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ROLE OF FINE NEEDLE ASPIRATION BIOPSY IN THE MANAGEMENT OF THYROID NODULES

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ABSTRACT

Objectives: To evaluate the degree of utilisation, the accuracy and the effect of fine needle aspiration biopsy (FNAB) in patients with nodular thyroid lesions.

Design: Cross-sectional study.

Setting: King Khalid University Hospital, Riyadh, Saudi Arabia.

Subjects: Four hundred and twenty eight patients with thyroid lesions who were treated surgically were reviewed. The FNAB of 201 patients were compared with the post-operative histopathological findings.

Results: Most of the patients (69%) presented with nodular thyroid disease (solitary and multinodular) and among this group 31.4% did not undergo FNAB pre-operatively. In more than 76%, the FNAB resulted in a definite cytologic diagnosis. A sensitivity of 71.4% and a specificity of 96.4% was achieved.

Conclusion: If FNAB were used routinely in the initial evaluation of patients with thyroid nodules it could have an enormous effect on their management. It reduces the number of patients going for thyroidectomy and eliminates the need for nuclear scans to screen patients with thyroid nodules. Therefore, we recommend FNAB to be part of the initial evaluation of all patients with nodular thyroid disease.

INTRODUCTION

Focal and diffuse enlargement of the thyroid gland are amongst the most common endocrine problems encountered in clinical practice(1). Clinically, more than six per cent of women and almost two per cent of men have palpable thyroid nodules(2). Radiologically, nodules have been reported to be demonstrable in 35% of women by ultrasound(3). A careful history and physical examination are essential in the assessment of a patient with a thyroid nodule. Measurement of serum levels of hormones [free thyroxine (FT4) and sensitive thyrotropin (TSH)] and isotope scans are not necessary and are useful only in determining the activity of the gland and nodules(4). However, fine needle aspiration biopsy (FNAB) of thyroid nodules has become the cornerstone of the diagnostic evaluation of nodular thyroid disease(5).

The aim of the present study was to analyse the results of FNAB and highlight its worldwide importance as a principle diagnostic tool in the management of nodular thyroid disease.

MATERIALS AND METHODS

All patients with thyroid lesions presenting to the surgical clinic at King Khalid University Hospital from January 1985 to December 1997 were reviewed. The clinical and pathological data of the 428 patients who were treated surgically were

analysed. Of these patients, 132 presenting clinically with diffuse goitres, and ninety three with nodular lesions who had not undergone FNAB pre-operatively, were excluded from the study. In two patients, the histological diagnosis could not be traced, and therefore, these also were not included in the analysis. The FNAB of the remaining 201 patients were compared with the post-operative histopathological findings. This included 30 males and 171 females with ages ranging from 16 to 70 years. In those patients with multiple nodules, the most prominent was chosen for FNAB.

Cytopathologic results were divided into four categories according to Caplan *et al*(6): benign (negative) and this includes colloid lesions, cysts, thyroiditis; suspicious (indeterminate) including Hurthle or follicular cell neoplasm; findings suggestive of the malignancies listed below; malignant (positive) including primary carcinoma (papillary, medullary, anaplastic) metastatic carcinoma and lymphoma and; unsatisfactory specimens (non-diagnostic).

Yield was defined as the ratio of the total number of patients with malignant lesions to the total number of cases operated. The false-negative rate was defined as the percentage of patients with benign cytologic findings who were confirmed histologically to have malignant lesions of the thyroid.

Two criteria for the value of a diagnostic test are sensitivity and specificity. Sensitivity is defined as the test-diagnosed positive divided by the total positive diagnoses (which would include false-negative diagnoses). The specificity is defined as the test-diagnosed negatives divided by the total negative diagnoses (which would include false-positive diagnoses).

RESULTS

Two hundred and ninety six (69%) patients presented with nodular thyroid disease (solitary 40% and multinodular 29%) and 132 (31%) presented with diffuse goitre.

Table 1

Result of FNAB in the 201 patients (those who had both FNAB and surgery)

Cytologic diagnosis	No. of patients
Benign	138
Malignant	15
Suspicious (indeterminate)	21
Insufficient (non-diagnostic)	27

Table 2

*Yield; false - negative, false-positive, sensitivity and specificity of thyroid fine needle aspiration biopsy**

No. of cases operated	Malignant n (%)	False negative rate	False positive rate	Sensitivity	Specificity
201	50 (24.9)	3%	2.5%	71.4%	96.4%

*For definitions of false-negative rate, false positive rate, sensitivity and specificity.

Among patients with nodular thyroid disease 93 (31.4%) had not undergone FNAB pre-operatively. In more than 76% of the cases FNAB resulted in a definitive cytologic diagnosis of either benign or malignant disease (153 of the 201 cases) (Table 1). Comparing the FNAB and the final histopathological results, a sensitivity of 71.4% and a specificity of 96.4% was achieved (Table 2).

DISCUSSION

Fine needle aspiration has two major limitations: non diagnostic samples and suspicious or indeterminate results. None diagnostic smears often occur in the setting of cystic or vascular lesions(7). Examination of cyst fluid, biopsy of the cyst capsule, or repeat biopsy may produce satisfactory results. The second limitation of FNAB is the suspicious or indeterminate results(8).

In most series, 20-30% of aspirates show suspicious results(9), because of the cytopathological difficulty in differentiating benign Hurthle or follicular cell neoplasms from their malignant counterparts. Recent FNAB series have established the accuracy and limitations of this procedure(10). The estimation of sensitivity and specificity depends on how the suspicious category is handled(11). If suspicious cytological results are considered positive, then, sensitivity will increase and specificity will decrease. On the other hand, if the suspicious results are considered negative, specificity will increase and sensitivity will decrease. Nonetheless, overall sensitivity varies from 68% to 98% (mean 83%), specificity varies from 72% to

100% (mean 92%), false positive rates range from one per cent to eight per cent, and false negative rates range from 1% to 11% (mean 5%)(10). The sensitivity and specificity of FNAB in our study (without including the suspicious group) were 71.4% and 96.4% respectively which are comparable to these rates.

With regards to the two major limitations of FNAB, we observed a rate of non diagnostic results of 13.3% and suspicious results of 10.3%. These data are similar to the published figures(10,12). In the category of follicular neoplasms, cytology alone cannot distinguish between benign and malignant lesions since malignancy is determined by evidence of vascular, lymphatic, or capsular invasion. Malignancy is found in about 15% to 22% of specimens with cytological diagnosis of follicular neoplasm(13). Due to this fact we and others recommend that all such nodules be promptly removed. Different ways to minimise suspicious cytological findings have been suggested, e.g. ultrasound guided biopsy and radioisotope scanning of the suspicious nodule. In our study, a false negative rate of three per cent was observed. This compares well with the reported false negative rates ranging from 1.3% to 11.5%(10). This group of patients requires close follow up.

Most of the centers utilising FNAB as a principal tool in the evaluation of thyroid nodules have achieved a 35% to 75% reduction in the number of patients requiring surgery(14), a doubling or tripling of malignancy yield at thyroidectomy(15), and a reduction in thyroid nodule management cost by as much as 25%(14). However, ninety three (31.4%) of our patients had surgical therapy without having FNAB pre-operatively. Although almost all of them had a preoperative thyroid scan, most of the patients in this group had unnecessary surgery. This was more costly than those who had FNAB as their initial test.

Future directions for clinical application of FNAB include the use of special staining techniques and the use of ultrasonographically guided techniques. Smears from benign thyroid tumours stain positively for thyroid peroxidase, whereas many thyroid carcinomas do not(16). This may be helpful in the differentiation of follicular adenomas from follicular carcinomas. Ultrasonographically guided FNAB is particularly useful for the cytologic diagnosis of small nodules (less than 1cm in diameter) or deep nodules that are difficult to feel or localise(17).

In conclusion, if FNAB were used routinely in the initial evaluation of patients with thyroid nodules it could have an enormous effect on their management. It may eliminate the necessity of surgical removal of the nodule to make a pathological diagnosis thereby reducing the number of thyroid operations. It also will allow immediate surgery for patients with malignancy, and markedly reduce the cost of screening patients with thyroid nodules by eliminating the need for nuclear scans. Thus, with an adequate sample and a trained cytopathologist, FNAB is a reliable diagnostic test in the evaluation of a thyroid nodule. Therefore, we recommend FNAB to be part of the initial evaluation of all patients with nodular thyroid disease.

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