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Peri anaesthesia in thyroid cancer patients with uncontrolled hypertension

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Abstract. The high incidence of case fatality in patients with hypertension as a comorbidity involving anaesthesia poses a challenge for anaesthetists. Effective management prioritises the prevention of excessive vasodilatation that can result in hypoxia, haemodynamic instability, and imbalance of pre- and post-induction Blood Pressure changes resulting in the need for careful selection of appropriate anaesthetic maintenance regimens. Here, we outline an anaesthetic approach for tyroidectomy in a patient with Thyroid Cancer who requires surgical intervention under special monitoring due to comorbid uncontrolled Hypertension and excessive vasodilatory changes during intra-anesthesia. This study used a single case observation method with the subject of a 57-year-old male patient diagnosed with thyroid cancer and uncontrolled hypertension. Data were collected comprehensively and longitudinally in three phases: pre, intra, and post-anesthesia. In thyroid cancer patients with hypertension, intravenous midazolam was effective for pre-anesthesia anxiety. However, high doses of isoflurane in the intra-anesthesia phase can cause hypotension, which requires close hemodynamic monitoring. Careful anesthesia management, including dose adjustment and monitoring, is important to prevent complications and ensure patient safety.

1 Introduction

Thyroid cell carcinoma is a malignant illness affecting the thyroid cells of the parenchyma. The thyroid parenchyma is made up of two main types of cells. Follicular cells found in the thyroid cause differentiated thyroid cancer (DTC), while parafollicular cells, sometimes known as C-cells, cause medullary thyroid cancer. DTC, which encompasses papillary thyroid cancer (PTC), follicular thyroid carcinoma (FTC), and Hurtled cellular carcinoma, accounts for between 90 and 95% of all thyroid cancers. MTC contributes to roughly 1-2%, while anaplastic tissue thyroid carcinoma account for just under one percent of all thyroid malignancies (1).

The World Health Organization (WHO) reports that, with 586,202 cases, thyroid cancer ranks 7th most of all cancers worldwide in 2020. According to Purnajaya et al., (2024) In 2020 in Indonesia, thyroid cancer ranks 12th of all cancers, with 13,114 cases and 2,224 deaths, then there are about 1,100 cases of thyroid cancer found in West Java, ranking highest after South Sumatra and Central Java (2).

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The body's circulatory system and nervous system are affected by hyperthyroidism (increased thyroid hormones) which causes high blood pressure and a higher than normal pulse frequency (tachycardia). thyroid cancer contributes to increased blood pressure through several mechanisms associated with impaired thyroid gland function, especially in cases of hyperthyroidism. Atherosclerotic changes resulting from lipid abnormalities due to thyroid dysfunction also affect blood vessels and can cause high blood pressure (3).

Women have up to 5% of palpable nodules in their thyroids, whereas men had 1%. Conversely, excellent quality ultrasonography of the head and the thyroid gland can reveal thyroid nodules in approximately 19% to 68% of persons, but they are more common in women and older adults (4).

Non-communicable diseases (NCDs) are the leading cause of death globally (5). Hypertension is one of the biggest public health issues and is commonly called a silent killer because the signs or symptoms are difficult to detect. Hypertension increases the risk of cardiovascular disease, such as heart attacks, strokes, and kidney disease (6). Hypertension is a chronic medical condition that requires surgical management due to the risk of cardiovascular disease, currently the number one cause of death by 2030 (7). Perioperative and in-patient care focuses on controlling the history of uncontrolled hypertension. Once hypertension is under control, surgery can be performed. Perioperative and in-patient care focuses on reducing intracranial symptoms. If the cause and location of the haemorrhage are known, surgery is performed to reduce the pressure on the brain and remove the blood clot (6). Intraoperative measures are aimed at removing the thyroid cancer cells, with regular monitoring of vasodilation after induction. The use of GA techniques in patients by considering the duration of surgery, the location of surgery shown by the examination (anything that supports) and monitoring and effects in the use of drugs and general anaesthetic agents so that tyrpidectomy can be performed (8).

The results of this scientific paper publication are expected to add references that support theoretical and applicative understanding in the development of anesthesiology nursing and perioperative nursing. For Nurse Anesthetists With this scientific paper publication, it is hoped that it can increase understanding of comprehensive anesthesiology nursing care so that it can provide appropriate anesthesiology nursing interventions to reduce complications and postoperative mortality rates. For Hospital Agencies The results of this scientific publication paper can be useful for hospital agencies to improve the quality of service in hospitals in providing anesthesiology nursing management in thyroid cancer patients with uncontrolled hypertension. For Further Research The results of this scientific publication paper can be useful for future researchers to develop research with statistically better methods with the number of observations not only in single patients, but the number of observations in patients with cases of thyroid cancer patients with uncontrolled hypertension is more and more comprehensive.

2 Method

This research uses an observational method through a single case study approach. The subject was a 57-year-old male patient who was diagnosed with thyroid cancer and had a history of uncontrolled hypertension. Data collection was comprehensive and longitudinal, covering three phases: pre-anesthesia, intra-anesthesia and post-anesthesia. Questions were collected through various means, namely through a thorough physical examination, medical history, and regular monitoring of vital signs. Anaesthesia protocols are drawn up with the patient's health condition in mind, including the selection of appropriate anaesthesia techniques and strict management of blood pressure during the intra-anesthesia procedure. Postoperative monitoring is performed to evaluate vital signs and provide appropriate pain management, as well as follow-up to ensure optimal management of hypertension. This process is carefully

conducted, data collection is done preoperatively, during intra anaesthesia and during post anaesthesia. This method aims to understand the challenges faced in peri anaesthesia in patients with complex medical conditions. Physical examination method B6. B1 (breathing) is an assessment of the respiratory organs. B2 (blood) is an assessment of organs related to blood circulation, namely the heart and blood vessels. B3 (brain) is a physical assessment of consciousness and sensory perception function. B4 (bladder) is an assessment of the urological system. B5 (bowel) is an assessment of the digestive system. B6 (bone) is an assessment of the muscoloskeletal and integumentary systems.

3 Case History

A 57-year-old man weighing 54 kg came with complaints of a lump on the right neck that had enlarged about 1 month ago by 4 cm and was painful especially when swallowing. The findings of the Provocating/Palliative, Qualitative, Region, Severity, Time (PQRST) pain assessment were pain when swallowing, dull pain in the neck region but not spreading. Moderate pain with a pain scale of 4 using the Numeric Rating Scale (NRS) with intermittent intensity. Another complaint felt by the patient is the feeling of dizziness that has arisen since 1 month ago. Based on the history of clinical examination and radiological findings he was diagnosed with papillary thyroid carcinoma.

Examination of anaesthesia focus data on the assessment of Allergies, Medications, Past Illness, Last Meal, Environments (AMPLE) found that the patient did not have allergies to food, drinks and medicines. The patient has a history of uncontrolled hypertension by not taking anti-hypertensive drugs, and the patient has no history of previous surgery and anaesthesia. The patient was satisfied to eat and drink for 8 hours before surgery. The patient was a light smoker with a consumption of 5-8 cigarettes per day. The patient was classified as American Society of Anesthesiologists (ASA) Physical Status III.

Preoperative evaluation showed haemodynamic blood pressure 210/105 mmHg, HR 110x/min, MAP 150 mmHg, Spo2 98% and temperature 36.5°C. Airway assessment in this patient from external examination found a mass on the right neck of 4 cm and minimal tracheal deviation to the left, from 3- 3-2 evaluation: the patient can open the mouth more than 3 fingers, the distance between the tip of the mentum and the mandibular-neck junction is 3 fingers and the distance between the mandibular-neck junction and the thyroid notch is 2 fingers. The patient's Mallampati Score is in category I. On obstruction examination, there was obstruction in the form of thyroid swelling, and good neck mobility. Physical examination of the lungs found vesicular breath sounds, sonorous lung percussion. On electrocardiography examination, sinus tachycardia was found (Figure 1). Several laboratory examinations showed results including Haemoglobin (13.1 g/dL), Erythrocytes (4.25 Jt/uL), Leukocytosis (10,990 /cmm) . There were no abnormalities on thorax examination. Thyroid ultrasound examination revealed multiple irregular border solid nodules in the right thyroid, cystic nodules with solid component with irregular border solid component in the right coli ec. Suspected metastasis DD. KGB enlargement (Figure 2).

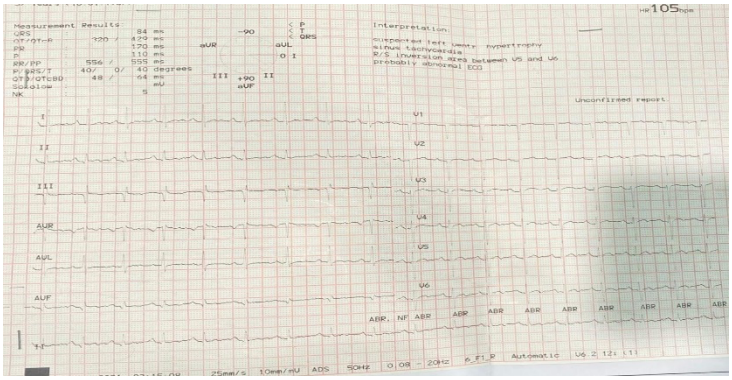

Fig.1 The examination results showed sinus tachycardia with a heart rate of 105 bpm.

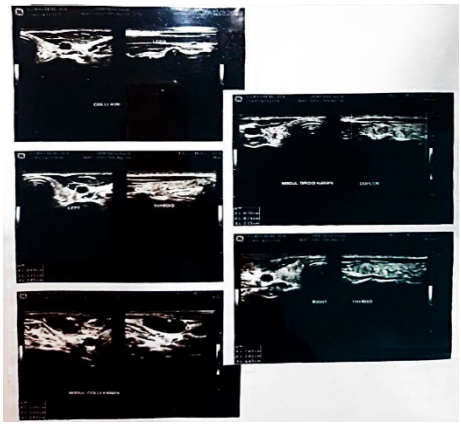

Fig.2 Thyroid ultrasound reading showed suspected DD metastasis of KGB enlargement

Patients are also asked to provide written informed consent regarding the anaesthetic procedure to be carried out. These steps are taken to minimise the risk of aspiration and ensure the patient receives adequate information about the anaesthetic procedure and potential associated risks. Pre-induction assessment was performed by monitoring vital signs, fluid therapy, and smooth intravenous (IV) access to the distal manus sinistra using an 18G IV catheter with a lactated ringer infusion of 20 drops/minute. In the pre-induction assessment, the patient was premedicated with midazolam 4mg per IV to reduce anxiety and lower blood pressure before intubation. After giving midazolam 4mg per IV, the patient's blood pressure decreased to 198/90 mmHg.

STATICS as anaesthesia instrument was prepared with stethoscope, macintosh type laryngoscope size 04, endotracheal tube (ETT) king king type size 7.0, Oropharyngeal Airway (OPA) size 3, tape or plaster as much as 2 with a length of 20cm, introducer, suction hose size 10. In the intra-anesthesia phase the patient is positioned supine and then induced IV fentanyl 100 mcg, IV propofol 100 mg and IV atracurium 25 mg, after the patient is sedated then the triple manoeuvre airway management intervention (head tilt-chin lift and jaw trust) and then given 100% positive pressure pre oxygenation for approximately 3 minutes until there are signs of PRST, namely pressure (blood pressure), Rate (pulse), Sweating (tears), Tears (sweat), after obtaining sufficient depth of anaesthesia, then

intubation was performed and no difficulties were found. The patient had a 7.0 ETT installed, mechanical ventilation with breath control Maintenance inhalation Isovoflurance MAC 2%; N20 2 lpm and O2 2 lpm. During intra anaesthesia, 2,000cc lactated ringer fluid therapy was given. At the time of intra anaesthesia, the patient was found to be hypotensive with a blood pressure of 80/56 mmHg so collaboration was made to administer ephedrine 10-60 mg per IV within 30 minutes, then collaboration was made to administer atracurium 5mg per IV every 30 minutes to keep the patient relaxed.

The operation was performed for 4 hours. Weaning was done when the operator was seen suturing the fascia. Neostigmin 0.5mg and Atropine sulfate 0.25mg were administered simultaneously via IV. The patient was extubated conscious after adequate spontaneous breathing was obtained and then observed in the hospital. In the recovery room, the patient's consciousness, blood pressure, pulse frequency, and oxygen saturation were monitored. The patient received oxygen through the nasal cannula at a rate of 3 liters per minute, the patient was given tramadol 100mg drip and was given analgesic ketorolac 30mg per IV to reduce postoperative pain, along with the administration of antiemetic ondansetron 4mg per IV to prevent nausea and vomiting. After 30 minutes of observation, the patient's hemodynamics were assessed as good and there were no signs of airway obstruction and obtained an Aldrete score of oogenation 2, respiration 2, circulation 2, consciousness 2, activity 2 with a total score of 10, which means the patient can be transferred to the treatment room. In the treatment room there were no complaints, which meant that the patient could be discharged on the 3rd postoperative day.

4 Discussion

Clients in thyroid disease that require operation should be appropriately assessed by collecting a medical past history; a physical exam, testing in the laboratory, and imaging investigations seek to clarify and verify assessment hypotheses to help the selection of an acceptable surgical tackle and extending the procedure to be performed (9).

Thyroid cancer develops from thyroid gland cells and is classified into four histopathological types: a papillary, follicular, medullary or, and indeterminate. It is a prevalent kind of cancer that may usually be treated if caught early. While the outcome varies according to the kind of cancer and stage, epithelial and follicle cancers of the thyroid often have a better prognosis than medulla and undifferentiated malignancies. Thyroid cancer has a good life expectancy rate, with more than 98% of patients living for less than 5 years after diagnoses. In some circumstances, advanced or metastasis cancers of the thyroid, including anaplastic thyroid cancer (ATC) and poorly diagnosed the thyroid gland cancer, might develop (10).

The gland that houses the thyroid is an endocrine gland that produces thyroid hormone, which serves a variety of functions in the body. Both of of these conditions cause a broad range of symptoms, therefore thyroid deficiency is considered an alternative diagnosis for a similar set of symptoms. The thyroid gland lies in the front of the neck, in the middle layer of the deep cervical fascia. The carotid artery borders the gland laterally, the pretracheal ligament and tracheal posteriorly, and the connective muscles anteriorly. The thyroid isthmus connects the left and right thyroid lobes in the midline, which are anterior and lateral to the trachea. Most patients' pretracheal fascia connects to the thyroid gland between the second and third tracheal rings (11).

The body's circulatory system and nervous system are affected by hyperthyroidism (increased thyroid hormones) which causes high blood pressure and a higher than normal pulse frequency (tachycardia). thyroid cancer contributes to increased blood pressure through several mechanisms associated with impaired thyroid gland function, especially in cases of hyperthyroidism. Atherosclerotic changes resulting from lipid abnormalities due to thyroid

dysfunction also affect blood vessels and can cause high blood pressure. Hyperthyroidism is an endocrine gland disorder that can cause many problems, including high blood pressure. Treating hyperthyroidism can help regulate one's blood pressure. Between 36% and 59%Trusted Source of hyperthyroidism sufferers also have high blood pressure, or hypertension. Untreated hyperthyroidism can lead to thyroid storm, a rare life-threatening complication.may cause reliable sources a person to have a hypertensive crisis. This is dangerously high blood pressure (3).

In this patient with a history of uncontrolled hypertension for 2 years classified as ASA III status, thyroidectomy surgery using general anaesthesia will be performed. Uncontrolled hypertension increases the perioperative risk of thyroidectomy surgery using general anaesthesia. General anaesthesia is a medically induced loss of consciousness with concomitant loss of protective reflexes. Various drugs may be prescribed to cause loss of consciousness, memory loss, analgesia, skeletal muscle relaxation, and loss of autonomic nervous system reflexes. In this condition, the patient cannot be awakened by verbal, tactile, or pain stimuli (12). Furthermore, the patient's clinical status raises the risk of cardiovascular problems characterized by haemodynamic instability during anesthesia. Evidence suggests that the presence of hypotension or hypertension during GA is an independent factor influencing postoperative patient outcomes. Haemodynamic alterations (mainly hypotension) are common following GA induction and prior to surgical incision. Even brief bouts of hypotension can cause tissue hypoperfusion and consequences that can increase postoperative morbidity and death (13). The illustration above illustrates how the authors classify the patient as ASA III.

On pre-anesthetic assessment, the patient complained of fear characterised by tachycardia. Fear is a form of An adaptive emotional reaction to potentially hazardous conditions. The sympathetic nervous system regulates involuntary body activities include blood pressure, heart rate, respiration rate (thyroid function), motility of the gut, and cardiac output (14). These symptoms can be managed with premedication, one of which was implemented in this case, the patient was given midazolam 4mg per IV collaborative intervention. Short-acting benzodiazepines have anxiolytic, hypnotic, anticonvulsant, muscle relaxant, and anterograde amnestic effects. The administration of midazolam is in line with research conducted by Marzuki, M.S., et al (2022) with the results of this study found that there was an effect of midazolam administration on reducing systole and diastole blood pressure in premedication, The decrease in blood pressure can be caused by the vasodilating effect of midazolam which causes disruption of transmembrane Ca (15).

In the intra-anesthesia phase, the patient was positioned supine and then induced IV fentanyl 100 mcg, IV propofol 100 mg and IV atracurium 25 mg, and intubated with an ETT without any intubation difficulties, collaborative intervention was carried out by administering atracurium 5 mg intravenously and carried out every 30 minutes (16). here are numerous anaesthetic formulations available, including intermittent injection of the muscle relaxant atracurium and fluid treatment to maintain intraanesthetic haemodynamic stability. Atracurium is a nondepolarizing neurological and muscular block from the benzylisoquinolinium category. Atracurium is used as an adjuvant to general anesthesia in order to aid with endotracheal intubation and relaxation of skeletal muscles in surgery and mechanically breathing. Atracurium stimulates histamine release, causing bronchospasm, hypotension, and tachycardia due to peripheral vasodilation (17). Another intra-anesthesia complication is blood pressure monitoring because the patient is hypotensive.

Hypertension is generally asymptomatic and can be detected during routine blood pressure tests or during clinical evaluation for other diseases or surgical plans. Clinical evaluation of hypertensive patients should include assessment of overall cardiovascular risk and comorbidities with hypertension as a risk factor (18). Since the 1950s, uncontrolled hypertension has been linked to poor perioperative outcomes. Patients with uncontrolled

hypertension who undergo anaesthesia have a higher risk of complications such as myocardial ischaemia, whereas patients with uncontrolled preoperative hypertension have a higher risk of perioperative cardiovascular death, which is strongly linked to renal dysfunction and cerebrovascular disease. Diastolic hypertension is linked to higher postoperative mortality, and high pulse pressure before to surgery is linked to an increased risk of myocardial injury, even when systolic blood pressure is controlled. There is minimal data on the degree of hypertension and the risk of perioperative mortality, but it is hypothesized that systolic blood pressure <180 mmHg or diastolic blood pressure <110 mmHg (i.e., stage 1 or 2 hypertension) may have a lower risk of perioperative complications compared to patients with hypertension (19).

In this case the administration of the volatile agent Isoflurane causes minimal cardiac depression and thus maintains oxygen through increased heart rate due to partial preservation of the carotid baroreflex. However, there is a drop in blood pressure due to decreased systemic vascular resistance (20). Isoflurane must be administered with caution depending on the patient's hemodynamics, as it might cause a fast drop in blood pressure due to dose-dependent vasodilation of the peripheral vessels. Hypovolemic patients may be particularly susceptible to this impact (20).

In post-anesthesia the patient was monitored for haemodynamic stability and transferred to the treatment room, the patient could be transferred to the treatment room because the haemodynamic status was stable and the aldrete score was 10, the appropriate recovery phase is when the Aldrete score has reached a score >9 at 60 minutes or less than 60 minutes which means that the recovery phase is good and the patient does not experience prolongation of the recovery process(21). in the treatment room there was a collaborative intervention of analgesic drugs, namely ketorolac 30mg per IV if the patient felt pain and antiemetic, namely ondansetron 4mg if the patient complained of nausea and vomiting.

5 Conclusion

In the case of peri-anesthesia of thyroid cancer patients with hypertension, the use of intravenous midazolam is effective in managing pre-anesthesia anxiety. However, during the intra-anesthetic phase, administration of isoflurane at deep doses causes hypotension, which needs to be addressed by close haemodynamic monitoring. Careful anaesthesia management, including dose adjustment and careful monitoring, is essential to reduce the risk of complications and ensure patient safety during the procedure. Appropriate management of factors such as anxiety, hypertension and anaesthetic side effects can improve clinical outcomes in patients with complex conditions. The post-anesthetic prognosis in patients with thyroid cancer accompanied by hypertension depends on the management of both conditions. Thyroid cancer may increase the risk of surgical complications such as bleeding or injury to neighbouring organs, while uncontrolled hypertension may worsen the risk of cardiac and vascular complications after surgery. Good blood pressure control before and after the procedure is essential to reduce such risks. Overall, with proper management of both thyroid cancer and hypertension, the post-operative prognosis can be good, although unexpected complications may prolong recovery.

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