Original Article

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Accuracy of Fine Needle Aspiration Cytology in Diagnosis of Cyto-Architecture of Thyroid Lesions

Sanjeev Kumar Jain

Professor, Department of Anatomy, Teerthanker Mahaveer Medical College And Research Centre, Moradabad, Uttar Pradesh, India

Abstract

Background: The morphological characterization of thyroid swellings is one of the most difficult parts of the treatment protocol. The most diagnostic tests now-a-day to confirm the cyto-architecture is fine needle aspiration cytology (FNAC) which is confirmed by histopathology after surgery. The aim of this study is to analyze the results of FNAC with histopathology and to assess its sensitivity and specificity.

Materials and Methods: The study included 50 patients with thyroid swellings whose observations of FNAC were compared with the histopathology after surgery. The sensitivity, specificity, positive predictive value, and negative predictive value of the test were determined together with 95% confidence interval.

Result: Sensitivity and specificity of the diagnostic test were 96.77%, 50.00%, respectively. Positive predictive value was 98.77%, and negative predictive value was 55.80%.

Conclusion: FNAC plays an important part in the selection of patients in surgical management thus controlling the surgical burden.

Key words: Diagnosis, Fine needle aspiration cytology, Histopathology, Malignancy, Thyroid swelling

INTRODUCTION

Thyroid swelling is a very frequent dilemma in developing countries like India. It is the more common in females as compared to males and is linked with assorted disorders.[1] Thyroid swellings are classified on the basis of cyto-architecture of the growth. Besides it, the treatment and prognosis of disease also depends on the cellular pattern of the swelling (benign or malignant).[2]

It should be mentioned that morphological characterization of thyroid tumors vestiges one of the most difficult parts of the treatment protocol. The variety of histological forms is allied with a big amount of possible sources of the rise of tumors. The cyto-architecture of swelling also helps in knowing the etiology of the disease and helps in deciding the prevention the disease.[3]

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The universally used mode to determine the malignancy of swelling is fine needle aspiration cytology (FNAC). It is a harmless, non-invasive, cheap, and competent time-saving outpatient department procedure, which provides specific, quick diagnosis with nominal complications. It is considered as a good quality diagnostic tool for the evaluation of clinically palpable thyroid lesions.[4]

Although FNAC is not a replacement of conventional histopathology, it is tremendously required in categorizing the diseases. It is used mainly in deciding the treatment protocol of the disease and bridges the gap between clinical evaluation and final treatment thus reducing the unnecessary surgeries. Varied imaging methods, now-a-days have become popular for preoperative diagnosis of clinically palpable thyroid lesions such as radionuclide scanning and high-resolution ultrasonography.[5] However, FNAC and histopathology are still regarded as the better accurate procedures.

The diagnosis of thyroid tumors by histopathological examination has been established as the gold standard technique.[6] However, due to the limited medical facility and availability of the techniques for establishing the diagnosis of thyroid tumors, we planned to formulate a study

Corresponding Author: Dr. Sanjeev Kumar Jain, Department of Anatomy, Teerthanker Mahaveer Medical College and Research Centre, Moradabad - 244 001, Uttar Pradesh, India. Phone: +91-9997168754. E-mail: drskjain2005@rediffmail.com

comparing the diagnostic correlation of thyroid tumors between imprint cytology and histopathology.

The aim of this study is to analyze the cyto-architecture of clinically palpable thyroid lesions and compare the results with the histopathological examination and to assess its sensitivity and specificity.

MATERIALS AND METHODS

After obtaining Institutional Ethical approval, we conducted a prospective study in our Department of Pathology from January 2015 to June 2015. We included 50 patients in our study referred from different clinical departments with thyroid swelling. Patients' clinical profile, relevant investigations and informed consent were obtained before commencing the study.

Under strict aseptic precautions, a 23 Gauge spinal needle fitted with a 10 ml syringe was introduced in the swelling. After careful aspiration of the fluid, smears were prepared, dried by air and fixed using alcohol. All slides were fixed using hematoxylin and eosin stain, Giemsa stain, Papanicolaou stain, and Ziehl–Nelson stain. All cases selected for histopathological examination were fixed by 10% formalin. Two pathologists were assigned to perform the histopathological examination to eliminate the observer bias. Moreover, the pathologists performing the histopathological examination were blinded regarding the diagnosis.

Statistical Analysis

True positives were cytology or histology positive tumors; true negatives were cytology or histology negative tumors; false positives (FP) were histology negative and cytology positives; false negatives (FN) were histology positive and cytology negative cases. The cases where pathologist felt difficulty in establishing a diagnosis were labeled as inconclusive. Statistical analysis of data was performed by using SPSS version 20 software. Based on above parameters, the sensitivity, specificity, positive predictive value, and negative predictive value were determined together with 95% confidence interval (CI).

RESULTS

The age of the patients varied between 7 and 65 years, the mean age being 31 years. Male: female ratio was about 22:28 (Table 1). The aspirates of 50 patients showed three patterns clinically, which were gray white (58%), gray white with necrotic tissue (28%), and gray white with hemorrhage (14%) (Table 2). Among 50 cases, the FNAC of six patients presented infective lesions (Table 3). So, histopathology was done only in 44 patients.

The FNAC was compared with the equivalent histopathological diagnosis. Out of 34 benign cases in FNAC, only 31 showed a similar pattern in histopathology. Similarly, only 2 cases out of 10 showed similar results in both techniques (Table 4 and Figure 1).

Based on the above data, we derived the following parameters;

a. Sensitivity: True positive/true positive + FN = 96.77% (83.3−99.92%, 95% CI)
b. Specificity: True negative/FP + true negative = 50.00% (1.26−98.74%, 95% CI)
c. Positive predictive value: True positive/true positive + FP = 98.77% (82.3−97.92%, 95% CI)
d. Negative predictive value: True negative/FN + true negative = 55.80% (1.56−96.74%, 95% CI).

DISCUSSION

Presently, FNAC of the thyroid nodule is the most preferred analytic method for the preliminary evaluation of

Table 1: Demographic characteristics

Demographic profile	Thyroid swelling patients (*n*=50)
Age	7-65 years (median=31 years)
Weight	14-79 kg (median=57 kg)
M:F ratio	22:28

Table 2: Thyroid swelling aspirate on FNAC

Nature of aspirate	Number of cases (*n*)	Percentage
Gray white	29	58
Gray white with necrotic tissue	14	28
Gray white with hemorrhagic tissue	7	14

FNAC: Fine needle aspiration cytology

Table 3: Incidence of infective and malignant lesions on FNAC

Lesions	Number of cases (*n*)	Percentage
Infective	6	12
Malignant	44	88

FNAC: Fine needle aspiration cytology

Table 4: Diagnostic accuracy of FNAC in thyroid lesions

FNAC diagnosis	Total number of FNAC cases	Number of cases with histopathology	Correct FNAC diagnosis	FN	FP
Benign	34	31	30	-	1
Malignant	10	2	1	1	-
Total	44	33	-	-	-

FN: False negative, FP: False positive, FNAC: Fine needle aspiration cytology

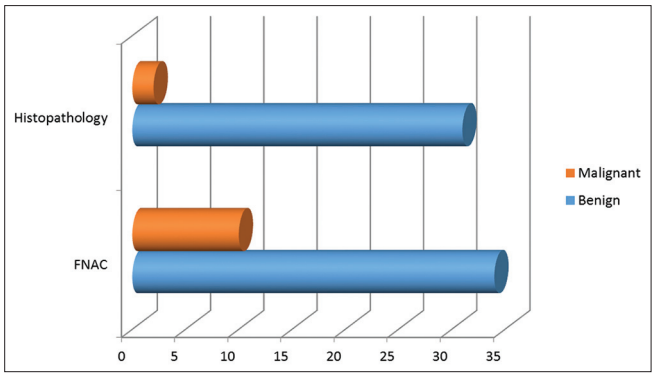

Figure 1: Comparison of the results of fine needle aspiration cytology and histopathology

thyroid nodules. It has decreased the quantity of patients who have undergone surgical management by 25-50%,[7,8] thus increasing the rightness of the treatment decision taken by the consulting team in the hospitals.

However, still in few cases the disparity is seen in the results of FNAC done pre-operatively and histopathology done during or after surgeries. The present study was undertaken to correlate the observations of these two techniques in the same person in order to verify the effectiveness and diagnostic accuracy of FNAC.

The FNAC of the thyroid swelling was performed in 50 cases, out of which histopathological specimen of only 44 patients were compared during the study phase. Different parameters in our present study were compared with previous studies in order to establish the correlation between the two procedures.

In our study, the average age of the subjects was 31 years with most of the patients in the third and fourth decade which is analogous to the previous studies.[9,10]

Females were the more affected than males in this study (M: F = 22:28), which showed concordance with the earlier research.[9-11]

Being a tertiary care center, large population which is a representative of the general population was involved in the study. In addition, this region comes under sub-Himalayan belt or "goiter belt," therefore percentage of benign cases is more as compared to malignant.[12]

In the present study, the similar cytohistological end result rate was achieved in 31 (93.9%) cases whereas 2 cases (FN, FP) showed disconcordance (3.03% of FN and 3.03% of FP). Similar study conducted showed in sub-Himalayan belt showed the percentage of similar end result rate of 97.5% with the percentage of FN and FP as 1.65% and 0.80%, respectively.[13]

Misunderstanding of aspirate from a malignant lesion of the thyroid as benign occurred in only 1 case where a follicular neoplasm diagnosed on FNAC was actually a colloid Goitre on histopathology. The reason might be the aspiration done from the hypercellular areas of colloid nodules resulting in misdiagnosis. A possible solution to this problem is that multiple aspirates from diverse parts of the swelling must be collected to decrease the chances of incorrect diagnosis.[14,15]

FN cases (misunderstanding of benign nodules of the thyroid as malignant) occur due to inaccuracy in the understanding of the cytological material because of overlapping features of different lesions.[16] This is of great fear because it can lead to missing of the malignant lesion and thus endangering the life of the patient.

So, proper sampling from different areas is extremely important for the correct diagnosis. Some pathologists advocate the preparation of 4-6 smears from different sites of the nodule. Ultrasound-guided FNAC is a better alternative for better sample attainment leading to a little rate of non-diagnostic smears.[17]

According to earlier studies,[9,18] the sensitivity and specificity of the thyroid FNAC ranges from 43% to 99% and 72% to 100%, respectively. In the present study, results were analogous with the findings in this sequence.

CONCLUSION

Thus, we conclude from the study that FNAC is an outstanding, harmless, and less invasive diagnostic procedure with a high degree of accuracy. Besides this, in a developing country like India less expertise people are required for FNAC along with less investment as compared with the tissue biopsy. It plays an important part in the selection of patients in surgical management thus controlling the surgical burden.

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