

## The Role of Fine Needle Aspiration Cytology (Fnac) In the Evaluation of Thyroid Lesions

Dr. Manish Kumar, Dr. Dharm Chand Kothari

<sup>1</sup>M.D. Pathology NIMS Medical College, Jaipur

<sup>2</sup>M.D. Pathology Sardar Patel Medical College, Bikaner

---

### **Abstract:**

**Objective:** To determine the sensitivity, specificity and diagnostic accuracy of fine needle aspiration cytology in the management of thyroid lesions.

**Material and Methods:** A prospective study of Fine needle aspiration cytology of the thyroid gland was undertaken to evaluate its diagnostic utility, during the period from June 2011 to December 2013 in the Department of Pathology, S.P. Medical College Bikaner. A total of 52 patients presenting with palpable thyroid nodule was included in the study. All the patients underwent fine needle aspiration of the nodule. Among 52 cases, 37 were biopsied subsequently and subjected to histopathological study. A comparison of FNA cytology and biopsy results was made.

**Results:** Age of the patients ranged from 15-70 yrs with a mean age of 42.44 yrs. The majority of the patients were females in the present study with 45 (86.5%) females and 7 males, with a ratio of 6.41:1. Urban and rural distribution of sample population included 38 (73.1%) cases from rural and 14 (26.9%) cases from the urban population. Of the 52 cases of thyroid lesions, 39 were Non neoplastic lesions and 9 were Neoplastic lesions. Of the Non neoplastic lesions, 34 were Nodular colloid/ Adenomatous goiter, 4 Hashimoto thyroiditis, 1 neoplasm and 1 anaplastic neoplasm. Among 52 cases, 37 were biopsied subsequently and subjected to histopathological study. 28 cases were Non-neoplastic, 9 cases were Neoplastic. Out of 9 cases of Neoplastic lesions, 4 were Papillary carcinoma, 5 were Follicular adenoma. The diagnostic accuracy of non neoplastic and neoplastic lesions is 96.42% and 88.9% respectively. The sensitivity, specificity, positive predictive value and negative predictive value for FNAC of thyroid lesion neoplasm in the present study are 92.86%, 95.65%, 92.86% and 95.65% respectively.

**Conclusion:** It helps to categorize Non-neoplastic from Neoplastic thyroid lesions. Its use has decreased the number of surgeries performed. FNAC of thyroid lesions has been shown to be safe, simple, cost effective and accurate method for the management of palpable thyroid lesions.

However, in view of a small number of false negative results, the FNA results should be interpreted in the light of clinical findings. In case of doubt the true nature of the disease should be confirmed by biopsy.

**Keywords:** Palpable thyroid lesions, Fine Needle Aspiration Cytology, Histopathology, Sensitivity, Specificity

---

### **I. Introduction:**

Thyroid lesions are one of the common conditions encountered in clinical practice. The diseases of thyroid are of great importance because most of them are amenable to medical or surgical treatment<sup>1</sup>. Often it is difficult to make an accurate diagnosis by clinical evaluation alone. Hence Fine Needle Aspiration Cytology (FNAC) study of such lesions along with clinical evaluation is emphasized in order to make an accurate diagnosis. As all palpable lesions can be assessed by FNAC technique, early diagnosis is often possible<sup>2</sup>. It is also a speedy, safe, cost effective and an accurate technique being used world wide. FNAC is being increasingly used for evaluation of thyroid swellings<sup>2</sup>. This technique is now considered as the gold standard in the evaluation of thyroid lesions<sup>3</sup>.

According to various studies sensitivities is 65-100% and specificity is 75-100%<sup>4,5</sup>. Overall accuracy is estimated to be 92 to 95%<sup>5,6</sup>. One of the largest series retrospectively reviewed 6226 cases of FNAC from 1982 to 1998. They reported sensitivity and specificity of 93% and 96% respectively<sup>7</sup>.

The present study aims at diagnosing various thyroid diseases based upon cytomorphological features with its histopathological correlation. Also the study is intended to evaluate the sensitivity and specificity of the fine needle aspiration procedure and its interpretation.

### **II. Material And Methods**

The study was carried out in the Department of Pathology Sardar Patel Medical College and Associated Group of Hospitals, Bikaner. This study was hospital based prospective study, including all the patients with thyroid lesion who had attended hospital. Comparison between cytology and histology was done according to availability of the biopsy sample.

**The material for study will comprise of-**

Cytosmear – made from material obtained by fine needle aspiration.

Biopsy – from surgery

**Sample Size:**

The study included 52 cases of palpable thyroid lesions.

**Inclusion Criteria:**

1. Patients of all ages and both sexes.
2. All new and undiagnosed cases.

**Exclusion Criteria:**

1. Patients presenting with thyrotoxicosis and or hypothyroidism
2. Patients with solitary thyroid nodules in whom surgery was not indicated.
3. Inconclusive aspirates

Cases fulfilling the laid down criteria were included in the study. After obtaining informed consent, detailed history was taken. Clinical examination of each case was carried out. Most of the cases had an ultrasonographic examination of the thyroid lesions and serum T3, T4 and TSH estimation before advising FNAC. All the FNAs were performed by pathologists as outdoor procedures without administering any type of anaesthesia. The patients were admitted to the ward and all the biopsies were carried out as indoor procedures as part of the definitive treatment. The results obtained on FNAC were categorized into three categories, 'Non Neoplastic', 'Neoplastic' and 'Unsatisfactory'. The results obtained by histopathological examination of the respective specimens were compared with those of FNAC. Final diagnosis was made on the basis of histopathological examination of the biopsy, which was categorized as either 'Non Neoplastic', or 'Neoplastic'. The results were analyzed and the sensitivity, specificity, positive predictive value (PPV) & negative predictive value (NPV) of FNAC were calculated from the data. Conclusions were made and a comparative assessment of our results with local and international studies was made.

**III. Results**

A total of 52 cases was included in the study. Age of the patients ranged from 15-70 yrs with a mean age of 42.44 yrs. The majority of the patients were females in the present study with 45 (86.5%) females and 7 males, with a ratio of 6.41:1. The FNAC findings in this series for distribution of thyroid lesion in FNAC were: Neoplastic 17.3% and Non Neoplastic 75% and Unsatisfactory 7.7%

The distribution of various diseases in the solitary thyroid nodules on FNAC is shown in

**Table No. 1 Neoplastic and Non Neoplastic distribution of thyroid lesion in FNAC**

		No.	%
Neoplastic	Anaplastic	1	1.9
	Follicular Neoplasm	5	9.6
	Papillary Carcinoma	3	5.8
Non-neoplastic	Adenomatous goiter	20	38.5
	Colloid goiter	14	26.9
	Hashimoto thyroiditis	4	7.7
	Lymphocytic thyroiditis	1	1.9
Unsatisfactory		4	7.7

According to histopathological diagnosis in relation to cytological diagnosis. Out of total 52 patients, in 15 patients histological diagnosis was not available and out of them 1, 1, 9 and 4 had anaplastic carcinoma, lymphocytic thyroiditis, goiter and unsatisfactory cytological diagnosis. Out of total 24 goiter cases, all belonged to goiter cytological diagnosis while 5 patients had follicular neoplasm and out of them 4 had follicular and 1 had goiter cytological diagnosis while 4 patients each had Hashimoto thyroiditis and papillary carcinoma.

Out of total 28 non neoplastic patients, one patient was converted in neoplastic so accuracy of FNAC diagnosis was 96.42%, while in neoplastic group, out of 9 patients, 1 case was converted into neoplastic according to FNAC diagnosis who had a history of non neoplastic type in FNAC diagnosis. So the accuracy rate was 88.9%.

#### IV. Discussion

Thyroid cancer is uncommon, with an estimated incidence in various parts of the world of 0.5 to 10 cases per 100,000 population. It accounts roughly for about 0.5% of all cancers in men and 1.5% of all cancers in women. The most common types of thyroid cancers are differentiated thyroid cancers and follicular and papillary thyroid cancers are the main differentiated thyroid cancers. Papillary carcinoma contributes to 70%, follicular carcinoma for 12% and the follicular variant of the papillary carcinoma for 6% of all the thyroid cancers. The histopathologic distribution of differentiated thyroid cancer is comparable to international literature, as has been reported previously from India by various authors.

The fine needle aspiration cytology of the thyroid gland was performed in 52 patients in the Department of Pathology, S.P. Medical College, Bikaner. Out of 52 patients studied histopathological results were available in 37 cases.

**Table 2 Distribution of cases, according to hisopathological diagnosis in relation to cytological diagnosis**

Histopathological diagnosis	Cytological Diagnosis							Total
	Anaplastic carcinoma	Follicular neoplasm	Hashimoto thyroiditis	Papillary carcinoma	Lymphocytic Thyroiditis	Goiter	Unsatisfactory	
Nil	1	0	0	0	1	9	4	15
Goiter (Colloid/adenomatous)	0	0	0	0	0	24	0	24
Follicular Neoplasm	0	4	0	0	0	1	0	5
Hashimoto	0	0	4	0	0	0	0	4
Papillary Carcinoma	0	1	0	3	0	0	0	4
Total	1	5	4	3	1	34	4	52

In the study of Silverman et al<sup>8</sup>, the age group of the patients was in the range of 16 yrs to 79 yrs with a mean age of 44.8 yrs. In the study by Burch et al<sup>9</sup>, the age group of the patients was in the range of 15 yrs to 83 yrs with a mean age of 51.1 yrs. In a study by Jogai et al<sup>10</sup>, the age group of the patients was in the range of 19 yrs to 70 yrs with a mean age of 45.6 yrs. In the present study of 52 patients, age group is similar to the study of Silverman et al<sup>8</sup> as seen above. The mean age of the patient was 42.44 yrs.

Silverman et al<sup>8</sup> and Burch et al<sup>9</sup> in their study reported Male to Female ratio was 1:8.7, 1:3.6 respectively. In the present study male to female ratio is 1:6.2.

In the present study of 52 cases, 39 were Non-neoplastic and 9 Neoplastic lesions and 4 unsatisfactory. In Non-neoplastic lesions, 34 were Nodular colloid/adenomatous goiter, 4 were Hashimoto thyroiditis and 1 thyroiditis. In our study, of the 9 cases of neoplastic lesions, 5 cases were Follicular neoplasm, 4 cases were Papillary carcinoma and 1 was Anaplastic which is similar to the study of Hawkins et al<sup>12</sup>.

In the present study, 3 cases of papillary carcinoma on FNA were confirmed by histopathology with and 1 case of Follicular adenoma on FNAC turned out to be follicular variant of papillary carcinoma with a diagnostic accuracy of 66.7% which is comparable with the study of Gupta et al<sup>11</sup>.

In the present study, of the 5 cases of Follicular neoplasm on FNAC, 1 case was Follicular adenoma on histopathology and the other case turned out to be follicular variant of Papillary thyroid carcinoma (FVPTC) on histopathology, giving a diagnostic accuracy of 80% which is consistent with the study of Silverman et al<sup>8</sup>.

One case of follicular variant of Papillary carcinoma, which was misdiagnosed as Follicular neoplasm had smears showing follicular cells arranged in repetitive follicles, sheets and clusters with occasional nuclear crowding and overlapping and scanty colloid The presence of follicular structures led to a misinterpretation, as seen in other studies.

**Table No. 3 Overall accuracy of FNAC diagnosis in 37 histopathologically proven cases of thyroid lesion**

Histological Diagnosis	No. of Cases	FNAC Diagnosis		Accuracy of FNAC diagnosis (%)	False Positive	False Negative
		Non Neoplastic	Neoplastic			
Non Neoplastic	28	27	1	96.42	0	1
Neoplastic	9	8	1	88.9%	1	0

In the present study, 4 cases of Hurthle cell neoplasm were reported on FNAC which was confirmed on histopathology with a diagnostic accuracy of 100% similar to the study of Sekhri et al<sup>13</sup>. The current international data show the diagnostic accuracy of FNAC to be 75.2-94%, sensitivity 80-93% and specificity at 73-95% in palpable thyroid lesions according to various studies.<sup>8,9,11,12</sup>

In the present study sensitivity is 92.86%, specificity 95.65%, positive predictive value 92.86%, negative predictive value 95.65%, false positive rate of 4.34%, false negative rate of 7.14% and diagnostic accuracy of

94.59%, which are consistent with the study of Silverman et al with a sensitivity of 93%, specificity of 95.1% and diagnostic accuracy of 94%.

Fine needle aspiration cytology is a simple, reliable & cost effective technique without complications. This can be used as a safe outpatient procedure with minimal discomfort to the patient. The combination of clinical examination and FNAC remains the mainstay in selecting patients for thyroid surgery.

The sensitivity, specificity and accuracy of FNA for malignancy detection have eclipsed the diagnostic utility of other diagnostic methods and this procedure has assumed a dominant role in determining the managements of patients with thyroid nodules.

## V. Conclusion

The results of this study suggest that FNAC of thyroid lesions has been shown to be safe, simple, cost effective and accurate method for the management of palpable thyroid lesions.

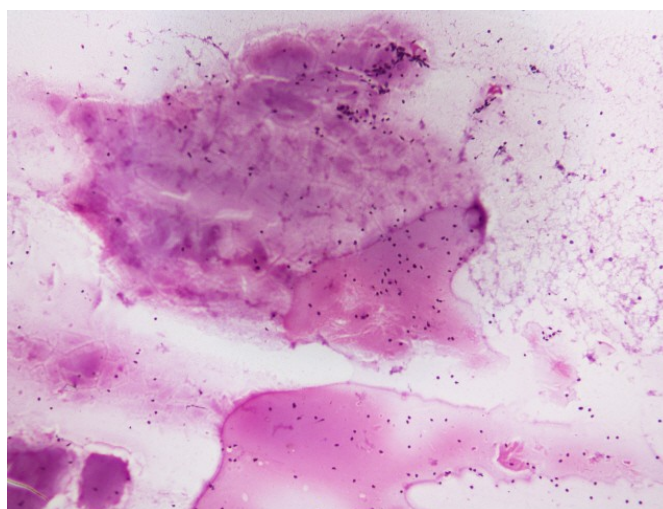
The present study suggests that FNAC gives good positive correlation with histopathology with high sensitivity and specificity.

The scope and limitations of FNAC should be fully realized, especially in the interpretation of Follicular neoplasms and also in various types of thyroid cancers especially Papillary carcinoma.

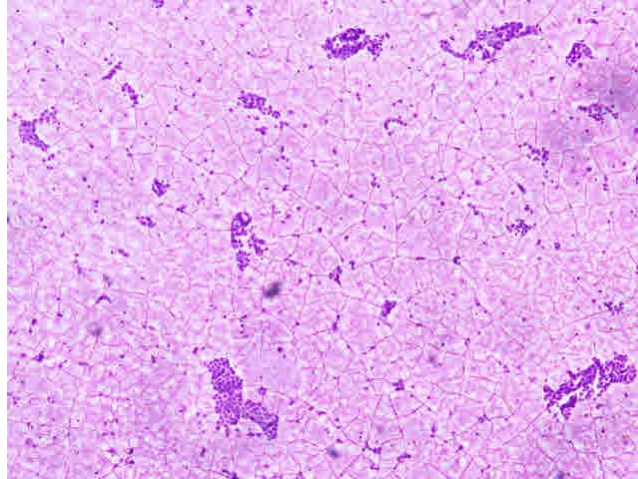
## Reference

- [1]. Mitra A, Abbas AK. The endocrine system. In: Robbins and Cotran Pathologic Basis of Disease, 8<sup>th</sup> edn. Kumar V, Abbas AK, Fausto N, Aster JC (eds). Philadelphia: Saunders 2010; 1097- 1164.
- [2]. Thyroid. In : Fine needle aspiration cytology, 4<sup>th</sup> edn. Orell SR, Sterrett GF, Whitaker D. Philadelphia: Churchill Livingstone; 2005; 125-164.
- [3]. Miller JM, Hamburger JJ, Kimi SR. Diagnosis of thyroid nodule by fine needle aspiration and needle biopsy. JAMA 1979; 241:481-486.
- [4]. Boyd LA, Earnhardt RC, Dunn JT. Preoperative evaluation and predictive value of fine needle aspiration and frozen section of thyroid nodules. J Am Coll Surg 1998; 187:494-502.
- [5]. Sabel MS, Staren ED, Gianakakis LM. Use of fine needle aspiration biopsy and frozen section in the management of the solitary thyroid nodule. Surgery 1997; 122:1021-1027.
- [6]. Chehade JM, Silverberg AB, Kim J. Role of repeated fine needle aspiration of thyroid nodules with benign cytologic features. Endocr Pract 2001; 7:237-43.
- [7]. Schmidt T, Riggs MW, Speights VO. Significance of non-diagnostic fine needle aspiration of the thyroid. South Med J 1997; 90:1183-1186.
- [8]. Silverman JF, West LR, Larkin EW, Park HK, Finley JL, Swanson MS et al. The role of Fine-Needle Aspiration Biopsy in the Rapid diagnosis and Management of Thyroid Neoplasm. Cancer 1986; 57: 1164-1170.
- [9]. Burch HB, Burman KD, Reed HL, Buckner L, Raber T, Ownbey JL. Fine Needle Aspiration of Thyroid Nodules-Determinants of Insufficiency Rate and Malignancy Yield at Thyroidectomy. Acta Cytol 1996; 40(6):1176-1183.
- [10]. Jogai S, Jassar AA, Temmim L, Dey P, Adesina AO, Amanguno HG. Fine needle aspiration cytology of the thyroid: a cytohistologic study with evaluation of discordant cases. Acta Cytol. 2005; 49(5):483-488.
- [11]. Gupta M, Guptha S, VedBhushan Gupta. Correlation of Fine Needle Aspiration cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule, Journal of Thyroid research 2010:1-5.
- [12]. Hawkins F, Bellido D, Bernal C, Rigopoulou D, Valdepenas MPR, Lazaro E, et al. Fine needle aspiration Biopsy in the Diagnosis of Thyroid Cancer and Thyroid Disease. Cancer 1987; 59: 1206-1209.
- [13]. Sekhri T, Sankar JK, Bansal M, Magdum M, Sahoo M, Sen S et Al. Role of different diagnostic modalities in the evaluation of solitary thyroid nodules: Experience in a tertiary referral centre of North India. IJNM 2001; 16(3):105-108.

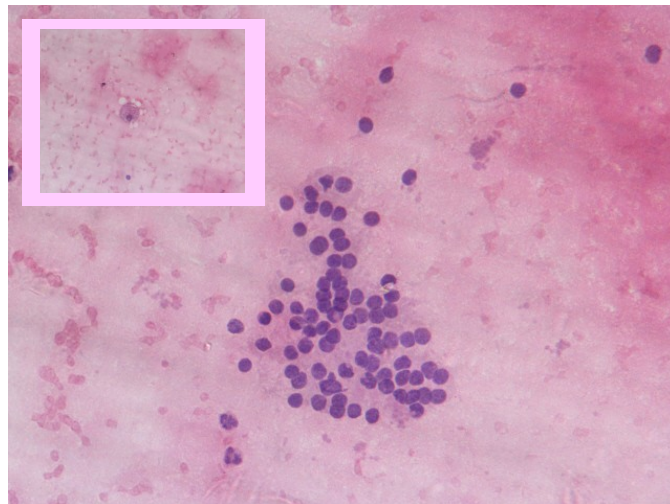
## Figure with Legends



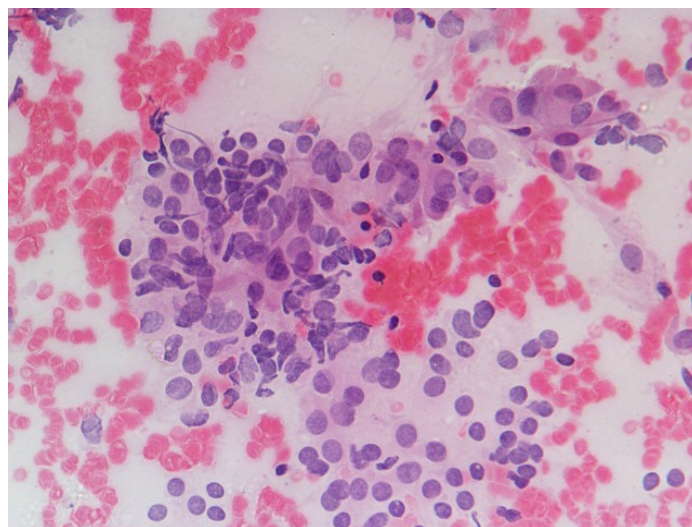
**Fig. 1- Colloid : A Varnish Like Coat Of Variable Density With Cracks And Folds (H&E 10x)**



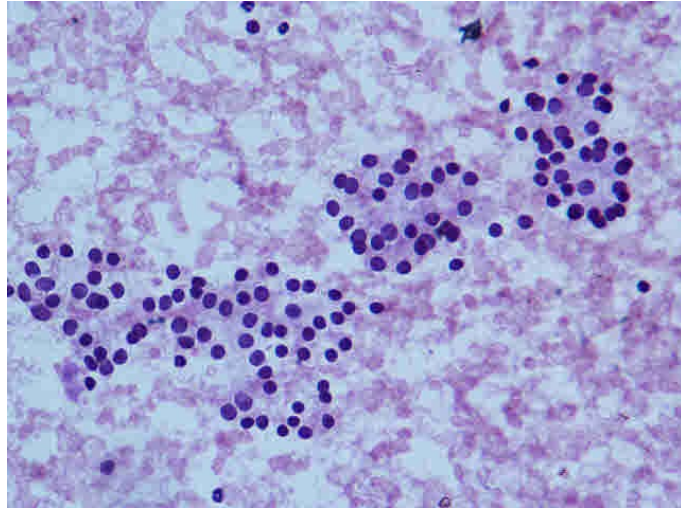
**Fig. 2- Colloid Goiter : Monolayered Sheet Of Follicular Epithelial Cells, Few Scattered Cells And Colloid (H&E 10x)**



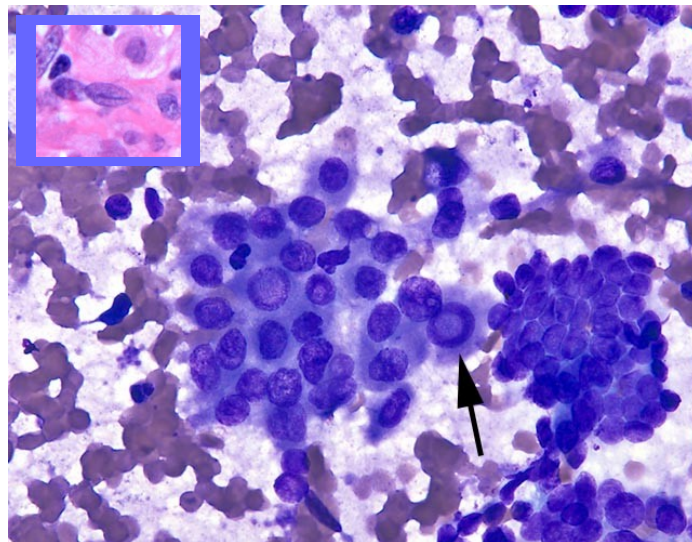
**Fig. 3 Adenomatous Goiter : Cluster Of Follicular Epithelial Cells In A Haemorrhagic Background (Inset Foamy Macrophage) (H&E 40x)**



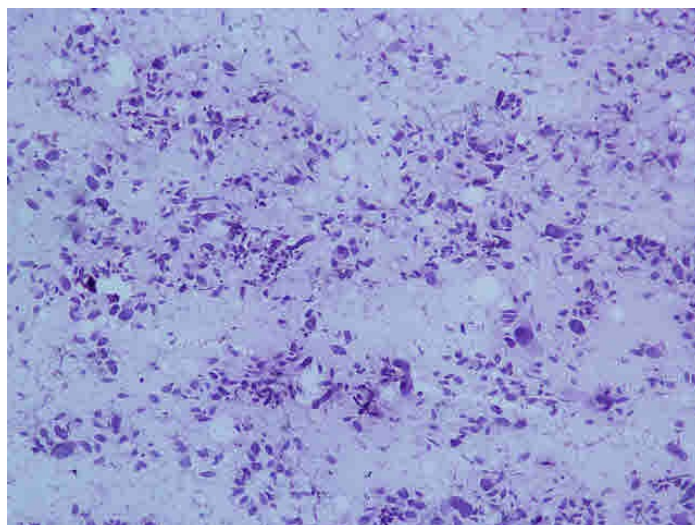
**Fig. 4 Hashimoto Thyroiditis Group Of Hurthle Cells And A Few Lymphocytes In A Haemorrhagic Background (H&E 40x)**



**Fig. 5 Follicular Neoplasm Many Syncytial Cell Clusters Forming Microfollicles Or Rosettes (H&E 40x)**



**Fig.6 Papillary Carcinoma: Flat Sheet With Some Nuclear Crowding, Few Cells Showing Intranuclear Vacuoles (Giemsa 40x) (Inset : Intranuclear Groove H&E 40x)**



**Fig. 7 Anaplastic Carcinoma: Bizarre, Large Malignant Cells With Marked Pleomorphism (H&E 10x)**