

The effect of the type of thyroidectomy on the incidence of hypothyroidism

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ABSTRACT

Background: Thyroidectomy is the surgical removal of part or all of the thyroid glands. Thyroidectomy is performed to treat thyroid disease which can be in the form of enlargement of the thyroid glands and thyroid cancer. Thyroidectomy is performed to help cure the patient's disease, but after thyroidectomy, there is still the possibility of post-operative complications. One of the common complications that can occur is hypothyroidism. The type of thyroidectomy surgery that generally results in hypothyroidism is near-total or total thyroidectomy.

Methods: An analytic observational study with a cross-sectional design was carried out at PKU Muhammadiyah Gamping Hospital. A total of 50 people who had thyroid problems or diseases and had undergone thyroidectomy surgery were included in the samples. The inclusion criteria for this study were patients aged 20–80 years, with hyperthyroidism or euthyroidism, both outpatients or inpatients. Patients with hypothyroidism and those with thyroid disease are excluded from this study. The research data were analyzed with the Fisher exact test.

Results: Majority of the sex of subjects in this study were female. Most of the subject age groups in this study were in the 20–50 year age group. Hypothyroid complications occur in 8% of subjects. The results of bivariate analysis obtained a significant value $p = 0.011$ ($p < 0.05$) for near-total thyroidectomy and isthmolobectomy.

Conclusion: The type of thyroidectomy has a relationship with the occurrence of postoperative hypothyroidism.

Keywords: Hypothyroidism, isthmolobectomy, near-total thyroidectomy.

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INTRODUCTION

The thyroid gland can enlarge due to a variety of physiological or pathological stimuli. The enlargement of the thyroid gland, called goiter can be physiological, such as during adolescence and pregnancy. Goiter can be associated with euthyroidism, hypothyroidism, or hyperthyroidism. Clinically, it can be diffuse, nodular, or multinodular.¹ Thyroid nodules are very common and some of these nodules may finally become malignancy. Multinodular goiter (MNG) disease without thyroid dysfunction (whether lower or higher) is defined as non-toxic MNG.² It is not due to inflammation or neoplasia. Abnormalities of iodine supplies or metabolism always lead to nontoxic goiter.³

Malignant neoplasms represent around 1% of all malignant tumors and are the most common endocrine neoplasms. Thyroid nodules present a malignancy prevalence of 5 to 15%.⁴ That is why TMNG needed treatment. These depend on patient preference, symptoms, nodule

volume, comorbidities, speed of recovery, side effects, and cost. The options for treatment for TMNG are radioiodine ablation and surgery. Thyroidectomy is generally the preferred treatment because it resolves both toxic and compressive symptoms.⁵ Thyroidectomy is carried out to help cure the patient's disease, but after thyroidectomy, there is still the possibility of post-operative complications occurring. One of the common complications that can occur is hypothyroidism.⁶

The removal of the thyroid gland causes the patient to experience a decrease in thyroid hormone production, which triggers the patient to become hypothyroidism. There are two types of surgery, those are total thyroidectomy (TT) and subtotal thyroidectomy. Hemithyroidectomy is a widely used and relatively safe procedure. There are subsequent major complications such as incidental parathyroidectomy during thyroid resection, postoperative hemorrhage, hypocalcemia, and recurrent laryngeal nerve injury. Those can threaten

the postoperative quality of life of patients.⁷ Total and near-total thyroidectomy are two commonly used surgical methods in clinics.⁸

The incidence of postoperative hypothyroidism associated with bilateral total (HR, 4.27; 95% CI, 3.32–5.50), one-side total, and another subtotal (HR, 3.16; 95% CI, 2.59–3.86), bilateral-subtotal (HR, 1.65; 95% CI, 1.37–1.98), and unilateral-total (HR, 1.17; 95% CI, 0.95–1.44) surgical procedures.⁹ The prevalence of hypothyroidism following thyroid lobectomy (including hemithyroidectomy with isthmusectomy) is reported to range between 6.5% and 45%. Published literature shows considerable heterogeneity regarding risk factors for developing hypothyroidism following different types of thyroid lobectomy.¹⁰ Hypothyroidism can cause fatigue, lethargy, cold intolerance, weight gain, constipation, voice changes, and dry skin and can lead to increased vascular resistance, decreased cardiac output, decreased left ventricular function, and changes in some markers of

cardiovascular contractility. Indications for the type of thyroidectomy surgery performed on patients are based on the size of gland dilation experienced by the patient.¹¹

The conventional open approach to thyroidectomy, initially proposed by Theodore Kocher in the late 1800s, leaves a neck scar that is associated with great concern.¹² Thyroidectomy surgery is classified based on the part removed and the number of parts taken. There are four types; lobectomy, the removal of a lobe of the thyroid. Operations were performed with indications to treat unilateral goiter or adenoma;¹³ isthmusectomy, and removal of the isthmus from the thyroid. Operations were performed with indications for treating multinodular goiter;¹⁴ near-total thyroidectomy, removal of almost the entire thyroid gland leaving <1g of thyroid tissue, surgery indicated for the treatment of toxic;¹⁵ total thyroidectomy, the removal of the entire thyroid gland. This operation is performed with indications for treating carcinoma of the thyroid gland.¹⁶

MATERIAL AND METHODS

This was a large-scale, cross-sectional analytical study and measures variables simultaneously. A total of 50 people who had thyroid problems or diseases and had undergone thyroidectomy surgery were included in the samples. This study employed a sapling method of total sampling, hence the calculations of samples not needed. In December 2022, data collecting took place at the PKU Muhammadiyah Gamping Hospital in Yogyakarta, Indonesia. By perusing the patient's medical file, information was gathered. The inclusion criteria for this study were patients aged 20–80 years, with hyperthyroidism or euthyroidism, who were outpatients or inpatients at PKU Muhammadiyah Gamping Hospital in Yogyakarta, Indonesia. Patients with hypothyroidism and those with thyroid disease are excluded from this study. There were two kinds of operation; isthmulobectomy and total thyroidectomy. The variables included in this study were gender, age, type of operation, and the occurrence of complications.

All variables are analyzed by univariate statistics. Bivariate analysis was carried

out by chi-square analysis or Fisher exact test to observe the effect of the type of thyroidectomy on the incidence of hypothyroidism. Data were analyzed with significance level set at $p < 0.05$.

RESULTS

The majority of the sex of subjects in this study were female with a total of 42 subjects (84%), while the male subjects were 8 (16%). Most of the subject age groups in this study were in the 20-50 year age group (21 subjects, 42%), while 29 subjects (58%) in the 51-80 year age group. The subjects which underwent isthmulobectomy operation were 42 subjects (84%), while the subjects who underwent near-total thyroidectomy surgery were 8 subjects (16%). The subjects in this study who experienced hypothyroid complications were 4 subjects (8%), while the subjects who did not experience hypothyroid complications were 46 (92%) (Table 1).

Table 2 showed that subjects who underwent near-total thyroidectomy experienced more hypothyroid complications compared with subjects with isthmolobectomy surgery.

Subjects who experienced hypothyroid complications after undergoing total thyroidectomy were 3 subjects (6%), while subjects who experienced hypothyroidism after undergoing isthmulobectomy were 1 subject (2%). The p value was 0.011 ($p < 0.05$), which showed that the type of surgery has a relationship with hypothyroid complications.

DISCUSSION

Based on the gender of subjects included in this study, most of the subjects were female. The findings of this study demonstrated that female individuals got thyroidectomy surgery at a higher rate than male subjects. The outcomes are consistent with a Taiwanese study that found more female patients had thyroidectomy surgery. The findings did not support previous studies that found male subjects to be more dominant than female individuals.¹⁷ The subjects were classified into two age groups; 20 - 50 years and 51 - 80 years. The findings of this study demonstrated that more patients in the age group of 51 to 80 age underwent thyroidectomy surgery, compared to the

Table 1. Demographic characteristics of subjects

Variables	n	%
Sex		
Man	8	16%
Woman	42	84%
Age group		
20 - 50 years	21	42%
51 - 80 years	29	58%
Operation type		
Isthmulobectomy	42	84%
Near-total thyroidectomy	8	16%
Complications		
Hypothyroid	4	8%
Not Hypothyroid	46	92%

Table 2. Bivariate analysis of operation type with the occurrence of complications

Operation Type	Complications		Total	p value
	Hypothyroid	Not hypothyroid		
Isthmulobectomy, n (%)	1 (2)	41 (82)	42 (84)	0.011
Near total thyroidectomy, n (%)	3 (6)	5 (10)	8 (16)	
Total, n (%)	4 (8)	46 (92)	50 (100)	

20 to 50 age group. The outcomes did not in line with a study from Egypt, in which patients between the ages of 25 and 50 were more prevalent than those between 51 and 75 (15).¹⁵

This study found a relationship between the type of surgery with the occurrence of hypothyroid complication, with a p value of 0.011. The findings demonstrated that total thyroidectomy patients had a higher incidence of hypothyroidism than isthmolobectomy patients. The findings are consistent with literature showing a low overall prevalence of hypothyroidism following thyroid gland surgery.⁹ These findings contradict the prevalence of hypothyroidism, which was shown to be about 1 in 5 individuals.¹⁸ After a near-total thyroidectomy, hypothyroidism is a frequent long-term side effect.¹¹

The type of thyroidectomy surgery carried out on the patients in this study revealed that many underwent isthmolobectomy as opposed to near-total thyroidectomy. This is because geographically, patients in Indonesia tend to have thyroid disease toward the struma, cystic goiter, where isthmolobectomy is sufficient for handling, and with the choice of this operation, the risk of postoperative hypothyroidism is low. Foreign patients tend to have thyroid illness toward nodules and goiters and are typically treated with thyroidectomies that are almost total or even whole, which increases the chance of developing hypothyroidism after surgery. After downstaging, surgery may be chosen for locally advanced illnesses.¹⁹ The entire tumor must be removed, not just the bulk of it.^{20,21}

Hypothyroidism that occurs in postoperative patients is caused by reduced or cessation of thyroid hormone.¹⁷ Blood tests that assess the levels of TSH and thyroid hormone can detect hypothyroidism following thyroid surgery because, in the general condition of hypothyroidism, TSH is elevated and thyroid hormone is lowered.^{22,23}

Although hypothyroidism cannot be cured, almost all patients can regulate it. Treatment options for thyroid hormone management include hormone replacement therapy, which replaces the hormone that the thyroid cannot produce on its own to bring T4

and TSH levels back to normal. When the diagnosis of persistent thyroid hormone insufficiency is confirmed,²⁴ lifelong thyroid hormone medication (replacement therapy) is required. For patients with hypothyroidism, the LT4/LT3 combination therapy is not currently supported by enough clinical data.²⁵ This study is also subject to several limitations. The limitation of this study was not observing the long-term complication of hypothyroidism. Therefore, it is suggested that future studies analyzed this limitation in the study.

CONCLUSION

The incidence of postoperative hypothyroidism is influenced by the type of thyroidectomy surgery undertaken. The type of near-total thyroidectomy significantly caused postoperative hypothyroidism.

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ETHICAL STATEMENT

This study has been approved with the research ethical clearance number : No.190/KEP – PKU/XII/2022.

CONFLICT OF INTEREST

There is no conflict of interest.

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AUTHOR CONTRIBUTION

All authors have contributed to this research process, including preparation, data gathering, analysis, drafting, and approval to publish this manuscript.

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