Original Research Paper

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Accuracy of Fine Needle Aspiration Cytology of Thyroid Swelling With Histopathological Correlation

Medical Science

KEYWORDS : Fine needle aspiration cytology (FNAC), Thyroid swelling.

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ABSTRACT

Fine needle aspiration cytology (FNAC) is cost effective, minimally invasive and time saving, accurate method as first line of evaluation (1) for assessment of thyroid swellings and to distinguish between benign and malignant lesions. A prospective study of 100 patients with thyroid swelling during the period from May 2015 to April 2016 was conducted to determine the utility and diagnostic accuracy in establishing the diagnosis of thyroid lesions and to assess the correlation between preoperative cytological and postoperative histopathological diagnoses.

Introduction

Epidemiological studies have shown that thyroid swellings can be detected by palpation in 5% of cases (1, 2). Thyroid swellings are more common in females with a M:F of 1.2:4.3 (1,3). Palpable swellings are clinically noted as solitary nodule, nodular goiter and diffuse swellings but only 5-30% of them are malignant (4). Hence thyroid swellings remain a problem all over the world to distinguish malignant from non-malignant tumors. FNAC has been used since 1950s and still one of the effective methods in diagnosis of thyroid nodules (5). FNAC helps in definitive preoperative diagnosis and allows surgeon to plan for appropriate surgery.

Some studies on goiters showed that there is overall prevalence of hypothyroidism in 5.4% and hyperthyroidism in 1.9%. Prevalence of autoimmune thyroidits confirmed by FNAC decrease unnecessary surgical intervention. However FNAC has its limitations like specimen inadequacy, sampling technique, skills of cytopathologist and technician which may decline diagnostic efficacy (6,7)

AIMS AND OBJECTIVES

Aim of the study was to assess the effectiveness of FNAC in the evaluation of thyroid swellings by comparing the results with histopathological evaluation and comparing the consistency of results with literature.

Material and Methods

A prospective study on 100 cases was done in the department of Pathology, Katuri Medical College and Hospital, Guntur, A.P during the period from May 2015 to April 2016. All patients were evaluated by thorough clinical examination including analysis of age and sex, followed by FNAC and HPE. Cases studied presented with solitary nodule, nodular goiter and diffuse thyroid swellings. FNAC done by pathologist under strict aseptic conditions, using 22 gauge needle and 5ml syringe without local anesthetic. Then the aspirate was smeared on 2-4 microscopic slides and fixed in isopropyl alcohol and stained with Harry's Haematoxylin and Eosin. Repetition of aspiration was done in few cases when first aspiration was inadequate.

Inclusion criteria – Those patients presenting with thyroid swelling, who underwent FNAC, thyroid surgery and histopathological examination within the study period were included in this study.

Exclusion criteria – Those patients having FNAC done but did not have thyroid surgery were excluded

Results

100 cases were studied where both Fine needle aspiration cytology (FNAC) and Histopathological examination (HPE) reports were available and FNAC reports were compared with HPE reports. Patients were grouped in age groups of 0-20; 21-40; 41-60 and 61-80 years & patients in each group were 12%; 64%; 17% and 7% respectively. Females were higher in frequency (83%) than males (17%).

Table 1: Incidence of Neoplastic and Non-Neoplastic lesions at different age groups

Type of lesion	0-20 Years	21-40 Years	41-60 Years	61-80 Years	Total
Neoplastic	4	14	6	3	27
Non-Neoplastic	8	50	11	4	73
Total	12	64	17	7	100

Table 2: Relative frequency of Neoplastic and Non-Neoplastic lesions in various age groups & sexes

Type of lesion	0-20 Years		21-40 Years		41-60 Years		61-80 Years		Total
	F	M	F	M	F	M	F	M	
Neoplastic	3	1	11	3	5	1	2	1	27
Non-Neoplastic	5	3	46	4	8	3	3	1	73
Total	8	4	57	7	13	4	5	2	100

Table 3: Variation of diagnosis between FNAC and HPE in Thyroid Swellings

	Diagnosis	FNAC	HPE
Non-Neoplastic	Nodular Goitre	68	62
	Chronic Thyroiditis	03	09
	Colloid Cyst	02	02
Neoplastic	Papillary carcinoma	17	16
	Follicular carcinoma	0	04
	Medullary carcinoma	0	01
	Anaplastic carcinoma	01	01
	Follicular Neoplasm	08	0
	Hurthle cell neoplasm	01	0
	Follicular Adenoma	0	05
Total		100	100

Table- 4; Comparison of Benign and Malignant cases on FNAC and HPE

Type of lesion	FNAC	HPE
Benign	82	78
Malignant	18	22
Total	100	100

On FNAC 73 cases (73%) were non-neoplastic and 27 (27%) were neoplastic. Among non-neoplastic lesions nodular goiter was most common with 68 cases (71.24%) followed by chronic thyroiditis with 03 (26.02%) cases and colloid cyst with 2 (2.74%) cases. Of 27 neoplastic swellings, 09 (77.77%) cases were diagnosed as benign lesions and 18 (22.23%) cases as malignant lesions of which papillary carcinoma thyroid was most common.

On HPE 73 (73%) cases were diagnosed as non-neoplastic and 27 (27%) were neoplastic. Among 73 non-neoplastic cases, 62 (84.93%) cases were nodular goiter, 09 (12.32%) cases were chronic thyroiditis and 2 (2.73%) cases were colloid cyst. Of 27 neoplastic cases, 05 cases (18.51%) were benign and 22 (81.48%) cases were malignant. Among 22 malignant lesions 16 (72.72%) cases were papillary thyroid carcinoma fallowed by 04 (18.18%) cases of follicular carcinoma and one case each (4.54% each) of medullary carcinoma & anaplastic carcinoma.

On comparing the findings of FNAC and histopathological examination, we see;

For non-neoplastic lesions, chi square test =2.193, with degree of freedom (d.f) = 2.0, we get probability (p) 0.3 i.e difference between two tests is not significant.

For neoplastic cases, chi square test = 19.1, with degree of freedom (d.f) = 6.0, we get probability (p) 0.003 i.e difference between two tests is significant.

Four cases of nodular goiter in FNAC were diagnosed as chronic thyroiditis and two cases were diagnosed as follicular adenoma in HPE. Out of 08 cases of follicular neoplasms diagnosed on FNAC, 03 cases came out to be follicular adenoma, 04 cases of follicular carcinoma and one case of medullary carcinoma thyroid. One case of hurthle cell neoplasm diagnosed on FNAC came out to be papillary thyroid carcinoma of hurthle cell variant on HPE.

Out of 100 cases on FNAC, 68 cases diagnosed as nodular goiter, 03 cases as chronic thyroiditis, 2 cases as colloid cyst, 17 cases as papillary carcinoma, one case of anaplastic carcinoma, one case of hurthle cell neoplasm and 08 cases of follicular neoplasm.

Cytological diagnoses were then compared with histopathological diagnoses. Cyto-histopathological concordance was obtained in 83 cases (83%)

On FNAC, benign cases were 82 and malignant were 18 whereas on HPE benign cases were 78 and malignant cases were 22. Out of 08 follicular neoplasms diagnosed on FNAC, 03 came out to be follicular adenoma. We have to look for capsular and vascular infiltration to differentiate between a Follicular adenoma and acarcinoma, which is not possible on FNAC. Hence, we could diagnose it as follicular neoplasm only. HPE is essential to differentiate benign from malignant follicular neoplasms which shows capsular or vascular infiltration.

It is difficult to differentiate follicular/hurhle cell adenoma from carcinoma on FNAC because cytology can not evaluate the criteria of vascular or capsular invasion.

Cytological diagnoses were then compared with histopathological diagnoses. Cyto-histopathological concordance was obtained in 83 cases (83%)

Test (FNAC)	Malignant in HPE	Benign in HPE
Positive test	True Positive (TP) 16	False Positive (FP) 2
Negative test	False Negative (FN) 6	True Negative (TN) 76

Sensitivity shows the portion of the patients having malignant thyroid disease and positive cytological diagnosis on FNAC, which is found to be 73%.

Specificity shows the portion of the patients with non-malignant thyroid disease and positive cytological diagnosis which is found to be 98%

False positive rate – 2.56%

False negative rate – 24%

Accuracy is the portion of the correct results, true positive and true negative in relation to all cases studied is found to be 92%.

Positive predictive value (PPV) = 89%

Negative predictive value (NPV) = 92.68%

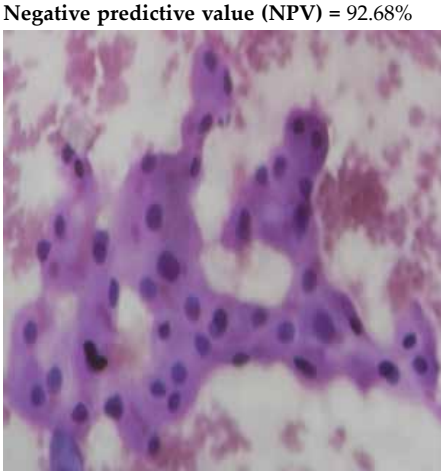

Fig-1: 40x; Hurthle cell neoplasm

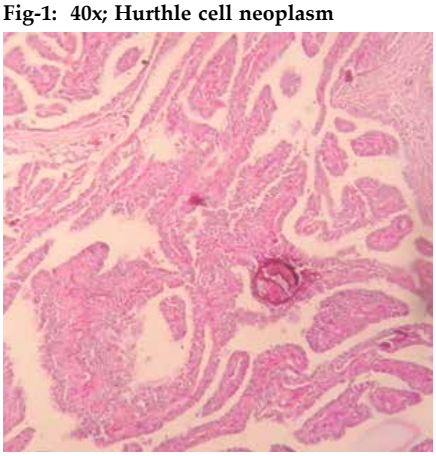

Fig-2: 10x; Papillary carcinoma with papillary process and psammoma body

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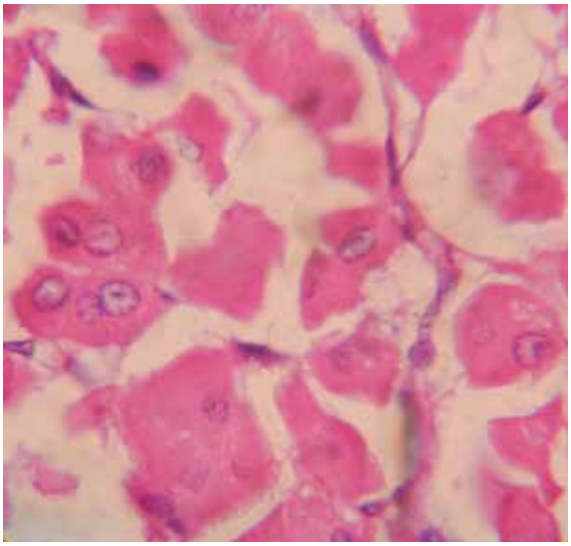

Fig-3: 40x; Papillary carcinoma Hurthle cell variant showing nuclear grooving

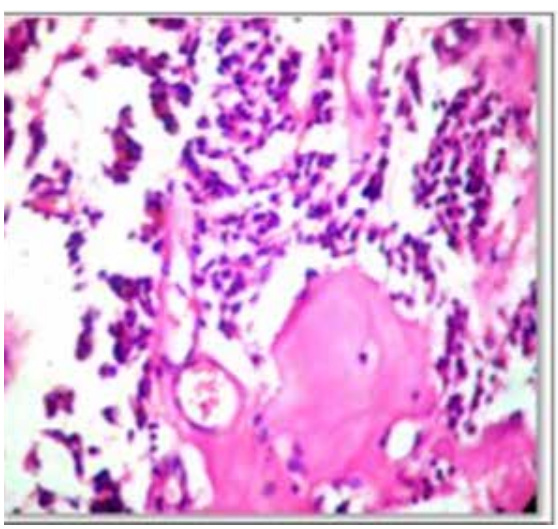

Fig-4: 40x; Medullary carcinoma with plasmacytoid cells and deposition of amyloid

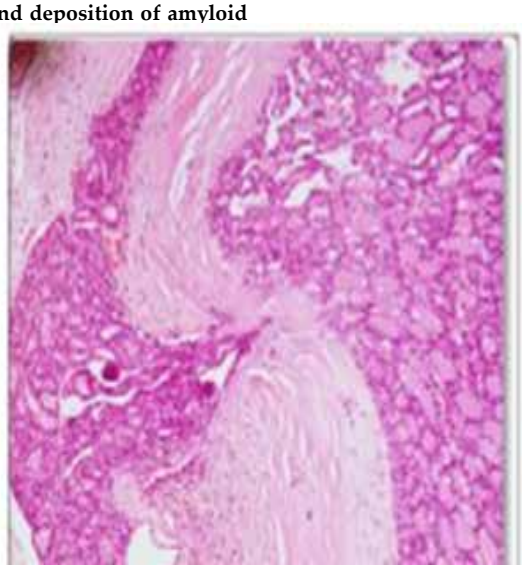

Fig-5: 10x; Follicular carcinoma showing capsular invasion

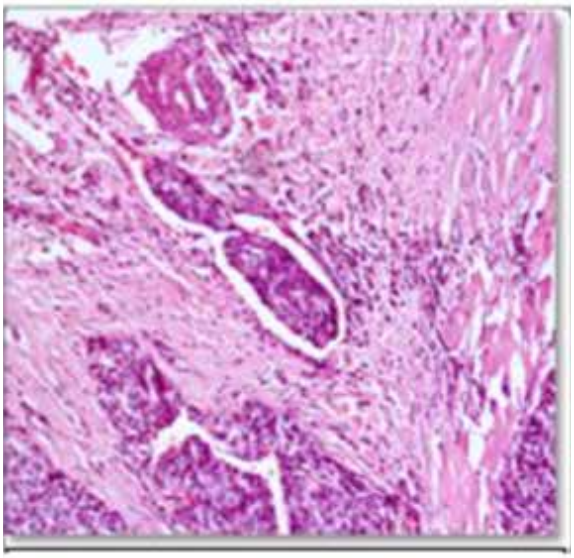

Fig-6: 10x; Follicular carcinoma showing vascular invasion

Discussion

FNAC is regarded as gold standard in the initial diagnosis and preoperative assessment of thyroid swellings. However there are some limitations of FNAC which a pathologist must be aware of (8). The current study was undertaken to evaluate accuracy of FNAC results and to correlate between FNAC and HPE diagnoses in our institution and to analyse the cause of diagnostic error with an eventual aim to improve accuracy.

In present study of 100 cases majority of cases were seen in age group of 21-40 Yrs. (64%). Females were higher in frequency (83%). Youngest patient of this series was a girl of 13 Years with chronic thyroiditis and the oldest patient was a man of 72 Years with follicular carcinoma.

In our study FNAC showed 27% neoplastic cases. Among neoplastic thyroid swellings papillary carcinoma was most common with 63% followed by follicular carcinoma

While comparing FNAC with histopathological examination in the present study it was found that 91% cases of nodular goiter on FNAC were diagnosed as nodular goiter on HPE. Out of 17 cases of papillary carcinoma diagnosed by FNAC, on histopathology 15 cases were confirmed as papillary carcinoma, 2 cases came out to be chronic thyroiditis. One case of anaplastic carcinoma thyroid on FNAC, confirmed by HPE.

The main information one wants from FNAC is to distinguish a malignant lesion from a benign one. This distinction has dramatically reduced the surgery rates in thyroid diseases (9). But FNAC cannot differentiate follicular adenoma from follicular carcinoma, a major limitation of this procedure as it cannot evaluate criteria of capsular or vascular invasion (10). In our study we reported 08 cases of follicular neoplasms out of which 3 cases turned out to be follicular adenoma, one case as medullary carcinoma and 4 cases confirmed as follicular carcinoma (50%) on HPE, comparable to reported 50-70% of thyroid aspirates (11). wC. Faquin, 2009 reported 15-30% of FNA diagnosed follicular neoplasms were actually carcinomas; remaining 70-85% were benign(12). Baloch ZW, 2002 observed that the diagnosis" follicular neoplasm" is indeterminate; 70% are benign (12). One case of hurthle cell neoplasm on FNAC

was diagnosed as papillary carcinoma thyroid of hurthle cell variant.

As FNAC is mainly aimed to rule out malignancy it should have a low false negative rate, acceptable sensitivity and specificity for detection of malignancy and high negative predictive value. In our study sensitivity of FNAC was 73%, Specificity was 98%, PPV was 89% and NPV was 93%. These values are matching with several international studies which have documented the sensitivity of FNAC in thyroid nodules as 52-98%, specificity of 72-100%, PPV of 50-90% and negative predictive value of 84-93%. (13). False negative rate is 24% comparable with literature showing 6.6-25%. (14) False positive rates in our study were comparable to other reports showing 0-9% (15). The spresent study achieved the diagnostic accuracy of 92% which is similar to experience of others (16).

CONCLUSION

FNAC is simple, cost effective, highly reliable and accurate tool to differentiate a malignant lesion from a benign one with high specificity of 98% and accuracy as high as 92%. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up if there is clinical suspicion of malignancy.

REFERENCES

1. Esmaili HA, Taghipour H. Fine needle aspiration in the diagnosis of thyroid diseases. An appraisal in our institution. ISRN Pathology 2012:912728.
2. Muratli A Erdogan et. All: Diagnostic cytology and importance of Fine needle aspiration cytology of thyroid nodules. J.Cytol 2014:31:73-8.
3. Khayamzadeh M et.all: Survival of Thyroid Cancer and social determinants in Iran, 2001-2005. Asian. J.cancer prev :2011;12:95-8.
4. Franklin JA, Sheppard MC, Aspiration cytology of thyroid BMJ 1987;295:510-1.
5. Rich S, Mathur DR: Diagnostic Accuracy of fine needle aspiration of cytology of Thyroid gland lesions: Int.J Health Scie.2012;2:1-7.
6. Samma J et.all; Thyroid fine needle aspiration cytology: Follicular lesions & the gray zone: Acta cytol; 210;54 (2):123-13.
7. Caraway NP et.all: Diagnostic pitfalls in thyroid fine needle aspiration. A review of 394 cases; Digm cytol:345-350
8. G.Sangali et.al. Fine needle aspiration cytology of the thyroid: a comparison of 5469 cytological and final histological diagnosis; Cytopathology. Volume 17, 2006. Pp.245-250.
9. M.K.Sidawy et. al; Fine needle aspiration of thyroid nodules: correlation between cytology and histology and evaluation of discrepant cases; cancer. Volume 81. 1997
10. Greaves et.al. Follicular lesions of thyroid: A five year fine needle aspiration experience. Cancer, 2000, 90(6):335-341.
11. Ergete W. Abebe D: Discotdance rate between thyroid fine needle aspiration cytology and histopathologic diagnosis. Ethip J health Dev., 2002;16:227-231.
12. Holleman F Hoekstra JBL., Ruutenbery HM; Evaluation of fine needle aspiration cytology in the diagnosis of thyroid nodules. Cytopathology, 1995:6:168-175.
13. Ramacciotti CE, Pretorius HT et.al.; Diagnostic accuracy and use of aspiration biopsy in the management of thyroid nodules. Arch Intern Med., 1984; 1446 (6):1169-1173
14. Wilems JS, Lowhagen T; Fine needle aspiration cytology in the thyroid disease. Clin endocrinol Metab., 1981; 10 (2):247-266.
15. Liel Y, Ariad s, Barchana M; Long term fallow up of patient with initially benign thyroid, fine needle aspiration. Thyroid, 2001;11(8):775-778.
16. Pandey P, Dixit A, Mahajan NC; Fine needle aspiration cytology of the thyroid: A cytohistologic correlation, critical evaluation of discordant cases. Thyroid Res Pract., 2012;9(2) 32-39.