

Original Article

Fine Needle Aspiration Cytology in the Diagnosis of Thyroid Diseases

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ABSTRACT

Objective: To evaluate the accuracy of Fine Needle Aspiration Cytology (FNAC) with comparison of histopathological findings of excised mass in the diagnosis of diseases of thyroid gland.

Design: Comparative observational study.

Setting & Duration: Departments of Pathology, ENT and Surgical Unit III. Peoples University of Medical & Health Sciences, Nawabshah, during January 2007 to December 2011.

Patients & Methods: 126 patients of both sexes were evaluated through detailed history, general physical examination, otolaryngology & neck examination, hormonal assay (serum T₃, T₄ & TSH) & radio-isotope scan. All the data were collected on a pre-designed proforma. The FNAC was performed in all cases followed by excision biopsy. The cytological diagnosis was correlated with the histological diagnosis and the results were tabulated.

Results: The FNAC results show 112 benign & 14 malignant cases and the histological examination revealed 111 benign & 15 malignant cases, & proved one case of colloid cyst as nodular goiter, two cases of follicular adenoma as follicular carcinoma, one case of medullary carcinoma as papillary carcinoma, one case of lymphoma as Hashimotos Thyroiditis and one case of uncertain malignancy as papillary carcinoma. The diagnostic accuracy was 89.6%, and the sensitivity, specificity and the positive & negative predictive values detected were 85.7%, 99%, 92.3% & 98.2% respectively.

Conclusion: FNAC is a safe, inexpensive and minimally invasive procedure for the diagnosis of thyroid diseases, and is almost free of complications. In our study it is more specific than sensitive with a high diagnostic accuracy.

Key Words: Thyroid Gland, FNAC, Histopathology.

INTRODUCTION

Thyroid Gland is one of the largest endocrine gland¹. Diseases of thyroid gland are common in Pakistan² and majority of patients present with a lump in front of neck, seen or felt on self examination³. Usually, preoperative investigations for thyroid lesions consists of

combination of thyroid function tests, radiographs of the thoracic inlet, radioisotope scan, ultrasound scan and fine needle aspiration cytology (FNAC). The use of multiple investigations without any accuracy in diagnostic yield and with lot of expenses must be questioned⁴. As the techniques used to find out the nature of the disease like radio-isotope scan and ultrasound provide limited information for the diagnosis of underlying disease⁵. Practice guidelines set forth by American Thyroid Association and National Comprehensive Cancer Network state that due to superior diagnostic reliability and cost effectiveness fine needle aspiration should be done as first line initial diagnostic test⁶. FNAC is an important diagnostic tool in the preoperative evaluation of thyroid lesions⁷, & can differentiate benign and malignant thyroid lesions⁸. FNAC is both diagnostic and

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therapeutic in a cystic swelling and there is no evidence of spread of tumor through the skin tract⁹.

FNAC of thyroid lesions was first used by Soderstrom¹⁰ in 1952 and widely accepted in 1980s as the preferred test¹¹. Currently FNAC is viewed as the gold standard for initial diagnosis in most of cases of thyroid mass and it plays a crucial role in the selection of patients for surgery¹², and it reduces the percentage of surgery & hence its accuracy is very important in patients management¹³.

There are various limitations of FNAC, the reported pitfalls are those related to adequacy of specimen, sampling techniques, the skill of person performing the aspiration, the experience of pathologist who is interpreting the aspirate & overlapping cytological features between benign & malignant lesions¹⁴.

We have conducted the current study to evaluate the accuracy of FNAC with comparison of histopathological findings of excised mass in the diagnosis of diseases of thyroid gland.

MATHODOLOGY:

The current study was conducted in department of Pathology, ENT and Surgical Unit III. Peoples University of Medical & Health Sciences, Nawabshah, during January 2007 to December 2011. The study includes 126 patients of both sexes who were admitted through the out patients department having history of thyroid gland enlargement. The cases were also included from the private clinic. The patients were evaluated through detailed history, general physical examination, otolaryngology & neck examination, hormonal assay (serum T₃, T₄ & TSH) & radio isotope scan. All were noted on a pre-designed proforma.

The FNAC was performed in all 126 patients and among them the procedure was repeated in 18(14.2%) cases due to inadequate sample. The procedure was completed in 5-10 minutes. The complications of the procedure were few, the patients did experience pain by the prick of the needle. Bruises were pointed out by 6 (5%) patients, and 4 (3%) patients develop hematoma after aspiration, and were treated accordingly.

The FNAC was performed in all cases by a pathologist & cytological diagnosis was made, & appropriate surgical procedure was undertaken on

to the basis of FNAC results. The postoperative biopsy specimens were sent for histological examination. The FNAC findings were correlated with the histopathological diagnosis and the results were tabulated.

RESULTS:

The current study consists of 126 cases having female male ratio was 2.7:1 and with a mean age of 36 years (Table-1). The FNAC was performed in all 126 patients and among them the procedure was repeated in 18 (14.3%) cases due to inadequate sample.

The FNAC results show 112 benign and 14 malignant cases and the histological examination revealed 111 benign and 15 malignant cases (Table-2).

TABLE-01
Demographic Data

Total No. of cases	126
Female (%)	92 (73%)
Male (%)	34 (27%)
Age (years)	13 - 68
Mean age	36

TABLE-02
FNAC & Histological Diagnosis of 126 cases

Pathology	FNAC	Histopathology
Benign	112	111
Colloid Cyst	18	17
Nodular Goiter	80	81
Throiditis	05	05
Hashimotos Thyroiditis	02	03
Follicular Adenoma	07	05
Malignant	14	15
Papillary Carcinoma	08	11
Follicular Carcinoma	00	02
Medullary Carcinoma	02	01
Anaplastic Carcinoma	01	01
Lymphoma	01	00
Uncertain	02	00
Total	126	126

The histological examination confirms the diagnosis of all benign and malignant cases except one case of colloid cyst was confirmed as nodular goiter, two cases of follicular adenoma were proved to be follicular carcinoma, one case of medullary carcinoma confirmed as papillary carcinoma, one case of lymphoma was diagnosed as Hashimotos Thyroiditis and one case of uncertain malignancy was proved as papillary carcinoma. The correlation of different test values in comparison of FNAC and final histology are given in Table-3.

TABLE-03
Correlation between FNAC & Histological Diagnosis

True Positive	12 (9.5%)
False Positive	01 (0.8%)
True Negative	110 (87.3%)
False Negative	02 (1.6%)
Sensitivity	85.7%
Specificity	99%
Positive predictive Value	92.3%
Negative predictive Value	98.2%
Diagnostic Accuracy	89.6%

DISCUSSION:

The FNAC is a very simple procedure of histological diagnosis as compared to other procedures. The only equipment required is a 20 cc disposable syringe having 22 gauge needles and no anesthesia is required, and as there is no any hospital stay and psychological trauma so the procedure is well accepted by the patients¹².

Inadequate samples were seen in 18(14.3%) cases, the reported range in the literature is 1-5%¹⁵ this may be because of sampling of necrotic tissue, areas of cystic degeneration, heavy dilution with blood, areas of fibrosis and calcification. FNA under ultrasound guidance can reduce the percentage of inadequate sampling.

The Papanicolaou Society of Cytopathology have given the guidelines for the FNAC of thyroid specimens, and according to that the false negative results can be defined as the diagnosis of non-neoplastic lesion, in which surgical intervention is not required, rendered on a malignant lesion; and

its rate is computed as the number of false negative diagnoses divided by the total number of FNACs in the series multiplied by 100. While a false positive diagnosis is defined as a diagnosis of neoplasm, in which surgical intervention is needed, rendered on a non-neoplastic lesion; and its rate is computed as the number of false positive diagnosis divided by the total number of FNACs in the series multiplied by 100¹⁶. We observed false negative results in 02(1.6%) of cases, the recommended false negative rate in the literature is <5%¹⁷ different studies shows 1-16% false negative results^{18,19}.

The false positive results were present in only 1(0.8%) case. The reported range of false positive cases is 0-9% in different studies^{20,21}.

In current study the sensitivity observed was 85.7% and specificity was 99%, which confirms the observations of other studies^{22,23} the literature shows the range of 65-100% and 72-100% respectively in different studies^{24,25}.

The positive predictive value in our study was 92.3% and negative predictive value was 98.2%, which correlates with the other studies^{26,27}.

The diagnostic accuracy observed in the current study was 89.6%, which is in consistent with other different studies^{28,29}.

CONCLUSION:

FNAC is a safe, inexpensive and minimally invasive procedure for the diagnosis of thyroid diseases, and is almost free of complications when handled by experienced person. In our study it is more specific than sensitive with a high diagnostic accuracy. We suggest ultrasound guided aspiration to reduce inadequate sampling and also to increase the yield.

REFERENCES

1. Guyton C, Hall JE. Thyroid Metabolic Hormones. Textbook of medical physiology. 11th ed. Elsevier Saunders 2006;931-43.
2. Gharib H. Non toxic diffuse and nodular goiter. In: Atlas of clinical endocrinology, Surks MI Vol I, Thyroid diseases. Philadelphia. Current Medicine 1999;53-65.
3. Neki NS, Kazal HL. Solitary Thyroid Nodule-An Insight. JIACM 2006;7(4):328-33

4. Fon LJ, Deans GT, Lioe TF, Lawson JT, Briggs K, et al. An audit of thyroid surgery in a general surgical unit. *Ann R Coll Surg Engl* 1996;78:192-6.
5. Harach HR, Sanchez SS, Williams ED. Pathology of the autonomously functioning (hot) thyroid nodule. *Ann Diagn Pathol* 2002;6:10-19.
6. H. thyroid: fine needle aspiration (FNA) and cytology. *Thyroid* 2003;13:80-6.
7. Wong CK, Wheeler MH. Thyroid nodules: rational management. *World J Surg* 2000;24:934-41.
8. Lew JI, Snyder RA, Sanchez YM, et al. Fine needle aspiration of the thyroid: correlation with final histopathology in surgical series of 797 patients. *J Am Coll Surg* 2011;213(1):188-94.
9. Afridi S, Malik K, Waheed I. Role of fine needle aspiration biopsy and cytology in breast lumps. *JCPSP* 1995;5:75-7.
10. Orell S, Sterrett G, Walters M, et al. Introduction, historical perspective, in *Manual and atlas of fine needle aspiration cytology*. New York: Churchill Livingstone 1986;1-5.
11. Mazzaferri EL. Management of a solitary thyroid nodule. *New Eng J Med* 1993;328:55.
12. Tariq M, Iqbal MZ, Ali MZ, et al. FNAC of thyroid nodule; diagnostic accuracy of fine needle aspiration cytology (FNAC). *Prof Med J* 2010;17(4):589-97.
13. Cheung YS, Poon CM, Mak SM, et al. Fine - needle aspiration cytology of thyroid nodules how well are we doing? *Hong Kong Med J* 2007;13(1):12-5.
14. Kocjan G, Chandra A, Cross PA. The interobserver reproducibility of thyroid fine - needle aspiration using the UK Royal College of Pathologist's classification system. *Am J Clin Pathol* 2011;135(6):852-9.
15. Guido MS, Gregg AS, Suzanne ES, et al. Fine needle aspiration of thyroid & correlation with histopathology in a contemporary series of 240 patients. *Am J Surg* 2003;186:702-10.
16. Suen KC, Karim AFW, Kaminakay BD, Layfield LJ et al. Guidelines of Papanicolaou Society of Cytopathology for the examination of fine needle aspiration specimens from thyroid nodules. *Mod Path* 1996;9:710-5.
17. Gharib H, Goellner JR. Fine needle aspiration biopsy of the thyroid: an appraisal. *Ann Intern Med* 1993;118:282-9.
18. Baloch ZW, Sack MJ, Yu GH, et al. Fine needle aspiration of thyroid an institutional experience. *Thyroid* 1998;8:565-9.
19. Caraway NP, Sniege N, Samaan. Diagnostic pitfalls in thyroid fine needle aspiration: a review of 394 cases. *Diagn Cytopathol* 1993;9:345-50.
20. Goldstein RE, Netterville JL, Burkey B, et al. Implications of follicular neoplasms, atypia and lesions suspicious for malignancy diagnosed by fine needle aspiration of thyroid nodules. *Ann Surg* 2002;235:656-64.
21. Ogawa Y, Kato Y, Ikeda K, et al. The value of ultrasound guided fine needle aspiration of thyroid nodules: an assessment of its diagnostic potential and pitfalls. *Surg Today* 2001;31:97-101.
22. Hamburger JI. Diagnosis of thyroid nodules by fine needle biopsy: use and abuse. *J Clin Endocrinol Metab* 1994;79:335-9.
23. Haruna AN, Alhaji BM, Bata MG, et al. Fine needle aspiration cytology of thyroid nodule(S): A Nigerian Tertiary Hospital Experience. *Internet J Pathology* 2006;5(1). doi:10.5580/Id7c.
24. Gharib H. Fine needle aspiration biopsy of thyroid nodules: advantages, limitations, and effects. *Mayo Clin Proc* 1994;69:44-9.
25. Suresh K, Shakil A, Abdullah D. Role of fine needle aspiration cytology in thyroid diseases. *J Surg Pak (Inter)* 2008;13(1):22-5.
26. Afroze N, Kayani N, Hassan SH. Role of fine needle aspiration cytology in the diagnosis of palpable thyroid lesions. *Indian J Pathol Microbiol* 2002;45(3):241-6.
27. Chang HY, Lin JD, Chen JF, et al. Correlation of fine needle aspiration cytology and frozen section biopsies in the diagnosis of thyroid nodules. *J Clin Pathol* 1997;50:1005-9.
28. Saeed AM, Akhtar H, Najul I. Fine needle aspiration cytology of thyroid nodule: diagnostic accuracy and pitfalls. *J Ayub Med Coll* 2006;18(4):26-30.
29. Thoms JO, Adeyi OA, Nwachokor FN, et al. FNAC in the management of thyroid enlargement. *East Afr Med J* 1998;835:657-9.