

Concordance between fine needle aspiration cytology and post operative histopathology in thyroid nodules

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Summary

Objective: To analyze the concordance between fine needle aspiration cytopathology (FNAC) and post-operative histopathological (POH) reports including characteristics of local invasions and cervical lymph node metastasis (LNM) in thyroid carcinoma at the 108 Military Central Hospital. **Subject and method:** Retrospective study was designed to analyze 1384 thyroid nodules from 1322 patients who underwent surgery comparing preoperative fine needle aspiration cytology with post-operative histology results at the 108 Military Central Hospital from January 2020 to December 2020, these patients met eligible criteria to have simultaneously FNAC and POH reports. **Result:** There were (1259/1384) 90.97% cases of thyroid carcinoma in all thyroid nodules with ratio of male/female was 1/4.7, ages from 11 to 85 years old, the peak of malignancy at the group over fifth decade of life and papillary thyroid carcinoma (PTC) generally accounted for (1243/1259) 98.73% of all thyroid carcinomas. There were 6 categories of Bethesda System for Reporting Thyroid Cytopathology (BTS) including categories I, II, III, IV, V and VI; thyroid carcinomas in each category as following 89.09%, 45.10%, 76.09%, 71.05%, 98.93% and 100.00%, respectively. Local and vascular invasions also occurred at the rate of 12.44% in papillary thyroid microcarcinoma (PTMC) and 41.85% in PTC. LNM reached to 7.39% in PTMC, 25.23% in PTC. **Conclusion:** Most patients with thyroid nodules had FNAC and operated at The 108 Military Central Hospital (from January 2020 to December 2020) were thyroid carcinoma (90.97%) in which PTC accounted for 98.73%, the rate of PTC is very high in any BTS categories, and most of them come from BTS categories V plus VI (72.25%). Surprisingly, PTC occurs in BTS category I unusually reached to 89.09%. Local invasion was generally over 50% (682/1259) and LNM was nearly 30% (319/1259) in the all malignant nodules.

Keywords: Fine needle aspiration, thyroid carcinoma, cervical lymph node.

1. Background

Thyroid nodules are common, frequently detected during neck ultrasound and may be found in up to 60% of the general population [1]. FNAC of thyroid nodules has higher sensitivity and predictive value for diagnosis than any other single diagnostic method. It is a simple, rapid, cost-effective, useful

and reliable method used in the evaluation of thyroid nodules as one of the most important criterion for indication of forward treatments either conservative method or requiring surgery [2]. The Bethesda System for Reporting Thyroid Cytopathology (BTS) was introduced in 2007 to standardize terminology used in reporting thyroid cytology. The Bethesda system used six categories for thyroid cytology reporting, and each category is supplemented by a list of criteria [3]. TBS categories II, III, V and VI are considered as benign, atypia undetermined significance, suspicious for carcinoma

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and malignancy, respectively. Category IV is indeterminate category and suspicious for follicular neoplasms and needed to monitor those lesions forward or have surgery to remove these ones. The last one is category I means the unsatisfactory quality of the sample and needs to do FNAC again for an adequate sample for evaluation [4]. However, this system applied in each division probably induced different results because of being affected by other conditions such as: Race, location (geography), habits of communities, more importance is ultrasound image screening indicated for FNAC and different experienced pathologists who analyze the results of FNAC.

Here, in our hospital, the pathologists are currently using BTS as the standard schemes of FNAC reports for the diagnosis and management of thyroid nodules. Accordingly, the reports of FNAC was compared to POH analysis, that is very important to analyze the status of thyroid nodules before and after operation. The information plays an important role in planning strategy for the forward treatments of the disease, especially in the patients with PTMC but available associated with local invasions and LNM. Different each group of age and BTS category with different potential risks of malignancy and prognosis as the rate of PTC, local invasion and LNM.

This is the first study to be published on the implementation of the BTS in our hospital relating to the correlation between FNAC and POH results. Hence, this is regularly confronted with this problem during follow-up for thyroid nodules and the definition of substantial strategy for the treatment following FNAC reports remains unclear.

Therefore, we aimed to investigate the correlation between FNAC and POH results of thyroid nodules during preoperative work-up and their correlation with thyroid malignancy.

2. Subject and method

2.1. Subject

Of the 1384 thyroid nodules from 1322 patients operated at 108 Military Central Hospital from

January 2020 to December 2020, patients who simultaneously have FNAC results and POH reports were selected for the study.

2.2. Method

The retrospective study was conducted in accordance with the requirements regarding the protection of the right and private information of patients participating in medical research at the 108 Military Central Hospital. For FNAC smears were dried then fixed in alcohol and stained with Diff Quick staining; hematoxylin and eosin (HE) staining protocol were applied for POH assessment. All slides were interpreted by different 8 qualified pathologists at the 108 Military Central Hospital and the data was processed in excel 2013.

3. Result

3.1. The rate of PTC operated at the 108 Military Central Hospital dominated in overall thyroid nodules

After screening with neck ultrasound and FNAC of thyroid nodules, patients were indicated for hemithyroidectomy or near-total thyroidectomy or total thyroidectomy, the final reports confirmed by POH assessment. The data showed that, the rate of PTC was very high as 89.81% in overall and most operated thyroid nodules were from category V and VI (72.25%). In our hospital, the pathologists are currently using The 2017 Bethesda system for reporting Thyroid Cytopathology (BTS) as the standard schemes of FNAC reports for the diagnosis and management of thyroid nodules. Accordingly, there were 6 BTS categories including I, II, III, IV, V and VI, and the rate of PTC in each group were confirmed by POH assessment as following 89.09%, 45.10%, 76.09%, 71.05%, 98.93% and 100.00% respectively. In the Table 1 shows the number of operated nodules from category I to VI presented here as B I to B VI corresponding with the number of nodules with thyroid carcinoma, PTC and percentages of PTC in each category.

The scheme also figured out the number of nodules in B IV was the smallest, only 38 nodules (2.54%) meanwhile the biggest number belongs to B V, 657 nodules (47.47%). However, the percentages of PTC dominated in all groups.

Table 1. The number of thyroid nodules operated in each BTS category

Content	B I	B II	B III	B IV	B V	B VI	Total
Number of nodules	55	153	138	38	657	343	1384
Number of thyroid carcinoma nodules	50	69	113	31	653	343	1259
Number of PTC nodules	49	69	105	27	650	343	1243
Percentages of PTC nodules	89.09%	45.10%	76.09%	71.05%	98.93%	100%	89.81 %

**Note: Term of "PTC" in the table includes PTC and PTMC*

3.2. Percentages of PTC unusually increased in B I

There were (1259/1384) 90.97% of thyroid carcinoma in overall thyroid nodules admitted for operations at the 108 Military Central Hospital, it is so clear for us to see the number of PTC was very high in all categories from B I to B VI (Table 1). According to the BTS category interpretation and guidelines, there were only about 5% of malignant thyroid nodules in B I; However, the number of nodules diagnosed with PTC in our study was unusually high up to 89.09% (49/55 nodules).

3.3. Local invasion occurs at high incidence even in PTMC

The proportion of local invasion in papillary thyroid carcinoma was 53.98% (671/1243 nodules). Based on the size of tumor, papillary thyroid carcinoma was divided into 2 subgroups, one was papillary thyroid microcarcinoma (PTMC), these tumors with less than 10mm diameter and the other was PTC with diameter over 10mm in size. There were different rates of local invasion in each subgroup as 29.25% (153 nodules) in PTMC and 71.94% (518 nodules) in PTC shown in the Table 2 below.

Table 2. The percentages of local invasion in the group of PTMC and PTC

Content	PTMC		Total	PTC		Total
	No invasion	Invasion		No invasion	Invasion	
Number of carcinoma	370	153	523	202	518	720
Percentages of carcinoma	70.75%	29.25%	100%	28.06%	71.94%	100%

3.4. The rate of LNM was also high in PTMC

The incidence of PTC occurs at the group of ages over 50 years old was more common up to 34.39% (data not shown here). However, the rate of cervical lymph node metastasis (LNM) of the disease was the most numerous at the third decade of life, accounted for 32.29% (103/319) shown in the Table 3 and more interesting, the rate of LNM occurred in PTMC up to 11.60% (data not shown here).

Table 3. Percentages of cervical lymph node metastasis in each group

Ages (years)	Below 20	20 - 29	30 - 39	40 - 59	≥ 50	Total
Cervical lymph node metastasis	6	48	103	84	78	319
Percentages	1.88%	15.05%	32.29%	26.33%	24.45%	100%

4. Discussion

High proportion of PTC in all BTS categories

In general, the rate of PTC in each BTS category in our study was much higher than other studies [6], except B VI category was 100% (most studies have similar results), PTC was confirmed by POH examination. The result of B I, the percentages of PTC was up to 89.09% (49/55 nodules) with preoperative high suspicion of PTC on the images of ultrasound (the data not shown here). The big difference between the result and the guideline [4] comes from many reasons such as: With the result of B I, we often requested to repeat FNAC, then the new categories should be applied following the new results, but in fact these patients neglected forward schedule of health examination and hesitated to do FNAC again, that is why the percentages of PTC in B I group is so high. Another interesting reason, these nodules were so small and in deep, then quite hard for physician to take adequate materials for sample to analyze the smear again. Lastly, the pathologist who examined the smears not to request to repeat the test.

Almost half of nodules were diagnosed with PTC (45.10%) much higher compared to the rate of BTS category guidelines with malignant range of 0-5%. These patients who have nodules with B II of FNAC indicated for surgery based on many criteria from clinical to para-clinical parameters such as size of the nodules in associated with inflammation and accompanying symptoms. But the main reason comes to this figure, due to most of patients were diagnosed with this BTS category indicated for conservative treatment with radiofrequency ablation therapy (RFA therapy), then the number of thyroid nodules admitted for surgery were dramatically decreased. It means that, almost number of B II indicated for surgery with high suspicion of malignancy on ultrasound images in

combination with potential carcinoma in clinical manifestations.

There are 45.10% of BTS category III are PTC, that is much higher than the guidelines [3], the number figured out that, during making FNAC reports, some pathologists are afraid of high responsibilities for their decision; in case of this, they downgrade these ones from B V to B III to avoid the trouble, it should have been B V instead of B III.

B V was the most numerous in all categories 47.47% (657 nodules), and most of them were diagnosed with PTC up to 98.93% (650/657) much higher than any other studies [2]. This number could surprise some of us, however this one reflexes the status, the doctors and patients currently trend to think of FNAC results must be as gold standard (hallmarks) for planning forward treatment of the thyroid nodules. So that, if you give the FNAC result to others with B VI category, most of them certainly think that is malignant, not consider to follow the guidelines mentioned above. Hence, in order to protect themselves, they often trend to decrease the level of the BTS category, especially in case of wondering between B V and B VI. Somehow, the smears seem consistent with B VI, but the pathologist wanted to decrease the level of suggestion and put it to be B V instead of B VI. This explained the reason the number of B VI is much smaller than number of B V.

The rate of local invasion and LNM of PTC is similar with other studies as the result of Feng Cheng et al showed that the percentages of LNM in PTMC with the diameter of tumor below 5mm was 18.9% [8]. However, each group of age with different risks of local invasion and LNM which need to be clarified in another study.

5. Conclusion

Most patients with thyroid nodules operated at the 108 Military Central Hospital after thyroid ultrasound screening and FNAC performed were thyroid carcinoma (1259/1384) 90.97% in which PTC accounted for (1243/1259) 98.73%, the rate of PTC was very high in all BTS categories and PTC was unusually high in B I category reached to 89.09%. Most of thyroid nodules come from B V plus B VI, up to 72.25%. Local invasion occurred at the rate of about 50% and LNM was nearly 30% in all categories.

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