

A CORRELATIVE CYTOLOGICAL AND HISTOPATHOLOGICAL STUDY ON LESIONS OF THYROID GLANDSivaelagovan R¹, Malliga S², A. Veni Alagamuthu³¹Assistant Professor, Department of Pathology, KAPV Government Medical College/MGM Government Hospital, Trichy, Tamilnadu, India.²Associate Professor, Department of Pathology, Sivagangai Government Medical College, Sivagangai, Tamilnadu, India.³Assistant Professor, Department of Neurology, KAPV Government Medical College/MGM Government Hospital, Trichy, Tamilnadu, India.**ABSTRACT****BACKGROUND**

Thyroid gland is affected by a variety of pathological lesions. Fine needle aspiration cytology is a safe as well as cost effective tool in the study of thyroid lesions. Observations strongly support that Fine Needle Aspiration Cytology should be the initial investigation for thyroid disease. This study was conducted to find out the diagnostic ability of the FNAC (Fine Needle Aspiration Cytology) in detecting malignant neoplasm in comparison with histopathology.

METHODS

A diagnostic evaluation study was conducted in the Department of Pathology, Madurai Medical College, Madurai. A correlative study between Fine Needle Aspiration Cytology and histopathology was done for 117 cases. A range of cytological diagnosis was offered on all satisfactory smears. Finally, the results of FNAC and the histopathology were compared for all the 117 cases.

RESULTS

Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy for malignant lesions of thyroid were 58%, 98%, 85%, 92% and 91.45% respectively. Our study results were correlating with those of other studies.

CONCLUSIONS

Fine Needle Aspiration Cytology is a cost effective, simple, rapid, almost non-invasive, and an efficient method in differentiating benign and malignant lesions. With the aid of FNAC, unnecessary surgical procedures can be reduced.

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BACKGROUND

The Thyroid gland is unique among the endocrine glands. It is the largest of all the endocrine glands and it is superficial in location. It is the only gland which is easily approachable to direct physical and cytological examination. The thyroid gland is affected by a variety of pathological lesions that are manifested by various morphologies including developmental, inflammatory, hyperplastic and neoplastic pathology which are quite common in the clinical practice. Lesions of thyroid are so common, and it presents as diffuse enlargement or solitary or multiple nodules. The Incidence of malignancy presenting on thyroid lesion is quite low when compared with the overall incidence of thyroid nodular lesions. Emphasis is placed upon to find diagnostic modalities that may improve the ability to differentiate between non-neoplastic and neoplastic lesions and differentiation of benign and malignant lesions. There is continuous discussion for appropriate interpretation and management of thyroid lesions. A need to address these arguments and to provide a clinically applicable with cost effective approach to the evaluation of thyroid lesions and its management has prompted to take up this study.

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Fine needle aspiration cytology is a safe as well as cost effective tool in the study of thyroid lesions. Observations strongly support that Fine needle aspiration cytology should be the initial investigation of thyroid disease. We also studied the incidence in relevance to age, sex in various categories of thyroid lesions. In this study we have evaluated the accuracy of Fine needle aspiration cytology correlation with histopathological study.

Fine Needle Aspiration Cytology has been established as the investigation of choice in thyroid lesions. It has excellent patient compliance, simple and quick to perform in outpatient department and is cost effective with high degree of sensitivity and specificity. Fine Needle Aspiration cytology is almost non-invasive and an efficient method in differentiating benign and malignant thyroid lesions there by unnecessary surgical procedures can be reduced. Hence the study was conducted to find out the diagnostic ability of the FNAC (Fine Needle Aspiration Cytology) in detecting malignant neoplasm in comparison with histopathology.

METHODS

A diagnostic evaluation study was conducted in the Department of pathology, Madurai Medical College, Madurai. A total of 1123 head and neck lesions were received during the study period. Out of these, 926 were thyroid lesions. Among these thyroid lesions, 117 cases had post-surgical follow up. The detailed clinical history of these 117 patients including the duration of swelling, pain, fever, loss of weight, loss of appetite and cough with expectoration, etc. were obtained. A correlative study between Fine Needle Aspiration Cytology and histopathology was done for these 117 cases. A range of cytological diagnosis was offered on all satisfactory

smears. The surgery was conducted based on the results of the FNAC and the specimens were collected. Then all the specimens were undergone the gold standard histopathological examination. Finally, the results of FNAC and the histopathology were compared for all the 117 cases.

FNAC

In Fine Needle Aspiration Cytology, the syringes used were 5-10 ml and the needle size between 22-23 gauges. The cytological materials obtained were fixed in ninety-five (95%) ethyl alcohol then stained with haematoxylin and eosin.

Histopathology

The specimens of lobectomy, hemi-thyroidectomy, near total thyroidectomy and total thyroidectomy with modified neck dissection were received for histopathological examination. The specimens were fixed in 10% formalin for 24 – 48 hours. Then detailed gross examination including weight, measurement, shape, colour and consistency were noted. They were cut into parallel and longitudinal slices including the capsular invading areas. The additional features such as haemorrhage, cystic degeneration, calcification, necrosis and distance from the line of resection were noted.

Statistical Analysis

All the collected information was entered in excel sheet and the analysis was done using Epidemiological Information Package (EPI). Descriptive statistics were done to express the age, sex. To assess the diagnostic ability of the FNAC in various parameters like sensitivity, specificity, positive predictive value, negative predictive value and accuracy were calculated. The following formulas were used to calculate various parameters. (Sensitivity=True positive x 100/True positive + False negative, Specificity=True negative x 100/False positive + True negative, Positive predictive value=True positive x 100/True positive + False positive, Negative predictive value=True negative x 100/True negative + False negative, Accuracy=True positive + True negative x 100 N).

Ethical Issues

To conduct the study permission was obtained from various department including Department of surgery, Department of Ear, nose and Throat, Department of surgical oncology. Informed written consent was obtained from all the study participants before doing FNAC. Ethical clearance was obtained from Institutional Ethical Committee, Madurai medical College.

RESULTS

Sex Distribution

A total of 117 patients / specimens were included. There were 8 Males (6.8%) and 109 females (93.2%) in the study.

Age Distribution

The mean (SD) age of the study population was found to be 39.8 years (13.3 years). In the present study, the youngest patient was fifteen years old and oldest patient was seventy years old. Maximum number of participants were found to be in the age group of 21 to 30 years (29%) (Table- 1),

Age Group (in Years)	Cases	
	No.	%
Up to 20 Years	4	3.4
21-30 Years	34	29.0
31-40 Years	25	21.4
41-50 Years	27	23.1
Above 50 Years	27	23.1
Total	117	100

Table 1. Age Distribution

FNAC Diagnosis

Out of these 117 FNAC studies, eighty one cases were reported as nodular goiter (69.23%), twelve cases as papillary carcinoma (10.3%), Nine cases as Hashimoto's thyroiditis (7.7%), Five cases as Lymphocytic thyroiditis (4.3%), Eight cases as follicular neoplasm (6.8%), one case as Granulomatous thyroiditis (0.85%) and another one case as anaplastic carcinoma (0.85%).

Out of these 117 specimens, 73 cases were reported as Non-neoplastic Lesions, (62%) 44 cases as neoplastic lesions (38%), Out of these 73 Non-neoplastic Lesions cases, 54 were reported as Nodular goiter. 18 were reported as Hashimoto's thyroiditis, one was reported as Granulomatous thyroiditis. Out of the 44 neoplastic lesions 25 cases were reported as benign neoplastic lesions and 19 as malignant neoplastic lesions. Among the 19 malignant neoplastic lesions 16 cases were reported as papillary carcinoma, 2 cases as medullary carcinoma thyroid and 1 case as anaplastic carcinoma.

Correlation Between FNAC and Histopathology

In the present study 81 cases of Nodular goiter on Fine Needle Aspiration cytology were found to be Nodular goiter in 45 cases (Fig. 6, 7, 8), Follicular adenoma in 20 cases, Hashimoto's thyroiditis in 10 cases, Papillary carcinoma in five cases and Medullary carcinoma in one case on subsequent histopathological examination.

Five cases of Lymphocytic thyroiditis on Fine Needle Aspiration cytology were found to be Nodular goiter in one case, Follicular adenoma in two cases and Hashimoto's thyroiditis in two cases on subsequent histopathological examination.

Eight cases of Follicular neoplasm on Fine Needle Aspiration cytology were found to be Nodular goiter in five cases and Follicular adenoma in three cases on subsequent histopathological examination (Fig. 9, 10, 11).

Nine cases of Hashimoto's thyroiditis on Fine Needle Aspiration cytology were found to be Hashimoto's thyroiditis in five cases (Fig. 3, 4, 5), Nodular goiter in two cases, medullary carcinoma in one case and papillary carcinoma in one case on subsequent histopathological examination.

Twelve cases of Papillary carcinoma on Fine Needle Aspiration cytology were found to be Papillary carcinoma in ten cases (Fig 12, 13, 14, 15, 16, 17), Hashimoto's thyroiditis in one case and Nodular goiter in one case on subsequent histopathological examination.

One case of anaplastic carcinoma (Fig. 18, 19) and another one case of Granulomatous thyroiditis on Fine Needle Aspiration cytology were confirmed by subsequent histopathological examination (Fig. 1, 2). In the present study, sensitivity, specificity, positive predictive value, negative predictive value, positive LR, negative LR, accuracy was found to be 58% (95% CI: 34% to 80%), 98% (95% CI: 93% to 99%), 85% (95% CI: 57 to -96%), 92% (95% CI: 87% to

96%),28.37(95% CI 6.83 to 117.87), 0.43 (95% CI 0.25 to 0.73), 91.45% (95% CI: 84.84% to 95.83%) respectively and were calculated using the following table-2.

Histopathological				Total	
FNAC		Positive	Negative		
		Positive	11	2	13
		Negative	8	96	104
Total		19	98	117	

Table 2

DISCUSSION

Fine Needle Aspiration Cytology of thyroid has become the most common and well established preoperative diagnostic procedure used in the management of patients with thyroid lesions. It is relatively cost-effective procedure that provide diagnosis rapidly.

Incidence of Thyroid Lesions

We received 117 gross specimens for histopathological examination following initial cytological evaluation by fine needle aspiration cytology. In present study non neoplastic lesions accounts for seventy-three cases and neoplastic lesions accounts for forty-four cases. The ratio between non neoplastic and neoplastic thyroid lesions in this study is 1.66:1. Incidence of non-neoplastic and neoplastic thyroid lesions in this study is tabulated in table number 3.

Sl. No.	Studies	Non-Neoplastic	Neoplastic	Ratio
1.	Pepper G.M ¹	84	18	4.66:1
2.	Dorairajan N ²	78	20	3.90:1
4.	Naggada HA ³	51	18	2.83:1
5.	Gupta C ⁴	470	30	15.66:1
6.	Kaur K ⁵	32	15	2.13:1
7.	Due k SD	145	61	2.37:1
8.	Hurtado - Lopez LM ⁶	80	50	1.60:1
10.	Prakash H.M ⁷	138	24	5.75:1
11.	Present Study	73	44	1.66:1

Table 3. Incidence of Thyroid Lesions

Incidence of Malignancy

In the present study, the incidence of malignant neoplastic thyroid lesions accounts for 16.24% which well correlates with studies conducted by various research workers as well as in literature and tabulated in the Table number -4.

Sl. No.	Study	Percentage
1.	Mary Jo Welker et al ⁸	5-10%
2.	Kaur et al ⁵	18%
3.	YS Chenug et al ⁹	5-10%
4.	Munsad B et al ¹⁰	4.16%
5.	Suresh et al ¹¹	10%
6.	GG Swamy et al ¹²	18.33%
7.	Prakash H.M ⁷	14.81%
8.	present study	16.24%

Table 4. Incidence of Malignancy

Age Incidence

In the present study the mean age of presentation is 39.8 years which correlates with the literature of various authors and tabulated in table number -5.

Sl. No.	Studies	Mean Age
1.	Prakash HM et al ⁷	35.67 Years
2.	Manoj Gupta et al ¹³	38.7 Years
3.	Martin et al ¹⁴	39.5 Years
4.	Present Study	39.8 Years

Table 5. Comparative Incidence of Mean Age in Different Studies

Sex Incidence

In this study, majority of them were females. Female to male ratio of 13.6: 1 and correlates with observation of other various authors as indicated in table number-6.

Sl. No.	Studies	Sex Incidence (Female: Male) Ratio
1.	Das DK ⁵	5.39: 1
2.	Manoj Gupta ¹³	11:1
3.	Martin etal ¹⁴	6.4:1
4.	Prakash H.M ⁷	7.1: 1
5.	Dorairajan N ²	9:1
6.	Present Study	13.6: 1

Table 6. Comparative Sex Incidence of Thyroid Lesions in Different Studies

Concordance Between FNAC and Histopathology

In the present study sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), diagnostic accuracy for malignant lesions of thyroid were 58%98%85%,92%,91.45% respectively. The following table (Table 7) shows the comparison of specificity, sensitivity and diagnostic accuracy for malignant lesions of thyroid with various authors and is correlating well.

Sl. No.	Studies	Concordance Between FNAC and Histopathology
1	Harach et al ¹⁵	58.30%
3	Kunori et al ¹⁶	98.00%
4	Das et al ⁵	90.00%
5	Hag et al ¹⁷	91.40%
6	Sandeep R Mathur et al ¹⁸	97.01%
7	Present Study	91.45%

Table 7

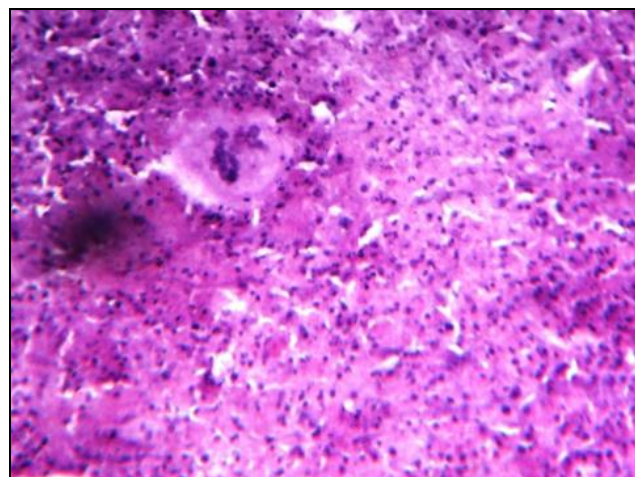


Figure 1. Granulomatous Thyroiditis: FNAC Smear Shows Multinucleate Histiocytic Giant Cells, Dirty Background of Colloid, Inflammatory Cells and Degenerated Epithelial Cells H&E

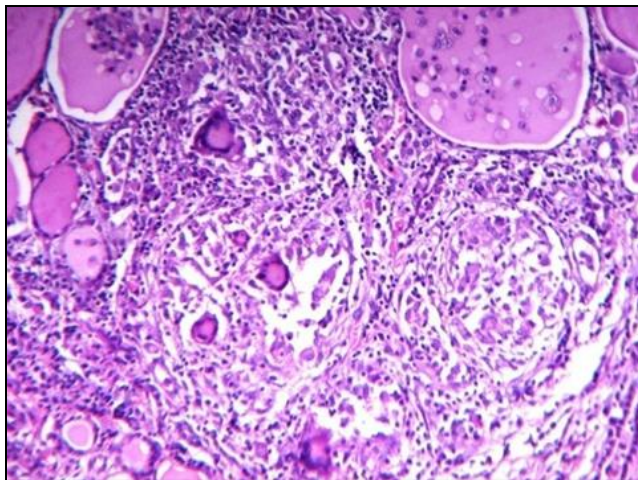


Figure 2. Granulomatous Thyroiditis: Photomicrograph Shows Macrophages, Plasma Cells about Collapsed and Damaged Thyroid Follicles and Multinucleate giant Cells. H&E

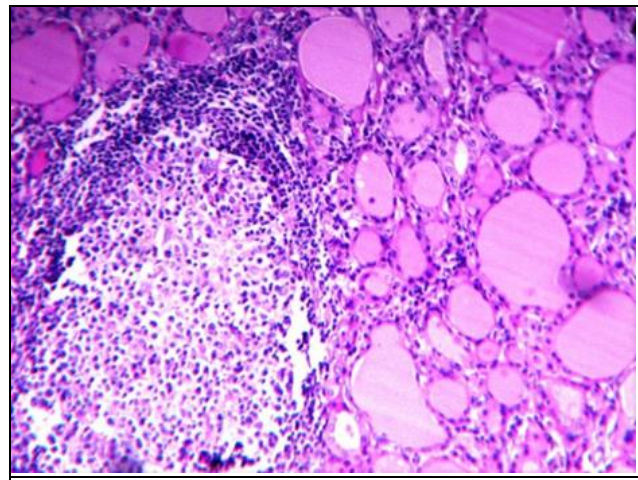


Figure-5. Hashimoto Thyroiditis: Photomicrograph Shows Infiltration of the Parenchyma by Mononuclear Inflammatory Infiltrate and Well-Developed Germinal Center (H&E)

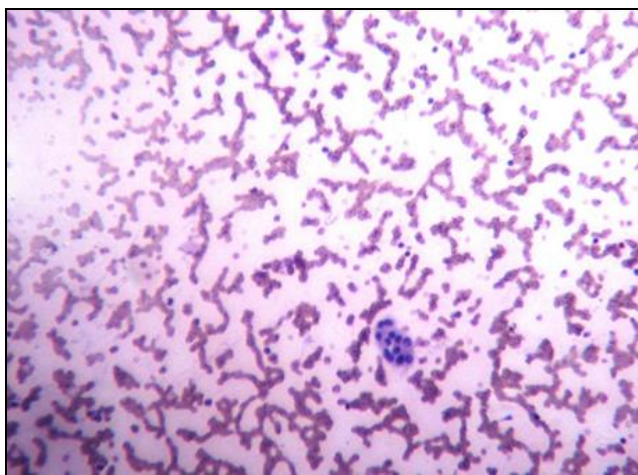


Figure 3. Hashimoto Thyroiditis: Photomicrograph-FNAC Smear Shows Hurthle Cells. H&E

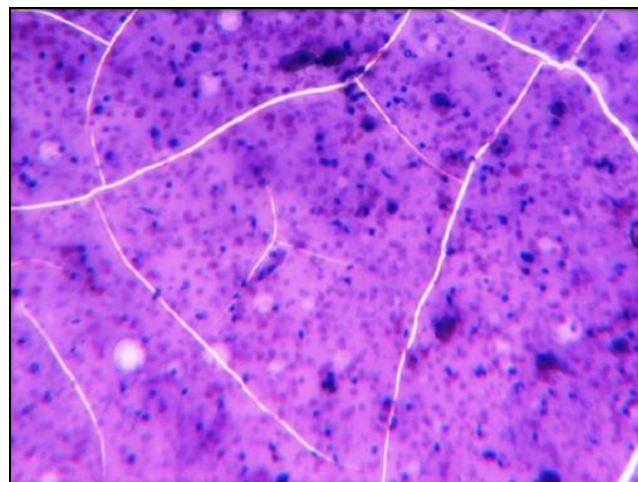


Figure 6. FNAC-Smear Showing Follicular Epithelial Cells in Background of Colloid H & E



Figure 4. Hashimoto's Thyroiditis: Cut Surface is Pale, Yellow Tan in Appearance. Gross Specimen.



Figure 7. Multi nodular Goiter: Gross Morphology Showing a Coarsely Nodular Gland with Areas of Fibrosis and Cystic Change. Gross Specimen

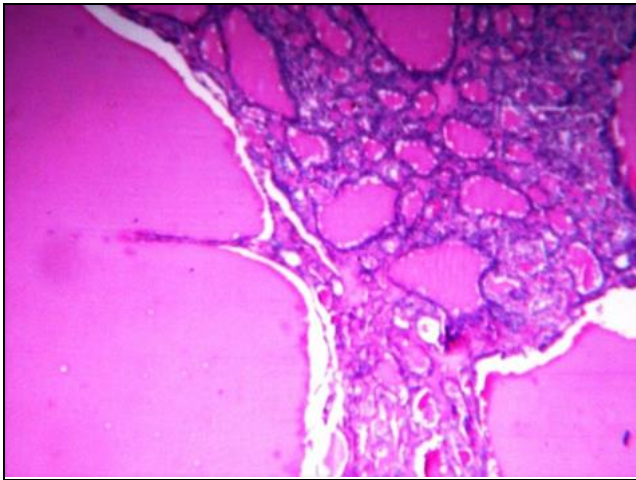


Figure 8. Multinodular Goiter Photomicrograph Shows Colloid-Rich Follicles and Areas of Follicular Hyperplasia H&E

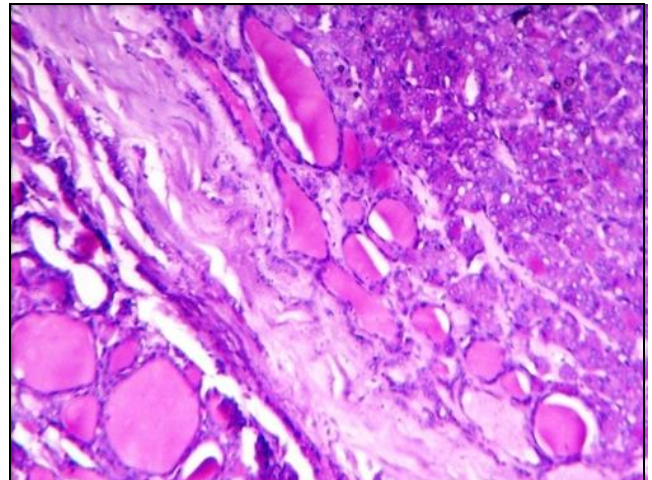


Figure 11. Follicular Adenoma: Photomicrograph Shows Well Formed Capsule Encircling the Tumor H&E

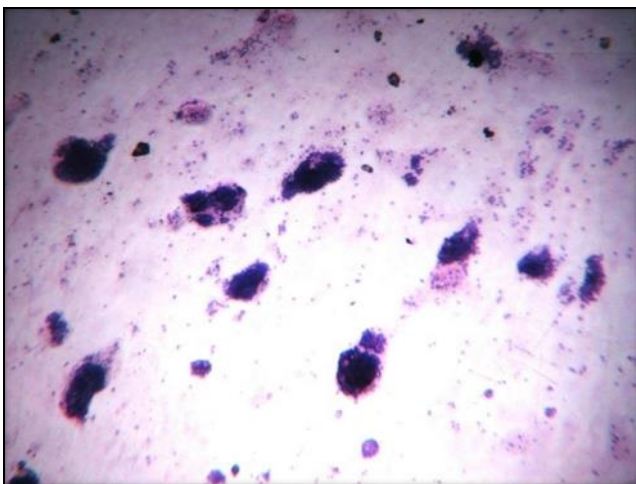


Figure 9. Follicular neoplasm: FNAC Smear Showing Follicular Epithelial Cells Arranged in Repetitive Follicular Pattern. H&E

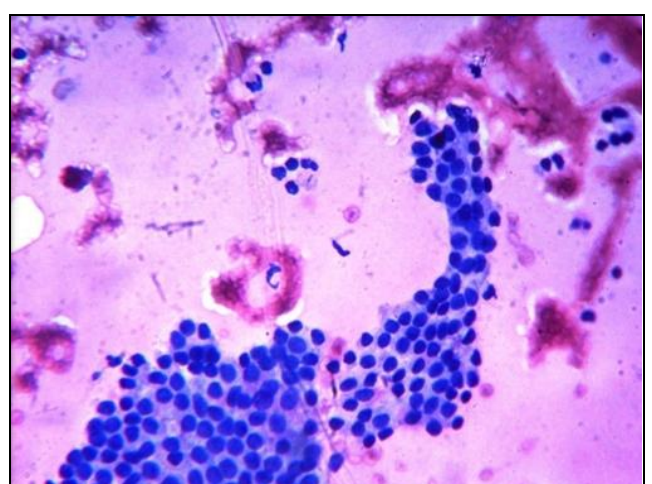


Figure 12. FNAC Smear Showing Papillary Fronds with Anatomical Edging H&E x100



Figure 10. Follicular Adenoma: Showing Well Encapsulated Nodule. Gross Specimen

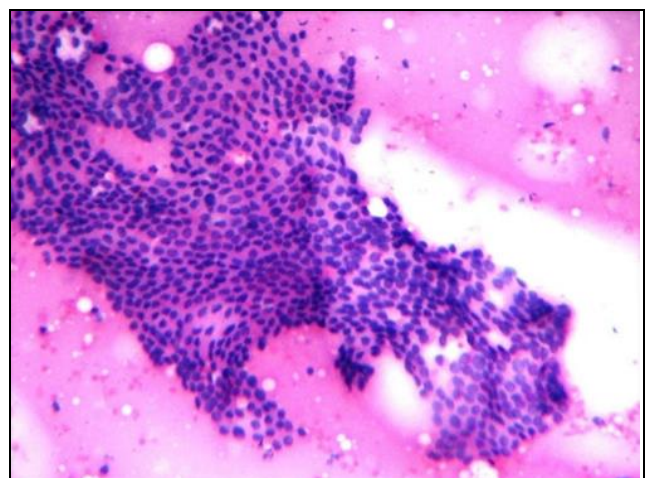


Figure 13. FNAC Smear Showing Papillary Fronds with Anatomical Edging H&E x100



Figure 14. Macroscopic Appearance of Papillary Carcinoma of Thyroid Showing Focal Greyish White Tumour

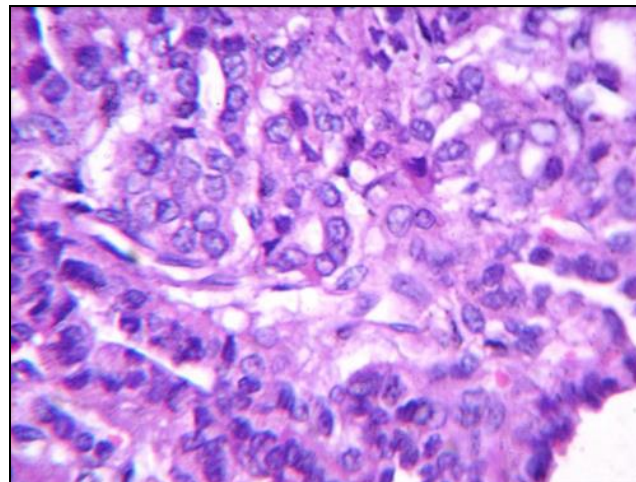


Figure 17. The nuclei of Papillary Carcinoma Cells Contain Finely Dispersed Chromatin, With an Optically Clear Or Empty Appearance (Orphan Annie Eye Nuclei) H&E)

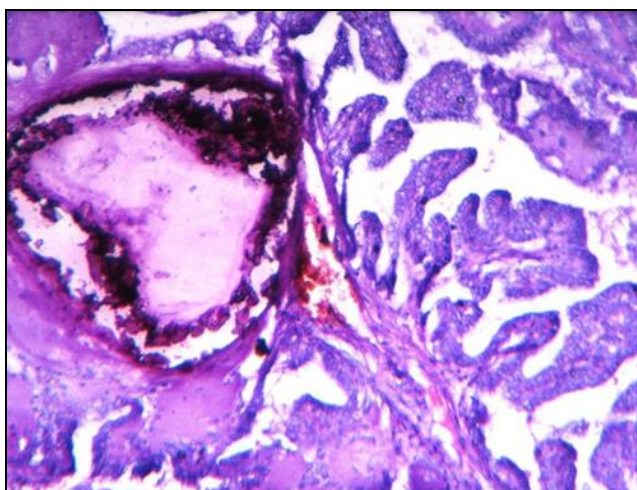


Figure 15. Papillary Carcinoma Photomicrograph Shows Psammoma Bodies Within the Cores of Papillae H&E

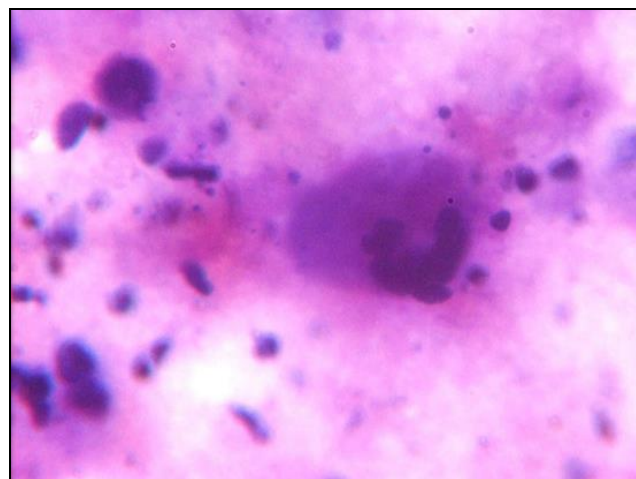


Figure 18. Anaplastic Carcinoma: FNA Cytology Smear Shows Histiocyte-Like Giant Cell with Fibroblastoid Spindle Cells H&E

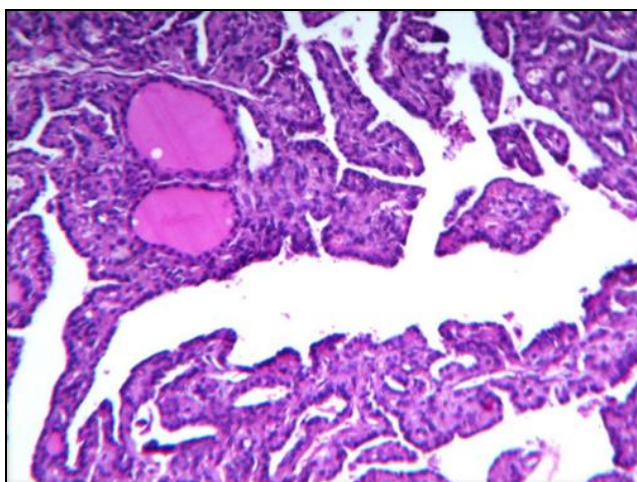


Figure 16 Papillary Carcinoma: Photomicrograph Shows Branching Papillae Having a Fibrovascular Stalk Covered By a Single to Multiple Layers of Cuboidal Epithelial Cells. H&E x100

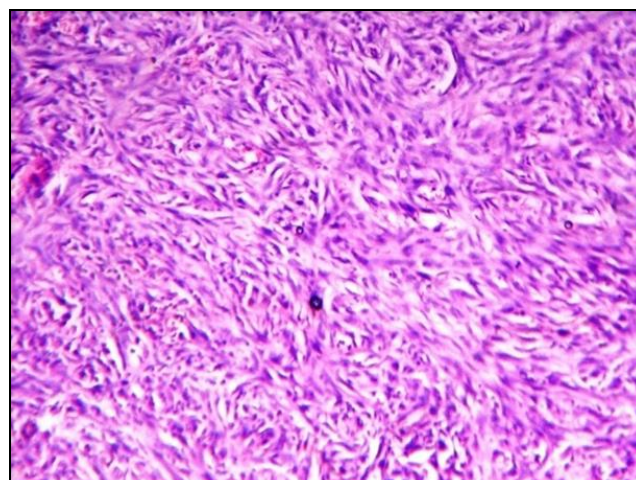


Figure 19. Anaplastic Carcinomas: Highly Anaplastic Spindle Cells With a Sarcomatous Appearance H&E x100

CONCLUSION

Fine Needle Aspiration Cytology is a cost effective, simple, rapid, almost noninvasive, and an efficient method in differentiating benign and malignant lesions. With the aid of FNAC unnecessary surgical procedures can be reduced.

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