrenal Tumor Patients Accompanied by Cushing Syndrome

Laparoscopic adrenalectomy is the standard in treatment *Cushing Syndrome.* Preoperative procedures that emphasize the control of hypercortisolism, hypertension, hyperglycemia, hypokalemi, and prevention of hypercoagulation [12]. Patients generally experience hypertension and hypervolemi even under the administration of antihypertensive drugs for a long time. In the case of blood pressure of patients 112/70 mmHg with irregular consumption of hypertension drugs accompanied by complaints of frequent bruising in the lower extremity area. At the time of the patient's GDS examination reaches 118 mg / dL, this is still within the maintenance limit of preoperative blood glucose levels which range from 100-180 mg / dL[13]. An increase in blood sugar levels is common due to interference with the secretion of glucorticoids that will affect the secretion of insulin[14]. High blood sugar levels are associated with a higher risk of death, risk of infection, and length of patient stay in the hospital[12].

The objectives of anesthesia management in patients focus on adrenergic blockade and fluid volume replacement. Administration of anesthesia by the method *Deep Sedation* In patients it is something that should be avoided because it is associated with

the risk of hypoxia and disorders of the airway[12]. In this condition it can be prevented by adequate pre-oxygenation and appropriate intubation. Gentle intubation can prevent an increase in sympathetic nerve tone[12].

Induction is carried out using fentanyl and propofol. Induction is given slowly through the iv-line along with the selection of atrcurium. Atracurium which is a neuromuscular non-depolarizing agent blockers becomes the main consideration to prevent arrhythmias may occur which after the intubation process also serves to blunt sympathetic nerves[15]. Its nature also has a relatively fast recovery process in surgical procedures. Atracurium is also an intermediate when compared to agents *muscle relaxant* Others are also the next consideration[15].

Anesthesia management is carried out by administering 1-2% sevoflurane in oxygen-nitric oxide. It is necessary to monitor against possible aspiration as an effect of $N_{The\ 2O}$ may result in distention of the gastrointestinal tract. Sevoflurane is an agent *volatile anesthetics* which can be inhaled and will provide hypnotic, analgesic and autonomic nerve blockade effects during the operation process[16]. During administration of sevoflurane is also followed by monitoring of fluid and bleeding during surgery. As a result, the surgical removal of the tumor was declared successful and the patient did not experience significant blood loss.

Postoperative management focuses on pain control by administering analgesics[17]. In patients given fentanyl at a dose of 35 mcg / hour while the patient is in the ICU room. Control of hyperglycemia that occurs as a result of adrenal gland resection also needs to be carried out in the monitoring of patients in the ICU room. Periodic checking of cortisol levels and replacement of cortisol levels should be done periodically in patients. Early mobilization, breathing exercises, and electrolyte control also need to be done to prevent postoperative complications[17].

Conclusion

Anesthesia management in patients with adrenal tumors accompanied by Cushing syndrome with adrenalectomy procedures can lead to various complications both during surgery and afterwards. Primary adrenal insufficiency after adrenalectomy includes hypotension, hyponatremy, to renal dysfunction. These complications can be avoided by proper anesthesia management such as thorough planning in the pre-operative phase, pedarahant control and adrenergic blockade in the intra-operative phase. Comprehensive monitoring of hemodynamic, hypoglycemic status, cortisol levels, electrolyte status, is something that must be considered during the post-operative phase to prevent complications in patients.

Reference

1. Kastomo DR. Malignancy of the adrenal glands. *Indones J Cancer*. 2009; 3(3):123-126. DOI:10.33371/ijoc.v3i3.126
2. Made N, Adnyani D, Widiana IGR. Diagnosis and management of renal cell carcinoma patients. *Jpdunud*. 2018; 2(2):23-27.
3. Ebbehoj A, Li D, Kaur RJ, Jang K, Singh S, Li T. Epidemiology of Adrenal Tumors - a Population-based Study in Olmsted County, Minnesota. *Lancet Diabetes Endocrinol*. 2020; 8(11):894-902. DOI:10.1016/S2213-8587(20)30314-4.Epidemiology
4. Mahmood E, Loughner CL, Anastasopoulou. C. Adrenal Adenoma. StatPearls Publishing. Published 2023. Accessed November 13, 2023. https://www.ncbi.nlm.nih.gov/books/NBK539906/
5. Bhatti P, Cushing-Haugen KL, Wicklund KG, Doherty JA, Rossing MA. Nightshift work and risk of ovarian cancer. *Occup Environ Med*. 2013; 70(4):231-237. DOI:10.1136/OEMMED-2012-101146

6. Chang KY, Ryu S, Cho JY, Kim HW. Aldosterone- and cortisol-co-producing adrenal adenoma without clinical features of cushing syndrome. *Korean J Intern Med*. 2014; 29(5):679-682. DOI:10.3904/KJIM.2014.29.5.679
7. Lattin GE, Sturgill ED, Tujo CA, et al. From the radiologic pathology archives: Adrenal tumors and tumor-like conditions in the adult: Radiologic-pathologic correlation. *Radiographics*. 2014; 34(3):805-829. DOI:10.1148/RG.343130127
8. Kanesalingam K, van Dellen D, Davis J, Augustine T. The Management of Adrenal Adenomas. *Found Years*. 2012;6.
9. Adrian SJ. Essential Hypertension: Recent Diagnosis and Treatment in Adults. *Cdk-274*. 2019; 46(3):172-178.
10. Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia. *Basic Health Research*.; 2013. DOI:10.1126/Science.127.3309.1275
11. WHO. Hypertension. Published 2023. https://www.who.int/news-room/fact-sheets/detail/hypertension#:~:text=Modifiable risk factors include unhealthy,and being overweight or obese.
12. Domi R, Sula H, Kaci M, Paparisto S, Bodeci A, Xhemali A. Anesthetic Considerations on Adrenal Gland Surgery. *J Clin Med Res*. 2015; 7(1):1-7. DOI:10.14740/JOCMR1960W
13. The American Diabetes Association (ADA). 14 . Diabetes Care in the Hospital : Standards of Medical Care in Diabetes d 2018. 2018; 41(January):144-151.
14. Anu Sharma AV. Glucose Metabolism in Cushing Syndrome. *Curr Opin Endocrinol Diabetes Obese*. 2020; (3):140-145. doi:10.1097/MED.0000000000000537. Glucose
15. Bansal S, Rao MMP, Rao MMP. Intubating Conditions and Efficacy of Rocuronium versus Atracurium in Paediatric Patients undergoing Elective Surgeries under General Anaesthesia: A Randomised Clinical Trial. *J Clin Diagnostic Res*. 2023; 17(1):36-40. DOI:10.7860/JCDR/2023/61085.17427
16. Edgington TL, Muco' E, Maani C V. *Sevoflurane*. StatPearls Publishing Copyright © 2023, StatPearls Publishing LLC.; 2023. https://www.ncbi.nlm.nih.gov/books/NBK534781/
17. Domi R. Cushing's surgery: Role of the anesthesiologist. *Indian J Endocrinol Metab*. 2011; 15(8):322. DOI:10.4103/2230-8210.86975

Appendix

Appendix 1.

Hemoglobin	Hematokrit	Leukosit	Trombosit
13,3	46	19.860	245.00
GDS	**Alb**	**Ur**	**Cr**
118	3,2	32	0,77
Na	**C**	**Ak**	
141	4,5	1,9	

Appendix 2.