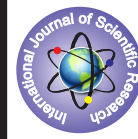


## CYTOHISTOPATHOLOGICAL CORRELATION OF THYROID LESIONS- A STUDY OF 962 CASES.



### Pathology

**KEYWORDS:** Cytology, Histopathology, Correlation, Diagnosis, Thyroid

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### ABSTRACT

*Fine needle aspiration cytology is an accepted cost-effective simple method for screening the thyroid lesions. But to categorically state whether the diagnosis is benign or malignant is difficult, hence the 'indeterminate' or 'suspicious' categories were introduced. The purpose of study is to assess the diagnostic accuracy of cytodiagnosis and the percentage of cytohistological correlation of various thyroid lesions.*

### INTRODUCTION

The earliest documented report of fine needle aspiration cytology is in the latter half of 10th century and it is by Arabian physician Abul Casim to describe needle puncture of thyroid to distinguish different types of goitre. According to Webb (1974) James Paget was the first to use aspirated samples of breast tumours for microscopic examination. Paget's description of (1853) mammary cancer cells written in 1853 is remarkable for the accuracy. Greig and Gray (1904) made a landmark, contribution by identifying living trypanosomes in aspirates from lymph nodes of patients with sleeping sickness by means of a needle attached to a syringe. In 1912, Hirschfield identified a lymphoma of skin by means of an aspiration smear.

In the modern era, it was first used for cytodagnostic purposes as early as 1926 in America. Stewart, Martin and Ellis the pioneers of needle aspiration, in 1933 described needle aspiration cytology from series of cases

The thyroid lesions can be broadly categorised into generalised swellings and nodular thyroid diseases clinically. The diagnosis of generalised swellings are fairly clear-cut since malignancies are infrequent and when present are clinically obvious. Though the cytological findings may be characteristic in many cases, especially lymphocytic thyroiditis, it is not usually necessary to do an aspiration. However, FNAB can provide an additional reassurance that a neoplastic condition is not being overlooked. Coming to malignancies, anaplastic carcinomas, which most often present as generalised swellings usually possess no problem in diagnosis clinically. Here FNAB if used, can avoid the necessity for open biopsy for histological confirmation before the patient is sent for radiation. In the case of lymphomas also the same is applicable.

### OBJECTIVE OF THE STUDY

To assess the diagnostic accuracy of Cytodiagnosis by comparing the results with the histopathological diagnosis.

### MATERIALS AND METHODS

The study was on cytological and histopathological study of 962 palpable thyroid lesions admitted in the surgical units of Medical College Hospital, Kottayam Kerala from March 2012 to March 2015.

The techniques involved aspiration by means of a thin needle with an external diameter of 0.6 to 0.7 mm (21 to 23 gauge) attached to a 10ml disposable plastic syringe. The wet smear fixed in ether- ethyl alcohol mixture and dry smears were stained with Papanicolaou and Geimsa stains respectively, for histopathology the Haematoxylin and eosin stained sections were studied.

### OBSERVATION

A Total number of 28416 specimens were received at the histopathology laboratory, Medical College Hospital from March 2012 to March 2015. Out of these 1451 specimens were thyroidectomy specimens – total, subtotal or partial. This constitutes 5% of the total number of specimens.

The frequency of histological findings of these 1451 are cases are tabulated in the table I. The maximum number of patients

histologically diagnosed were with multinodular goitre ie.57 %. Among the neoplastic conditions follicular adenoma was diagnosed in 9% of cases. Of the carcinomas, papillary carcinomas had the highest incidence 2.1%. Colloid or hyperplastic lesions were diagnosed in 81.04 %, inflammatory lesions in 6.74 % cases and neoplastic lesions in 12.7 %. Two cases were diagnosed as metastatic lesions to the thyroid from poorly differentiated carcinomas.

**Table I**

**Frequency of thyroid lesions by histopathological diagnosis**

Lesions	Total No	Male	Female	Percentage
MNG	819	78	741	57
Col G	78	23	55	5.35
Adeo G	59	6	53	4.06
Toxic G	46	9	37	3.17
Tymp. Thyro	65	10	55	4.47
HM thyroiditis	33	9	24	2.27
Col Adenoma	156	26	130	11.44
Hurthel C Adenoma	10	4	6	0.68
Fol Adenoma	130	33	97	9
Fol. Ca	13	5	8	0.9
Pap. Ca	29	9	20	2.1
Med. Ca	5	1	4	0.3
Ana. Ca	6	2	4	0.4
Metastasis	2	0	2	0.13
Total	1451	213	1238	100

Male Female ratio was found to be 1:5.8

All the above thyroid specimens were analysed and found that 962 cases were having both FNAC and histopathological diagnosis. Hence 962 cases were taken for the study of cytopathological correlation.

FNAC diagnosis and histopathological diagnosis of 962 cases in its aspects of correlation are summarised in Table III

FNAC diagnosis of 962 cases are presented in Table II.

**Table II**

**FNAC Diagnosis of Thyroid Lesions with Distribution of Sex**

Lesions	Total No.	Male	Female
Nodular goitre	385	36	348
Colloid goitre	104	30	74
Toxic goitre	6	2	4
Adenomatous goitre	29	2	27
Colloid nodule	192	30	162
Lymphocytic thyroiditis	17	3	14
Granulomatous thyroiditis	2	0	2
Hashimotos' thyroiditis	8	3	5
Follicular neoplasms	165	32	133
Hurthle cell neoplasm	9	3	6
Papillary carcinomas	28	11	17

Medullary carcinoma	5	2	3
Anaplastic carcinoma	6	3	3
Thyroglossal cyst	6	3	3
Total	962	160	802

**Table III**  
Showing percentage of cytohistological correlation of thyroid lesions

FNAC	No.	Histopathology correlated	% of Cytological correlated
Multinodular goitre	385	348	90.38
Colloid Goitre	104	94	90.3
Colloid Nodule	192	164	85.41
Toxic goitre	6	3	50
Adenomatous goitre	29	16	55.17
Lymphocytic Thyroiditis	17	13	76.47
Granulomatous Thyroiditis	2	2	100
Hashimoto's thyroiditis	8	6	75
Hurthle cell neoplasm	9	7	77.78
Follicular neoplasm	165	97(follicular adenoma: 86;follicular carcinoma :11)	58.79
Papillary carcinoma	28	24	85.41
Medullary carcinoma	5	4	80
Anaplastic carcinoma	6	5	83.3
Thyroglossal cyst	6	6	100
Total	962	789	81.7

Out of 385 FNAC diagnosed nodular goitres 348 cases were proved histologically as multinodular goitre.

**Table IV**  
Cytohistological correlation for the colloid / hyperplastic lesions of thyroid

FNAC	No.	Histopathology								%
		MNG	Colloid goitre	Colloid nodule	Toxic goitre	Adenomatous goitre	Thyroglossal cyst	Neoplasm	Inflammation	
MNG	385	348				24		13		90.38
Colloid goitre	104	5	94					1	2	90.3
Colloid nodule	192	24		164		4				85.41
Toxic goitre	6	1	2		3					50
Adenomatous goitre	29		9			16		3	1	83.33
Thyroglossal cyst	6						6			100
Total	722							Average		93.6

So out of 385 FNAC diagnosed nodular goitre 90.38% cases ie.348 were histologically found to be multinodular goitre. That means the cytohistological correlation for multinodular goitre is 90.38%

104 cases were diagnosed cytologically as colloid goitre. Out of which 94 ie. 90.3% were histologically proved to be colloid goitre and the rest of them as multinodular goitre, lymphocytic thyroiditis, Hashimoto's thyroiditis and follicular neoplasms as tabulated in table IV.

Six patients were diagnosed with toxic goitre cytologically and 3 cases had got histological correlation. The remaining 2 cases were diagnosed as 1 colloid goitre and 1 multinodular goitre.

Cytohistological correlation for toxic goitre was found to be 50%.

Out of the 29 cases of adenomatous goitre diagnosed by the fine

needle aspiration cytology 16 cases showed histological correlation.

Out of 192 cytologically diagnosed colloid nodules 164 had got histological correlation. Details are presented in Table V.

**Table V**  
Cytohistological Correlations of Colloid/ Hyperplastic Relations of Thyroid

FNAC	HISTOPATHOLOGY	NUMBER	PERCENTAGE
Multinodular goitre	Multinodular goitre	348	90.38
Multinodular goitre	Adenomatous goitre	24	6.23
Multinodular goitre	Papillary carcinoma	7	1.85
Multinodular goitre	Oxyphil adenoma	2	0.51
Multinodular goitre	Follicular adenoma	4	1.03
Total		385	100
Colloid goitre	Colloid goitre	94	90.3
Colloid goitre	Multinodular goitre	5	4.9
Colloid goitre	Lymphocytic thyroiditis	3	2.9
Colloid goitre	Hashimoto's thyroiditis	1	0.96
Colloid goitre	Follicular neoplasm	1	0.96
Total		104	100
Toxic goitre	Toxic goitre	3	50
Toxic goitre	Colloid goitre	2	33.33
toxic goitre	Multinodular goitre	1	16.66
Total		6	100
Colloid nodule	Colloid nodule	164	85.4
Colloid nodule	Multinodular goitre	24	12.5
Colloid nodule	Colloid adenoma	4	2.08
Total		192	100

17 patients were diagnosed as lymphocytic thyroiditis by FNAC and out of these 13 were histologically proved to be the same, 2 as multinodular goitre, and one each for adenomatous goitre and papillary carcinoma (Table VI).

**Table VI**  
Cytohistological Correlation for Inflammatory Lesions of Thyroid

FNAC	HISTOPATHOLOGY	NUMBER	PERCENTAGE
Lymphocytic thyroiditis	Lymphocytic thyroiditis	13	76.47
Lymphocytic thyroiditis	Multinodular goitre	2	11.76
Lymphocytic thyroiditis	Adenomatous goitre	1	5.88
Lymphocytic thyroiditis	Papillary carcinoma	1	5.88
Total		17	100
Hashimoto's thyroiditis	Hashimoto's thyroiditis	6	75
Hashimoto's thyroiditis	Multinodular goitre	1	25
Hashimoto's thyroiditis	Papillary carcinoma	1	25
Total		8	100

Hashimoto's thyroiditis was diagnosed in 8 patients by fine needle aspiration cytology, histological correlation was found in 6 patients and the remaining two patients were diagnosed as multinodular goitre and papillary carcinoma, hence percentage of cytohistological correlation is 75 percentage.

**Table VII**  
Cytohistological Correlation for Neoplastic Lesions of Thyroid

FNAC	HISTOPATHOLOGY	NUMBER	PERCENTAGE
Follicular neoplasm	Follicular neoplasm(F. adenoma-86 F. carcinoma-11)	97	58.79
Follicular neoplasm	Multinodular goitre	54	32.72
Follicular neoplasm	Papillary carcinoma	5	3.03
Follicular neoplasm	Medullary carcinoma	3	1.81
Follicular neoplasm	Hurthle cell adenoma	2	1.21

Follicular neoplasm	Lymphocytic thyroiditis	4	2.42
Total		165	100
Hurthle cell adenoma	Hurthle cell adenoma	7	77.7
Hurthle cell adenoma	Follicular adenoma	1	11.11
Hurthle cell adenoma	Multinodular goitre	1	11.11
Total		9	100
Papillary carcinoma	Papillary carcinoma	24	85.41
Papillary carcinoma	Multinodular goitre	2	7.14
Papillary carcinoma	Follicular adenoma	1	3.58
Papillary carcinoma	Hashimoto's thyroiditis	1	3.58
Total		28	100
Medullary carcinoma	Medullary carcinoma	4	80
Medullary carcinoma	Follicular adenoma	1	20
Total		5	100
Anaplastic carcinoma	Anaplastic carcinoma	5	83.3
Anaplastic carcinoma	Poorly differentiated carcinoma	1	16.7
Total		6	100

On FNAC 165 patients were diagnosed as follicular neoplasm and out of these 97 were histologically proved as follicular neoplasm comprising 58.79% correlation. 54 were diagnosed as multinodular goitre, 5 as papillary carcinoma, 3 as medullary carcinoma, 4 as lymphocytic thyroiditis and 2 as Hurthle cell adenoma. Hence cytohistological correlation for follicular neoplasm was 58.79%.

Out of the 9 cases of cytologically diagnosed Hurthle cell neoplasms, 7 were shown histopathological the same, and one each for follicular adenoma and multinodular goitre.

Hence the cytohistological correlation was found to be 77.7%

28 Papillary carcinoma cases were diagnosed cytologically, out of 965 cases and 24 were proved to be the same histopathological constituting 85.41% correlation. The remaining two were diagnosed as multinodular goitre and one each for follicular adenoma and Hashimoto's thyroiditis.

Medullary carcinoma was diagnosed cytologically for 5 patients and of these 4 correlated histologically. The remaining one was follicular adenoma.

So, the percentage of cytohistological was 80 percent.

Six cases of anaplastic carcinoma were diagnosed by FNAC histopathological 5 of those were anaplastic carcinoma and 1 was metastasis from poorly differentiated carcinoma, hence the percentage of cytohistologic correlation, 83.3%.

When the cytohistopathologic correlation was observed for each category i.e. Colloid /hyperplastic, inflammatory and neoplastic lesion it was found that maximum correlation was obtained with colloid or hyperplastic lesions 93.6%. Thyroglossal cysts were included along with colloid or hyperplastic lesions and cent percent correlation was observed with thyroglossal cysts. Minimum correlation was found with toxic goitre (50%).

Among the colloid or hyperplastic lesions, 722 FNAC diagnosed lesions were studied and found 631 with histopathological correlation i.e. 93.6%. Multinodular and colloid goitre have shown 90% correlation. However, 14 of them proved histopathological malignant lesions.

Out of 962 cases with FNAC diagnosis 27 inflammatory lesions were there, and 22 showed histopathological correlation i.e. 77.7%.

Granulomatous thyroiditis showed 100 percent correlation with histopathological findings. Other inflammatory lesions showed histopathological correlation in more than 75% cases.

About the neoplastic lesions: 213 cases were diagnosed cytologically as neoplasm out of which 106 benign, 42 malignant and 65 belonged to non-neoplastic lesions. Along with the lesions follicular neoplasms were also included. Even then 61.49% showed histopathological correlation.

In short when cytological and histopathological diagnosis of 962 cases were studied, the percentage of correlation was as follows:

Thyroglossal Cysts	: 100 percent
Colloid / hyperplastic lesions	: 93.6%
Inflammatory lesions	: 77.77%
Neoplastic lesions	: 73.57%
Malignant lesions	: 82.9%
Average	: 81.69%

Out of 962 cases 789 cases showed cytohistological correlation and the details were presented in table III. The incidence of malignant lesions out of 789 correlated lesions is 44, i.e. 5.6 percent. Hence the incidence of malignancy is 5.6 percent.

## DISCUSSION

Out of 1451 thyroidectomy specimens received at the Dept. of Pathology, Medical College hospital, Kottayam from March 2012 to March 2015, 962 cases were having both FNAC and histopathological diagnosis. And these were taken for cytohistopathologic correlation. The study included all palpable thyroid lesions and not just solitary nodules.

Increased cellularity of the epithelium was always viewed with suspicion. This is a difficult area with considerable overlap between hyperplasia and neoplasia. In the case of a doubtless benign clinical picture, a moderately highly cellular smear was considered as benign provided no cytological atypia, papillary fronds, intranuclear inclusion or spindle or plasmacytoid forms, existed. Abundance of colloid was considered as an index of benignancy. Sparse colloid and a strikingly haemorrhagic background on the other hand indicates a neoplastic process and demands cautious approach, especially when associated with some of the above mentioned features.

Apart from the high cellularity, if some of the above features were predominated, the smears were labelled 'suspicious of malignancy', indicating the atypical epithelial hyperplasia. This could be resulted in over diagnosis and false positives

In this context, one has to agree with many authors who believe that in order to maintain a high sensitivity for cancer detection, over diagnosis to a certain extent is pardonable (Noston 1982, Anderson 1987). 13,15

Nodular goitre is one of the most common endocrine problems in the world today. Because the usual progression of a goitre is from diffuse thyroid enlargement to nodular goitre, the term nodular goitre is used. Malignancy in multinodular goitre is rare but it can occur.

Aspirates from colloid goitre were generally hypocellular, but moderate or even high in occasional cases with follicular cells in prominent acinar pattern in hyperplastic goitres. Such cases may cause a problem in cytologic distinction from follicular neoplasms that show colloid storage. Although aspirates from colloid goitres generally hypercellular, hypocellularity can also be seen in cystic tumours or desmoplastic neoplasm. So, the hypocellularity due to operator inexperience needs to be ruled out before attempting conclusive diagnosis.

Colloid goitre /nodular goitre showed 90.3% histopathological correlation (Table.IV)

Thyroglossal cysts and true cysts of the thyroid may show identical cytologic appearance and need to be distinguished by clinical examination and ultra-sonographic examination.

Cytologically diagnosed thyroglossal cysts were proved to be histologically same and showed cyst wall lined by squamous or respiratory epithelial cells.

Cystic lesions less than 3cm in diameter have less than 2% chance of being malignant. Hence all cystic plus solid lesions of >4cm diameter should be carefully aspirated as the chance of missing the cellular areas of large cystic neoplasms is higher.

A diagnosis of toxicity was never ventured on unless there was specific clinical suggestion. Out of 6 cytologically diagnosed cases of toxic goitre 3 were found histologically same. Sparsity of colloid, abundance of RBCs and anisonucleosis were the features regularly observed. The so called 'flare cells' were less prominent, probably because of the wet fixation which interferes these morphological features. The large amount of cytoplasm of the hyperplastic epithelium were remarkably well seen in many cells in all the cases.

Out of two cytologically diagnosed granulomatous thyroiditis, one had attempted giant cell formation and numerous mononuclear inflammatory cells mainly macrophages, the other smear showed no giant cells, but epithelioid cell granulomas were present. Both resected specimen showed a classical case of granulomatous thyroiditis. This illustrates a non-specific nature of the aspirates in granulomatous thyroiditis. (Jayaraman 1985) Das K, Pant C B and Chaithra found fine needle aspirates from thyroid swelling showed epithelioid granuloma with necrosis in three cases and necrosis without epithelioid granuloma in another three cases.

Aspirates of some cases of Hashimoto's thyroiditis may show high cellularity with pleomorphic follicular cells or Hurthle cells and insignificant lymphoid population. These aspirates are obtained while needling proliferating follicular or Hurthle cell nodules that occur in the evolving stages of Hashimoto's thyroiditis and can give rise to erroneous interpretation as follicular or Hurthle cell tumours. A few cases of Hashimoto's thyroiditis show occasional epithelioid cell granulomas or multinodular goitre. Out of 8 Hashimoto's thyroiditis 6 were proved histologically same one multinodular goitre and the other papillary carcinoma.

The Hurthle cell population and Hurthlisation changes usually described in nodular goitre could not be appreciated in many of the smears, probably due to inexperience. Many cells which initially appeared as Hurthle cell on closer scrutiny proved to be histiocytes (Jayaraman 1985). As in follicular tumours and it is not possible to distinguish malignant from benign Hurthle cell tumours and this can be done only in histopathological studies in the capsules and the blood vessels. Pleomorphism of Hurthle cell is not an indicator of malignancy and non-neoplastic Hurthle cell lesions often show more cytologic atypia than neoplastic lesions.

In this study, out of 44 cases diagnosed as malignancy 24 were papillary carcinomas i.e. 54.5% followed by 11 cases i.e. 25% of follicular carcinoma 4 cases i.e. 9% of medullary carcinoma and 5 cases i.e. 11.3% of anaplastic carcinoma. In the literature in most series papillary carcinoma appeared to be the predominant type. Follicular carcinoma comes next, and the anaplastic and medullary carcinoma rarely. Howard found 69% papillary carcinomas and 16% follicular carcinomas in the nodular non-toxic goitres he studied. Schlesinger et al in their studies in nodular goitre found an incidence of 55% papillary carcinomas 20% follicular carcinomas 8% anaplastic carcinomas and 3% medullary carcinomas. The present study does not show much difference with these findings. The range of difference in the incidence of malignancy may be explained on the basis that these statistics represents highly selected group of patients. The statistical conclusions achieved from these studies are not necessarily representative of these groups. In this study, all the young individuals showed well differentiated carcinoma and older age group showed less differentiated carcinoma (anaplastic). Helmuth found that majority of thyroid carcinoma in younger age group were well differentiated. Silverberg also found that

undifferentiated tumour was unusual in younger age group and was accounting for only 2.9% of malignancy in children younger than 15 years. However, a few cases of undifferentiated thyroid carcinomas have been reported in children by Warren and Hoyles. According to Raal Silverman et al (1995) the prevalence of thyroid nodularity in children has been estimated to be 1.8%. The reported prevalence of specific diseases which comprise these nodules is conflicting as evidenced a reported range of malignancy of 2 to 50% in solitary nodules. If classified as paediatrics with less than 18 years old the prevalence of malignancy was 18%.

The criteria for the histological diagnosis of malignancy accepted by the pathologists are not uniform. There has been considerable difference of opinion as to what constitute the malignancy of the thyroid. The most significant histologic criteria used for the diagnosis of malignancy are

1. Atypical appearance or lack of differentiation of cell.
2. Many mitotic figures
3. Invasion of the capsule of neoplasm, blood vessels, the surrounding tissue and lymph nodes.

Vigorous epithelial hyperplasia, sometimes associated with nuclear enlargement, nuclear irregularity and prominent nucleoli may be found in thyrotoxic goitre especially after treatment with chemical agents or irradiation. Bizarre nuclear pattern may also be found in congenital goitre and may be a feature of Hurthle cells. Correct interpretation depends on correlation of the histological appearance of the gland and clinical features of the cases.

Papillary hyperplasia which may occur in thyrotoxic goitre and Struma lymphomatosa must not be confused with true papillary neoplasm. Definite papillary pattern and epithelial cells covering fibrovascular frond which display true branching are characteristics of papillary carcinoma. Apparent infiltration of the capsule must be interpreted with caution because the entrapping and distortion of acini by fibrous overgrowth following haemorrhage or inflammation may produce a spurious pattern of invasion. Small fingers of tumour tissue penetrating into the capsule constitute true capsular invasion. (Kahn et al 1983) Definite invasion of blood vessels must be accepted as evidence of malignancy. Its demonstration may require the examination of multiple blocks prepared from the periphery of the tumour and the special staining for elastic tissue. (Meissner & Warren). It is important to stress that the appearance of tumour cells lying free within the thin walled blood vessels may be an artefact produced during the preparation of sections. Some authors have stated that the tumour should be found extending through a vessel wall to diagnose vascular invasion but, even serial sections frequently fail to demonstrate the precise point of invasion.

Most authors have stated that tumour cells should be found in the vessel lumen attached to the intima or to the blood vessel wall to diagnose vascular invasion. Nests of tumour cells forming a tumour thrombus within lumen of a vessel possessing a fibromuscular coat is considered the most convincing evidence of vascular invasion (Ashley 1978; Kahn 1983).

In the present study, out of 962 cases, 51 cases were undoubtedly malignant. 24 cases were diagnosed as papillary carcinomas and showed papillary structures with definite fibromuscular core covered by a single layer of neoplastic cells. 22 showed the typical ground glass nuclei and 13 showed psammoma body formation. All these are diagnostic of papillary carcinoma (Klinck Meissan and Warsen, Fransilla 1993). Enlarged clear empty looking and often indented nuclei are characteristic and helpful in histological identification of papillary carcinoma and helps to differentiate from non-neoplastic papillary hyperplasia (Gray et al: Besument, 1987). But the nuclear appearance may vary from typical ground glass pattern to normochromatic and hyperchromatic forms. None of the follicular carcinomas showed this feature. Selzer et al found typical ground glass nuclei in 51.5%, of all papillary carcinoma, 10.3% of

follicular carcinoma and 53% of mixed carcinomas.

Psmammoma bodies are basophilic concentrically laminated structures 70 to 80  $\mu$  in diameter, most frequently associated with tumours and they often calcify. Klinck et al found these bodies in 48% of papillary carcinomas. Selzer (1977) found these bodies in 38% of papillary carcinomas. Fransilla found psammoma bodies in 42% papillary carcinomas but none in follicular carcinoma.

In this study 50% of the cases of papillary carcinomas showed psammoma bodies, which is in agreement with Fransilla. If these are present within the neoplastic cells, it certainly indicates malignancy. If found in the thyroid tissue without obvious neoplasm, a detailed study should be done to identify any malignancy.

In two cases, follicular patterns rather than papillary pattern were seen and one was diagnosed histopathological as follicular variant of papillary carcinoma.

The presence of papillary tissue fragments and mono layered sheets are the most common features of papillary carcinoma but several conditions presenting clinically as solid nodules also show papillary fragments and monolayered sheets on cytology smears. Examples, papillary hyperplasia in goitre, follicular adenomas or Hashimoto's thyroiditis. Nuclear grooves when seen in abundance can be considered as reliable criteria for diagnosis of papillary carcinoma. But when seen, in few cells their diagnostic significance is diminished.

Presence of intranuclear cytoplasmic inclusions is a consistent feature seen in about 70 to 90 % cases. The tetrad of nuclear features includes:

1. large pale nucleus with powdery chromatin
2. nucleoli
3. nuclear grooves
4. intranuclear inclusions

This tetrad of nuclear feature formation is initially is pathognomonic of papillary carcinoma but when observed individually are nonspecific.

Kim et al have identified essential or minimal criteria for diagnosis of papillary carcinoma which are consistently present even when cellularity is low. These are:

1. Syncytial type of fragment with or without any architectural pattern
2. Enlarged pale nuclei with very fine chromatin (watery appearance)
3. Micro or macro nucleoli
4. Intra nuclear inclusions
5. Nuclear grooves

Out of 28 papillary carcinomas cytologically diagnosed, 2 cases showed histologically nodule formations separated by fibrous septa and multinodular goitres were diagnosed. Follicular adenoma and Hashimoto's thyroiditis were diagnosed for one each.

165 cases were diagnosed as follicular neoplasm on FNAC but histology showed 86 follicular adenomas and 11 follicular carcinomas. Papillary carcinomas, medullary carcinomas, lymphocytic thyroiditis and Hurthle cell adenoma were diagnosed histologically. Follicular carcinoma was found in one per nine cases of follicular neoplasms on histology. This study comes similar to Y.M.Serpal. The cytology smears in these cases had depicted cytological atypia but labelled as follicular neoplasm owing to the limitations in cytologic definition.

Five cases were diagnosed as medullary carcinoma cytologically because of the dispersed cell pattern, the polygonal appearance of the cells, binucleated cells and the presence of amyloid. Histologically 4 cases were confirmed as medullary carcinoma and one follicular neoplasm giving 80% correlation.

Six cases were diagnosed as anaplastic carcinoma because of the presence of large pleomorphic bizarre malignant giant cells with a macrophage like appearance along with multinucleate forms and spindle cell forms with a mesenchymal appearance. The background was dirty with necrotic debris and degenerated cell fragments. Histological examination confirmed five anaplastic carcinomas and one metastasis from a poorly differentiated carcinoma.

Thus out 962 thyroid lesions studied 789 showed cytohistological correlation. Through there were only 6 cases, thyroglossal cyst showed maximum correlation, 100%. Colloid or hyperplastic lesions had 93.6% correlation, inflammatory lesions 77.7% and malignant lesions 82.9% cytohistological correlation. The details are shown in the table.

The sensitivity, specificity and the overall accuracy were calculated and compared with a series of studies.

**Table IX**  
**Sensitivity, specificity and accuracy of reported cases and present study**

Authors	Reported cases	Sensitivity %	Specificity %	Accuracy %
Norton	102	70	90	88
Anderson	562	93	99.4	98.9
Caraway	394	93	91	92.4
Prollet B	132	95	87.7	89
Liuq & Castel	100	93	67	83
Varghese Dan Iniguez	111	72	91	85.5
Parmeggini	104	75	82.6	81.7
Aggarwal S	100	76.5	95.9	90.9
Present study	962	75.3	82.8	81.7

The positive predictive value is relatively low, the false positive fraction relatively high in comparison to Anderson's series. This reflects a tendency for over-diagnosis. Norton states that thyroid aspiration biopsies are bound to have a low positive predictive value. He states that if all 'atypical' and 'suspicious' cases are considered as malignant, only 31% of the patients determined by the test to have the disease would have it actually. But Anderson maintains that only by considering the suspicious category also as malignant can the risk of missing a truly malignant neoplasm be minimized.

The index of strength of association was calculated from the present study; the values are very satisfactory indicating good association.

Thus, this experience, through relatively small, does substantiate the utility, diagnostic efficiency, cytohistological correlation as well as limitations of fine needle aspiration cytology of the thyroid gland.

## SUMMARY

At the histopathology laboratory, Medical college Hospital, Kottayam 28416 specimens were received from March 2012 to March 2015 and thyroid specimens included were 1451 that comprised 5% of the total number of specimens. Out of these 1451 patients who had undergone thyroidectomy, 962 patients had been done FNAC diagnosis, hence these 962 cases were taken for the study of cytohistological correlation and 789 cases i.e. 81.69% showed cytohistological correlation.

Colloid or hyperplastic lesions showed 93.6% cytohistological correlation inflammatory lesions 77.77 percent and neoplastic lesions including the follicular neoplasms showed 73.59 %. Malignant lesions (excluding follicular carcinoma because of the inability to distinguish between follicular adenoma and carcinoma) showed 82.9% and thyroglossal cysts 100% correlation.

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