

ROLE OF FINE NEEDLE ASPIRATION CYTOLOGY IN THYROID DISEASES

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ABSTRACT

Objective To evaluate the accuracy and efficacy of fine needle aspiration cytology (FNAC) in thyroid gland diseases.

Study design Cross sectional study

Place & Duration of study Department of Otolaryngology / Head & Neck Surgery Liaquat National Hospital Karachi, from April 2001 to December 2005.

Patients and Methods Eighty nine patients with enlarged thyroid gland, of both sexes were selected from out patients department. All patients had preoperative FNAC, performed by pathologist at histopathology department and postoperative specimens were also examined and histopathological diagnosis made. All FNAC reports were correlated with histopathology diagnosis.

Results Out of 89 patients 60 were female and 29 male. In 82 patients FNAC showed benign lesion, of which 80 were true negative and 2 false negative, which on histopathology reported malignant. Remaining 9 cases were diagnosed as malignant on histopathology of which 7 were true positive. No case of false positive was detected in our study. Over all sensitivity was 77%, specificity of 100% and accuracy 97.7%.

Conclusions FNAC is reliable, safe and accurate method as a first line of evaluation in thyroid gland nodules before surgery. FNAC is more specific than sensitive in detecting thyroid gland malignancy and therefore its use as a reliable diagnostic test cannot be overemphasized

Key words Thyroid Gland, FNAC,

INTRODUCTION:

In Great Britain in 1927, Dudgeon and Patric proposed the needling of tumor as a mean of rapid microscopic diagnosis. FNA biopsy and direct cytological examination, from a number of organs was pioneered by Martin & Ellis in 1930. In 1952, Soderstrom used FNAC for thyroid nodule. It is relatively simple technique requiring no anesthesia and not

associated with any serious complications. The fear of needle tract implantation is possible, but it is largely due to the use of large needle (18 gauge). The most commonly reported complication is hematoma. The purpose of biopsy is to obtain diagnostic material for cytological study from tissue or that does not shed cells spontaneously.¹ Biopsy by aspiration, also known as thin or fine needle aspiration biopsy, has become an important diagnostic technique, replacing to some extent and complementing tissue pathology in many clinical situations.² Pathologist in early days insisted on sectioning as well as smearing the sample and only made a confident diagnosis if cell block

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preparation were obtained consequently. Martin Ellis used needle of thick caliber (18 gauge), than those commonly used today.³

Malignant tumors of thyroid gland represent less than 0.5% of all cancers in England and Wales. In Southern Sweden, there are roughly two cases per 100,000 population per annum and in the USA the equivalent figure is slightly less than four. It is predominantly disease of women, the female to male ratio is about 2.5:1.⁴ The purpose of present study is to report the outcome of FNAC in thyroid disorders in our clinical set up.

PATIENTS AND METHODS:

This study was conducted at the Department of Otolaryngology / Head & Neck Surgery Liaquat National Hospital Karachi, from April 2001 to December 2005. The aim of the study was to assess the accuracy and efficacy of FNAC in the thyroid gland disease and to determine its sensitivity and specificity comparison with histopathology. Eighty nine patients with enlarged thyroid gland were included in the study and evaluated through detailed history, general physical examination, and otolaryngology & neck examination. Findings were noted on pre-designed performa. Pathologist performed all FNAC aspirations and cytological diagnosis was made. All the postoperative specimens were send to the same cytopathologist for histopathology diagnosis. All the FNAC reports were correlated with histopathology diagnosis. No blinding was done.

All patients were admitted to our surgical facility and operated. Investigations performed were complete blood count, FNAC, thyroid function profile and chest x-ray in all patients. In selected cases blood sugar, thyroid isotope scans, ultrasound and C.T scan, where required, were also done. In all multinodular goiters FNAC done on the predominant site of cold nodule according to isotope scan findings. Patients with toxic goiter made euthyroid before surgery. Written and informed consent for surgery was taken. SPSS-10 was used for data analysis. Frequencies and percentages were computed to present FNAC and histological findings. Taking histopathology as gold standard criteria, sensitivity, specificity and accuracy were calculated.

Statistical analysis was made in the following way. True positive, were defined as those samples of or suspicious of malignancy by FNAC and confirmed on histopathology as malignant. True negative were those that were negative for malignancy on FNAC and also on histopathology. False positive were those that were positive for or suspicious of malignancy on FNAC but with no evidence of malignancy on histopathology. False negative were those that were negative for malignancy on FNAC but a diagnosis of malignant disease was made on histopathology.

Sensitivity was defined on the basis of thyroid cancer detection using FNAC or biopsy (true positive/true positive +false

negative). Specificity was defined on the basis of benign thyroid disease detection (true negative /true negative +false positive). Diagnostic accuracy represents combination of sensitivity and specificity.⁵ Criteria used for detection of sensitivity and specificity is given below :-

Sensitivity = True positive / True positive + False negative x 100

Specificity = True negative / True negative + False positive x 100

Accuracy = (True positive + True negative) / (True positive + False positive + True negative + False negative) x 100.

RESULTS :

Out of 89 patients 60 were females and 29 males with F:M ratio of 2:1 The age ranged from 18-75 years with the mean age of 38.5 years. Out of 89 cases 85 had unilateral lobe enlargement, 5 were nontoxic multinodular and 1 was toxic multinodular goiter with cold nodules. The definitive histopathology study revealed 80 cases as benign and 9 malignant. On cytology 82 cases were benign, of which 80 cases were correctly diagnosed as benign (true negative), and 2 were false negative. Out of these two one showed follicular cells on FNAC that on histopathology diagnosed follicular variant of papillary carcinoma (mixed type papillary carcinoma) and another was diagnosed as lymphoma. In 9 malignant cases 7 were diagnosed correctly on cytology as well as histopathology report (7 cases were true positive). No case of false positive detected in our study.

In malignant cases predominant lesion was papillary carcinoma - 5 cases, of which 4 were papillary and one was follicular variant of papillary carcinoma. One was medullary, one anaplastic carcinoma and 2 lymphomas. All malignant cases presented as solitary nodule. All 5 cases of papillary carcinoma were female patients of age range 24-30 years. One case was medullary carcinoma, a male of 46 years. Statistical analysis showed sensitivity 77%, specificity 100%, and accuracy 97.7% (table I).

Table 1
Statistical Analysis of Thyroid Gland Biopsy Results

Test (FNAC)	Disease Positive		Disease Negative	
Positive	7	TP	0	FP
Negative	02	FN	80	TN

Sensitivity = TP / TP+FN X 100- (7/9x 100 = 77%)
 Specificity = TN / TN+FP X100 (80/80 x 100= 100%)
 Accuracy = TP + TN / Total No (87/89 x 100 = 97.7%)
 TP= True Positive. FP= False Positive.
 TN= True Negative. FN= False Negative.

DISCUSSION:

Goiter is seen in general population with a frequency varying between 4-10%. The prevalence of thyroid cancer is quite rare. Between 3-11% of thyroid pathologies will be malignant.^{6,7}

In our study malignancy in thyroid gland disease detected in about 10% cases. Carcinoma of the thyroid gland is uncommon, but there is a wide geographical variation in its incidence. In the UK the annual incidence is about between 2-3/100,000 population.⁸ In America, 11000 cases of thyroid carcinoma are reported every year and more than 1 person die of thyroid cancer each year.⁹ In India thyroid cancer is 1% of all head and neck cancers. The clinical challenge has been to identify the malignant nodules preoperatively and thus minimize the indication for surgery in benign lesions.^{3,10}

FNAC is commonly used for the diagnosis of thyroid pathology. Many authors have reported a very high accuracy. The sensitivity of FNAC varies from 70% to 95%. In our study result shows over all sensitivity 77.0%, specificity of 100% and accuracy 97.7%. Nair and Kapila in their study conclude that FNAC is highly specific for diagnosis of papillary carcinoma of thyroid, but difficulty encountered in correctly categorizing the follicular variant of papillary carcinoma, which is mistaken for follicular lesion.¹¹ In our study out of 9 malignant cases 5 were papillary carcinoma of which 4 were correctly diagnosed on FNAC. One case of follicular variant of papillary was not detected on FNAC. All patients of papillary carcinoma were young females In our series FNAC showed high percentage of accuracy in papillary carcinoma. Thom JO et al report the diagnostic accuracy of FNAC for malignancy as 80.6% and specificity of 83%. They conclude FNAC as a first line of investigation in evaluation of thyroid pathology.¹²

In other study on 138 patients, FNAC was done after clinical assessment. Twelve patients had histology-confirmed papillary carcinoma of which 9 had papillary carcinoma, 1 had follicular lesion and 2 had Hurthle cell tumor on FNAC report. Postoperative histology compared well with FNAC in almost 100% cases of follicular carcinoma and 73% of papillary carcinoma.¹⁶ In our study we find very low sensitivity for follicular lesions on FNAC. One case of follicular cell that was missed on FNAC but confirmed on histology. Desai MP performed FNAC in autoimmune thyroid diseases in children and showed high accuracy of FNAC in autoimmune disorders of thyroid.¹³ In our study we didn't find any case of autoimmune thyroid disorder.

Chow TL compared results between frozen section and FNAC in thyroid nodule. Their study showed diagnostic accuracy of FNAC in benign group as 94% and that of frozen section 91%. In malignant lesions FNAC showed 70% accuracy, while frozen section gave 100% accuracy.¹⁴ Giard and colleagues showed results of 70% lowest for follicular carcinoma and highest for anaplastic and medullary carcinoma.¹⁵ This low sensitivity is because FNAC does not differentiate between follicular adenoma from carcinoma. This study data revealed sensitivity of 88.9% and specificity of 96.1%, which translate into a diagnostic accuracy of 94.2%.¹⁷

Jandu M described the role of operator experience in FNAC in head and neck masses, with sensitivity of 90% and specificity 97% and accuracy 100%, when FNAC performed by consultant. Accuracy decreased to 91% when performed by junior staff. Our study revealed that FNAC is more specific than sensitive in detecting thyroid malignancy and therefore its use, as a reliable diagnostic test, cannot be overemphasized.

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