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Analyzing the ATA statement on outpatient thyroidectomy using the NSQIP database

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ABSTRACT

Introduction: The aim of this study is to examine the outcomes of outpatient thyroidectomy per the American Thyroid Association (ATA) statement on this procedure using the American College of Surgeons National Surgical Quality Improvement Project (NSQIP) database.

Methods: A retrospective study using NSQIP database (2016 2017) comparing outpatient (OP) and inpatient (IP) thyroidectomies based on the ATA statement.

Results: There were 382 inpatient and 628 outpatient thyroidectomies. A vessel sealing device and intraoperative nerve monitoring were more commonly used in OP group. Drain use was less common in OP group.

There was no difference in the rate of recurrent laryngeal nerve injury, neck hematoma, or postoperative hypocalcemia within 30 days after surgery. IP group had a higher rate of readmissions (3.4% vs 1.8%, $p = 0.004$). Logistic regression showed OP surgery was associated with a lower risk of readmission OR 0.38 (CI 0.15–0.97; $p = 0.04$).

Conclusion: The ATA criteria can be used to identify good candidates for outpatient thyroidectomy.

Introduction

Thyroidectomy has evolved into a very safe procedure with low complication risks with hematoma occurring in less than one-percent, temporary hypocalcaemia in 25%, and recurrent laryngeal nerve injury in one-percent of patients.[1] The first feasibility study of outpatient thyroidectomy was reported in 1986 and since then multiple studies have reported the safety of outpatient thyroidectomy given the improved outcomes.[2]

In 2013, the American Thyroid Association (ATA) published its statement on the safety of outpatient thyroidectomy through the Surgical Affairs Committee Writing Task Force.[1] A review of published series on outpatient thyroidectomy as well as a two-phase comment period were conducted with the participation of members of the ATA, the American Association of Endocrine Surgeons (AAES), the American Head and Neck Society, and the American Academy of Otolaryngology. The potential advantages of performing this operation as an outpatient procedure include patient comfort and convenience as well as decreased cost.

The American College of Surgeons' National Surgical Quality Improvement Project (NSQIP) is a national risk-adjusted outcomes-based program designed to help gather surgical data to improve the quality of surgical care and for research purposes. It was launched in 2001 and now includes data from more than 600 hospitals. A procedure-specific data collection tool was designed for specific procedures including thyroidectomy starting in 2016. The targeted data collection helps examine patient and surgical factors that are relevant to each procedure. (https://www.facs.org/quality-programs/acs-nsqip/about/history).

The literature thus far has supported the implementation of outpatient thyroidectomy,[3,4] however, studies frequently describe them in "select patients" with little agreement on those selection criteria and hence the ATA published its census statement. We aim to use the NSQIP database to compare the outcomes between inpatient and outpatient surgeries in patients who are considered candidates for an outpatient procedure based on the ATA statement to examine its applicability.

Methods

After obtaining institutional review board approval, we used the American College of Surgeons NSQIP general and thyroidectomy targeted databases between 2016 and 2017 (years with targeted

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thyroidectomy procedure data is available) to conduct a retrospective cross-sectional study. We collected data from participating facilities encompassing general patient demographics and risk factors, intraoperative data, and post-operative outcomes. Post-operative variables are collected for thirty days following the date of the procedure. All ACS-NSQIP data is de-identified and comply with the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

All patients undergoing thyroidectomy were identified using their specified Current Procedural Terminology (CPT) codes ("38724", "60254", "60252", "60271", "60270", "38720") from the procedure targeted Thyroidectomy Participant Use Data File (PUF). Using the unique case ID, patients who underwent thyroidectomy were identified and merged with data from the general NSQIP PUF for corresponding years, after which inclusion and exclusion criteria were applied.

Patients with a history of HF, renal failure, chronic obstructive pulmonary disease (COPD) or bleeding disorders were initially excluded from the study based on the ATA statement on outpatient thyroidectomy. Further, patients on anticoagulant or antiplatelet therapy, bleeding disorder (INR >1.5, PTT > 35, platelets <100,000) were also excluded. Patients with locally advanced thyroid cancer including T4a, T4b or N1b, patients with Graves' disease or goiter with a substernal component as a primary indication were also excluded. These exclusion criteria were all based on the ATA statement. We compared the outcomes of patients who underwent an outpatient procedure versus the ones who underwent an inpatient procedure.

Statistical analysis

Quantitative variables were described using means and standard deviations (SD). Categorical variables were described using frequencies and proportions. Student's T-test and the chi−squared test was used to assess the patient's baseline demographic and operation differences across inpatient and outpatient care. Logistic regression models were used to assess the unadjusted and adjusted postoperative complication rates in inpatient and outpatient care. These estimates were reported as odds ratio (OR) together with their 95% confidence interval (CI). P values less than 0.05 were considered statistically significant. All analyses were carried out using SAS V.9.4 (SAS Institute, Cary, NC, USA) and STATA V.15 (StataCorp, College Station, TX, USA).

Results

A total of 1010 thyroidectomy patients meeting the inclusion criteria were identified between 2016 and 2017. Three hundred eighty-two of these were done on an inpatient basis and 628 were done on an outpatient basis. Refer to Table 1 for complete demographic information. The outpatient cohort had a higher proportion of patients with American Society of Anesthesiologists (ASA) classes II and III whilethe inpatient group had a higher proportion of ASA class I patients ($p < 0.001$). While the outpatient group had a higher average BMI (31.1 vs 28.5, $p < 0.001$), there was no difference in the presence of other comorbidities between the two groups.

The proportion of patients with a history of prior neck surgery was not different (9.7% in both, $p = 0.98$). The indication for surgery

Table 1
Patients' demographic, and comorbidities.

	Inpatient 382	Outpatient 628	p-value
Height (inches), mean (SD)	64.0 (3.7)	64.7 (3.7)	0.005
Weight (lbs.), mean (SD)	167.5 (48.7)	186.8 (51.5)	<0.001
BMI, mean (SD)	28.5 (7.1)	31.3 (8.0)	<0.001
Age of patient (years), mean (SD)	36.3 (14.3)	34.9 (14.4)	0.13
Length of total hospital stay (days), mean (SD)	2.0 (2.8)	0.7 (1.1)	<0.001
Age (years)			0.36
18–39 years	74 (19.4%)	135 (21.5%)	
40–59 years	163 (42.7%)	282 (44.9%)	
60 + years	145 (38.0%)	211 (33.6%)	
Gender			0.91
Female	300 (78.5%)	495 (78.8%)	
Male	82 (21.5%)	133 (21.2%)	
Race			<0.001
Asian/native	120 (31.4%)	55 (8.8%)	
Black or African American	22 (5.8%)	121 (19.3%)	
Unknown/Not Reported	139 (36.4%)	71 (11.3%)	
White	101 (26.4%)	381 (60.7%)	
Current smoker within one year	39 (10.2%)	81 (12.9%)	0.2
COMMORBIDITIES			
Hypertension requiring medication	134 (35.1%)	256 (40.8%)	0.072
On dialysis	1 (0.3%)	0 (0.0%)	0.2
Open wound/wound infection	0 (0.0%)	1 (0.2%)	0.44
Steroid use	15 (3.9%)	14 (2.2%)	0.12
>10% loss body weight in last 6 months	1 (0.3%)	1 (0.2%)	0.72
Transfusion≥1 units PRBCs in 72 h before surgery	0 (0.0%)	2 (0.3%)	0.27
Diabetes mellitus with oral agents or insulin			0.29
Insulin use	12 (3.1%)	20 (3.2%)	
No	339 (88.7%)	538 (85.7%)	
Non - insulin	31 (8.1%)	70 (11.1%)	
ASA classification			<0.001
1-No Disturb	31 (8.1%)	23 (3.7%)	
2-Mild Disturb	224 (58.6%)	379 (60.4%)	
3-Severe Disturb	109 (28.5%)	216 (34.4%)	
4-Life Threat	7 (1.8%)	9 (1.4%)	
None assigned	11 (2.9%)	1 (0.2%)	

Table 2
Operative variables.

Thyroidectomy characteristics	Inpatient n (%)	Outpatient n (%)	p-value
Primary Indication for Surgery			0.13
Known differentiated/poorly or undifferentiated malignancy	62 (16.2%)	75 (11.9%)	
Other malignancy (lymphoma, sarcoma)/Other specified indication	15 (3.9%)	20 (3.2%)	
Unknown	4 (1.0%)	8 (1.3%)	
Goiter, multinodular/severe	136 (35.6%)	259 (41.2%)	
Single Nodule or Neoplasm/Single Nodule Goiter	165 (43.2%)	266 (42.4%)	
If Nodule, Goiter, or Graves- Clinical Toxicity	37 (9.7%)	18 (2.9%)	<0.001
Extent of thyroidectomy			0.082
Partial (partial or total lobectomy or isthmusectomy)	505 (50)	174 (45.55)	
Total	451 (44.65)	187 (48.95)	
Completion	54 (5.35)	21 (5.5)	
Preoperative Needle Biopsy Result			0.79
Follicular neoplasm	66 (17.3%)	112 (17.8%)	
Hurthle cell neoplasm	17 (4.5%)	34 (5.4%)	
Indeterminate result	48 (12.6%)	88 (14.0%)	
No evidence of preoperative needle biopsy	180 (47.1%)	272 (43.3%)	
Suspicious for papillary thyroid cancer	71 (18.6%)	122 (19.4%)	
Operative Approach			0.039
Open	367 (96.1%)	619 (98.6%)	
Other, other MIS approach w/open assist/Unknown	9 (2.4%)	6 (1.0%)	
Robotic, robotic w/open assist, robotic unplanned conversion to open	6 (1.6%)	3 (0.5%)	
Central Neck Dissection Performed	51 (13.4%)	108 (17.2%)	0.054
Use of Harmonic Scalpel or LigaSure or Other Vessel Sealant Device	190 (49.7%)	474 (75.5%)	<0.001
Intraoperative Recurrent Laryngeal Nerve Monitoring	134 (35.1%)	444 (70.7%)	<0.001
Drain Usage	150 (39.3%)	185 (29.5%)	0.001

(carcinoma vs. multinodular goiter vs. single nodular goiter/neoplasm) was also similar ($p = 0.13$). The extent of surgery between the two groups (partial vs. total vs. completion thyroidectomy) was not different ($p = 0.08$).

As far as the operative approach, open thyroidectomy was the most common (97.6%) in both groups. A vessel sealing device was more commonly used in the outpatient group (75.5% vs. 49.7%, $p < 0.001$). The same was true for intraoperative nerve monitoring (70.7% vs. 35.1%, $p < 0.001$). Drain use was less common in the outpatient group (29.5% vs. 39.3%, $p = 0.001$) (Table 2).

The rate of unplanned intubation was higher in the inpatient group (0.8% vs 0%, $p = 0.026$) as unplanned intubation would inevitably convert the patient's stay into an inpatient one. Unplanned reoperation rate was low and showed no difference between the inpatient and outpatient groups (1% vs. 0.3%, $p = 0.14$). The inpatient group had a higher rate of unplanned readmissions (3.4% vs. 1.8%, $p = 0.004$).

Postoperative calcium levels were checked more often in the inpatient group (63.1% vs. 50.2%, $p < 0.001$). Similarly, postoperative PTH levels were also checked more often in the inpatient group (51.3% vs. 29.5%, $p < 0.001$). The rate of significant postoperative hypocalcaemia was higher in the inpatient group (4.5% vs. 2.2%, $p = 0.002$), but significant postoperative hypocalcaemia within 30 days after surgery was similar (4.5% vs. 4.3%, $p = 0.066$). There was a trend but no statistically significant increase in the rate of recurrent laryngeal nerve injury or dysfunction in the inpatient group (6.8% vs. 4.3%, $p = 0.19$). Similarly the rate of neck hematoma was not significantly different (1.6% vs. 0.8%, $p = 0.49$) (Table 3).

Logistic regression analysis showed that the odds ratio (OR) of significant postoperative hypocalcaemia prior to (OR 0.47, 95% CI 0.19–1.16; $p = 0.1$) or at 30 days (OR 1.11, 95% CI 0.51–2.43; $p = 0.79$) after discharge were similar. The rate of RLN injury or dysfunction was not different between the two groups (OR 0.67, 95% CI 0.4–1.34; $p = 0.26$), neither was neck hematoma/bleeding

Table 3
Postoperative complications.

	Inpatient n (%)	Outpatient n (%)	p-value
Superficial surgical site infection	4 (1.0%)	3 (0.5%)	0.29
Deep surgical site infection	0 (0.0%)	1 (0.2%)	0.44
Pneumonia	0 (0.0%)	1 (0.2%)	0.44
Unplanned Intubation	3 (0.8%)	0 (0.0%)	0.026
Pulmonary Embolism	1 (0.3%)	1 (0.2%)	0.72
Urinary Tract Infection	2 (0.5%)	1 (0.2%)	0.3
Cardiac Arrest Requiring CPR	1 (0.3%)	0 (0.0%)	0.2
Bleeding Transfusions	2 (0.5%)	0 (0.0%)	0.07
DVT/Thrombophlebitis	0 (0.0%)	1 (0.2%)	0.44
Unplanned Reoperation	4 (1.0%)	2 (0.3%)	0.14
Any readmission	18 (4.71)	11 (1.75)	0.006
Significant Postoperative Hypocalcemia Prior to Discharge	17 (4.5%)	14 (2.2%)	0.002
Significant Postoperative Hypocalcemia Within 30 days	17 (4.5%)	27 (4.3%)	0.066
Clinically Severe Hypocalcemia-related Event [a]	10 (2.6%)	8 (1.3%)	0.12
Recurrent Laryngeal Nerve (RLN) Injury or Dysfunction[b]	26 (6.8%)	27 (4.3%)	0.19
Neck Hematoma	6 (1.6%)	5 (0.8%)	0.49
30-day Readmission	18 (4.71)	11 (1.75)	0.006

[a] Defined as emergent evaluation in clinical office, emergency dept IV calcium supplementation, or readmitted for low calcium.
[b] Defined as presence of hoarseness.

Table 4
Multivariate analysis.

	OR Outpatient (ref = Inpatient)	95% CI		P value
Postoperative Calcium Level Checked	0.63	0.43	0.92	0.017
Postoperative Parathyroid (PTH) Level Checked	0.49	0.35	0.70	<0.001
Significant Postoperative Hypocalcemia Prior to Discharge	0.47	0.19	1.16	0.1
Significant Postoperative Hypocalcemia Prior to Discharge at 30 days	1.11	0.51	2.43	0.794
Recurrent Laryngeal Nerve Injury	0.67	0.34	1.34	0.26
Neck Hematoma	0.42	0.10	1.73	0.231
Any Readmission	0.38	0.15	0.97	0.043

Variables adjusted for include BMI, race, clinical toxicity, drain usage, type of operational approach and Use of Harmonic Scalpel or LigaSure or Other Vessel Sealant Device and length of stay. CI = confidence interval.

(OR 0.42, 95% CI 0.1–1.73; p = 0.23). Readmission was less likely in the outpatient group (OR 0.38, 95%CI 0.15–0.97; p = 0.04) (Table 4).

Discussion

As the outcomes of thyroidectomy continue to improve, more surgeons are electing to perform surgery on an outpatient basis. The ATA decided to utilize a task force to publish guidelines to help surgeons decide if an outpatient procedure is a safe and viable option. In this study we show that following these guidelines is associated with excellent outcomes.

Outpatient thyroidectomy is increasingly performed. This trend has been boosted by a number of studies on the safety of performing it in an outpatient setting. In a review of ten observational studies, Lee et al. showed that there was no difference in the complication or readmission rates between outpatient and inpatient groups. In fact, that review showed that hypocalcemia was higher in the inpatient setting which may have been attributed to performing routine blood work and detecting subclinical hypocalcemia.[4] Similarly in a large series of 1460 thyroidectomies, there was no difference in the rates of hypocalcemia, postoperative emergency department visits, or postoperative hypocalcemia when the surgery was performed on an inpatient or outpatient basis.[5] These are in accordance with our findings.

The enthusiasm for performing thyroidectomy on outpatient basis is two-fold; improved patient satisfaction and reduced cost. A large study of 1571 patients from Italy used patient satisfaction questionnaire to show that 95% of patients undergoing outpatient surgery were “satisfied” or “very satisfied” with their experience.[6] Samson et al. showed that patients who had an outpatient procedure were more pleased with their experience than their inpatient counterparts.[7] In terms of cost, it is estimated that the per-capita charges for outpatient thyroidectomy is $7,222, much lower than that of inpatient surgery ($22,523), yielding an estimated yearly savings of $63.6 million if cases are transitioned to the outpatient setting.[8]

An interesting finding in this study is the variation in the surgical technique between the two groups. In the patients who were operated on in the outpatient setting, we found that surgeons were more likely to use advanced energy devices, intraoperative nerve monitoring (IONM), and less likely to utilize drains. There has been an old debate on whether IONM prevents recurrent laryngeal nerve injury at the time of thyroidectomy. Various studies have reported conflicting results.[9] However, there is no doubt about the benefit of the IONM for identifying loss of signal events which detect nonfunctioning nerve that is visibly and anatomically intact.[10–12] The use of drains in thyroid surgery has never been proven to be beneficial, and in some studies has been shown to increase the risk of infection and the hospital length of stay.[13,14] The use of advanced vessel-sealing energy devices such as ultrasonic coagulation and electrothermal bipolar sealing systems have been shown to be as safe as the traditional clamp-and-tie technique and more time efficient.[15] Surveys have shown that high-volume thyroid surgeons are more likely to use advanced energy devices, IONM, and less likely to use drains.[16,17] The above suggests that the difference in surgical technique between our groups is due to more outpatient procedures being performed by high-volume surgeons.

This study has several limitations. First is its retrospective nature. In addition, the NSQIP database, including the thyroidectomy specific files, does not include data on surgeon volume or long-term follow up (beyond 30 days). The incidence of some complications such as recurrent laryngeal nerve injury is not well defined and there is no information on the criteria to examine and diagnose vocal cord paralysis. Lastly, the outpatient status in NSQIP means that the patient stayed in the hospital less than 23 h, so it is impossible to differentiate those who may have been planned for an outpatient procedure and later their stay was converted to inpatient due to adverse outcomes.

Conclusion

Outpatient thyroidectomy in select patients as outlined by the ATA is safe and associated with outcomes as good as inpatient surgery. Patients who underwent outpatient surgery had a lower risk of readmission.

Disclosures

None.

Grants

None

Declaration of competing interest

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Christopher Dodoo MS: nothing to disclose.
Eyas Alkhalili MD: nothing to disclose.

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