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Risk factors in perioperative anesthesia management in multiple thyroid nodule surgery



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ABSTRACT

Introduction: Thyroid nodules are the most common endocrine disorders (endocrine neoplasms). Conducting regular physical examinations in risk factors of thyroid nodules is essential. This case report aims to describe how multiple thyroid nodules could be why muscle relaxant administration was repeated in this patient in a short time.

Case Presentation: A 39 years old female, with clinical complaints of a lump in her neck. Right colli anterior region, fine needle aspiration biopsy (FNAB) gives a result the impression of cytomorphological picture is suspicious for papillary thyroid carcinoma. And the thyroid ultrasound examination results found the Impression of Single solid nodule with calcification

on the right thyroid, multiple cystic nodules on the left thyroid, and bilateral multiple non-specific colli lymphadenopathy. The patient underwent total thyroidectomy, using General Anesthesia, with the muscle relaxant used, namely rocuronium, which was then carried out with a maintenance dose 3 times intraoperatively because the patient's spontaneous breathing returned while the operation was still in progress, after which the patient was transferred to the recovery room for post-operative monitoring.

Conclusion: Multiple thyroid nodules could be the reason why muscle relaxant (rocuronium) administration was repeated in this patient in a short time.

Keywords: nodules, total thyroidectomy, rocuronium, spontaneous breathing, general anesthesia.

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INTRODUCTION

Nodules in the thyroid gland, solitary or multiple, are common in clinical practice. Thyroid nodules are detected in approximately 5-7% of adults upon physical examination. Since modern ultrasound (US) techniques can detect small nodules, the frequency of thyroid nodules has been reported as high as 67% in unselected subjects.¹ Thyroid nodules are clinically important because they can represent thyroid cancer, which occurs in approximately 10-15% of nodules.²

Thyroid nodules occur more often in women, where the incidence rate in women is about three to four times higher than in men.^{3,4} The cause of this difference is still unknown. Still, it is suspected that metabolic parameters and the effects of the hormone estrogen play an essential role in the incidence of thyroid nodules.⁴

The initial evaluation in all patients with a thyroid nodule includes a detailed history and physical examination assessing risk factors, serum thyroid stimulating

hormone (TSH) measurement, and neck ultrasonography to determine the size and suspicious characteristics. Fine needle aspiration biopsy is an accurate and cost-effective way to evaluate thyroid nodules. Patients with benign nodules are usually followed without surgery. Patients with cytology suggesting cancer should be referred for surgery.⁵

CASE PRESENTATION

A woman, 39 years old, was referred to Wangaya General Hospital with clinical complaints of a lump in her neck more or less 5 months ago. The lump was getting bigger, and she felt no pain. To give a definitive diagnosis and evaluate whether the lumps may represent malignancy the surgeon to determine when surgery is indicated. Ultrasound was preferred for imaging modality, and the ultrasound-guided Fine needle aspiration biopsy (FNAB), was the preferred method of tissue sampling. Cytology FNAB examination shows the cytomorphological picture is

suspicious for papillary thyroid carcinoma. A thyroid ultrasound was performed on the patient, and examination results found a single solid nodule with calcification on the right thyroid, multiple cystic nodules on the left thyroid, and bilateral multiple non-specific colli lymphadenopathy.

The patient underwent total thyroidectomy, using general anesthesia with a nasotracheal tube (GA-NTT) surgical technique with induction using propofol 200 mg, and sevoflurane 3 MAP. Stable hemodynamics intra-operatively. At the time of surgery, the initial dose of muscle relaxant of rocuronium was used, 40 mg, 40 minutes later, the patient spontaneously breathed again, and another dose of 10 mg was added because the operation was long. Thirty-five minutes later, the patient's breathing returned spontaneously, and 10 mg of rocuronium was repeated. Thirty minutes later, the patient spontaneously breathed again, and another dose of 10 mg was added and the dose outlast until the operation was complete and the patient

was ready for transfer to the recovery room. Postoperatively, the patient was given analgesics in the form of Fentanyl 300 mcg + normal saline 50 cc in a syringe pump, ketorolac 3 times 30 mg IV, and paracetamol 3 times 1 gram.

DISCUSSION

Thyroid hormone regulates metabolic processes, so they continue running normally in adults. Metabolism that is influenced by thyroid hormone is as thermoregulation, protein metabolism, carbohydrate metabolism, lipid metabolism, vitamin A metabolism, creatinine phosphate metabolism. If there is a disturbance in the production process, this can cause various disturbances in various metabolisms and body physiology.⁶

Studies have identified that age, female, gender, and diabetes are positively associated with thyroid nodule risk, and a high level of low-density lipoprotein cholesterol (LDL-C) cholesterolemia is more likely to be associated with multiple thyroid nodules.^{7,8}

Rezzonico et al. found that insulin is a growth factor for the thyroid gland; therefore, high levels of insulin in the blood circulation can promote the proliferation of thyroid cells through the insulin receptor, leading to thyroid nodules.⁹ Kimura et al. showed that insulin-like growth factor (IGF-1) can stimulate the proliferation and differentiation of thyroid cells, which partially explains the high prevalence of thyroid nodules in diabetic patients.¹⁰ Jornayvaz et al. found that insulin resistance can cause an increase in body fat, making excessive adipose tissue release non-lipidized fatty acids. Excessive fatty acids will enter the liver to induce fatty liver. The incidence of fatty liver is related to insulin resistance, which correlates with thyroid nodules. Therefore, in future health checkups, thyroid ultrasound screening should be performed, especially in men with diabetes and central obesity and elderly women with fatty liver.¹¹

Fine needle aspiration biopsy (FNAB) used in this case is the most important step in the workup of the thyroid nodule, as cytology is the primary determinant in whether thyroidectomy is indicated. Ultrasonography is the imaging study of choice for the reason that. It can identify

nodules too small to be palpated, the presence of multiple nodules, central, or lateral neck lymphadenopathy, and provides accurate measurements of nodule diameter for interval monitoring. Solid appearance (or hypoechogenicity), increased vascularity, microcalcifications, irregular margins, and the absence of a halo are features that have been consistently associated with malignancy.¹²

In this case, multiple thyroid nodules could be the reason why muscle relaxant administration was repeated in this patient in a short time. The dose-response relationship commonly expresses drug potency. The dose of a neuromuscular blocking drug required to produce an effect (e.g., 50%, 90%, or 95% depression of twitch height, commonly expressed as ED50, ED90, and ED95, respectively) is taken as a measure of the potency of neuromuscular.¹³

The dose-response relationship of the non-depolarizing neuromuscular blocking drug used in this case report is Intermediate-acting Rocuronium. Based on studies of the pharmacodynamic effects of the non-depolarizing neuromuscular blocker of steroidal compounds is rocuronium with isoflurane anesthesia using a recommended intubating dose of 0.6 mg/kg body weight, has a clinical duration of 37 minutes (250). Meanwhile, a 0.9 mg/kg body weight has a clinical duration of 53 minutes.¹⁴

Meanwhile, in this case, the muscle relaxant rocuronium was used with isoflurane and propofol anesthesia with an initial dose of rocuronium for intubation of 0.73 with a clinical duration of 40 minutes. However, in this case report, the patient required repeated administration of rocuronium earlier due to signs of spontaneous breathing at the 40th perioperative minute. Despite the effect Inhaled anesthetics potentiate the neuromuscular blocking effect of nondepolarizing neuromuscular blockers. This potentiation results mainly in a decrease in the dosage requirement of the neuromuscular blocker and prolongation of both the duration of action of the relaxant and recovery from neuromuscular blockade.¹⁵

Although multiple thyroid nodules can reduce carbohydrate, fat, and protein

metabolism so that they can affect the potential effect of anesthesia drugs, several conditions can affect the elimination of muscle relaxant drugs. In addition to the pharmacodynamics of the individual neuromuscular blocking agents, factors such as timing of anticholinesterase administration, dose of anticholinesterase, concomitant medications, electrolyte abnormalities, and hepatic or renal disease can influence the degree of reversal.¹⁶

Only pancuronium, vecuronium, and rocuronium are metabolized to varying degrees by the liver. Vecuronium and rocuronium depend heavily on biliary excretion. Clinically, liver failure prolongs blockade. The kidneys partially excrete pancuronium, vecuronium, and rocuronium. Renal dysfunction does not significantly affect the duration of action of rocuronium and mivacurium.^{15,16}

So it is important to carry out investigations regarding risk factors for thyroid nodules, especially in women and elderly patients, in these patients, no cholesterol investigations are carried out, considering that Fatty liver is the highest risk factor in women associated with thyroid nodules.

CONCLUSION

Age, Female, Gender, and diabetes are positively associated with thyroid nodule risk, and high LDL cholesterolemia is more likely to be associated with multiple thyroid nodules. Multiple thyroid nodules could be the reason why muscle relaxant administration was repeated in this patient in a short time. So it is important to carry out investigations regarding risk factors for thyroid nodules, especially in women, and elderly patients.

CONFLICT OF INTEREST

The author declares that they have no competing interest.

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ETHICAL APPROVAL

The patient had received signed written informed consent regarding publication of medical data in scientific medical

journal with confidentiality to personal information.

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