Original Article

Combination of aspiration and non-aspiration fine needle biopsy for cytological diagnosis of thyroid nodules

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Abstract

Background: Good cytological sample is very important for the cytological diagnosis of thyroid nodules. The aim of this study was to evaluate the adequacy of prepared samples by the combination of aspiration and non- aspiration fine needle biopsy.

Methods: In this descriptive – analytical study, sampling was done simultaneously for each patient in fine needle aspiration and non-aspiration biopsy. The sufficiency of samples was studied using Mair Scoring System. Wilcoxon Signed Rank test was used for the data analysis.

Results: Three hundred two cases (289 females, 13 males) with the mean age of 43.83±12.9 years were evaluated. Inadequate samples were 31 (10.3%) in fine needle aspiration, 40 (13.2%) in non-aspiration and 13 cases (4.3%) by using two methods together (p=0.0001). The average total score was 6.00±2.17 in fine needle aspiration and 5.76±2.26 in non-aspiration method (p=0.08), and 6.6±1.98 in the combination of the two methods (p<0001 comparing with one method alone).

Conclusion: The results show that using both methods simultaneously in each nodule considerably increases the efficiency of samples for cytological diagnosis.

Key words: Fine needle aspiration, Fine- needle- non-aspiration, Thyroid nodule, fine needle biopsy, Technique, Cytology.

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Thyroid nodules are very common clinical findings worldwide. The estimated range of prevalence of thyroid nodules based on palpation in North America was from 4% to 7% (1, 2). In Iran, the prevalence of thyroid nodules was reported to be 3% of men and 8.3% of women and overall 5.9% of the Iranian population had thyroid nodules (3). These nodules are frequently observed in endemic goiter areas, to 2.5 times more (4-6). The clinical importance of thyroid nodules is primarily the need to exclude the presence of a thyroid malignant lesion, which accounts for about 1% to 10% of all thyroid nodules (7-9). Furthermore, epidemiologic studies indicated that the rate of thyroid cancer is on the rise (10, 11). Fine needle aspiration (FNA) is the first diagnostic method in the assessment of thyroid nodules cytology (12-14).

In different studies, this method has had 65-98% sensitivity and 72-100% specificity (15). FNA is a simple, accurate and cost-effective test that is routinely used as the first step in the evaluation of thyroid nodules, especially in thyroid disease groups that need curable surgical treatment (16).

This method has the same reliability in all age groups (17). Naturally, the adequacy of specimens is very important in accurate pathologic results (18). The quantitative and qualitative adequacy of samples significantly depends on several factors, such as the skill of physicians in FNA performance and the size of needles. Inserting a needle into vascular organs, such as the thyroid gland, however, leads to microscopic intraparanchymal hemorrhages.

In aspiration method, the tissue is actively aspirated into the needle, which can result in diluted cell content and disrupted architecture of tissue. Tissue damage and hemorrhage are two important factors that affect sample adequacy (19). To overcome these problems, Briffod et al. introduced the non- aspiration technique in breast and liver masses in 1982 (19). Then, the non-aspiration technique was firstly applied by Santos in 1988 to obtain cytological specimens from thyroid nodules (20).

Fine needle non-aspiration (FNNA) avoids aspiration and depends on capillary effect of the needle (19). There are some studies about the usefulness of FNNA method for sampling of eye, liver, breast and thyroid masses (21-25). Several subsequent studies have reported conflicting results between FNA and FNNA (26-32). Some studies have reported that FNNA produces better specimens for cytological diagnosis (26, 27). Other reports claim equivalence of the two methods (28). Moreover, previous studies had some limitations.

Small population of study, different groups of thyroid disorders for sampling such as diffuse and nodular lesions, sampling from multiple different organs, evaluation of only nodules with 1-4 cm diameter, induced iatrogenic trauma before sampling are some of the limitations of these studies (26-31).

According to the defects and conflicts in previous findings, this study was designed to evaluate the adequacy of prepared samples in the combination of aspiration and non aspiration fine needle biopsy of thyroid nodules.

Methods

This descriptive – analytical study was done on patients with thyroid nodule referred to Endocrine clinics in Sari, Iran, from 2006 to 2008. The Research and Ethics Committee of Mazandaran University of Medical Sciences approved this research project. The aim of the study was explained to the patients and the written consent were obtained by all of them. The excluding criteria were history of bleeding disorders and the use of anticoagulant drugs.

FNA and FNNA methods were applied to all the patients by a single skilled endocrinologist. FNA followed by FNNA were performed in half of the studied patients and vice versa. This was done because of the damage and hemorrhage caused by the first procedure as well to minimize the differences in results induced by the first procedure. FNA was performed with a 25-gauge needle attached to 10-ml disposable plastic syringe. The syringe pump was aspirated with 5cc thyroid material for 5-10s repetitively moving with a vertically positioned needle.

FNNA technique was performed as follows: The hub of a 25- gauge needle was held in a pencil – grip position, and the needle was gently inserted into the nodule after 5-10 secs of repetitive motions back and forth. When the material flowed into the needle through capillary action and appeared in the hub, the needle was withdrawn and attached to the syringe with air inside. Then, the plunger was used to expel the material into glass slides. Sampling was repeated two times for small nodule (size <2 cm) and three times for larger nodules (size >2 cm) by each method.

In cases of cystic lesion, the entire material was aspirated and then the residual nodule was sampled by both techniques. Although the aspirated fluid was sent to cytocentrifuge, the contribution of these smears was not included in the first interpretation. For patients with multiple nodules, the dominant nodule was sampled.

Smears were stained by Giemsa and Papanicolaou method. In Papanicolaou staining method, we used 95% ethanol for the immediate fixation of samples. The smears were sent to a well-experienced cytopathologist on blind condition who scored the samples according to Mair criteria presented in table 1. A cumulative score between 0 and 10 was allocated to each fine needle specimen, which was then assigned to one of the three categories based on the total points scored (28).

Table 1. Mair scoring system for cytopathologic diagnosis

0=inadequate for diagnosis, 1=adequate for diagnosis 2= easy for diagnosis

Background blood or clot (0-2)

Amount of cellular material (0-2)

Degree of cellular degeneration (0-2)

Degree of cellular trauma (0-2)

Retention of appropriate architecture (0-2)

Total score: (0-2) inadequate for cytopathologic diagnosis, (3-6) adequate for cytopathologic diagnosis, (7-10) excellent for cytopathologic diagnosis

The gender, age, size of nodule, number of nodules (single or multiple) and nodular consistency were recorded. Each parameter of score was done separately and also the total score was compared between the two techniques and their combination. SPSS software version 17.0 was used for the data analysis. To compare the scores of the two techniques Wilcoxon signed ranks test was used. A pvalue less than 0.05 was considered significant.

Results

Three hundred two patients, 289 Females (95.7%) and 13 males (4.3%) were enrolled in the study. Their mean age was 43.83±12.9 years. Seven (2.3%) samples were papillary carcinoma. figure 1 shows the overall cytopathological report of specimens. One hundred forty-seven patients (48.7%) had single nodule; the others (51.3%) had multiple nodules. Fourteen patients (4.6%) had soft consistency, 261 patients (86.4%) had firm consistency, and 27 patients had hard consistency in examination the cases varies with regard to nodular size. 4 cases (1.3%) <1cm, 235 cases (77.8%) between 1 and 4 cms, 63 cases (20.9%) >4cms.

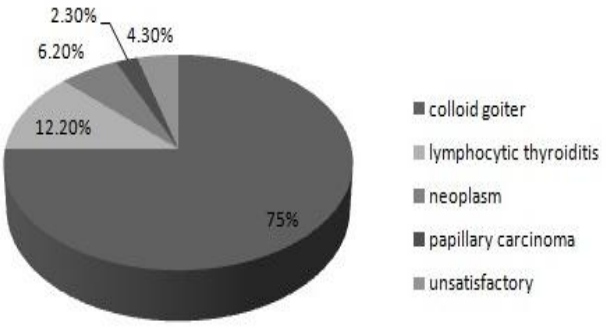

Figure 1. Distribution of thyroid pathology in 302 cases with thyroid nodule

The review of cytological report showed that in FNA method, 31 (10.3%) and in FNNA method 40 (13.2%), totally the samples were inadequate for diagnosis (p<0.01). With both methods together, 13 samples (4.3%) were non-diagnostic and this difference was statistically significant in comparison to a single method (FNA or FNNA) (p=0.0001) (table 2). The average total score was 6.00±2.17 in fine needle aspiration and 5.76±2.26 in fine needle non-aspiration (p=0.08) and 6.6±1.98 in the combination of two methods (p<0.0001). Background blood in FNA method and the amount of cellular material and retention of appropriate architecture were better in FNNA method (table 3).

The adequacy of samples was not associated with nodular size. Papillary carcinoma was reported in 1.6% of samples with nodular size ≥ 4 cms and 2.5% of samples with nodular size less than four centimeters (p=0.8). More than eighteen percent of hard nodules, 0.8% of firm nodules and none of soft nodules were malignant (p<0.001). We found malignancy in 0.6% of samples with multinodular goiter and 4.1% of samples with single nodule (p=0.05).

Table 2. Frequency of unsatisfactory specimens for FNA, FNNA and combination of both methods

Adequacy of specimens	FNA N (%)	FNNA N (%)	FNA+FNNA N (%)
Unsatisfactory	31 (10.3)	40 (13.2)¶	13 (4.3)*
Adequate for diagnosis	149 (49.3)	164 (54.3)	135 (44.7)
Excellent for diagnosis	122 (40.4)	98 (32.5)	154 (51)

*pvalue<0.01(FNA+FNNA vs FNA or FNNA) and pvalue<0.0001 (FNA vs FNNA)

Table 3. Comparison of FNA and FNNA techniques by each assessment Parameter

Techniques / Parameter	FNA Mean±SD	FNNA Mean±SD	P. value
Background blood	1.82±0.42	1.87±0.36	0.01
Amount of cellular material	1.28±0.65	1.19±0.65	0.04
Degree of cellular degeneration	0.99±0.57	0.93±0.62	0.1
Degree of cellular trauma	0.98±0.58	0.93±0.62	0.1
Retention of appropriate architecture	0.97±1.03	0.83±0.61	0.02
Total score	6.00±2.17	5.76±2.3	0.08

Discussion

One of the most important problems in cytopathologic study and diagnosis in thyroid nodule is the preparation of a suitable sample. The preparation of a specimen with adequate cellularity and suitable architecture without hemorrhage and degradation is very significant (9). The biopsy without aspiration (FNNA) has been introduced as the easier technique than FNA (33).

In this study, the combination of FNA and FNNA were significantly better than one method alone. We found that in

FNA method the amount of cellular material is higher and appropriate architecture is retained more, but the background blood is higher than FNNA method. This difference can be the cause of better adequacy of samples by the combination of two methods compared to one method alone. Kamal and Haddadi-Nezhad reported similar adequacy for the two techniques in their patients and they believed that the use of both techniques considerably decreased the number of unsatisfactory specimens but since their population study was smaller than our study, they could not find the cause of their findings (30, 31).

Pothier in 2006 in a systematic review could not find any superiority of one method, but they did not discuss about the combination of the two methods (34). Gosh et al. studied about 160 superficial and deep nodules in breast, thyroid, lymph node and liver. They reported some advantages and disadvantages for each method and believed that by the combination of the two techniques, a better diagnostic accuracy can be achieved. The number of thyroid samples in their study was low (14 cases) (35). In Romitelli study, thyroid nodule FNNA sampling from 104 patients had better quality and fewer inadequate results. They did not have suggestions about the combination of the two methods and the number of cases in their study was low (26).

Haddadi-Nezhad et al. reported no differences between FNNA and FNA for each item. One of the conflicting problems in this study was iatrogenic traumatization before thyroid sampling and small population (31). One of the advantages of our study is the existence of more samples for comparison. In our study, the prevalence of malignancy was more in nodules with more than 4 cms. in diameter and hard consistency. In addition, malignancy was higher in patients with single nodule, although some patients with multinodular goiter had malignancy, too. The limitation of our study was that, we did not use the guided sonography biopsy for all the samplings, but we did the biopsy with the guided sonography for small nodules and some multinodular goiter.

In conclusion, in this study we did not find significant differences between FNA and FNNA methods in total score, but field hemorrhage was better in FNNA method, whereas, the amount of cellular material and retention of appropriate architecture were better in FNA method. This can be a reason of preference of using the combination of two methods than one method alone. We suggest the combination of both sampling techniques FNA and FNNA for each thyroid nodule.

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