Indian Journal of Surgical Oncology (March 2019) 10(1):130–134
https://doi.org/10.1007/s13193-018-0845-4

ORIGINAL ARTICLE

Completion Thyroidectomy in Differentiated Thyroid Malignancy—A Prospective Analysis

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Received: 18 July 2018 / Accepted: 28 November 2018 / Published online: 5 December 2018

Abstract

Completion thyroidectomy, being a surgically challenging procedure, choice of doing such procedure in differentiated thyroid cancer (DTC), remains unclear due to the complications involved following the procedure. So this study is intended to look into risk factors that will prompt completion thyroidectomy and surgery-related complications. A prospective analysis was done in 48 patients diagnosed with DTC during the year 2017. Completion thyroidectomy with or without neck dissection was performed as per institutional protocol. Clinico-radiological features were compared with histopathology in completion thyroidectomy specimen. The incidence of malignancy in completion thyroidectomy specimen and complications during the procedure were noted. Risk factors associated with malignancy were statistically analyzed. The incidence of malignancy in completion thyroidectomy specimen was 56.25%. Papillary carcinoma thyroid (PCT) had a statistically significant risk compared to follicular carcinoma thyroid ($p = 0.042$). Also, capsular invasion in primary specimen had a significant impact ($p = 0.021$) with odds of 7.20 times increase in incidence of malignancy and patients with age more than 55 years had a significantly increased risk of malignancy ($p = 0.05$). There was no statistically significant increase in complications following procedure, with respect to duration between surgeries or type of surgeries performed. Incidence of malignancy in completion thyroidectomy specimen was high. Completion thyroidectomy can be safely performed under experienced hands with an acceptable level of complications. It should be considered in places where patients are non-compliant and in those with PCT, tumor with capsular invasion and elderly patients.

Keywords Completion thyroidectomy · Differentiated thyroid cancer (DTC) · Papillary carcinoma thyroid (PCT) · Thyroidectomy · Revision surgery

Introduction

Completion thyroidectomy is defined as the surgical removal of the remnant thyroid tissue following procedures less than total thyroidectomy [1]. Completion thyroidectomy is indicated in malignant disease of thyroid gland as well in certain benign lesions. In malignant disease, it is performed either as a planned procedure or when there is a tumor recurrence in thyroid bed. It is also done to remove the thyroid completely so as to prepare the patient for ^{131}I ablation, thus eliminating disease not only from thyroid bed but also from regional and distant site [2, 3].

It is a challenge to the operating surgeon especially on the side where thyroid bed has been explored, due to extensive scarring and fibrosis. Hence, the morbidity due to the procedure seems to be high. So the surgeon should have extreme caution and adequate experience and complications should be well explained before surgery.

In this article, we are interested in completion thyroidectomy done in differentiated thyroid carcinoma (DTC). This is a prospective study intended to analyze the correlation of clinical-radiological features with histopathology in completion thyroidectomy specimen. Incidence of malignancy in completion thyroidectomy specimen and complications during the procedure were noted.

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Materials and Methods

Institutional ethical committee approval was taken prior to the study. The study was a prospective analysis carried out in patients undergoing completion thyroidectomy in a tertiary care cancer center, Regional Cancer Centre, Trivandrum, during a period of one year. Patient who was previously treated with less than total thyroidectomy with proven DTC with or without metastasis, between January 2017 and December 2017, were included in the study. As per institution protocol, completion thyroidectomy was considered in enrolled patients after contrast-enhanced computerized tomography (CECT) neck when the size of the residual thyroid was at least 2 cm.

Forty eight patients were enrolled after taking informed consent. A complete clinical evaluation and preoperative assessment were done, as per institution protocol which included indirect laryngoscopy, CECT neck, serum calcium, thyroid hormone assay, and slide review of previous surgery. Additional information like family history of thyroid cancer and radiation exposure was noted.

Postoperatively, patients underwent indirect laryngoscopy (when indicated). Serum calcium examination was done on the first day and third day, postoperatively. Routine neck examination was done.

Re-evaluation was done at the end of first week, fourth week, then after every 6 months. During these visits, patient underwent indirect laryngoscopy, serum calcium estimation (when indicated) and neck examination. All patients underwent a minimal follow-up of 6 months. The following features were noted in the histopathology of review cases and our main specimen: size of the tumor, lymphovascular invasion, perineural invasion, extrathyroidal extension, tumor capsule involvement, multifocality, and lymph node involvement.

Statistical Methods

The categorical variables were expressed as frequencies and percentages. The continuous variables were summarized using mean and standard deviation. The association between categorical variables was assessed using Fisher's exact test. Univariate analysis was done using logistic regression. A p value < 0.05 was considered to be statistically significant. The analysis was done using SPSS 11.0 software.

Results

We prospectively analyzed 48 patients, which included 36 women and 12 men (3:1 ratio). Mean age of the patients were 43.9± 13.4 years (range 18 to 69 years). (Table. 1) All, except one, were referred from outside centers for further management. Forty two (87.5%) patients underwent hemithyroidectomy, 4(8.3%) underwent subtotal thyroidectomy and 2(4.2%) underwent near-total thyroidectomy, previously. Family history of thyroid malignancy was noted in only one patient and none had radiation exposure.

Thirty six (75%) patients did not have any symptoms and they underwent completion procedure as a part of planned procedure, 7(14.6%) patients noted swelling in front of the neck, 3(6.2%) had disease picked up on imaging, and 2(4.2%) were evaluated for distant metastasis. Seventeen (35.4%) were hypothyroid on presentation and were on replacement thyroxine, 1 (2.1%) was hyperthyroid.

CECT showed that 24(50%) patients had unexplored thyroid lobe measuring 2–4 cm with no thyroid nodules and thyroid nodule was noted in 10(20.9%) of the patients. It was surprising to note that 22(45.8%) patients had residual thyroid tissue in the previously operated side with a mean size of 11.7 mm. Significantly, lymph nodes were noted in 8(16.7%) patients.

Twelve (25%) patients had palpable thyroid nodules in completion thyroidectomy specimen. Completion thyroidectomy was done unilaterally in 42 (87.5%) patients and bilaterally in 6 (12.5%) patients and neck dissection in the form of central with or without lateral node dissection was done in 10 (20.8%) patients.

Following surgery, 8 (16.7%) patients developed transient hypocalcemia which became permanent in 7 (14.6%). Six (12.5%) patients had RLN palsy due to previous surgery and only 1 (2.1%) had transient RLN palsy following completion thyroidectomy. Wound site edema post-surgery was noted in 1 patient. (Table 2).

Two-thirds (60.4%) of our patients underwent completion thyroidectomy over 3 months to 12 months following the first surgery. It was noted that the duration of surgery did not have any significant impact on hypocalcemia or RLN palsy. Even the type of surgery, unilateral/bilateral thyroid bed exploration, with or without neck dissection did not have significant impact on hypocalcemia or RLN palsy.

The incidence of malignancy in completion thyroidectomy specimen was noted in 27 (56.25%) patients among which 2 patients had only nodal disease and residual thyroid lobe was free of disease. Eleven had papillary carcinoma thyroid (PCT), 12 had follicular variant of PCT, 1 had poorly differentiated PCT, and 1 had follicular carcinoma thyroid (FCT).

On the analysis of gender, family history, radiation exposure, clinical examination findings, surgical findings, CECT findings with respect to size of thyroid/thyroid nodule, residual thyroid, and thyroxine requirement, no factors were found to increase the risk of incidence of malignancy in completion thyroidectomy specimen. Patients with age more than 55 years had a significantly increased risk of malignancy in completion thyroidectomy specimen ($p = 0.05$, 95%CI: 0.960 to 73.873) (Fig. 1).

In histopathological parameters (Table 3), PCT (95.8%) compared to FCT (4.2%) showed a greater chance for incidence of malignancy in completion thyroidectomy specimen with p value of 0.042. Presence of capsular involvement in primary surgical specimen (32.6%) was associated with

Table 1 Age/gender distribution

		Malignancy	No malignancy	Total
Age Group	Less than 25 years	1(2%)	5(10.4)	6(12.4)
	25–55 years	18(37.5%)	15(31.25)	33(68.75%)
	More than 55 years	8(16.6%)	1(2%)	9(18.75%)
		27(56.25%)	21(43.75%)	48(100%)
Sex	Male	4(8.3%)	8(16.6%)	12(25%)
	Female	23(47.9%)	13(27%)	36(75%)
		27(56.25%)	21(43.75%)	48(100%)

significant risk of malignancy in completion thyroidectomy specimen (64.3%) with p value of 0.021 and odds of 7.20 times increased risk (95% CI: 1.353 to 38.326). Mean size of thyroid nodule resected during the first surgery was 25 mm (range 2 mm to 70 mm). Size did not have an impact on p value. Multifocality was noted in 46.5% of cases but it did not have statistically significant impact on tumor incidence in completion thyroidectomy specimen.

All these patients were followed up for a period of 6 months to 18 months. One patient who had extensive skeletal metastases succumbed to the disease, none of the other patients had locoregional recurrence.

Discussion

The main reasons for performing a completion thyroidectomy are as follows [1, 4]:

1) Elimination of potential residual tumor because the incidence of bilateral DTC in literature ranges from 30% to 88%.
2) Follow-up of thyroglobulin levels with the aim of detecting recurrences.
3) To obtain a complete tumor excision in case of multifocal disease.
4) Optimize radioiodine ablation of the remaining thyroid tissue, to allow for better postoperative management.
5) When the entire thyroid tissue is being removed, anaplastic transformation can also be eliminated in the remnant thyroid tissue. Although the probability of this transformation is quite small, patients who develop anaplastic transformation have an extremely poor prognosis.
6) Though papillary microcarcinoma thyroid has an excellent prognosis with a 10-year survival of 90–95% [5], inclination towards completion thyroidectomy is again a choice of many Indian patients due to the social stigma of carrying cancer.

Fine needle aspiration biopsy (FNAB) is a primary diagnostic modality in the workup of thyroid nodules. However, 15–30% of FNAB would turn out to be indeterminate, leaving the physician and the patient unable to determine disease with certainty. Intra-operative frozen section consultations may not always be conclusive in case of thyroid carcinoma during the

Table 2 Surgery-related complications

First surgery	Hypocalcemia			Total
		Present	Absent	
		0	48(100%)	48(100%)
Second surgery	Permanent hypocalcemia			
		Present	Absent	
	Unilateral CT	4(8.3%)	29(60.4%)	33(68.75%)
	Bilateral CT	1(2.1%)	4(8.3%)	5(10.4%)
	Unilateral CT + neck dissection	2(4.2%)	7(14.6%)	9(18.75%)
	Bilateral CT + neck dissection	0	1(2.1%)	1(2.1%)
	Total	7(14.6%)	41(85.4%)	48(100%)
First surgery	Permanent vocal cord palsy			
		Present	Absent	
		6(12.5%)	42(87.5%)	48(100%)
Second surgery	Permanent vocal cord palsy			
		Present	Absent	
		0	48(100%)	48(100%)

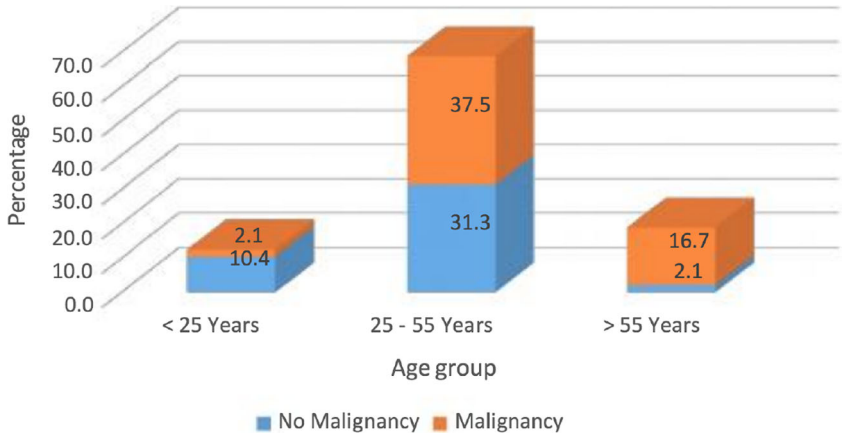

Fig. 1 Age group vs malignancy

course of lobectomy for a dominant nodule. So, histopathological analysis of the hemithyroidectomy becomes the cornerstone of decision-making process in advising the patients on the need for completion thyroidectomy [3, 4, 6].

The extent of surgical management for DTC is controversial [1, 7]. Timing for completion thyroidectomy also varies with most surgeons preferring to do the surgery within 10 days or after 3 months. This is because of inflammation, edema, adhesion, and scarring, which also has a tendency for excess bleeding thereby increasing the complications [7]. However, a meta-analysis by Yu-Jie Li et al. in 2015 did not show any significant difference in complication rate related to the timing of surgery [8]. Our study also did not show any statistically significant increase in complications with respect to timing and type of surgery.

The major complications occur during dissection of the scar tissue surrounding either the recurrent laryngeal nerve or the vascular pedicle of the parathyroid glands. Morbidity for completion thyroidectomy includes a reported 2% to 5% risk of RLN injury and an 8% to 15% incidence of hypoparathyroidism [9–11], which was comparable to our results, we had 14.6% hypoparathyroidism and no permanent RLN palsy. These complications are common in hands of inexperienced surgeons and complication rate is very low in completion thyroidectomy done by high-volume surgeon [8].

Many studies had noted that pathological factors that necessitate completion thyroidectomy includes multifocality, extrathyroidal extension, and some studies also quote the size of the nodule [12, 13]. In our study, it was noted that patients with age more than 55 years 6.67 times increased risk of malignancy compared to middle age group (25–54 years). PCT and capsular invasion had a statistically significant impact on disease in completion thyroidectomy specimen. Cases wherein extrathyroidal extension and multifocality were noted clinically/radiologically, patients would have been counseled and might have undergone total thyroidectomy in first sitting, when malignancy was suspected. Capsular invasion is one factor that is more evident microscopically. Size of nodule did not have a statistically significant impact because even micropapillary carcinoma can harbor disease in opposite lobe, as in 50% of our cases.

It is worthy to note that 19 of our 25(76%) positive cases who had nodule in completion thyroidectomy specimen had tumor size less than 1 cm, which can be easily missed by neck ultrasound or CECT. So imaging cannot be relied upon to consider completion thyroidectomy.

Table 3 Comparison of histopathological features with respect to presence or absence of malignancy in second surgery (CT)

	First surgery specimen($n = 48$)		Second surgery specimen($n = 27/48$)	
		P value		*P* value
Diagnosis - PCT VS Diagnosis - FCT	46 2	0.042	26 1	
Mean size of nodule	25 mm	.996	8.8 mm	1.000
Lymphovascular emboli	6	.151	1	1.000
Node positive	2	.355	6	.999
Extrathyroid extension	4	.202	3	.999
Capsular involvement	14	.019	8	.999
Multiple foci	20	.639	12	.999

Intraoperative monitoring of RLN using nerve monitor during procedure might minimize the nerve damage, more so in case when previously operated site has to be explored [14].

Limitation of this study is the small sample size. The other being even though all pathological risk factors were analyzed in the completion thyroidectomy specimen almost all the patients underwent hemithyroidectomy from outside centers, thus complete histopathological examination of all the primary specimens were not possible.

Conclusion

The incidence of malignancy in completion thyroidectomy specimen was high (56.25%). Completion thyroidectomy can be safely performed under experienced hands with an acceptable level of complications. There was an increased risk of malignancy in completion thyroidectomy specimen when age was more than 55 years, PCT and specimens showing capsular invasion. This further indicates that tumor histopathology should be looked into; completion thyroidectomy should be performed in patients who have the above risk factors and in those whom follow-up is uncertain.

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