

Role of fine-needle aspiration in the management of thyroid nodules

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ABSTRACT

الأهداف: إظهار الفائدة من سحب العينة بالإبرة الدقيقة (FNAB) في علاج العقيدات الدرقية.

الطريقة: أجريت دراسة إستيعادية تم فيها مراجعة تقارير 888 عينة بالإبرة الدقيقة من الدرقية والتي أجريت خلال 11 عاماً في الفترة ما بين 1996م وحتى 2007م. كان التشخيص النسيجي متاحاً لـ 182 حالة وقمنا بمقارنة التشخيصات الخلوية للعينات المسحوبة بالإبرة الدقيقة (FNAB) مع تقارير علم الأمراض.

النتائج: كانت التشخيصات الخلوية بواسطة العينات المسحوبة بالإبرة الدقيقة (FNAB) كالتالي: حليمي (3.2%) 6، ورم نامي جريبي شاذ (28%) 51، ورم غدي جريبي (5.4%) 10، ورم نامي شاذ نوع هورثل (4.3%) 8، مشبوه (10.9%) 20، غير مستنتج (1%) 2، ورم حميد (46.4%) 85. نتيجة تقارير علم جراحة الأمراض، كانت الخلايا الخبيثة كالتالي: حليمي (100%) 6، ورم نامي جريبي شاذ (1.96%) 1، ورم نامي شاذ نوع هورثل (50%) 4. التقارير المشتبهة، (55%) 11 من تقارير علم الأمراض كانت خبيثة، وفي التقارير غير المستنتجة كان تقرير واحد (50%) عبارة عن ورم خبيث. كانت العينة المسحوبة بالإبرة الدقيقة (FNAB) مقبولة بشكل عام كطريقة سريعة ودقيقة وغير مكلفة في تشخيص أنواع العقيدات الدرقية.

خاتمة: تعتبر تقنية السحب بالإبرة الدقيقة تقنية مفيدة لاختيار المرضى المصابين بأمراض العقيدات الدرقية للعملية الجراحية.

Objectives: To show the benefits of fine-needle aspiration biopsy (FNAB) in managing thyroid nodules.

Methods: As a retrospective study, reports of 888 FNABs of the thyroid performed during a period of 11 years (1996-2007) at Tehran University of Medical Sciences, Sina Hospital and Endocrine Clinic, Tehran, Iran were reviewed. Histological diagnoses were available for 182 cases, and we compared cytological diagnoses of FNAB with pathologic reports.

Results: The cytology diagnoses by FNAB were: papillary 6 (3.2%); follicular neoplasm 51 (28%);

follicular adenoma 10 (5.4%); Hurthle cell neoplasm 8 (4.3%); suspicious 20 (10.9%); inconclusive 2 (1%); and benign 85 (46.4%). Due to surgery pathologic reports, malignant cytologies were: 6 (100%) for papillary, 1 (1.96%) for follicular neoplasm, 4 (50%) for Hurthle cell neoplasm. In suspicious reports, 11 (55%) reports of pathology were malignant; and in inconclusive reports, one report (50%) was malignant.

Conclusion: Fine needle aspiration is a useful technique for selecting patients with nodular thyroid disease for surgery.

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One of the most prevalent clinical findings is a thyroid nodule with a prevalence rate of 4-7% in the general public.¹⁻³ The nodules are commonly seen in females and some factors including age, having a history of radiation to the head and neck, and a deficiency of iodine in the diet, and the excessive use of goiterogenic materials can affect its incidence rate in an ascending manner.³ Thyroid nodules are chiefly benign; however, benignness and malignancy can be based on clinical presentations as only one approach among many others. According to the recent studies, FNA is the most preferable method among the other approaches since the screening test is precise, cost-effective and simple, and allows the quick diagnosis of nodules;⁴⁻⁶ it has also been of similar or higher sensitivity and specificity in

the diagnosis of the nodule types compared to other methods.⁷⁻⁹ Surgeries have become more selective and restricted to those who need it. Cancers are diagnosed more effectively by the application of FNA biopsy (FNAB).¹⁰ Since the application of FNAB is simple, financially reasonable, and mainly complication-free, it has made the diagnosis of thyroid cancers in the early stages possible, it has remarkably improved the outcome of such patients. Indubitably, FNA has its own restrictions. One of the drawbacks of the method is the need for specimen adequacy. The competence and expertise of the physicians responsible for performing aspiration, is the determining factor in providing appropriate sampling techniques. Moreover, in order to determine the validity of the technique, an experienced pathologist should interpret the aspirate.¹¹⁻¹³

Methods. We reviewed the medical history of 888 patients with thyroid nodules, and FNAB was carried out for them during a period of 11 years (1996-2007) at Tehran University of Medical Sciences, Sina Hospital and Endocrine Clinic, Tehran, Iran. The Institutional Review Board of Tehran University of Medical Sciences and Health System approved this study. An informed consent was obtained from the patients. Age, gender, history of familial goiter, radiation to the head and neck, duration of the disease before coming to the private clinic, and check of antithyroid peroxidase (anti-TPO) antibody were completed in questionnaires. Then, the cytology of FNA was reviewed for all patients. Surgery was recommended for patients with malignant and suspicious reports, and in benign reports, surgery was carried out upon the request of the patient. Then, the pathologic report was reviewed and compared with the cytology of FNA in this group. In 195 cases, we had a pathology report, 13 of which had undergone surgery directly and, we compared cytology and pathology reports in the other 182 cases. Cytology results were categorized into 4 groups; benign, suspicious, malignant, and unsatisfactory (inconclusive). Malignant reports include papillary, follicular neoplasm, and Hurthle cell neoplasm. Aspirates were classified as benign including adenomatous (colloid) nodule, Hashimoto thyroiditis, and cystic goiter. Aspirates with atypical features suggestive of, but not diagnostic for malignancy, were classified as suspicious. The sensitivity and specificity of FNAB, relation of goiter and its malignancy to factors such as a positive history of familial goiter, history of radiation to the head and neck, and others were calculated. In our study, malignancy was described as any neoplastic report and adenomas that are not determined as malignant nodules.

The statistical analysis was carried out by Statistical Package for the Social Sciences (SPSS Version 11.5), Inc., Chicago, IL., USA. We used the t- test and chi-square test. A p-value of ≤ 0.05 was considered significant.

Results. Eight hundred and eighty-eight patients (759 women, 129 men) with the average age of 40 ± 12.29 in men and 39 ± 12.05 in women were found to had undergone thyroid nodule aspiration from 1996 to 2007. The nodules were hot in 19 patients, warm in 55, and in the others, the type of nodule was cold on thyroid scanning. As a rule, for all the patients with cold nodules, FNAB was carried out. In patients with hot and warm nodules, FNAB was carried out if the nodule had enlarged over several visits, or if there was a suspicious examination, or if the nodule was very firm (Table 1). In 195 patients, thyroidectomy was carried out, and Table 2 summarizes the pathology reports. In patients whose pathologic reports were malignant (72 patients), the reports of FNA biopsies showed; 6 patients with papillary cell carcinoma pathologic report also had a papillary FNA cytology report; 10 reports were follicular neoplasm, one was follicular adenoma, and 4 were suspicious. It was benign in 6 cases, and surgery was carried out directly in 3 cases, due to a suspicious examination or the patient's request. In one patient, whose pathologic report was follicular neoplasm, the cytology report was Hurthle cell neoplasm, and in one patient whose pathologic report was medullary carcinoma, the cytology report of FNAB was follicular neoplasm. In 3 cases, the pathologic reports were Hurthle cell neoplasm; the cytology was suspicious in 2 of them, and it was Hurthle cell neoplasm in one patient. In benign pathologic reports, a total of 27 cytology

Table 1 - General information of patients.

Variable	Female n (%)	Male
Number of patients	759	129
Age (years)	39 ± 12.05	40 ± 12.29
<i>Type of nodule</i>		
Cold	709	105
Warm	40	15
Hot	10	9
<i>Size of nodules in malignant cases</i>		
<1.5cm ²	4	3
1.5-3cm ²	7	4
>3cm ²	9	6
Positive family history in malignant cases	5 (14.3)	2 (5.7)
Positive family history in benign cases	41 (25.6)	20 (12.5)
Positive history of radiation to head and neck in malignant nodules	3 (8.6)	4 (11.4)

Table 2 - Comparing of cytology and pathology reports of thyroid nodules.

Reports	Cytology report n (%)		Pathology report n (%)	
Papillary	6	(3.2)	30	(15.4)
Follicular neoplasm	51	(28)	1	(0.5)
Follicular adenoma	10	(5.4)	34	(17.4)
Hurthle cell neoplasm	8	(4.3)	3	(1.5)
Hurthle cell adenoma			3	(1.5)
Suspicious	20	(10.9)		
Inconclusive	2	(1)		
Medullary carcinoma	1	(0.5)	1	(0.5)
Benign	85	(46.4)	123	(63.1)

reports were follicular neoplasm, 4 were Hurthle cell neoplasm, 5 were follicular adenoma, 9 were suspicious, one was inconclusive, and 67 were benign, and in 10 of the cases, surgery was carried out directly (data not shown).

In malignant nodules, the type of nodule in thyroid scan was: 34 were cold, one was hot, and none was warm. The size of the nodules in malignant cases is shown in Table 1, and 2 nodules were diffused in the physical examination. In 7 patients (20%) with malignant nodules, the familial history of goiter was positive, and in 61 cases (49.6%) of benign nodules it was positive; in 7 (20%) of 35 malignant nodules, the pathologic report history of radiation to the head and neck was positive, and in 7 (5.7%) cases with benign pathologic reports, it was also positive. In patients who used a minimum of 100 µg levothyroxin sodium daily for at least one year, malignancies were seen in 19 cases (54.3%) and it showed that suppression therapy is not protective for malignancy in thyroid nodules ($p=0.084$).

Discussion. In our study, it is obvious that FNAB is an effective and comfortable method for clinical judgments in assessing thyroid nodules.¹⁴⁻¹⁶ A negative aspiration report does not mean that the patient does not have a malignancy. The FNAB is a diagnostic test that requires careful interpretation. When other clinical parameters are suggestive of malignancy, a negative aspiration should not provide the surgical exploration of the thyroid. Fine needle aspiration biopsy is an extremely safe procedure that can be performed without patient morbidity. No instance of malignancy during aspiration, patient acceptance, safety, ease of performance, and reliability makes it an important diagnostic tool for evaluating thyroid nodules.^{17,18}

Limitations of our study include its retrospective design and the technical difficulty of inadequate

sampling faced during the aspiration; this gives rise to non-diagnostic results. The insufficient cellular material from cystic lesions, the experience of pathologists in performing FNA, the number of punctures, and the technique of preparing smears can affect the rate of non-diagnostic results. The pathologists performed the FNA as freehand. The use of ultrasound guidance can decrease the proportion of non-diagnostic results in comparison to freehand.

Our experience confirms that FNAB is a useful technique for selecting patients with nodular thyroid disease for surgery.¹⁹ Unlike clinical examinations, thyroid function tests, radioactive scans, ultrasound, and responses of the nodule to thyroid-stimulating hormone suppression with exogenous thyroid hormone, which can only provide indirect information on the nature of a thyroid nodule, FNA provides direct material for deciding upon the pathologic diagnosis of the nodule type.²⁰ In patients with a satisfactory specimen for cytology diagnosis, this technique correctly identified over 81.6% of the patients with thyroid neoplasia and 94.6% of them with non-neoplastic disease. We found that a FNA diagnosis of the type of nodules has a sensitivity of 45.7% and a specificity of 89.7%. Our study carried out on the Iranian population showed that FNAB is a reliable and valuable tool that can lead to the diagnosis of the type of thyroid nodules, and the diagnosis of malignant nodules ($p=0.014$). This study showed that a negative FNA report does not mean that the nodule is benign, however, a positive FNA shows the necessity for surgery.^{21,22}

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