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Short-stay sutureless total thyroidectomy

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Abstract

Background and objective: Thyroid surgery has traditionally been done on an inpatient basis. With the advent of minimal access techniques**.** This study aimed to assess the outcome of short-stay total thyroidectomy in comparison with a longer stay in terms of postoperative complications.

Methods: This was an observational comparative study which was carried out at the surgical units of Erbil of Rizgary Teaching Hospital and private hospitals in Erbil city. The data were collected in the period between January 2017 and March 2021. Data of 192 patients' records who underwent thyroidectomy were collected.

Results: In this study, 33 (17.1%) patients were males while 159 (82.8%) were females. Out of 192 patients, 137 underwent sutureless technique while 55 of them underwent sutured way of hemostasis. Majority of patients 173 (90.1%) were discharged before 23 hours, while 19 (9.9%) were discharged after 23 hours. Significantly, higher percentage of males (24.2%) stayed more than 23 hours in the hospital compared with 6.9% of females (P = 0.006). The majority of indications with goiter, Graves' disease, toxic nodule and solitary stayed between 12-23 hours while half of those with cancer stayed more than 23 hours (P = 0.023).

Conclusion: Short-stay thyroid surgery is a feasible and safe procedure when combined with sutureless technique: this returns to overall less postoperative complications; day-case and short-stay procedures account for an expanding area of modern-day surgery.

Keywords: Short-stay; Sutureless; Thyroidectomy.

Introduction

In the 12th and 13th centuries AD, the earliest thyroid surgery accounts are reported.[1] During this traditional period, the initial mortality rate was high. However, later, with progress in surgical instrumentation and the advent of antiseptics and anesthesia, the mortality rate was dropped.[1,2] Standardized thyroid surgery technique is composed of three primary phases, which include principles of safe and efficient thyroid surgery, which have already been established, identification and ligation of vessels, identification and preservation of laryngeal nerves, and identification and preservation of parathyroid glands. The standard surgical instruments have not changed significantly; the main technology was coagulation techniques and vascular area.[3] The awareness of the life-threatening complications following thyroid operation and the period within which they occur were the primary deciding factors for patients' postoperative stay.[4]

The main complications associated with thyroidectomy include; bleeding, hematoma, recurrent laryngeal nerve injury and postoperative hypocalcemia.[5,6] It is now clear that bleeding could be fatal

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when it occurs 4-6 hours after surgery; meanwhile a few hours later or after 24 hours, the risk of fatality is less.[7] Recurrent laryngeal nerve injury is mostly appearing within 24 hours; early diagnosis and adequate treatment of this complication are regarded as contraindications for discharging the patients from the hospital.[8,9] Malignancy, secondary procedures, anatomic variation, anomaly, distortion and damage to the superior laryngeal nerve's external branch can all affect the possibility of recurrent palsy by 2 to 13%.[8]

Postoperative hypocalcemia was the most frequent complication after total thyroidectomy. Many clinical conditions were associated with this complication. The most significant factor in reducing postoperative hypocalcemia was a thorough understanding of thyroidal anatomy and the parathyroid glands' embryological origins. Although the incidence of postoperative hypocalcemia was variable, transient hypocalcemia incidence of temporary and long term post-surgical hypocalcemia was (19–38%) and (0–3%) respectively.[10-13] Since hypocalcemia can be efficiently treated with complementary calcium and vitamin D treatment, it was not yet a clinical challenge.[11]

Reduced hospital stays have many benefits, including lower costs, shorter inpatient waits times, more inpatient beds available, fewer postoperative complications, and the psychological benefit of preventing a lengthy stay.[4] Sutureless thyroid surgery using a sealing instrument such as a harmonic scalpel has many benefits. This procedure will decrease blood loss, shorten the length of thyroid surgery and maintaining a strong safety profile. However, the use of harmonic scalpel was costly and needs hand skills.[3] This procedure was effective, secure and quick with lower perioperative morbidities compared to those described by Kocher's "cut-and-tie" technique.[14]

Previously, patients who underwent thyroid surgery were observed for up to 72 hours before discharge.[15] Nowadays, with the technological advancement and safe surgical procedures, day case surgery which includes admission, surgery, observation and discharge on the same operation day was adopted.[16,17] Short-stay surgery was a surgery followed by overnight observation with discharge the following morning with an average stay of 23 hours at the hospital.[17,18]

The primary aim of this study was to assess the outcome of 23 hours short-stay total thyroidectomy in comparison with a longer stay in terms of postoperative complications. The secondary aim of this study was to investigate the outcome of short stay sutureless versus sutured in terms of complications.

Methods

An observational comparative study was carried out in the surgical departments of Erbil, Rizgary teaching hospital and several private hospitals in Erbil city/Iraq. The entire study period was ranged from January 2017 to March 2021; the study group included patients records who underwent short stay thyroidectomy while the control group included matched records of patients who were qualified for inclusion criteria but did not undergo short stay surgery due to different reasons. The outcome was compared in terms of short stay less than 23 hours or more than 23 hours, sutureless and sutured, and their complication proportions.

All patients scheduled for thyroidectomy were admitted for the same-day surgery. Written informed consent was taken from the patients who were willing to participate in the study. History and physical examination were taken. This study used a questionnaire that was designed for the study. The questionnaire included demographic characteristics, past medical history, the indication of thyroid surgery, anthropometric measures of height and weight. Investigations included in the questionnaire were thyroid function test,

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fine needle aspiration and chest x-ray. Vocal cords were assessed by indirect laryngoscopy and neck ultrasound

The inclusion criteria were as following: patients of all age groups, patients of ASA grade I, II, and III, first neck surgery, euthyroid and have no locally advanced malignancies or intrathoracic goiter.

The exclusion criteria were as following: patients who were not euthyroid and patient ASA grade IV and grade V.

The surgical procedures were performed under general anesthesia with endotracheal intubation. Patients were injected with intravenous midazolam fentanyl and propofol while were maintaining vecuronium and desflurane. The patients lie supine with the neck extended; a skin crease incision was placed around the level of the cricoid cartilage; Subplatysmal flaps were raised. The midline was identified between the strap muscles. The sternothyroid muscle was then mobilized from the gland, identify the middle thyroid vein if present and ligated near to the gland . The superior vascular pedicle was dissected, controlled with ties, bipolar diathermy or harmonic scalpel and divided individually with preserves the blood supply to the superior parathyroid gland. In addition, preserves the superior laryngeal nerve and recurrent laryngeal nerve.

The fascia from the thyroid was mobilized, during this part of the dissection the surgeon must prioritize identification of the nerve, preservation of the inferior parathyroid and its blood supply, as well as control of branches of the inferior thyroid artery, the isthmus should be divided. The surgical bed is then inspected to confirm the integrity of the nerve and the state of the parathyroid glands. Irrigation followed by meticulous hemostasis.

From the total of 192 cases, vacuum drain was left in the paratracheal space for only 58 cases, following complete hemostasis the strap muscles were loosely re approximated. The wound was then closed in layers with absorbable suture to platysma and skin closure. This may be with clips, non-absorbable sutures or subcuticular closure.

All patients were evaluated on the same evening of operation and the next day according to the discharge criteria as following: stable vital signs, apyretic, no wound or airway problems and tolerating diet during the postoperative period. Patients not meeting these criteria were asked to stay in the hospital. On discharge, each patient was received a written and verbal instructions for wound management, postoperative pain, and signs/symptoms associated with possible complications. Patients were followed up for early and late complications.

The sample size was calculated using OpenEpi software, Version 3. Population size (N):500,hypothesized % frequency of outcome factor in the population (p): 75%+/-5, confidence limits as % of 100 (absolute +/- %),(d): 5% and the design effect (for cluster surveys-DEFF): 1. The Sample Size (n) for 95% confidence level was 184 using the equation of sample size n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)].

For the convenience of the sample size, 193 cases were taken. One case with 8 years old was excluded in the study to avoid large extremities of the data, therefore data of the total of 192 cases was analyzed.

Statistical Analysis: Data on demography and clinical features of patients were expressed as means ± SDs. Chi square test of association to compare variables was used; when the expected count of more than 20% of the cells of the table was less than 5, Fisher's exact test was used. A *P*-value of ≤0.05 was considered as the level of significance for all the analyses. The Statistical Package for the Social Sciences (SPSS) software, version 22 was used for data analysis.

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Results

Out of 192 cases of thyroidectomy included in this study 33 (17.1%) were males while 159 (82.8%) were females. The mean ± SD of their age was 45.15 ± 15.5 years meanwhile the mean ± SD of the BMI was 28.7 ± 4.3 Kg/m^2. Table 1 shows the association of demography and some characteristics with the duration of stay in hours. Significantly, higher percentage of males (24.2%) stayed more than 23 hours in the hospital compared with 6.9% of females (*P* = 0.006). There was a statistically significant association between indication of operation and duration of stay (*P* = 0.023), where it is evident that half of those with cancer stayed more than 23 hours while the majority of those with goiter, graves' disease, toxic nodule and solitary stayed between 12-23 hours.

Table 1 Association of some characteristics with the duration of stay in hours.

Characteristics		Duration of stay								*P*-value
		< 12 hours		12-23 hours		> 23 hours		Total		
		No.	%	No.	%	No.	%	No.	%	
Gender	Male	4	12.1	21	63.6	8	24.2	33	100	0.006**
	Female	12	7.5	136	85.5	11	6.9	159	100	
Age groups	<25	1	12.5	7	87.5	0	0.0	8	100	0.370**
	25-34	7	17.1	31	75.6	3	7.3	41	100	
	35-44	2	4.3	41	87.2	4	8.5	47	100	
	45-54	4	8.3	41	85.4	3	6.3	48	100	
	55-64	1	4.0	18	72.0	6	24.0	25	100	
	65-74	1	5.0	16	80.0	3	15.0	20	100	
	≥75	0	0.0	3	100	0	0.0	3	100	
BMI category	Underweight	1	50.0	1	50.0	0	0.0	2	100	0.326**
	Normal weight	3	10.3	23	79.3	3	10.3	29	100	
	Overweight	9	10.3	69	79.3	9	10.3	87	100	
	Obese	3	4.1	64	86.5	7	9.5	74	100	
Indication	Goiter	7	6.2	94	83.2	12	10.6	113	100	0.023**
	Graves' disease	2	13.3	12	80.0	1	6.7	15	100	
	Toxic nodule	2	18.2	9	81.8	0	0.0	11	100	
	Solitary	4	8.9	39	86.7	2	4.4	45	100	
	Cancer	1	12.5	3	37.5	4	50.0	8	100	

**Fisher's exact test.

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Table 2 shows the association of some characteristics with the way of hemostasis. Most of the males 21 (63.6%) and females 116 (73%) are underwent sutureless way of hemostasis with no significant association between way of hemostasis and gender (*P* = 0.281). Also, sutureless way of hemostasis constitutes the majority of age groups with no significant association. Regarding BMI category, from underweight to obese category, most of them underwent sutureless way of hemostasis, also with no significant association. Except the cancer, most of other indications for operations underwent sutureless way of hemostasis, the indication of operation was statistically significant with the way of hemostasis (*P* <0.001).

Table 2 Association of demography and some characteristics with the way of hemostasis

Demography		Way of hemostasis						*P*-value
		Sutureless		Sutured		Total		
		No.	%	No.	%	No.	%	
Gender	Male	21	63.6	12	36.4	33	100	0.281*
	Female	116	73.0	43	27.0	159	100	
Age groups	<25	7	87.5	1	12.5	8	100	0.836**
	25-34	30	73.2	11	26.8	41	100	
	35-44	33	70.2	14	29.8	47	100	
	45-54	35	72.9	13	27.1	48	100	
	55-64	15	60.0	10	40.0	25	100	
	65-75	15	75.0	5	25.0	20	100	
	≥75	2	66.7	1	33.3	3	100	
BMI category	Underweight	2	100	0	0.0	2	100	0.213**
	Normal weight	25	86.2	4	13.8	29	100	
	Overweight	60	69.	27	31.0	87	100	
	Obese	50	67.6	24	32.4	74	100	
Indication	Goiter	68	60.2	45	39.8	113	100	<0.001**
	Graves' disease	14	93.3	1	6.7	15	100	
	Toxic nodule	9	81.8	2	18.2	11	100	
	Solitary	44	97.8	1	2.2	45	100	
	Cancer	2	25.0	6	75.0	8	100	

*Chi-square test, **Fisher's exact test.

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In Table 3 association of postoperative complications with duration of stay is demonstrated. Within 6 hours hematoma and RLN were not found in <12 hours, within 6 hours hypocalcemia was found in 12-23 hours 3 (1.9%) meanwhile all other hypocalcemia complications occurred after 23 hours. Also, after 6 hours hematoma and RLN were not found in <12 hours meanwhile after 6 hours hypocalcemia were found in 12-23 hours 4 (2.5%) and > 23 hours 1 (5.3%). There was no statistical association between the postoperative complications and duration of stay.

Table 3 Association of postoperative complications and duration of stay

Postoperative complications		Duration of stay								
		< 12 hours		12-23 hours		> 23 hours		Total		*P*-value
		No.	%	No.	%	No.	%	No.	%	
Within 6 hours hematoma	No	16	100	157	100	19	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	0	0.0	
Within 6 hours hypocalcemia	No	16	100	154	98.1	19	100	189	98.4	1.00**
	Yes	0	0.0	3	1.9	0	0.0	3	1.6	
Within 6 hours RLN	No	16	100	157	100	19	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	0	0.0	
After 6 hours hematoma	No	16	100	157	100	19	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	0	0.0	
After 6 hours hypocalcemia	No	16	100	153	97.5	18	94.7	187	97.4	0.641**
	Yes	0	0.0	4	2.5	1	5.3	5	2.6	
After 6 hours RLN	No	16	100	156	100	19	100	191	100	None
	Yes	0	0.0	0	0.0	0	0.0	0	0.0	

**Fisher's exact test.

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Table 4 shows the association between postoperative complications and way of hemostasis. Within 6 hours hematoma, after 6 hours hematoma, within 6 hours RLN and after 6 hours RLN were not found in any way of hemostasis. Within 6 hours hypocalcemia were found in sutureless 2 (1.5%) and in sutured 1 (1.8%) ways of hemostasis. Also, after 6 hours hypocalcemia was found in sutureless 4 (2.9%) and sutured 1 (1.8%) way of hemostasis. There was no statistical association between the postoperative complications and way of hemostasis.

Discussion

Total thyroidectomy was an operation that requires delicate dissection, safe anatomical exposure, and good hemostasis. For many thyroid conditions, total thyroidectomy was the therapeutic option. This procedure is widely practiced and has a low rate of mortality and morbidity. In the last 30 years, there has been a definite trend toward outpatient surgery despite its growing popularity; outpatient thyroid surgery does not have universal support due to concerns about transient hypocalcemia and haemorrhage.[3,19,20]

In our study, 192 cases were included, 174 (90.1%) cases of less than 23 hours and only 19 (9.9%) cases of more than 23 hours had stayed at the hospital. Among the short-stay cases, 16 cases were discharged less than 12 hours, while 158 cases were discharged between 12-23 hours. This finding in our study is similar to the findings of other studies. For instance, in Snyder et al., 93.6% of the cases were completed as day case surgery; meanwhile, Alexander and co-workers (95.1%) were discharged within 24 hours of surgery.[4,21]

The most common indication for total thyroidectomy in benign disorders of the gland is non-toxic multinodular goiter, regarding the association of demography & some characteristics with the duration of stay in hours, our study shows a statistically significant association between indication of operation and duration of stay (P = 0.023). The most common indication of operation in the current study was

Table 4 Association of postoperative complications and way of hemostasis

Postoperative complications		Way of hemostasis						*P*-value
		Sutureless		Sutured		Total		
		No.	%	No.	%	No.	%	
Within 6 hours hematoma	No	137	100	55	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	
Within 6 hours hypocalcemia	No	135	98.5	54	98.2	189	98.4	1.00**
	Yes	2	1.5	1	1.8	3	1.6	
Within 6 hours RLN	No	137	100	55	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	
After 6 hours hematoma	No	137	100	55	100	192	100	None
	Yes	0	0.0	0	0.0	0	0.0	
After 6 hours hypocalcemia	No	133	97.1	54	98.2	187	97.4	1.00**
	Yes	4	2.9	1	1.8	5	2.6	
After 6 hours RLN	No	137	100	54	100	191	100	None
	Yes	0	0.0	0	0.0	0	0.0	

**Fisher's exact test.

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multinodular goiter 113 (58.8%), while the least indication of operation was cancer 8 (4.1%). This finding is similar to the finding of Accetta and co-workers for total thyroidectomy for benign thyroid disease, which was 37 (56.1 %)for the goiter and 2 (3%) for the cancer.[22]

Moreover, the females 159 (82.8%) with thyroidectomy were outnumbered of males 33 (17.1%) with male:female ratio of 0.2:1. Since females goiter is more prevalent than male goiter, similar findings were found in many studies. Females comprised 78.5% - 94% of patients, while males comprised 6% - 21.5% of patients.[4,22,23] The statistically significant cases of female to male ratio may be due to the number of thyroidectomies included in our study

In the last decade, sutureless thyroid surgery had gained ground. This approach was straight forward to implement. Sutureless thyroid surgery had been found to minimize operative time and eliminate thermal diffusion and harm to the surrounding tissues due to the effectiveness and safety of suture devices such as Harmonic-Scapel. The harmonic scalpel was relatively new surgical device that has only been available for a decade. It cuts and coagulates tissues at the same time with high-frequency mechanical energy. The end effect of ultrasonic coagulation achieved by the harmonic scalpel was a denatured protein coagulum that coapts and tamponades blood arteries, similar to electrocautery. The mechanism by which proteins were denatured.[5,14,19]

Regarding the association of demography and some characteristics with the way of hemostasis, in our study 137 cases involved in sutureless technique. In comparison, 55 cases in sutured way of hemostasis in a total of 192 cases for age, gender, body mass index, and indications, the most common indication of operation in our study which was multinodular goiter 113 (58.8%) and the slightest indication was cancer 8 (4.1%). Similar findings were found in the study of Accetta and co-workers for total thyroidectomy for benign thyroid disease, which was (56.1%) for goiter and (3%) for cancer.[22]

Any thyroid surgeon's greatest concern was postoperative bleeding, which can cause immediate airway compromise, hypoxia, and mortality. Those who oppose outpatient thyroid surgery believe that patients should be monitored in the hospital for longer periods of time to reduce the complications given the potentially fatal effects of a postoperative bleed.[24] Recurrent laryngeal nerve neurapraxia was the most common cause of restricted vocal cord movement after thyroid surgery, and it usually resolves within a few weeks. Neurapraxia can occur in up to 10% of patients, but lifelong recurrent laryngeal nerve injury should be less than 1%. In most cases, unilateral nerve damage resulting in postoperative hoarseness would not necessitate an inpatient stay. Bilateral nerve paralysis was extremely uncommon; with only 0.2%, it was life-threatening and would become apparent shortly after surgery.[18]

Association of postoperative complications within 6 hours and 23 hours for both duration of stay and way of hemostasis of both hematoma and recurrent laryngeal nerve injury showed no cases (0.0%). Nearly results were found in many studies, including Mayo clinic (0.3%), Lang with co-workers (0.7%), Snyder et al. (0.19%),[21,25] Overall, post-thyroid surgery RLNP incidence is0.16% and 1.25% for permanent and transient RLNP, respectively comparable to our study.[26] However, the results for both complications in our study were near to the results of other studies, but our study's outcome regarding hematoma and recurrent laryngeal nerve injury looks better than the results of the above comparable studies. This may be due to using the sutureless technique in the majority of cases 137 (71.4%) or the small sample size. In addition, by using the sutureless technique, the patient can be discharged in less than 23 hours.

Postoperative hypocalcemia remains

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a common complication following thyroid surgery. This was likely to preclude early discharge. Hypoparathyroidism (temporary or permanent) was considered the cause, and it was thought to develop for various reasons, including parathyroid devascularization, iatrogenic injury, inadvertent removal, and 'stunning' from dissection. Symptomatic hypocalcemia can take a long time to appear postoperatively.[12,24] In our study, postoperative hypocalcemia, only 3 cases from 157 cases that developed hypocalcemia within 6 hours postoperatively of those patients discharged before 23 hours and 5 cases from 24 cases of the patient who discharged after 23 hours. Al Essa and co-workers regarding postoperative hypocalcemia will develop in 2.15 (0.4) in outpatients and 2.22 (0.30) cases inpatient, which means overnight stay at hospital developed hypocalcemia, the usage of prophylactic supplements may have resulted in a decreased prevalence of hypocalcemia in the current study. The administration of a prophylactic postoperative calcium supplement plus vitamin D (1,25 dihydroxy vitamin D) had been proven to reduce the risk of hypocalcemia, and many institutions have implemented this practice with good results.[23]

Regarding the Table 4, within 6 hours postoperative hypocalcemia in sutureless group 2 cases out of 137 cases and 1 case out of 55 cases in the sutured group while those patents who discharged after 23 hours in sutureless group 4 cases from 136 cases and 1 case from 55 cases in the sutured group had developed hypocalcemia which was dislike to Emanuele Ferri and colleagues postoperative transient hypocalcemia occurred more frequently in the conventional hemostasis group than in the harmonic scalpel group. This difference was statistically significant (42%) in conventional hemostasis group; (14%) in harmonic scalpel group). Hypocalcemia was defined as a serum calcium level below 8.0 mg/dL (2.00 mmol/L) (reference range, 8.0–10.5 mg/dL [2.00–2.60 mmol/L]).[3]

Conclusion

Short-stay thyroid surgery was a feasible and safe procedure when combined with sutureless technique. In a total thyroidectomy, the harmonic scalpel is a reliable, practical, and fast alternative to conventional hemostasis. which will enhance discharge in less than 23 hours, this returns to overall less postoperative complications, so our conclusion that using a sutureless technique was a better outcome for both hospital bed and early discharge of the patient with less complication.

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Competing interests

The authors declare that they have no competing interests.

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