ORIGINAL RESEARCH

Investigation of the complication in patients undergoing total thyroidectomy after a hemithyroidectomy for thyroid nodule with indeterminate cytology

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ABSTRACT

Background: The question of whether individuals who receive a complete thyroidectomy following a hemithyroidectomy for a thyroid nodule with an ambiguous cytology are at the same or lower risk of complications as those who undergo primary thyroid surgery remains unsettled. **Objective:** To evaluate the rate of complications in this patient group, especially in patients who are having a complete thyroidectomy following a hemithyroidectomy for a thyroid nodule whose cytology is unclear. **Methods:** This is a retrospective, observational study. Preoperative and demographic information, details on the surgical technique, the length of the postoperative stay, histology results, and complications were evaluated. Four groups were determined based on the surgical technique that was carried out based on the thyroidectomy carried out. Recurrent laryngeal nerve damage, hypoparathyroidism, cervical hemorrhage, and wound infection were evaluated in all the patients along with the operation time. **Results:** A total of 104 patients met the established inclusion criteria: 34 (32.69%) males with a mean age of 50.8 ± 6.7 years. 56 (53.8%) underwent a total thyroidectomy (TT Group) and 48 (46.2%) a hemithyroidectomy (HT Group). In TT group, 31 cases (55.3%) of transient hypoparathyroidism, 25 cases (44.7%) of permanent hypoparathyroidism. there was no statistically significant difference seen between the two groups (TT vs HT + CT) in terms of the incidence of hypoparathyroidism, cervical hemorrhage, recurrent laryngeal nerve damage, and wound infection. When comparing HT with CT group, the length of the operation, the use of intraoperative nerve monitoring, the use of a drain, the length of the postoperative stay, and the complications were comparable. **Conclusion:** Patients submitting to primary thyroid surgery (both a whole thyroidectomy and a hemithyroidectomy) had a similar risk of problems from a completion thyroidectomy performed after a hemithyroidectomy for a thyroid nodule with an ambiguous cytology.

Keywords: Differentiated thyroid carcinoma, Indeterminate thyroid nodule, Total thyroidectomy, Hemithyroidectomy, Completion thyroidectomy, Complications

INTRODUCTION

In the thyroid, nodules are common. Clinically speaking, a thyroid nodule is a well-defined macroscopic neoformation that is found in the thyroid gland. Endocrinologists, biochemists, radiologists, surgeons, and pathologists must all work together to study thyroid nodules. Thyroid nodules are often benign and present as a component of multinodular alterations. Little thyroid nodules are difficult to identify with clinical examination; this is evidenced by the fact that 70% of normal thyroid glands have nodules measuring smaller than 1 cm on sonographic examination [1]. If the nodule is poorly defined, hypoechoic, has an irregularly thick capsule, and chaotic intranodular vascularity, suspicion of malignancy is increased. Only frank vascular invasion of nearby arteries (including the internal jugular vein and common carotid artery) is a reliable indicator of malignancy on ultrasonography [2]. Over the past seven decades, astounding advancements have been

made in the identification and management of thyroid pathology. In the 1950s, a thyroid nodule's sheer existence was sufficient reason to perform surgery. Most instances were big nodular goiters since the diagnosis was based on medical indicators and palpation.

Thyroid nodule detection has increased as a result of better access to healthcare and the growing use of high-quality imaging methods. In certain cases, preoperative tests like as ultrasonography and fine-needle cytology cannot completely rule out cancer. Therefore, surgical excision is frequently required for histopathologic testing. Over the past three decades, the prevalence of well-differentiated thyroid carcinoma has dramatically increased globally [3]. Currently, non-palpable nodules up to 2 mm in diameter may be identified with high-resolution ultrasonography [4]. By increasing the occurrence of thyroid nodules, this modifies paradigms related to diagnosis and treatment. During the past three decades, there has been a 300% global rise in the diagnosis of thyroid cancer. Additionally, cytological assessment of non-palpable nodules has been made possible by fine needle aspiration (FNA) performed under ultrasound supervision. In most situations, ultrasonography and FNA can now determine if a nodule has to be surgically removed.

Because of its high specificity (92%) and sensitivity (83%), fine-needle aspiration cytology (FNAC) is now thought to be the most reliable test for the evaluation of thyroid nodular disease. Unfortunately, the FNAC results in the diagnosis of an ambiguous thyroid nodule in around 25% of instances. This is problematic because, while the risk of cancer is minimal (up to 30%), it cannot be ruled out with confidence. Surgery or monitoring may be recommended for individuals with this diagnosis, depending on the risk of malignancy determined by preoperative examinations. Surgery serves more of a diagnostic than a therapeutic role in these patients, with around 80% of treatments being unneeded [5, 6].

Patients with thyroid nodules with an ambiguous cytology can have a hemithyroidectomy or a complete thyroidectomy, under the 2015 American Thyroid Association (ATA) recommendations [7]. A nodule size larger than 4 cm, a family history of differentiated thyroid carcinoma, prior radiation exposure, extremely suspicious ultrasound features, and positivity for known mutations specific for differentiated thyroid carcinoma are some of the factors that influence the decision between these two surgical procedures [8]. The existence of bilateral nodular disease, the potential coexistence of hyperthyroidism, the patient's medical comorbidities, and the patient's preferences must also be taken into consideration for each of these criteria [8]. Nevertheless, the aforementioned guidelines advise executing a completion thyroidectomy if a final histological examination identifies an intermediate or high-risk differentiated thyroid carcinoma following a hemithyroidectomy, as a hemithyroidectomy is deemed oncologically insufficient in these circumstances [7].

The risk of problems for individuals getting a complete thyroidectomy for this reason is still up for debate, with some suggesting that it is higher or lower than for people undergoing primary thyroid surgery [9, 10].

MATERIALS AND METHODS

STUDY DESIGN

Data from all participants is collected using a Microsoft Office Excel database. This is a retrospective, observational study on patients who underwent thyroidectomy for thyroid nodular disease with indeterminate cytology at the department of ENT and surgery in our hospital between January 2021 and December 2022.

INCLUSION AND EXCLUSION CRITERIA

This research included only individuals receiving open thyroidectomy, the standard method. Patients who had undergone parathyroidectomy and had a preoperative diagnosis of lymph node metastases, as well as those who had increased preoperative calcitonin levels and suspected medullary thyroid cancer, were not included in our analysis.

ASSESSMENT OF BASELINE DEMOGRAPHICS

Preoperative and demographic information, details on the surgical technique, the length of the postoperative stay, histology results, and complications were evaluated. Preoperative assessments of all included patients comprised high-resolution ultrasonography (US) of the neck, fine-needle aspiration cytology, blood tests to evaluate thyroid function, and medical histories and physical examinations. When thyroid-stimulating hormone (TSH) levels are low (<0.4 mIU/L) and thyrostatic medication is used, the condition was classified as hyperthyroidism. An expert surgeon would always do a high-resolution ultrasound of the neck before surgery, carefully examining the thyroid gland and cervical lymph nodes.

PATIENTS GROUPING

Four groups were determined based on the surgical technique that was carried out: There are four types of thyroidectomy: total (TT Group), hemithyroidectomy (HT Group), completion (CT Group), and HT + CT Group (hemithyroidectomy with subsequent completion thyroidectomy, which is regarded as a single bilateral surgical treatment).

STUDY ENDPOINTS

PRIMARY AND SECONDARY ENDPOINTS

Assessing the incidence of sequelae (recurrent laryngeal nerve damage, hypoparathyroidism, cervical hemorrhage, and wound infection) in patients

following total thyroidectomy was the main goal of the study. The two pairings below

Bilateral surgical operations - TT Group vs HT + CT Group and Unilateral surgical procedures - HT Group vs CT Group

Comparing the operational times of the CT and HT groups was the secondary goal.

SURGICAL PROCEDURE AND ESTIMATION OF PARAMETERS

The 2015 American Thyroid Association recommendations define the indication and the method of first surgery (hemithyroidectomy or complete thyroidectomy). Completion thyroidectomy, with or without central neck dissection, was carried done in compliance with the same parameters following the final histological inspection [7]. The parathyroid glands and recurrent laryngeal nerves were methodically examined and identified.

The operating surgeon's preference determined the usage of the energy-based device, drain, and intraoperative nerve monitoring (IONM). The whole expected time of the surgical process, from skin incision to skin closure, was measured in minutes. iPTH< 10 pg/mL after surgery was considered postsurgical hypoparathyroidism (normal range = 10-65 pg/mL). For more than a year, iPTH values below the normal range were considered permanent hypoparathyroidism.

RESULTS

A total of 104 patients met the established inclusion criteria: 34 (32.69%) males with a mean age of 50.8 ± 6.7 years. As for the initial surgery, 56 (53.8%) underwent a total thyroidectomy (TT Group) and 48 (46.2%) a hemithyroidectomy (HT Group). Detailed data regarding features of the whole sample and of these two groups are reported in Table 1 and 2.

Table 1: Baseline characteristics

Parameters	TT Group (n = 56)	HT Group (n = 48)
Sex		
- Male	19 (33.9)	15 (31.5)
- Female	37 (66.1)	33 (68.7)
Age (years, mean ± SD)	51.4 ±6.2	50.23 ± 7.2
Familial history of DTC	6 (10.7)	5 (10.4)
Hyperthyroidism	9 (16.1)	4 (8.33)
US findings		
- Nodule size (mm, mean ± SD)	23.45 ± 6.32	24.64 ± 7.12
- Bilateral nodules	71 (73.2)	1 (2.08)
Cytological category		
- TIR3A	23 (41.1)	41 (43.7%)

SD: standard deviation; DTC: differentiated thyroid carcinoma; US: ultrasound.

Table 2: Surgical procedure, postoperative stay, complications and histological findings

Parameters	TT Group (n = 56)	HT Group (n = 48)
Operative time (minutes, mean ± SD)	81.42 ± 23.15	45.98 ± 17.46
Use of IONM	31 (55.3)	28 (58.3)
Use of EBD	56 (100)	48 (100)
Use of drain	44 (78.6)	18 (37.5)
Postoperative stay (days, mean ± SD)	3.32 ± 1.66	2.12 ± 0.56
Hypoparathyroidism		
- Transient	31 (55.3)	4 (8.33)
- Permanent	25 (44.7)	1 (2.08)
Cervical haematoma	1 (1.79%)	1 (2.1%)
RLN injury		
- Unilateral	9 (16.1)	4 (8.33)
- Bilateral	1 (1.79%)	1 (2.1%)
- Transient	4 (7.1)	2 (4.2)
- Permanent	4 (0.79%)	2 (0.82%)
Wound infection	1 (1.79%)	1 (2.1%)
Histological findings		
- Benign disease	20 (35.7)	12 (25.0)
- DTC	18 (32.1)	13 (27.1)
- Microcarcinoma	12)21.4)	15 (31.2)
- LN metastasis	6 (10.7)	8 (16.6)

SD: standard deviation; IONM: intraoperative nerve monitoring; EBD: energy-based device; RLN: recurrent laryngeal nerve; DTC: differentiated thyroid carcinoma; LN: lymph node.

COMPLICATIONS IN TT GROUP AND HT + CT GROUP

31 cases (55.3%) of transient hypoparathyroidism, 25 cases (44.7%) of permanent hypoparathyroidism, 1 cervical haematoma (1.79%), 9 unilateral recurrent laryngeal nerve lesions (16.1%), 4 transient and permanent recurrent laryngeal nerve lesions (7.1%), and 1 wound infection (1.78%) were all observed in the TT Group. Table 3 presents the information from both TT and HT+CT for the one patient (1.79%) who had bilateral recurrent laryngeal nerve damage. Regarding the incidence of hypoparathyroidism, cervical hemorrhage, recurrent laryngeal nerve damage, and wound infection, there was no statistically significant difference seen between the two groups.

Table 3: Complications in TT Group and HT + CT Group

Parameters	TT Group (n = 56)	HT + CT Group (n = 28)
Hypoparathyroidism		
- Transient	31 (55.3)	16 (57.2)
- Permanent	25 (44.7)	10 (35.7)
Cervical haematoma	1 (1.79)	2 (7.1)
RLN injury		
- Unilateral	9 (16.1)	8 (28.6)
- Bilateral	1 (1.79)	2 (7.1)
- Transient	4 (7.1)	3 (10.7)
- Permanent	4 (7.1)	4 (14.3)
Wound infection	1 (1.78)	1 (3.57)

COMPARISON BETWEEN HT GROUP AND CT GROUP

The HT Group experienced an average surgical time of 50 minutes. In 14and 7 patients, intraoperative nerve monitoring, an energy-based device, and a drain were utilized, respectively. A postoperative stay of 2.31 days was averaged. Regarding complications, there were two permanent recurrent laryngeal nerve lesions, three temporary recurrent laryngeal nerve lesions, five unilateral recurrent laryngeal nerve lesions, and one cervical haematoma. An infection of the wound was not seen.

The average operating time for the CT Group was 53 minutes.13 and 8 patients had intraoperative nerve monitoring, an energy-based device, and a drain, respectively. A postoperative stay of 2.12 days was the average. About problems, there were one temporary and onepermanent recurrent laryngeal nerve lesion, as well as two unilateral recurrent laryngeal nerve lesions. There were no signs of a wound infection or cervical hemorrhage.

The length of the operation, the use of intraoperative nerve monitoring, the use of a drain, the length of the postoperative stay, and the complications, there was no statistically significant difference seen between the two groups.

DISCUSSION

The thyroidectomy, specifically the complete thyroidectomy, is a commonly done surgical technique in the field of endocrine surgery. It is utilized for the treatment of both benign and malignant conditions. While the mortality rate associated with this procedure is minimal, a significant proportion of patients may develop difficulties, even while under the care of highly skilled professionals and in specialized medical facilities. The primary manifestations of morbidity are hypoparathyroidism, recurrent laryngeal nerve damage, cervical hematoma, and wound infection. The aforementioned consequences result in a decline in the patients' quality of life and an escalation in healthcare system expenditures [11,12]. According to previous research, preoperative thyroid surgery has conventionally been associated with an elevated likelihood of problems [13]. The outcome is contingent upon the progression subsequent to the initial surgery, which is contingent upon the temporal gap between the two surgeries, involving tissue inflammation, oedema, adhesions, and scar tissue. These factors impede dissection and lead to an alteration of the typical neck architecture, resulting in the absence of identifiable reference points [14]. There are primarily three primary indications for a complete thyroidectomy. These include the presence of a residual or recurring thyroid carcinoma, a residual or recurrent benign thyroid illness, and the identification of intermediate or high-risk differentiated thyroid cancer (DTC) during histological testing following a hemithyroidectomy [14,15]. Furthermore, there is a lack of clarity on the potential impact of the timing of a complete thyroidectomy on patients who have been diagnosed with intermediate or high-risk differentiated thyroid cancer (DTC) following a hemithyroidectomy, particularly in relation to the risk of complications. While some studies have found no association between timing and morbidity, others have indicated

that completion surgery performed within the first 10 days or after 3 months may lead to higher complication rates. Specifically, a completion thyroidectomy performed during the intermediate postoperative period (between 10 days and 3 months) has been reported to be associated with increased complications [16].

The complication rate was evaluated in a specific group of patients, namely those who underwent a complete thyroidectomy following a hemithyroidectomy for a thyroid nodule with ambiguous cytology. There was no statistically significant difference observed in the occurrence of hypoparathyroidism, cervical hematoma, recurrent laryngeal nerve injury, and wound infection when comparing the TT Group (evaluated as bilateral surgical procedures) with the HT + CT Group, as well as when comparing the HT Group with the CT Group (both evaluated as unilateral surgical procedures). In relation to the secondary endpoint, namely the comparison of operational time between the HT Group and the CT Group, no statistically significant disparity was seen. It is noteworthy to emphasize that despite a slightly greater utilization of the energy-based device in the HT Group, which has been documented in the literature as contributing to decreased operative times, the overall operative times remained comparable between the groups. However, it is important to highlight that this difference was statistically significant. The incidence of complications in individuals who received a complete thyroidectomy was found to be similar to that observed in patients who underwent primary thyroid surgery, including both total thyroidectomy and hemithyroidectomy procedures.

The necessity of completion surgery was not universally indicated for all patients who underwent a hemithyroidectomy and were subsequently diagnosed with cancer based on histological examination. Consequently, by adhering to the criteria set forth by the American Thyroid Association (ATA), a substantial number of patients were able to avoid excessive overtreatment, namely in the form of complete thyroidectomy. It is worth noting that a whole thyroidectomy has a greater overall risk of complications compared to a hemithyroidectomy. Specifically, problems such as hypoparathyroidism and bilateral recurrent laryngeal nerve damage are exclusive to patients undergoing a total thyroidectomy. In the context of patients who are receiving a complete thyroidectomy, the utilization of intraoperative nerve monitoring has been shown to be beneficial in preventing bilateral recurrent laryngeal nerve damage. Additionally, the implementation of a drain, as well as the duration of the surgical procedure and the length of the postoperative hospital stay, have been found to be increased. The combination of these factors, together with the increased likelihood of complications, contributes to the greater overall expenditures (including both direct and indirect expenses) associated with a complete thyroidectomy compared to a hemithyroidectomy [17].

The incidence of problems in individuals who receive a complete thyroidectomy following a hemithyroidectomy for a thyroid nodule with an indeterminate cytology is similar to that observed in people who undergo primary thyroid surgery, including both total thyroidectomy and hemithyroidectomy. Moreover, the findings regarding operating timeframes, derived from the comparison of unilateral operations such as hemithyroidectomy and completion thyroidectomy, indicate that performing completion surgery does not pose any significant technical challenges for the surgeon in these patients.

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