

Risk Factors for Post-Operative Thyroid Related Complications in Patient Undergoing Thyroidectomy: A Single Center Study

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ABSTRACT

Background: Thyroid diseases are one of the most prevalent endocrinopathies globally ⁽¹⁾. Most of the thyroid diseases treated surgically. The operation duration is under multiple factors can be predicted preoperatively ⁽²⁾. Hypocalcaemia and nerve injury are serious complication after thyroid surgery and we hypothesized it could be prevented by simple measures to avoid such complications.

Objective: Was to assess the correlation between thyroidectomy operating time, histo-pathological diagnosis of thyroid disease and pre-operative vitamin D supplementation with post thyroidectomy complications mainly hypocalcaemia and nerve injury. **Method:** An observational retrospective cohort study with a total of 187 patients who underwent thyroidectomy from October 7th 2013 to January 4th 2018 were included in this study. Data were analyzed for demographic information including age, sex, nationality, height and weight. Information about the use of vitamin D supplementation before or after the operation, the clinical and the histological diagnosis of thyroid diseases, the name of the procedure (partial or total thyroidectomy), and the presence of any complications. **Result:** The mean age of the patients was 39.7±12.71 years. 81.8%(153) were females and 18.2%(34) were males. 53.5%(100) were given Vitamin-D supplements before or after the surgery. Histopathology showed that the most prevalent type was papillary Carcinoma accounting for 68 (36.4%). No significant association between histological diagnosis and complication of hypocalcaemia and nerve injury. Mean duration of surgery performed was 135.61±47.668. 83 of our patients suffered from hypocalcaemia and 6 suffered from nerve injury. When correlating between duration of surgery with hypocalcaemia and nerve injury, The independent t-test was associated with statistically insignificant effect $t(182) = -1.85$, $p = 0.066$ (>0.05) for hypocalcaemia and $t(185) = -0.075$, $p = 0.940$ (>0.05) for nerve injury.

Conclusion: Our study suggested that there was no significant correlation between the duration of surgery as well as histo-pathological diagnosis and the development of post-operative hypocalcaemia and nerve injury.

Keywords: Thyroidectomy, Post-operative hypocalcaemia, Post-operative nerve injury, Complications, Vitamin D.

INTRODUCTION

Thyroid diseases are one of the most prevalent endocrinopathies globally, however, the importance of thyroid diseases is recently identified and now is considered as one of the non-communicable diseases that affect the community. In Saudi Arabia thyroid ranked as fourth in male and second in female as most prevalent cancer and it represents 6.1% of newly diagnosed cancers, thyroid cancer is the most common endocrine malignancy and it accounts 87% of all endocrine gland cancers ⁽¹⁾. Most of the thyroid diseases treated surgically especially when medical treatment fails, cosmetic purposes or when thyroid cancer extensively invading the surrounding structures. The operation duration is under multiple factors can be predicted preoperatively ⁽²⁾. A study was conducted in tertiary referral center state that operation duration more than 120 min will lead to hypocalcaemia ⁽³⁾. Where was another study stated that there was no correlation between long operation duration and postoperative complications ⁽⁴⁾. Another

factor for postoperative hypocalcaemia is vitamin D preoperative and postoperative supplements. A randomized controlled trial of alfacalcidol supplementation. The results showed that preoperative and postoperative supplementation decreased transient hypocalcaemia ⁽⁵⁾. Another randomized controlled trial was conducted to assess the efficiency of preoperative and postoperative calcium and vitamin D supplementation to prevent postoperative hypocalcaemia. The results confirmed decreased postoperative hypocalcaemia ⁽⁶⁾. A systematic review and meta-analysis reported a significant decrease in postoperative hypocalcaemia in patients who received oral calcium or vitamin D supplementation ⁽⁷⁾. Hypocalcaemia and nerve injury were serious complication after thyroid surgery and we hypothesized it could be prevented by simple measures to avoid such complications. Our aim of this study was to estimate the relationship between thyroidectomy operating time and postoperative complications mainly hypocalcaemia and nerve injury and assess the correlation between

preoperative vitamin D supplementation and post-thyroidectomy hypocalcaemia.

METHODOLOGY

Procedures

The present research was an observational retrospective cohort study to measure the correlation between operating time and post thyroidectomy complications – mainly hypocalcemia and nerve injury-. A chart review of 187 files of patients undergoing thyroidectomy in King Fahad Specialist Hospital (KFSH) was done. KFSH was the only tertiary care hospital in Qassim region with referrals from all governmental hospitals in the region.

Measurement

The sheet used for collecting data included demographic information including age, sex, and nationality. We also included the file number to avoid duplication of data. Height and weight were also collected from patients' files. Information about the use of vitamin D supplementation before or after the operation, the clinical and the histological diagnosis of thyroid diseases, the name of the procedure (partial or total thyroidectomy), and the presence of any complications were included in the datasheet. All this information was based on previous medical literature ^(1,4) and the sheet was validated by a senior, the head of surgical department in KFSH.

Data Collection

Collection of data was started in January 2018, after the IRB approval was obtained from Qassim ethical committee and after hospital approval to conduct this study. Data were gathered from the General Surgery department of KFSH and we included all files from October 7th 2013 to January 4th 2018. Files with missing identification data or patients undergoing procedures other than thyroid surgery were excluded. Data were collected on Excel files and later on, were exported to SPSS program version 21 for analysis.

Statistical Analysis

Both descriptive and inferential statistics were done to determine the association between variables. Descriptive statistics included frequencies, counts, and percentages were presented in tables. Regarding inferential statistics, an independent t-test was performed to study the association between surgery duration and the development of postoperative complications.

RESULTS

Data from total of 187 patients. 7% (13) non-Saudi nationals and 93% (174) Saudi nationals was selected to be included in the study from hospital

records of thyroid surgeries. The mean age of the patients was 39.7 ± 12.71 years, mean height was 157.65 ± 8.407 cm. and mean weight was 74.06 ± 18.731 kg. Out of total 81.8% (153) patients were females and 18.2% (34) were males. It was calculated that for most of the patient's total thyroidectomy was chosen as the procedure 88.24% (165). Out of total 56 patients who developed post-operative complications, complications of 52 patients were resolved at the time of discharge from the hospital. Mean post-operative stay in hospital was 4.04 ± 3.764 days. 53.5% (100) were given Vitamin-D supplements before or after the surgery and 46.5% (87) were not given any vitamin D supplement. While addressing complication of hypocalcaemia 34 patients were given calcium carbonate and 20 were given calcium gluconate either alone, combined or with other treatment options.

After performing the histopathology, papillary Carcinoma 68 (36.4%) was found most common in our patients. When correlation between histological diagnosis and complication of hypocalcaemia and nerve injury were studied, the results don't show any significant relationship between histopathology and complication (Table1). More study is needed in this aspect of thyroid histopathology. Mean duration of surgery performed 135.61 ± 47.668 and most of the surgeries i.e. 111 (59.4%) were performed within time limit of 90-150 minutes (Table 2). During surgery only 2 patients had a complication of blood loss no other complication were documented. Among 187(N) patients 83 suffered from hypocalcaemia and 6 suffered from nerve injury. By comparison, there was no association between duration of surgery and complications. To test the hypothesis that the increase in the duration of surgery (135.61 ± 47.668) and complications are not associated statistically, an independent sample t-test was performed. As it can be seen in (Table 3) that duration of surgery is distributed sufficiently normal for the purpose of conducting a t-test (i.e., skew=1.255 and kurtosis 2.693) .

For association between duration of surgery with hypocalcaemia and nerve injury, the assumption of homogeneity of variance was tested and satisfied via Levene's F test, $F(182)=2.661$, $p=0.105$ (>0.05) and $F(185)=1.841$, $p=0.176$ (>0.05) respectively. The independent t-test was associated with statistically insignificant effect $t(182)=-1.85$, $p=0.066$ (>0.05) for hypocalcaemia and $t(185)=-0.075$, $p=0.940$ (>0.05) for nerve injury (Table 4,5) . Thus, the duration of surgery has no statistical association to the hypocalcaemia and nerve injury (Figure 1,2). The null hypothesis stays valid and showed that there was no relation between duration of surgery and complications.

Table 1. Correlation between histo-pathological type and post-operative complications.

Relationship between Histopathology and Complications							
		N	Percent %	hypocalcaemia		Nerve injury	
				Developed	%	Developed	%
Histological Diagnosis	Papillary Carcinoma	68	36.36	27	39.71%	2	3%
	Follicular Carcinoma	9	4.81	6	66.67%	0	0%
	Follicular Adenoma	10	5.35	2	20.00%	1	10%
	Benign	21	11.23	8	38.10%	1	5%
	Hurthle Cell Adenoma	3	1.60	1	33.33%	0	0%
	Hurthle Cell Carcinoma	5	2.67	1	20.00%	0	0%
	Non-Hodgkin Lymphoma	1	0.53	1	100.00%	0	0%
	Simple Goiter	40	21.39	22	55.00%	1	3%
	Toxic Goiter	1	0.53	1	100.00%	0	0%
Hashimoto Thyroiditis	23	12.3	11	47.83%	1	4%	

Table 2. Duration of thyroidectomy

Duration of surgery (Minutes)	Frequency
31 - 60	3
61 - 90	24
91 - 120	57
121 - 150	54
151 - 180	28
181 - 210	8
211 - 240	8
241 - 270	2
271 - 300	1
301 - 330	1
331+	1
Grand Total	187

Table 3. Correlation between duration of surgery and post-operative complication

Descriptive Statistics Associated with Duration of surgery and complications						
	N	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Erro	Statistic	Std. Error
Duration Of Surgery(min)	187	135.61	1.255	.178	2.693	.354
hypocalcaemia	187	.57	.040	.178	-1.276	.354
Nerve Injury	187	.97	-5.353	.178	26.947	.354

Table 4. Correlation between duration of surgery and hypocalcaemia

T-test (Duration of Surgery and Hypocalcaemia)					
	Hypocalcaemia	N	Mean	Std. Deviation	Sig. (2-tailed)
Duration of surgery(min)	No	101	130.10	22.210	182
	Yes	83	143.13	23.322	154.584

Table 5. Correlation between duration of surgery and nerve injury

T-test (Duration of Surgery and Nerve Injury)					
	Nerve Injury	N	Mean	Std. Deviation	Sig. (2-tailed)
Duration of Surgery(min)	Yes	6	134.17	20.837	0.940
	No	181	135.66	48.330	0.876

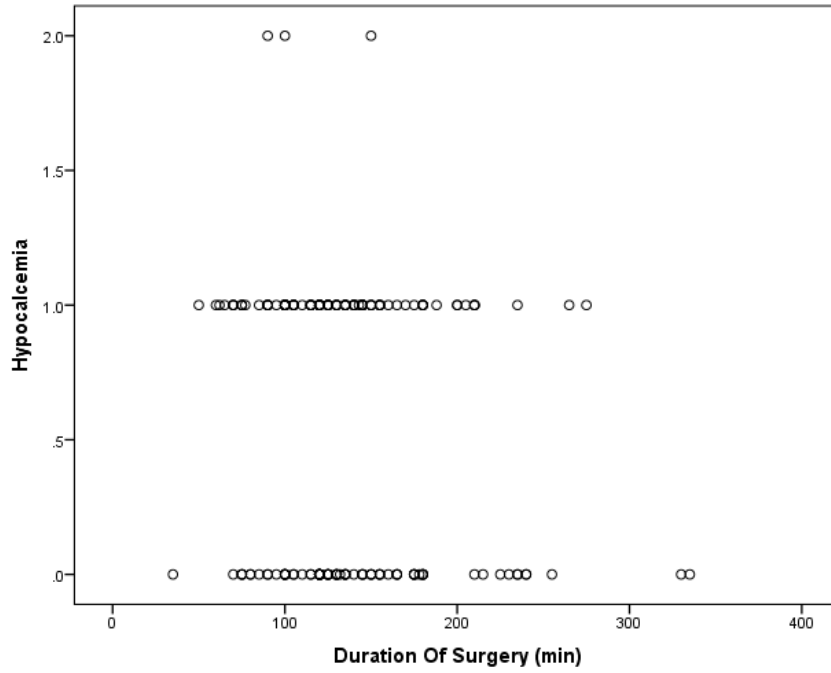


Figure 1. Association between the duration of surgery and complication of hypoglycemia ($p=0.044$, -0.148^*).

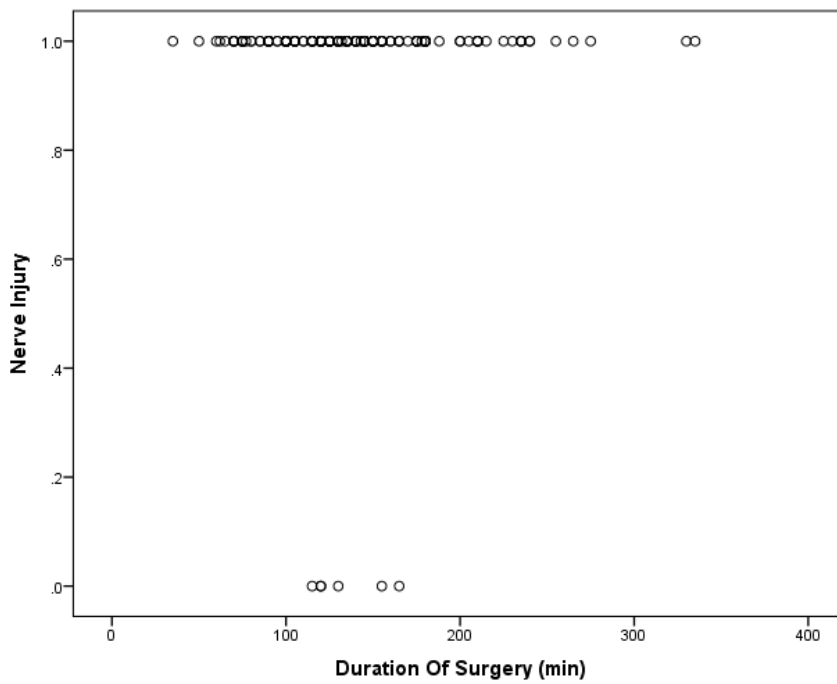


Figure 2. Association between the duration of surgery and nerve injury ($p=0.940$, 0.006^*).

DISCUSSION

Hypocalcaemia and nerve injury are the most concerning complications following thyroidectomy. In this study, we aimed to see the effect of thyroidectomy operating time and the development of postoperative complications mainly hypocalcaemia and nerve injury. Our study showed that most of the patients were females (81.8%), and the mean age for the patients was 39.7 years which was consistent with the findings of a study that was previously done in the eastern province in Saudi Arabia ⁽¹⁾.

Papillary thyroid carcinoma has been reported as the most common type among other histological pattern ⁽¹⁾. The histopathology results in our study as well showed that papillary thyroid carcinoma was the most prevalent type accounting for 36.4% of the sample followed by simple goiter and Hashimoto thyroiditis. Considering the histological type as a risk factor for developing post-operative hypocalcaemia and nerve injury, the analytical study showed no significant correlation. Rather than the histological type, Peter C Ambe had suggested that recurrent retrosternal and intra-thoracic goiter may contribute to the development of post-operative hypocalcaemia and nerve injury ⁽⁴⁾. In case of recurrent goiter, Hazem M. Zakaria justified that adhesions and anatomical displacement are the main reasons for developing post-operative nerve injury ⁽⁹⁾. Also, in his study which was specifically discussing recurrent laryngeal nerve injury. He reported that the histopathological diagnosis is a factor that can lead to nerve injury in addition to other factors ⁽⁹⁾.

According to American Thyroid Association, the duration for thyroidectomy range from 45 minutes to 3 hours which agrees with our findings with a mean duration of 135.61 ± 47.668 minutes ⁽¹⁰⁾. The variety in the operation length can be explained mainly by the surgeon's experience instead of what previously thought that the patient factors play an important role as **Patoir** had suggested ⁽²⁾. When correlating the operating time and post-operative complications mainly hypocalcaemia and nerve injury, there is no significant positive relationship in between, which has been reported previously that the increase in length of the surgery is not a risk factor for complications development ⁽⁴⁾. In contrast, a study done by Emilie Sonne-Holm demonstrated that longer surgery time (> 120 minutes) is an influential factor for post-operative hyperparathyroidism due to ischemia of the parathyroid gland which will lead subsequently to hypocalcaemia ⁽³⁾.

Previous studies reported that vitamin D in

addition to calcium supplementation is a protective factor from post-operative development of hypocalcaemia ⁽¹¹⁾. However, supplements are not usually given to all patients due to the possibility of adverse effects ⁽¹¹⁾. A randomized control study suggested that pre-operative vitamin D supplementation 1 day prior to surgery and 8 days following the surgery significantly have reduced the incidence of post-operative hypocalcaemia as well as accelerate the baseline return of calcium level ⁽⁵⁾.

Another study suggested the same result but supplementation of vitamin D was provided 7 days before and 7 days after the surgery ⁽⁶⁾. Amal Alhefdh as well demonstrated that further supplementation of vitamin D in addition to calcium significantly reduced the incidence of hypocalcaemia, but she suggested that further studies are needed to determine the dose and if it should be given pre or post operatively ⁽⁷⁾. Our concern is to determine if pre-operative vitamin D supplementation can reduce the incidence of post-operative hypocalcaemia. But we have major limitations because only 53.5% of our patients were given vitamin D and most of them were given the supplementation post-operatively along with calcium. For those who were given pre-operatively, the duration as well as the dose was different among the patients, also the form of vitamin D that was supplemented differ from one patient to another. For these reasons it was difficult to compare the effectiveness of the supplementation. Due to the retrospective nature of the study, there was troublesome to determine the reason for vitamin D supplementation pre-operatively so other co-morbidities that can affect the result cannot be excluded. We suggest a prospective study to be conducted comparing two groups of patients; one with pre-operative and the other with post-operative supplementation putting in mind that both groups will receive the same form, dose and duration of supplementation with exclusion of other co-morbidities.

In addition to the retrospective nature of the study, our limitations include: a relatively small sample size, and lack of detailed information of vitamin D supplementation which need to be obtained such as the dose, duration and presence of other co-morbidities that need vitamin D as treatment. Also, our study was conducted in a single center and the results cannot be generalized among all centers.

Conclusion

Our study suggests that there was no significant correlation between the duration of surgery as well as histo-pathological diagnosis and the development of post-operative hypocalcaemia

and nerve injury.

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