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Clinical Group

Archives of Otolaryngology and Rhinology

DOI http://doi.org/10.17352/2455-1759.000077

ISSN: 2455-1759 CC By

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Received: 31 July, 2018
Accepted: 29 August, 2018
Published: 30 August, 2018

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Research Article

Factors influencing extent of surgery for Substernal Thyroid Goiters: Hemithyroidectomy versus total Thyroidectomy

Abstract

Background: When compared to removal of cervical goiters, patients undergoing removal of substernal goiter have been found to have higher rates of complications, including recurrent laryngeal nerve injury, bleeding, and hypoparathyroidism. Previous literature has discussed hemithyroidectomy versus total thyroidectomy for cervical goiters showing that the less invasive procedure was a reasonable option with decreased morbidity overall.

Methods: A retrospective chart review was performed at 2 tertiary academic medical centers. The search was performed using the CPT codes for substernal removal of thyroid 60270 and 60271.

Results: 38 patients were identified between the years 2011-2017. Patients who underwent hemithyroidectomy in this study, had a trend toward older age, higher rate of medical co-morbidities and small size of non-dominant thyroid lobe. No patients who underwent hemithyroidectomy at this institution during this study period required completion thyroidectomy.

Conclusion: Hemithyroidectomy is an acceptable treatment option for substernal goiters in appropriate cases.

Introduction

Multinodular goiter is the most common form of benign thyroid disease both worldwide and in the United States [1]. Substernal goiters (SSGs) often originate from cervical goiters and occur due to downward growth through fascial planes in the neck. They have an incidence ranging from 3 to 13% in the literature [2].Due to the confined space of the thoracic cavity, SSGs have close proximity to the respiratory and digestive tracks, and the great vessels. Its cervical component may remain asymptomatic, however SSGs can cause compressive symptoms early in their course [3]. Common symptoms include dyspnea when supine, dysphagia, hoarseness, sensation of fullness in the throat [2].Physical assessment of an SSG may be difficult due its location, but ultrasound and CT scans are very valuable in demonstrating the relationship between the goiter and the trachea, esophagus, great vessels, aortic arch and carina.

Generally, a cervical approach can be used to deliver the thoracic portions of the goiter, but thoracic surgical colleagues are often consulted in rare case that a median sternotomy is necessary (0-12.2%) to completely remove the gland [3,4]. Medial sternotomy is typically indicated in cases in which substernal extent of the gland goes beyond the aortic arch or the tracheal carina. When compared to removal of cervical goiters, patients undergoing removal of SSG were found to have higher perioperative morbidity and generally require longer hospital stays [5]. The most common complications of thyroid surgery include hematoma, recurrent laryngeal nerve injury, transient post-operative hypocalcemia and permanent hypoparathyroidism [1].

There have been multiple articles published in the literature posing the question of hemi versus total thyroidectomy for cervical goiters. Indications for surgical removal of thyroid goiter include compression symptoms or biopsy indicating suspicion for malignancy. If the nodules on the non-dominant side are not felt to be symptomatic and have been biopsied benign, performing hemithyroidectomy would both decrease morbidity related to hypoparathyroidism, transient recurrent laryngeal nerve palsy and prevent patients from permanent hypothyroidism [6]. In our study, we contemplate whether these same principles should be applied to patients with

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substernal goiters and in what cases is hemi versus total thyroidectomy more appropriate for this subgroup of patients.

Methods

A retrospective chart review was performed at 2 tertiary medical centers, Our Lady of the Lake Regional Medical Center in Baton Rouge, La and University Medical Center in New Orleans, La between the years 2011-2017. The search was performed using the CPT codes for substernal removal of thyroid 60270 and 60271. Data collection included patient demographics such as age, sex, and medical co-morbidities, as well as surgery performed, US and CT characteristics of thyroid gland pre-operatively, surgical complications, TSH pre-operatively, pathology and need for completion thyroidectomy.

Results

38 patients were identified who underwent removal of substernal goiter. These patients were found based on procedure CPT codes from the year 2011-2017. There were 31 females and 8 males. 23 patients underwent hemithyroidectomy, 13 underwent total thyroidectomy and 2 patients underwent completion thyroidectomy. Of note, one of the hemithyroidectomy patients had previously undergone a nodulectomy on the contralateral side 30 years prior. Average age for hemithyroidectomy was 62.8 years while average age for total thyroidectomy was 52.1 years. Average BMI was 33.54 and was not found to be significantly different between the hemithyroidectomy and total thyroidectomy groups (33.69 and 33.24 respectively). Patients who underwent hemithyroidectomy averaged 3.36 medical diagnoses while those who underwent total thyroidectomy had 2.76 medical diagnoses. Patients who underwent hemithyroidectomy had an average length of stay of 1.64 days and patients who underwent total thyroidectomy had an average length of stay of 1.53 days (Table 1).

The average size of the dominant lobe in patients who had hemithyroidectomy was 8.58cm, while the average size of the non-dominant lobe was 4.8cm. For total thyroidectomy patients, the average size of the dominant lobe was 8.56cm while the non-dominant lobe was 6.51cm. Two patients required sternotomy, one due to extension below the aortic arch and another due to substernal extension below the level of the carina. Both patients underwent hemithyroidectomy.

Complications included hematoma, transient hypoparathyroidism, vocal cord paresis, DVT and atrial fibrillation in the post-operative period. Table 2 lists the most common complications in the post-operative period. In the hemithyroidectomy group, the most common complication was hematoma (12%). In the total thyroidectomy group, transient hypoparathyroidism was the most common complication with a rate of 30.7%. Of the three patients who underwent reoperation, all 3 did not have any postoperative complications. Two patients underwent median sternotomy for extension either below the level or the aortic arch or extension of the gland below the carina.Both patients underwent hemithyroidectomy and each of them remained in the hospital until post-operative day 3.One of these patients developed atrial fibrillation post operatively. The other patient had an uneventful postoperative course. The remainder of the patients were able to undergo removal of the gland from a cervical approach.

Table 1: Comparison of study group data.

	Hemithyroidectomy	Total Thyroidectomy
Mean Age	62.8 years	52.1 years
Mean BMI	33.69	33.24
Mean Number of Medical Co-Morbidities	3.36	2.76
Size of Dominant Lobe	8.58 cm	8.56 cm
Size of Non-Dominant Lobe	4.8 cm	6.51 cm
Mean Length of Hospital Stay	1.64 days	1.53 days

Table 2: Comparison of Rates of Common Complications.

	Hemithyroidectomy	Total Thyroidectomy
Hematoma	12%	-
TVC paresis	8%	7.6%
Transient Hypocalcemia	-	30.7%

The most common pathology was nodular hyperplasia (81.5%), other variants included chronic lymphocytic thyroiditis, papillary carcinoma and microcarcinoma, follicular carcinoma and poorly differentiated thyroid carcinoma.

Two patients in the hemithyroidectomy group underwent completion thyroidectomy for cancer found of final pathology. No patients in this group underwent completion thyroidectomy for compression symptoms from the contralateral lobe of the goiter during the follow up period. There were 2 patients who underwent completion thyroidectomy in this study who had previously undergone hemithyroidectomy at an outside institution. Time from original surgery ranged from 12-39 years prior. Average size of thyroid lobe in these patients was 10.5cm.

Discussion

It has been consistently reported in the literature that patients who undergo thyroidectomy for substernal versus cervical goiter have increased rates of morbidity and generally require longer hospital stays. Bove et al. compared complications of total thyroidectomy in substernal versus cervical goiters and found that substernal total thyroidectomy had statistically significant higher rates of transient hypoparathyroidism as well as transient recurrent laryngeal nerve palsy [5]. Sancho et al. reported similar findings with an incidence of 37% for transient hypoparathyroidism and 14% for temporary vocal cord paralysis in substernal goiters in which the tracheal carina is reached [7]. Bove et al. additionally found that recurrence and extension of the goiter beyond the carina were statistically significant pre-operative risk factors associated with higher risks of complications. They considered growth of the gland beyond the level of the carina to be a more significant risk factor than the volume of the gland itself [5].

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In our study, we found a trend towards higher complication rates in the hemithyroidectomy group. This is likely due patient selection up front for hemithyroidectomy by the operating surgeon to reduce morbidities due to patient prior medical history or size and substernal extent of the goiter. Patients in this group averaged 0.6 more medical diagnoses and were on average 10.7 years older. The average size of the dominant gland in the hemithyroidectomy group was essentially equivalent to the size of that in the total thyroidectomy group. However, the size of the non-dominant gland, however averaged 1.71cm smaller in the hemithyroidectomy group. Of the 3 patients in the hemithyroidectomy group who developed hematoma, 1 patient was placed on therapeutic anticoagulants perioperatively for DVT, another patient had poorly controlled hypertension in the post-operative setting. Patient medical history and co-morbidities put them at risk for these complications and further justifies limited surgery in these patients.

The recurrence rate for MNG in patients undergoing hemithyroidectomy is reported between 1.2-26% with average time for recurrence being 10 to 16 years.Recurrence rates for thyroid goiter in patients undergoing total thyroidectomy is 3%. Reoperation rate is still very low for recurrent MNG as it they generally only undergo reoperation for compressive symptoms, and complication rate is not significantly different from the initial procedure. In our study, 2 patients underwent completion thyroidectomy for malignancy. There were no patients who underwent completion thyroidectomy in which we had done their original thyroid procedure. 3 patients underwent reoperation at our facility. One patient had undergone a right sided nodulectomy 30 years prior and was found to have compressive symptoms from a left sided substernal goiter. Two other patients underwent completion thyroidectomy at 12 years and 39 years out from their original surgeries. This seems consistent with data previously cited in the literature pertaining to length of time for recurrence after hemithyroidectomy. Of note, none of the patients in the reoperation group, albeit a small sample size, suffered any perioperative complications.

Average BMI for all patients in this study put them into the obese category which can carry with it higher surgical risks. Buerba et al. performed a multi-institutional study on 30-day morbidity and mortality after endocrine surgery in patients with elevated BMI. They stratified groups based on the overweight, obese and morbidly obese categories. They found that obesity and morbid obesity were independent predictors for having at least 1 complication or having a wound "occurrence" defined as infection or dehiscence, after thyroid surgery. They also found that being overweight, obese and morbidly obese were independent predictors for spending greater durations of time in the operating room for thyroid surgery [8]. Milone et al. performed a single institution study on patients with elevated BMI and found that while BMI >25 increased operative times that there was no statistically significant difference in recurrent laryngeal nerve palsy, transient hypoparathyroidism or duration of hospital stay. Elevated BMI has been shown in other fields to be a risk factor for post-operative hematoma [9]. Zhang et al. confirmed this for thyroid surgery showing that BMI >30 increases risk of neck hematoma after thyroidectomy [10]. Considering that average BMI in this study was greater than 30, our patient population has baseline elevated risks for perioperative complications, longer surgeries and neck hematoma.

This is a limited series of patients in which we sought to examine the thought process of thyroid surgery in a patient group that is at higher risk for complications. In an age when thyroid surgery is becoming more conservative, the topic of extent of surgery for substernal goiter deserves its own examination and evaluation. It is the thought process of one of the senior authors that hemithyroidectomy, particularly in patients who are high risk for surgery or in whom the contralateral gland is likely asymptomatic is a favorable option to decrease overall morbidity of the surgery. In our patient demographic additionally, obesity is very prevalent, and many of our patients have multiple medical co-morbidities which put them at additional risk for perioperative complications.

Limitations include small study population and multiple different surgeons working at different medical facilities.A longer retrospective review with a larger patient data pool would likely deflate the complication rates and give better trends toward long term outcomes and potential need for completion thyroidectomy.Examination of rates of complications related to medical comorbidities and BMI would also give further insight into pre-operative decision making in these patients.

Conclusion

Hemithyroidectomy for thyroid goiter has been reported in the literature as an appropriate surgical option which can decrease patient morbidity and hospital stay. Patients who underwent hemithyroidectomy for substernal thyroid goiters in this study, had a trend toward older age, higher rate of medical co-morbidities and small size of non-dominant thyroid lobe. These patients did not require completion surgery for non-malignant pathology or have reported of hypoparathyroidism. Consequently, hemithyroidectomy is an acceptable possibly safer treatment option for substernal goiters in these select cases.

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