

Intraoperative Frozen Section Analysis of Indeterminate Thyroid Nodules

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INTRODUCTION

Indeterminate thyroid nodules, as established by the Bethesda criteria III and IV, pose a dilemma for surgeons. With an associated 5-30% risk of malignancy, a patient may be treated solely with hemithyroidectomy; however if final pathology reveals malignancy, a completion thyroidectomy may be indicated. The rise of molecular testing has allowed for further preoperative risk stratification, however, it remains a costly test and is often not covered by insurance. For that reason, surgeons may elect to utilize intraoperative frozen section (iFS) analysis to determine the need for immediate completion thyroidectomy and prevent the need for reoperation at a later time. Our objective is to report our institution’s utilization rate of iFS for indeterminate thyroid nodules and to perform a cost analysis to determine the most cost-effective approach to the treatment of ITN.

METHODS

After Institutional Review Board approval, patients who underwent Fine needle aspiration Bethesda III/IV with subsequent surgical intervention at University Hospitals Cleveland Medical Center from January 2010- December 2020 were identified. Inclusion criteria included FNA results of Bethesda III/IV.

None of the patients underwent molecular testing. All patients underwent thyroid surgery, and frozen section analysis was performed based on surgeon preference. Charts were queried and the following variables were analyzed: patient demographics, thyroid nodule characteristics, surgery intended and surgery performed, duration of procedure, use of frozen section analysis, procedure duration, final pathology, and need for repeat procedure. The rate of intended surgical procedure change from hemithyroidectomy to total thyroidectomy due to iFS was recorded. The rates of iFS false negative (iFS reporting benign diagnosis with final pathology reporting malignancy) were reported and compared to the rate of completion thyroidectomy in situations where iFS was not utilized.

RESULTS

206 patients met inclusion criteria, 59.7% (n=123) of which utilized iFS. Patients who underwent planned total thyroidectomy were excluded. Patient demographics and clinical characteristics are shown in Table 1. There were no significant differences in patient’s age, gender, BMI, medical history, or size of dominant nodule. The cohort was evenly split between Bethesda III and IV nodules, however there was a higher percentage of patients with Bethesda III in the subset that did undergo iFS (p=0.013). There were significant differences in the use of iFS by surgeon (p<0.001).

Table 1. Clinical and Pathologic Characteristics of Patients undergoing hemithyroidectomy , with and without the use of Intraoperative Frozen Analysis

Characteristic	Overall N = 206	Frozen Section		p- value
		No N = 83	Yes N = 123	
Age	53.5 (16.1)	54.3 (16.4)	52.9 (16.0)	0.478
Gender				0.765
Female	161 (78%)	64 (77%)	97 (79%)	
Male	45 (22%)	19 (23%)	26 (21%)	
BMI	29.9 (7.6)	29.8 (8.0)	29.9 (7.4)	0.906
H/O Thyroid Disease				0.509
No	187 (91%)	74 (89%)	113 (92%)	
Yes	19 (9.2%)	9 (11%)	10 (8.1%)	
Dominant Nodule Size (cm)	2.8 (1.3)	2.9 (1.4)	2.8 (1.3)	0.781
Preop FNA Bethesda Category				0.013
III	111 (54%)	36 (43%)	75 (61%)	
IV	95 (46%)	47 (57%)	48 (39%)	
Multiple FNA				0.137
No	180 (87%)	76 (92%)	104 (85%)	
Yes	26 (13%)	7 (8.4%)	19 (15%)	
Pathology				0.093
Benign	110 (58%)	35 (47%)	75 (65%)	
Follicular carcinoma	10 (5.3%)	5 (6.7%)	5 (4.3%)	
Hurthle cell carcinoma	2 (1.1%)	2 (2.7%)	0 (0%)	
Microcarcinoma/NIFTP	15 (7.9%)	8 (11%)	7 (6.1%)	
Oncocytic carcinoma	7 (3.7%)	4 (5.3%)	3 (2.6%)	
Papillary thyroid carcinoma	46 (24%)	21 (28%)	25 (22%)	
Repeat Procedure				0.260
No	140 (73%)	51 (68%)	89 (75%)	
Yes	53 (27%)	24 (32%)	29 (25%)	

Three patients underwent subtotal or total thyroidectomy (1.5%), which was an intraoperative change in management. In 2 of these situations, iFS was utilized. Of the entire cohort, 193 procedures were coded exclusively as hemithyroidectomy. These were analyzed to determine the procedure duration, revealing a statistically significant shorter duration in the subset that utilized iFS (77 min) versus not using iFS (93 min) (p<0.001).

In the 123 cases which utilized iFS, 29 (25%) required a completion thyroidectomy due to malignancy on final pathology. This was due to either benign diagnosis with iFS or deferral to final pathology. This rate of completion thyroidectomy was not statistically different from the 32% (n=24) patients requiring completion thyroidectomy whose surgeon did not utilize iFS.

The additional cost of performing iFS totaled \$854/case, which included materials, technical, and professional charges. There were not significant differences in rate of completion thyroidectomy to be included in the cost analysis.

DISCUSSION

- **Does intraoperative frozen analysis change management?**
 - 1.6% (2/123) cases had change from planned procedure
- **Does intraoperative frozen analysis lead to decreased rate of completion thyroidectomy?**
 - 25% (n=29) of patients with frozen analysis required completion thyroidectomy, compared to 32% (n=24) without (p=0.26)
- **Does intraoperative frozen analysis increase operative time?**
 - Procedure duration was slightly DECREASED in cases using frozen analysis

CONCLUSIONS

- **Frozen section analysis did not significantly change intraoperative management or decrease the rate of completion thyroidectomy.**
- **Although associated with a small additional cost, the use of frozen did not appear to lead to increased operative time.**

References:

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