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Evaluation of post-thyroidectomy complications and their management in King Khalid Hospital, Tabuk, Saudi Arabia

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Abstract
Background: Thyroid surgery is one of the common endocrine surgeries performed today. The main complications associated with thyroidectomy include injury to the recurrent laryngeal nerve, damage to the parathyroid glands and hypocalcemia, postoperative hematoma and respiratory obstruction, wound infection, superior laryngeal nerve damage, tracheomalacia, and thyroid storm. Recurrent laryngeal nerve injury and hypoparathyroidism have the potential to be lifelong, costly issues for a patient.
Materials and Methods: This study is a retrospective, descriptive study. Information was collected from patient records. The present study was conducted at King Khalid Hospital (KKH), Tabuk, KSA and included 100 patients admitted to the department of general surgery for various elective thyroidectomy procedures. A detailed history was taken from patient records.
Results: The results of the study suggest that health programs should be designed specifically for males and females and more attention should be paid to females regarding the causes of thyroidectomy in order to increase awareness.
Conclusion: Hypocalcemia is the most common complication of thyroidectomy in the literature as well as in our study. RLN Palsy is another complication associated with this procedure. It is essential to keep in mind the possible complications that may arise and be well prepared to manage them. Good surgical expertise is essential to avoid such complications.

Keywords: thyroid surgery, thyroidectomy, complication, hypocalcemia, recurrent laryngeal nerve injury

1. Introduction
Thyroid disorders are one of the most common causes of metabolic disturbances, with surgery being the mainstay of treatment of thyroid swelling [1]. Thyroid surgery is a common surgical procedure in the Kingdom of Saudi Arabia. Complications such as bleeding, hypoparathyroidism, and Recurrent Laryngeal Nerve Injury (RLNI) represent nearly half of all complications of thyroid surgery [2]. Disorders of the thyroid gland are very common in adults, occurring in 3% to 5% of the population, and are the second most prevalent endocrine disease, behind diabetes mellitus [2]. Thyroid surgery is one of the most common endocrine surgeries performed today. Despite advances in conservative management, surgery remains the treatment modality of choice in many cases. The mortality and morbidity of thyroidectomy are low, but some long-term post-operative complications continue to represent a significant health and social problem [2]. The thyroid gland is situated in a critical area of the neck surrounded by many vital structures. The occurrence of complications related to this surgery was very high [3]. The outcomes and complication rates are largely dependent on a surgeon's skill and experience, the extent of surgery and the number of thyroid surgeries performed at a particular center [4]. The main complications associated with thyroidectomy include injury to the recurrent laryngeal nerve, damage to the parathyroid glands and hypocalcemia, postoperative hematoma and respiratory obstruction, wound infection, superior laryngeal nerve damage, tracheomalacia, and thyroid storm. Recurrent laryngeal nerve injury and hypoparathyroidism have the potential to be lifelong, costly issues for a patient. The incidence of thyroidectomy complications increases depending on the pathology of the thyroid, associated with increased gland size, fibrosis, vascularity, or inflammation [5]. Individual surgeon experience is significantly associated with complication rates and length of stay for thyroidectomy [6]. Persistent postoperative hypoparathyroidism usually results from intentional or inadvertent extirpation of the parathyroid glands during thyroidectomy or from interruption of the blood supply to the glands with subsequent infarction [7]. Laryngeal nerve injury is another potentially serious complication of thyroidectomy. Permanent unilateral recurrent laryngeal nerve (RLN) paralysis manifests clinically as hoarseness, weakness, and breathiness of the voice, and occurs in 0% to 3.6% of patients who have undergone thyroidectomy [8].

2. Methodology
This study is a retrospective of 5 years from 1432 (2011) to 1436 (2015), descriptive study (categorical variables). The study was approved by the institutional ethics committee at King Khalid Hospital in Tabuk, Saudi Arabia. All patients which underwent thyroidectomy surgery at KKH during the study time were included. The study included 100 patients admitted to the department of general surgery for elective

thyroidectomy procedures. The study was approved by the ethical committee of King Khalid Hospital in Tabuk.

2.1 Data Collection Tool

A structured questionnaire was used to collect information from patients' medical records (with the help of hospital employees, protecting the identity of the patient). Information included demographic data, cause of thyroidectomy, type of thyroidectomy, operator, histopathological diagnosis, postoperative complications, need for intensive care unit admission, treatment of the patient post-thyroidectomy, duration of total hospital stay in days, and patient outcome. Apart from routine laboratory tests, serum calcium, electrolyte, thyroid profile, FNAC, indirect laryngoscopy, ECG, Echo, X-ray Chest & Neck, and USG of Neck & Abdomen were performed on all patients. Thyroid surgery was planned according to the clinical condition of the patient. The procedures were done under general anesthesia. Patients were monitored from time of admission until their 10th postoperative day. All excised specimens were sent for histopathological examination. The different types of surgeries performed were total thyroidectomy, total thyroidectomy with parathyroid auto-transplantation, subtotal thyroidectomy, hemi-thyroidectomy, and Dunhill procedure.

IBM SPSS statistics 20 software was used for the analysis. The Chi-square test was employed to determine the relationship between the qualitative characteristics (non-measurable variables). The statistical significance level (*p*-value) was 0.05 or lower.

Table 1: Demographic characteristics of patients

Percentage (%)	Frequency	
34.7	35	< 29
30.7	31	30-39
18.8	19	40-49
11.9	12	50-59
		Age
		Cause of thyroidectomy
66.3	67	Consultant
1.0	1	Controlled TMNG
34.7	35	Cosmetics
12.9	13	Diffuse colloid goiter
20.8	21	Failure of Medical T
64.4	65	Female
12.9	13	Follicular carcinoma
		Gender
3.0	3	Hashimoto's thyroiditis
		Histopathological Diagnosis
31.7	32	Male
4.0	4	Missing
4.0	4	Missing
2.0	2	Missing Data
12.9	13	Missing Data
23.8	24	Multinodular goiter
		Nationality
		Operator
11.9	12	Others
24.8	25	Papillary carcinoma
32.7	33	Pressure symptoms
1.0	1	Registrar
85.1	86	Saudi
19.8	20	Senior registrar
20.8	21	Solitary thyroid Nodule
10.9	11	Thyroid cancer

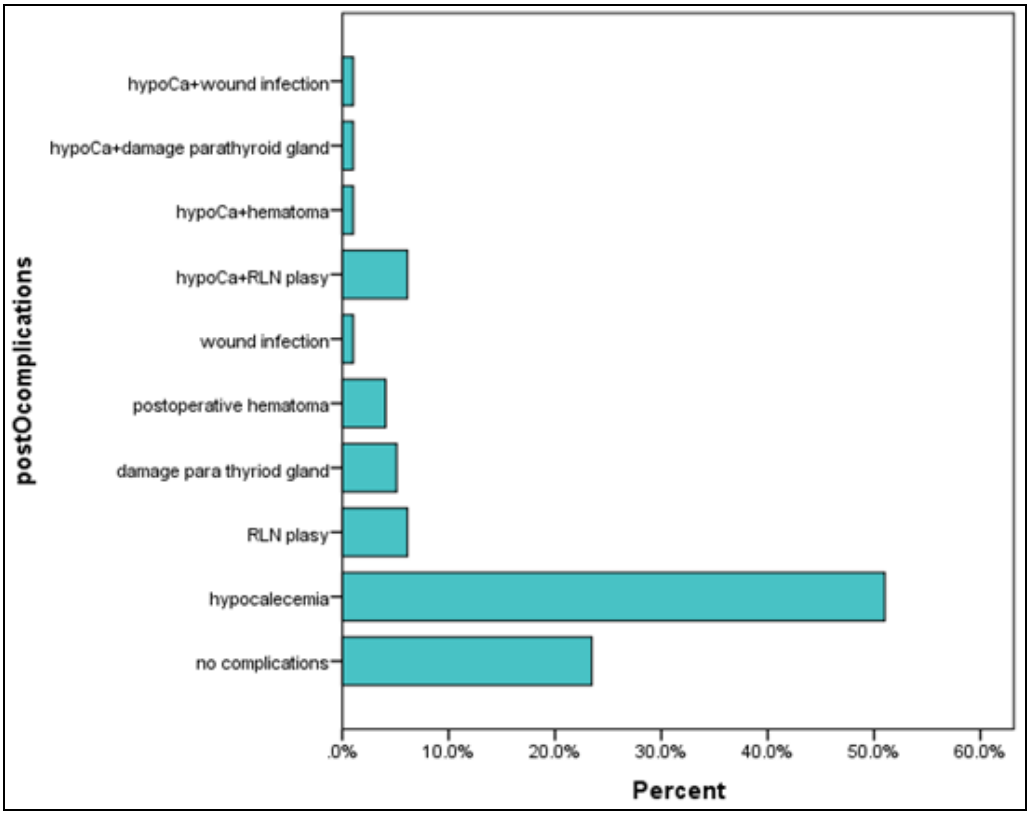

Fig 1: Frequency of post-op complications.

Table 2: Demographic and clinicopathological characteristics of patients depending on causes of thyroidectomy.

Total	Cause of Thyroidectomy					
(n=101)	Cosmetics	Controlled TMNG	Thyroid cancer	Failure of Medical treatment	Pressure symptoms	
						Gender
65	28 (43.1)	1 (1.5)	6 (9.2)	8 (12.3)	22 (33.8)	Female
32	7 (21.9)	0 (0.0)	5 (15.6)	11(34.4)	9 (28.1)	Male
4	0 (0.0)	0 (0.0)	0 (0.0)	2 (50)	2 (50.0)	Missing
						Age
35	19 (54.3)	1 (2.9)	5(14.3)	0	10 (28.6)	< 29
31	8 (25.8)	0	0	10 (32.3)	13 (41.9)	30-39
19	3 (15.8)	0	3(15.8)	8 (42.1)	5 (26.3)	40-49
12	4 (33.3)	0	3(25)	2 (16.7)	3 (25.0)	50-59
						Nationality
86	32 (37.2)	1 (1.2)	8 (9.3)	19 (22.1)	26 (30.2)	Saudi
12	3 (25.0)	0	2 (16.7)	1 (8.3)	6 (50.0)	Others

Table 3: The relationship between the complication rate and thyroid surgery "Types of thyroidectomy".

Types of Thyroidectomy				
R/L hemi-thyroidectomy	Subtotal Thyroidectomy	Total Thyroidectomy + MRND	Total Thyroidectomy	
34	13	17	34	Total Postoperative Complications
15	2	3	3	No complications
10	10	12	18	Hypocalcemia
4	0	0	2	RLN palsy
1	0	1	3	Damage parathyroid gland
0	1	0	3	Postoperative hematoma
1	0	0	0	Wound infection
2	0	0	4	hypoCa+RLN palsy
1	0	0	0	hypoCa+hematoma
0	0	0	1	hypoCa+damage parathyroid gland
0	0	1	0	hypoCa+wound infection

Table 4: The Chi-square test was employed to determine the relationship between the qualitative characteristics (non-measurable variables).

Chi-Square Tests			
Asymp. Sig. (2-sided)	**df**	**Value**	
.052*	27	39.928	Pearson Chi-Square
.019	27	44.330	Likelihood Ratio
.082	1	3.033	Linear-by-Linear Association
		98	N of Valid Cases

* *p*-value is 0.052 >= 0.050 meaning there is a weak relationship between type of thyroidectomy and postoperative complications.

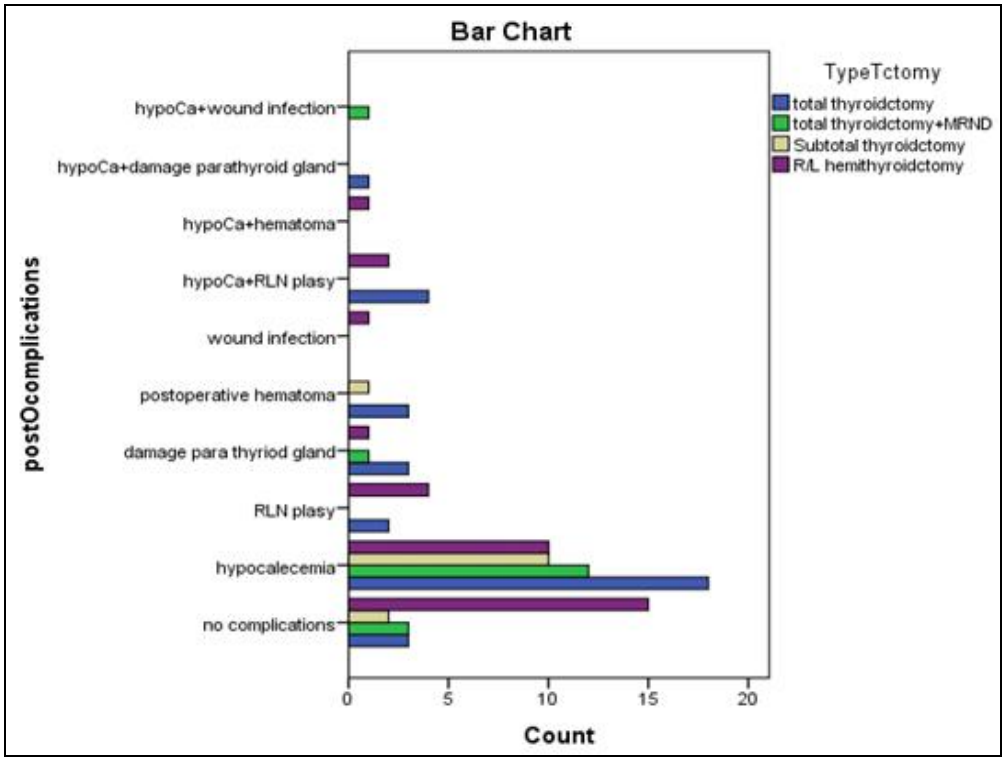

Fig 2: The relationship between complication rates and thyroid surgery "types of thyroidectomy".

2.2 The correlation between nominal variables

- Is there a significant relationship between complications and histopathological diagnosis?
- Is there a significant relationship between complications and causes of thyroidectomy?
- Is there a significant relationship between complications and surgeon experience?
- Is there a significant relationship between complications and outcomes?
- Is there a significant relationship between complications and total hospital stay in days?

Table 5: Chi-Square Tests.

Pearson Chi-Square			
Asymp .Sig. (2-sided)	df	Value of Chi	
.131	45	55.761	Histopathological diagnosis and post-op complications
.119	36	46.178	Cause of thyroidectomy and post-op complications
.745	18	13.757	Surgeon experience and post-op complications
.000	9	20.365	Total hospital staying and post-op complications
.157	18	23.932	Outcomes and post-op complications

Chi-Square Tests for Surgeon experience			
Asymp .Sig. (2-sided)	df	Value	
.745	18	13.757[a]	Pearson Chi-Square
.728	18	14.023	Likelihood Ratio
.253	1	1.305	Linear-by-Linear Association
		86	N of Valid Cases

a. 27 cells (90.0%) have expected count less than 5. The minimum expected count is.01.

Chi-Square tests for histopathological factors			
Asymp .Sig. (2-sided)	df	Value	
.131	45	55.761[a]	Pearson Chi-Square
.223	45	51.883	Likelihood Ratio
.862	1	.030	Linear-by-Linear Association
		96	N of Valid Cases

a. 53 cells (88.3%) have expected count less than 5. The minimum expected count is.03.

Chi-Square tests for outcomes			
Asymp .Sig. (2-sided)	df	Value	
.157	18	23.932a	Pearson Chi-Square
.826	18	12.393	Likelihood Ratio
.153	1	2.041	Linear-by-Linear Association
		98	N of Valid Cases

a,26 cells (86.7%) have expected count less than 5. The minimum expected count is.01.

Chi-Square tests for cause of thyroidectomy			
Asymp .Sig. (2-sided)	df	Value	
.119	36	46.178[a]	Pearson Chi-Square
.066	36	49.494	Likelihood Ratio
.026	1	4.939	Linear-by-Linear Association
		98	N of Valid Cases

a. 44 cells (88.0%) have expected count less than 5. The minimum expected count is.01.

It can be seen from the Table 5 that there is no significant relationship between complications and histopathological diagnosis, cause of thyroidectomy, surgeon experience or outcomes (*p*-value is greater than 0.05). On the other hand, total hospital stay is the only variable which has a significant relationship with complications, with a significance level of 0.00.

2.3 Description of the data

The data was taken from 101 patients. Variables in the dataset are:

- Identity data*:*
  Sex: male, female
  Age: <29, 30-39, 40-49, 50-59, > 60 years
  Nationality: Saudi, others
- Cause of thyroidectomy*:* Pressure symptoms, Failure of medical treatment, Thyroid Cancer, Controlled TMNG, Cosmetics
- Type of thyroidectomy: Total thyroidectomy, total thyroidectomy + MRND, Subtotal thyroidectomy, R/L hemithyroidectomy, Dunhill procedure
- Operator: Consultant, Senior registrar, Registrar
- Histopathological diagnosis: Multinodular goiter, Diffuse colloid goiter, Hashimoto's thyroids, solitary thyroid Nodule, Papillary Carcinoma, Follicular Carcinoma
- Postoperative complications: Hypocalcemia, RLN palsy, SLN injury, airway obstruction, damage to the parathyroid glands, postoperative hematoma, wound infection, respiratory obstruction, thyroid storm, hyperparathyroidism
- Treatment of the patient thyroidectomy: need for tracheotomy Yes, No Doses
- Total duration of hospital stays: 1-7 days, 8-15 days, 16-21 days, 22-29 days, 1-3 months, more than 3 months
- What was the patient's outcome? Normal discharge, discharge with disability, refer to another hospital

3. Discussion

In our study, thyroid disorders affected 65% of females and just 32% of males. Furthermore, patients may suffer from thyroid disorders at an early age as 66% of the study population were aged between 20 and 39 years, with 31% of respondents being older than 40 years. We therefore may conclude that thyroid disorders are more likely to affect young people than the elderly, or that the elderly are not aware of being affected. Also, 86% of the study population were Saudi and the rest were non-Saudis. The survey was conducted at a civilian hospital in Tabuk, so this does not suggest that Saudis are more likely to be diagnosed with thyroid disorders than others. The survey also showed that the causes of thyroid disorders vary from patient to patient, with the most common causes being (35%) cosmetics, (33%) pressure symptoms, (21%) failure of medical treatment, (11%) thyroid cancer, and (1%) controlled TMNG, which means that the common causes were almost all external. In addition, the survey showed the histopathological diagnosis as the following: (25%) papillary carcinoma, (24%) multinodular goiter, (21%) solitary thyroid nodule, (13%) diffuse colloid goiter, (13%) follicular carcinoma, and (3%) Hashimoto's thyroiditis. This means that different histopathological diagnoses were made with a higher incidence of papillary cancer. The type of surgeon was also identified with 67% being consultants, 20% senior registrars, and 1% registrars, suggesting that KKH in Tabuk has experienced surgeons. There may have been fewer complications because most operations were conducted by senior surgeons.

Moreover, Figure 1 showed many thyroidectomy and hypocalcemia procedures were classified as type number one with an average of (50%). In 23% of cases there were no complications and the remaining procedures performed could be classified into various categories. The Chi-square test was then used to determine the relationship between type of thyroidectomy and postoperative complications resulting in a

p-value of 0.052 >= 0.050, which means that there was a weak relationship. However, more samples and tests may be required to confidently determine this relationship. Moreover, other correlation tests were performed to determine the relationship between complications and histopathological diagnosis, cause of thyroidectomy, surgeon experience, outcomes, and total hospital stay. A Pearson Chi-square test revealed that there was no significant relationship at the level of (0.05) between complications and histopathological diagnosis, cause of thyroidectomy, surgeon experience, or outcomes due to the excellent work of the team at KKH in Tabuk, despite the fact that the environment of KKH in Tabuk was significantly correlated with complications at the level of (0.05), which means more attention should be paid to improving the hospital management plans.

4. Recommendations

Health programs should be specifically designed for males and females with more attention being paid to the causes of thyroidectomy in females in order to raise awareness. King Khalid Hospital in Tabuk should seek to improve its environment to reduce the incidence of thyroidectomy complications. More studies should be conducted at other hospitals including those outside Tabuk to better understand thyroid disorders and thyroidectomy procedures. Thyroid surgery is a common surgical procedure in the Kingdom of Saudi Arabia.1,2 Complications such as bleeding, hypoparathyroidism, and Recurrent Laryngeal Nerve Injury (RLNI) represent nearly half of all complications of thyroid surgery. 3-5 The latter complication, although rarely encountered, can jeopardize quality of life. A study conducted in the Medinah region of Saudi Arabia has shown that papillary carcinoma was the most common complication (91.8%), followed by malignancy of thyroid, and follicular (5.4%) and Medullary carcinoma (2.7%), with a papillary to follicular carcinoma ratio of 17:1. The male to female ratio for patients with thyroid malignancy in this series was almost 1:2 as is shown in Table 4. No malignant goiters were found in patients younger than 12 years.

5. Conclusion

Hypocalcemia is the most common complication in the literature as well as in our study. RLN Palsy is another complication of thyroidectomy. It is essential to keep in mind the possible complications associated with this procedure and be well prepared to manage them. Good surgical monitoring of patients is invaluable and helps in the early detection and management of such complications.

6. Conflict of interest

The authors have no conflicts of interest to report.

7. Acknowledgment

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