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Original Research Paper

Pathology

RELIABILITY OF FINE NEEDLE ASPIRATION CYTOLOGY AS A DIAGNOSTIC TOOL IN THYROID DISORDERS IN A TERTIARY CARE CENTRE

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ABSTRACT

Objectives : To assess the reliability of fine needle aspiration cytology as a diagnostic procedure of the thyroid disorders which will help to decide the line of management, treatment.and correlating its findings with subsequent histopathological examination.

Methodology: 108 cases of thyroid swelling due to various disorders were included. These cases were taken from different wards of Medical College as well as those referred from O.P.D. of this hospital. All patients were subjected to thorough clinical evaluation followed by F.N.A.C. In some cases histopathological examination was done subsequently for definitive diagnosis as others didn't turn up for follow up or refused to undergo surgery.

Results: Sensitivity of FNAC was 85.72% in the present study and specificity was 98.18%. The test was found to be more specific than sensitive in diagnosing malignant lesions after correlating with histopathological findings. Diagnostic accuracy of the test was 96.77% in the present study.

Conclusion: FNAC is an important diagnostic tool in diagnosing thyroid lesions with high degree of specificity and high diagnostic accuracy. It can be safely applied in all types of thyroid lesions with advantage of simple maneuvers without the need of assistance of surgeons and anaesthetists. It is economic, safe and least traumatic OPD procedure, which produce speedy results

KEYWORDS : Fine Needle Aspiration Cytology [FNAC],Thyroid Swelling,Histopathological examination

INTRODUCTION

Fine needle aspiration cytology (FNAC) of the thyroid gland is now established as the accurate diagnostic test that is routinely used as the first step in evaluation of goitre and single most effective test for the preoperative diagnosis of a thyroid nodule. In modern times, diagnosis of thyroid nodule by needle aspiration was first described by Martin & Ellis in 1930 who used an 18 gauge needle aspiration technique. Afterwards Scandinavian investigators in 1960s introduced the fine needle aspiration cytology, which was well accepted and came into wide use in 1980s.

Thyroid swellings are commonly encountered clinical problem and are of great importance as most are amenable to medical and surgical management due to its location and easily appreciable morphological changes. This organ is a most accessible site for fine needle aspiration cytology with almost nil side effects. In India, due to Iodine deficiency endemic goitre is a common public health problem. Currently in the sub-Himalayan goitre belt of India alone nearly 55 million people are estimated to be suffering from endemic goitre with an average prevalence rate of about 36%.

Fine needle aspiration cytology of thyroid is a simple, minimally traumatic, outdoor procedure done without advance preparation of anaesthesia, safe, painless, and rapid procedure with high diagnostic accuracy. It is inexpensive and cost effective. Experienced cytopathologist can accurately diagnose majority of thyroid diseases using this technique, with a high degree of specificity.

Excision biopsy and histopathological examination which for many years had final say in the diagnosis of thyroid swellings have many drawbacks. It necessitates expensive surgery under anaesthesia with variable degree of trauma, risk of complications with high morbidity, confinement and delay in treatment. Fine needle aspiration cytology is almost atraumatic and the best alternative to excision biopsy.The accuracy of clinical, biochemical, hormonal assays and radiological investigations in distinguishing between benign and malignant nodule when considered alone, is rather poor. FNAC can reliably confirm benignity in about 2/3rd of benign nodules and this is the main purpose of the test. Final diagnosis can be reached by correlation of all these above methods and this aids in reducing unnecessary surgery.

Fine needle aspiration cytology not only provides material for cytological evaluation and ancillary techniques but also for microbiological investigations are specialized staining includes immunocytochemistry.The specificity of fine needle aspiration cytology in diagnosing malignant lesions of thyroid is high. So it is stressed that surgeons can think positively for the various treatment options, when the FNAC indicates a malignant lesion. The fine needle aspiration cytology has been compared with the frozen section biopsy preoperatively. But it has little to offer over fine needle aspiration cytology in the assessment of follicular neoplasm, as these require extensive sampling to prove or exclude capsule or vascular invasion. Recognition of characteristic nuclear morphology of papillary carcinoma is easier in smears than in frozen section.

Core needle biopsy has shown increased diagnostic accuracy when compared to fine needle aspiration cytology, but the problem of distinguishing benign and malignant follicular neoplasm is unsolved. In general, safety and ease outweigh the slight increase in accuracy achieved by core needle biopsy.There is no absolute contraindication for the fine needle aspiration cytology. But it should be performed cautiously in children or uncooperative adults as they may move their head suddenly during the procedure. If FNAC is performed carefully, complications are practically non-existent.

The purpose of this work is to evaluate the efficacy of fine needle aspiration cytology to gain experience in the technique and to assess the wisdom of recommending use of fine needle aspiration cytology to obtain morphological diagnosis for management and treatment.

METHODOLOGY

The present study was done in a tertiary center medical college hospital in a duration of three years. In this study, 108 cases of thyroid swelling due to various disorders were included. These cases were taken from different wards of center as well as those referred from O.P.D. of this hospital. All patients were subjected to thorough clinical evaluation followed by F.N.A.C. In some cases histopathological examination was done subsequently for definitive diagnosis as others didn't turn up for follow up or refused to undergo surgery.

FINE NEEDLE ASPIRATION CYTOLOGY

Procedure for Aspiration – The overlying skin of the gland was cleaned well with spirit cotton swab to sterilize it. Patient was asked to keep still and refrain from swallowing while procedure was being done. No aspiration technique was used unless the lesion was cystic. The swelling was fixed with one hand and 23 G/24G needle was introduced into the lump and quick passes were made in different directions. As soon as the material came in the hub of the needle it was withdraw. The aspirate was pushed out on clean glass slides. With the help of another slide smears were made. If the lesion was cystic then as soon as the needle was introduced into the lump fluid came in the hub. Immediately a 10 ml syringe was attached to evacuate fluid. This fluid then was smeared on the slides or centrifuged and then smears were prepared.

Two types of smear were prepared.

(1) Air-dried smears which were stained by Leishman-Giemsa stain.
(2) Wet smears, which were fixed with 95% ethyl alcohol and stained with Haemotoxylin eosin.

HISTOPATHOLOGICAL EXAMINATION

It was done in some cases in which surgery was performed.

A. Collection of specimen – Biopsy specimens were collected from operation theatres in 10% formal saline.

B. Methods for tissue processing – A trimmed piece of tissue was kept in 10% formal saline overnight to get tissue fixed. A label was attached for identification.

- Then treated with increasing strengths of alcohol for dehydration: 50% 70% 90% absolute alcohol (2 hours each).
- The tissue was then kept in xylene for 2 hours for clearing (2 changes).
- Transferred to paraffin bath at 57.5° C for 2 hours along with label.
- After impregnation and infiltration with paraffin, block was made in 'L' block.
- It was trimmed and fixed on the block holder after hardening.
- Sections were made with rotating microtome (3 to 5 μ).
- The ribbon obtained was floated on the water bath (temperature maintained less than melting point of wax i.e. 40-45° C.
- Sections were lifted on the albuminous slides.
- Then the slides were put in incubator at 37°C for overnight.

Results of FNAC fall into one of four categories:

1. Inadequate / non-diagnostic / unsatisfactory – As mentioned above
2. Benign
3. Indeterminate or suspicious – It includes two types of lesions:

a. Showing some features of a particular neoplasm but not diagnostic thereof.
b. Cellular follicular clusters consistent with follicular neoplasm.

4. Malignant

OBSERVATION TABLES

A total number of 108 cases of thyroid lesions were subjected to F.N.A.C. during this period without any consideration of age, sex or possible nature of the lesion. In all cases successful aspirations were done. Cytological diagnosis was given for 102 cases. Out of these, only 62 cases were subsequently histopathologically examined as other patients failed to turn up for biopsy or refuse to undergo surgery. The stratification in the present study has been done as benign, malignant and indeterminate conditions as reported in the FNAC examination. Benign conditions include colloid goitre (simple colloid goitre + multinodular goitre + colloid cyst), granulomatous thyroiditis and lymphocytic thyroiditis. Indeterminate conditions include follicular neoplasm that is probably benign-follicular adenoma and probably malignant-follicular carcinoma. Malignant conditions include papillary carcinoma and anaplastic carcinoma. Various lesions were then histopathologically correlated and interpreted as benign and malignant conditions.

The usefulness of the present study showing FNAC as a diagnostic tool for various thyroid lesions has been shown using sensitivity, specificity, negative predictive value, positive predictive value and diagnostic accuracy as a scale for evaluation after correlating with histopathological diagnosis.

OBSERVATIONS

TABLE 1 ADEQUACY RATE OF FNAC TECHNIQUE (n=108)

Particular	No. of cases	Percentage
Adequate for diagnosis	102	94.44
Inadequate for diagnosis	6	5.56
a. Blood aspirates only	4	3.70
b. Thick colloid aspirates only	2	1.85

Out of 108 cases, 102 cases (94.44%) yielded adequate smear for diagnosis on FNAC in this series. The diagnostic yield was 94.44%.

TABLE 2 CYTOLOGICAL DIAGNOSIS OF THYROID LESIONS

Cytological diagnosis	No. of cases	Percentage
Benign	83	81.37
Indeterminate	14	13.73
Malignant	05	4.90
Total	102	100

On FNAC, out of 102 adequate cases, 83 (81.37%) cases were benign, 14 (13.73%) cases were indeterminate and 5 (4.90%) cases were malignant.

TABLE – 3 BENIGN THYROID LESIONS ON CYTOLOGICAL DIAGNOSIS

Sl. No.	Diagnosis	No. of cases	Percentage
1	Colloid goitre	77	81.05
2	Ganulomatous thyroiditis	02	2.11
3	Lymphocytic thyroiditis	04	4.21
4	Follicular neoplasm (probably benign)	12	12.63
	Total	95	100

On FNAC of 102 cases, 95 cases of thyroid lesions were found to be cytologically benign. 83 cases were true benign and 12 cases of follicular neoplasm were probably benign, therefore included in indeterminate but benign category.Out of these 95 cases, 77 (81.05%) were diagnosed as colloid goitre which included simple colloid goitre + multinodular goitre + colloid cyst. 12 cases (12.63%) were diagnosed as probably benign follicular neoplasm, 4 cases (4.2%) as lymphocytic thyroiditis and 2 cases (2.11%) as granulomatous thyroiditis.

TABLE 4 CORRELATION OF FNAC DIAGNOSIS WITH HISTOPATHOLOGICAL DIAGNOSIS

Diagnosis	No. of cases of FNAC	Histopathological examination	Correlation with histopathology	% of correlated cases
Colloid goitre	77	40	37	92.5
Granulomatous thyroiditis	2	1	1	100
Lymphocytic thyroiditis	4	2	2	100
Follicular adenoma	12	12	12	100
Benign cases	95	55	52	94.55

Out of 95 cases of benign thyroid lesion, histopathological

examination was done on 55 cases (57.89%) as other patients did not turn up for subsequent biopsy.Out of 55 cases of benign thyroid lesion, cytological diagnosis of 52 cases (94.55%) was confirmed by histopathology. Out of 40 cases diagnosed as colloid goitre on cytology, 37 cases (92.50%) were confirmed by histopathology to be cases of colloid goitre, 2 cases were diagnosed as follicular adenoma and 1 case was diagnosed as papillary carcinoma. The cases of granulomatous and lymphocytic thyroiditis on FNAC were confirmed to be the same on histopathology (100%). There were 15 cases of follicular adenoma on histopathological examination. 12 cases of FNAC of follicular adenoma were confirmed on histopathology (100% correlation). The remaining 3 cases were those, which were diagnosed as colloid goitre (2 cases) and follicular carcinoma (1 case) on FNAC.

TABLE 5 – ACCURACY OF FNAC IN DIAGNOSING THYROID LESIONS

Sl. No.	Components of validity	Percentage
1	Sensitivity	85.72
2	Specificity	98.18
3	Positive predictive value	85.72
4	Negative predictive value	98.18
5	Diagnostic accuracy	96.77

RESULTS

In the present study of 108 cases, 21 (19.44%) were males and 87 (80.56%) were females. This shows that there is clear predominance of females over males with females to male ratio of 4.1:1 in thyroid lesions. On palpation, the maximum number (65.74%) of thyroid swellings were of solid consistency. This includes thyroid swellings having both firm and hard consistency.

Sensitivity of FNAC was 85.72% in the present study and specificity was 98.18%. The test was found to be more specific than sensitive in diagnosing malignant lesions after correlating with histopathological findings. Diagnostic accuracy of the test was 96.77% in the present study.

Diagnostic yield of FNAC was found to be 94.44%.Out of 62 cases of thyroid disease, 55 cases (88.70%) were reported to be benign histologically and 7 cases (11.29%) were diagnosed malignant.Out of 55 cases reported benign on FNAC, 54 (98.18%) cases correlated with histopathological diagnosis and 1 case (1.82%) was falsely reported as benign, as it proved to be malignant on histopathology (False negative).Commonest thyroid lesions on FNAC were nodular colloid goitre 77 (75.49%). The diagnostic accuracy of FNAC for nodular colloid goitre (which included simple goitre, multinodular goitre and colloid cyst) was 92.5%.The diagnostic accuracy of FNAC for other benign lesions as granulomatous thyroiditis, lymphocytic thyroiditis and follicular adenoma was (100%).

Out of 7 cases reported as malignant on FNAC, 6 cases (85.71%) correlated with histopathology and 1 case (14.29%) was falsely reported as malignant (false positive).The diagnostic accuracy of FNAC for papillary carcinoma was 100%.The diagnostic accuracy of FNAC for follicular carcinoma was 50%.The diagnostic accuracy of FNAC for anaplastic carcinoma was 100%. The sensitivity, specificity, predictive value of a positive result, predictive value of a negative result and diagnostic accuracy of fine needle aspiration cytology when correlated with histology in terms of diagnosing malignancy was found to be 85.72%, 98.18%, 85.72%, 98.18% and 96.77% respectively. The number of true positive cases were 6 and 1 was false positive. The number of true negative cases were 54 and 1 was false negative in terms of detecting malignancy.No significant complication was found in this study.

STASTISTICAL ANALYSIS-

Data was analyzed using SPSS 20 statistical package. A descriptive analysis was done on all variables to obtain a frequency distribution. The mean + SD and ranges were calculated for quantitative variables. Continuous variables were compared by the Student t test. Proportions were analyzed with the chi-square test. A P value of 0.05 or less was considered statistically significant

DISCUSSION

This study of 108 cases was undertaken with an aim of ensuring the efficiency of FNAC as a diagnostic tool and also to find the incidence of different type of thyroid lesions in this area. The tertiary center caters a large population of the region. A large number of patients suffering from various thyroid disorders from the goitre belt of hilly region come to this hospital for treatment. The definitive value of FNAC lies in diagnosing benign and malignant thyroid lesions thus preventing the patient from unnecessary surgery.

In the present study, FNAC was performed on 108 patients. Out of 108 cases, 87 (80.56%) were females and 21 (19.44%) were males. Females predominated males with M:F ratio of 1:4.In this study most of patients i.e. 42 (38.89%) were in between 31-40 years of age.From the above findings it can be concluded that thyroid swelling incidence is more in females in most of the studies with majority of patients in 4^{th} and 5^{th} decade of life. Kotwal M et al dida study on Fnac of thyroid gland- a useful tool in preoperative diagnosis .Findings of current study correlated well our study.[1]

In the present study 6 out of 108 aspirates were inadequate for opinion. FNAC was repeated in all 6 cases but 4 of them yielded blood and 2 thick colloid aspirates only. The cellularity was very scanty in these cases. The adequacy of the smear was 94.44% i.e. in 102 cases, samples were adequate for diagnosis. In the present study adequacy or diagnostic yield of FNAC was found to be 94.44%, which correlated with study of Atula T, Grenman R, Laippala P.In the present study, on palpation 71 (65.74%) of the thyroid swellings were solid (firm/hard), 25 (23.15%) of the thyroid swellings were cystic and 12 (11.11%) were found to be of mixed consistency.In this study, most of thyroid swellings were solid in consistency on palpation (65.74%).In the current study, the most common presenting symptom was neck swelling. Pain was the second most common symptom.[2].

In the present study, out of 102 adequate smears, 83 (81.37%) were benign, 14 (13.73%) were indeterminate and 5 (4.90%) were malignant thyroid lesions. In the present study, out of 102 adequate smears, 77 (75.49%) cases were nodular colloid goitre, Choudhury AA et al in their study on diagnosis of thyroid gland mass by the fine needle aspiration cytology (FNAC) and its histopathological correlation also found similar results.In the present study, most of the patients were diagnosed as nodular colloid goitre, 77 (75.49%) cases out of 102 cases which include simple colloid goitre, multinodular goitre and colloid cysts which is in between that found byother authors. Thyroiditis includes granulomatous thyroiditis, Hashimoto's thyroiditis and Reidle's thyroiditis.[3]

In the present study, 12 cases (11.76%) were diagnosed as follicular neoplasm (probably benign) and 2 cases (1.96%) as follicular neoplasm (probably malignant) on FNAC. Together they constitute 13.72% as indeterminate lesion. These findings correlate somewhere near to findings of Boccato P et al who did fine needle aspiration biopsy of thyroid gland lesions and also listed reappraisal of pitfalls and problems. In the present study 3 (2.94%) cases were diagnosed as papillary carcinoma on FNAC. This is very well correlated with study of Boccato Pet al Out of 62 cases, 7 (11.29%) cases were reported as malignant which included 1 case (1.61%) of follicular carcinoma, 4 cases (6.45%) of papillary carcinoma and 2 cases of anaplastic carcinoma. [4]

The correlation of granulomatous and lymphocytic thyroiditis was 100%. Out of 12 cases diagnosed as follicular neoplasm on FNAC, histopathological correlation was 100%.The overall correlation of benign cases was 98.18%, 54 cases out of 55 were reported as benign cases were true benign cases. In the present study, 62 cytological diagnosis of thyroid lesions were correlated with histopathological diagnosis and diagnostic efficiency for benign

lesions of 98.18% was found, which correlates well with studies of Scalabas et al (2003). There was 85.72% correlation for malignant lesions, which correlates well with studies of Das DK, Petkar MA, et al. In the present study there was 1 false positive and 1 false negative case and this also correlates well with Das DK, Petkar MA, et al study.[5]

In the present study, 62 patients underwent surgery and were available for histopathological correlation. Out of 62 cases, 55 were benign and 7 malignant on FNAC. Out of 55 cases, 54 cases were confirmed by histopathology to be benign and 1 case was found to be malignant (False Negative).Out of 7 malignant cases, 6 were confirmed by histopathology and 1 was found to be benign (False Positive). This gives an overall sensitivity of 85.72% and specificity of 98.18%. The positive predictive value was found to be 85.72% and negative predictive value of 98.18%. Diagnostic accuracy of the test was 96.77%.In the present study, the sensitivity was found to be 85.72% which was compatible with studies of Nguansangiam S et al who studied the accuracy of fine needle aspiration cytology of thyroid gland lesions ,this being a routine diagnostic experience in Bangkok, Thailand. [6]

Hafez NH et al did a study on reliability of fine needle aspiration cytology (FNAC) as a diagnostic tool in cases of cervical lymphadenopathy The cytological diagnoses were found to be benign in 48 cases (30.6%) and malignant in 109 cases (69.4%). The overall diagnostic sensitivity, specificity, positive predictive value, and negative predictive value of FNAC of cervical lymph nodes were 90.9%, 67.2%, 82.6%, and 81.3%, respectively. The overall diagnostic accuracy of FNAC of cervical lymph nodes was 82.2% while the overall discordance rate was 17.8%. The evaluation of FNA in patients with no previously diagnosed malignancy should be interpreted by an experienced cytopathologist in the context of clinical, radiological, and laboratory finding and if any of these findings is suspicious, further investigation is justified to overcome the limitations and pitfalls of the cytomorphological features when applied alone.[7,8]

In the present study, capability of FNAC to diagnose true benign and true malignant thyroid lesions accurately was found to be 96.77%In the present study, diagnostic accuracy was 96.77%, which is compatible with studies of Gharib & Goellner (1993) and Harach et al (1989). In the present series, no complication other than mild pain or bleeding at puncture site was reported.

CONCLUSION

FNAC is an important diagnostic tool in diagnosing thyroid lesions with high degree of specificity and high diagnostic accuracy. It is highly suitable to evaluate malignancies of thyroid as it has high negative predictive value and very low chances of having false positive diagnosis, therefore has a bearing in management and can determine further treatment plan. It can be safely applied in all types of thyroid lesions with advantage of simple maneuvers without the need of assistance of surgeons and anaesthetists. It is economic, safe and least traumatic OPD procedure, which produce speedy results.

REFERENCE

1 Kotwal M, gaikwad S, patil R, munshi M. Fnac of thyroid gland- a useful tool in preoperative diagnosis or a cytopathologist's riddle?.journal of cytology 2007;24(2) : 85-88

2 Atula T, Grenman R, Laippala P. Fine-needle aspiration cytology of thyroid gland lesions. The Journal of Laryngology & Otology. 1995;109(9):853–858

3 Choudhury AA, Sultana T, Siddique BH, Amin ASA. Diagnosis of thyroid gland mass by the fine needle aspiration cytology (FNAC) and its histopathological correlation—2 years study in BSMMU, Dhaka. Bangabandhu Sheikh Mujib Medical University Journal. 2011;4(2):65–69.

4 Boccato P, Altavilla G, Blandamura S. Fine needle aspiration biopsy of thyroid gland lesions: a reappraisal of pitfalls and problems. Acta Cytologica. 1998;42(4):888–898

5 Das DK, Petkar MA, Al-Mane NM, Sheikh ZA, Mallik MK, Anim JT. Role of fine needle aspiration cytology in the diagnosis of swellings in the thyroid gland regions: a study of 712 cases. Medical Principles and Practice. 2004;13(2):95–106.

6 Nguansangiam S, Jesdapatarakul S, Dhanarak N, Sosrisakorn K. Accuracy of fine needle aspiration cytology of thyroid gland lesions: routine diagnostic experience in Bangkok, Thailand. Asian Pacific Journal of Cancer Prevention. 2012;13(4):158

7 Hafez NH, Tahoun NS. Reliability of fine needle aspiration cytology (FNAC) as a diagnostic tool in cases of cervical lymphadenopathy. Journal of the Egyptian National Cancer Institute. 2011 Sep 1;23(3):105-14.

8 Khanna M, Khanna A, Manjari M, Singh K, Kaur H. Fine Needle Aspiration Cytology as a Primary Diagnostic Tool in Thyroid Enlargement. Journal of Medical Science and Research. 2013 Jul 1;4(2):37.