

Comparative Study of Diagnostic Efficacy of FNAC and Cell Block Study of Thyroid LesionsAkshata B^{1*}, Narayana Murthy G², Seema S Maharana³¹Assistant Professor, Department of Pathology, East Point College of Medical Sciences and Research Centre, Bangalore, Karnataka, India²Assistant Professor, Department of Pathology, Sri Madhusudan Sai Institute of Medical Sciences and Research, Chikkaballapur, Karnataka, India³Senior Resident, Department of Pathology, East Point College of Medical Sciences and Research Centre, Bangalore, Karnataka, India

Received: 15-12-2023 / Revised: 20-01-2024 / Accepted: 05-02-2024

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Conflict of interest: Nil

Abstract:**Background:** Thyroid swellings are far common among the neck swellings with a prevalence of 4 to 7% of adult population. Fine needle aspiration (FNAC) cytology is one of the important tools for preoperative thyroid swelling evaluation. Cell block sections give a better architecture and allow multiple sections and useful if the sample contains more blood and less cells in the conventional smears.**Objective:** To compare the diagnostic efficacy between FNAC and cell block study in thyroid lesions.**Methods:** A prospective observational study was undertaken in the Department of Pathology, PES Medical College and Research centre, Kuppam, during the period from June 2015 to June 2017 comprising of 100 patients presented with thyroid lesions. Smears were prepared from thyroid aspirates and stained with haematoxylin and eosin stain, May Grunwald Giemsa stain and Papanicolaou stain. Cell blocks were prepared from the remnants. Smears were scored based on cell obscuration by blood, cellularity, cell degeneration and cell architecture. The results were compared with histology. Data were recorded using Microsoft Excel. Descriptive statistics, frequency, and proportion were used to describe demographic variables.**Results:** The sensitivity, specificity, positive predictive value and negative predictive value, in diagnosing malignancy were 50%, 100%, 100% and 100%, for FNAC and 100%, 100%, 100% and 100% for cell block in comparison with cytology, respectively.**Conclusion:** The cell block method is better in comparison with conventional FNAC in diagnosing thyroid aspirate lesions.**Keywords:** FNAC, Cell block, Thyroid Lesions, Sensitivity, Specificity, Diagnosis.

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Introduction

Neck swelling is a common clinical presentation all over the world. Thyroid swellings are prevalent in 4 to 7% of the Indian population and are commonly present in females. [1] The FNAC (Fine Needle Aspiration Cytology) showed the importance of suspicious thyroid swellings in cytology as an indication for surgery and decreased the overall incidence of thyroidectomy in patients with benign disease. The FNAC provide highly accurate cytologic information from which a definitive management plan could be arranged with high sensitivity and specificity approaching to 96%. [2]

FNAC is a predominantly operator-dependent technique. Inconclusive diagnosis on FNAC may be attributed to procedural errors in drawing samples, haemorrhagic or a pauci-cellular aspirates and incorrectly sampled lesions especially in case of small swellings. [3] Further in case of highly

vascular organs like thyroid, it often yields hemorrhagic aspirate which reduces its diagnostic efficacy. Cell blocks (CB) have been extensively promoted as an adjunct to FNAC in evaluating neck lesions as they aid in providing architectural details which supplements FNAC. [4]

The cell-block method is a procedure to concentrate and solidify cell samples from aspirates, to obtain additional information and observe them three dimensionally after processing by histopathological techniques, cell blocks prepared from residual tissue fluids and fine-needle aspirations can be useful adjuncts to smear for establishing a more definitive cytopathologic diagnosis, particularly useful for categorization of tumors. [5]

CB method provides high cellularity, better architectural patterns, morphological details and an additional material for demonstrating malignancy.

[6] According to previous studies using variable methodologies, sensitivity, specificity and diagnostic accuracy of FNAC and CB ranges from 65 to 100%. [7, 8]

Objective: The current study aims to compare the diagnostic efficacy of FNAC and CB in thyroid lesions.

Material and Methods

A prospective observational study was conducted in the Department of Pathology, PES Medical College and Research centre, Kuppam, from October 2015 to June 2017. A total of 100 patients presented with thyroid lesions were included in the study. All the patients were clinically examined in detail according to the proforma and the site for aspiration was judged precisely by careful palpation of the thyroid gland.

Inclusion Criteria: All patients who came with thyroid swelling with palpable thyroid lesions, either of sex and with no age limit were include in the study. The informed consent was taken before the procedure.

Exclusion Criteria: Cases yielding non-palpable thyroid swellings and inadequate material as defined by Bethesda system for reporting thyroid cytology, and patients not ready to give consent were excluded from the study.

Collection of Data: FNAC aspirations from thyroid swelling were taken and four slides were prepared and fixed in 95% ethyl alcohol for 30 minutes. Two smears were taken for Haematoxylin and Eosin (H&E) stain and one each slide is taken for May Grunwald Giemsa (MGG) stain and Papanicolaou stain. The remnants in syringe were centrifuged in 10 ml disposable centrifuge tube at 4000rpm for 6 minutes to create cell pellet.

The supernatant fluid is decanted and the deposit is fixed in freshly prepared alcohol formalin substitute consisting of 9 parts of 100%ethanol and

1 part of 40% formaldehyde. Fixed cell pellets were re-centrifuged at 4000 rpm for 6 minutes. The cell pellets were wrapped in crayon paper and placed in tissue cassette. Cassette is stored in ethanol until they are subjected for histopathological processing. Surgically resected thyroid specimens whenever available were subjected to histopathological examination and correlated with cytology and cell block study.

Statistical Analysis: Data were entered in excel sheet and analysed using STATA 14 version. Categorical data were analysed using percentage and continuous data were analysed using mean and standard deviation.

Results

A total of 100 study subjects were analyzed in the present study. In this study patient's age ranged from 12 - 70 years with mean age of 38.93 years. Majority of patients belonged to age group between 21-30 years i.e., 31 cases (31%), followed by 27 cases (27%) in age group of 41-50 years and about 24 cases (24%) in the age group 31-40 years. Majority (88%) of them were female showing female predominance. In the present study majority of patients presented with right lobe swelling i.e., 42 cases (42%), followed by diffuse swelling in 31 cases (31%) and left lobe swelling accounting to 27 cases (27%). Out of 100 cases 70 cases (70%) subjects showed swelling size between 3-5cm, followed by 24 cases (24%) in < 2cm subjects and 6 cases (6%) in > 6cm size. Nearly 43% of the subjects reported the duration of illness between 1 to 12 months, 36% of them between 1 to 2 years, 14% of them with more than 2 years and 7% of them with less than 1 year of duration. Most of the subjects 76 cases (76%) with thyroid swelling presented with euthyroid state, followed by hypothyroid 22 cases (22%) and hyperthyroid accounting to 2 cases (2%). (Table 1)

Table 1: Demographic details and characteristics of thyroid among patients

Characteristics		No. of patients	%
Age (year)	<20	3	3%
	21-30	31	31%
	31-40	24	24%
	41-50	27	27%
	51-60	9	9%
	>60	6	6%
Sex	F	88	88%
	M	12	12%
Swelling	Right Lobe	42	42%
	Left Lobe	27	27%
	Diffuse	31	31%
Size (cm)	<2	24	24%
	3-5	70	70%

	>6	6	6%
Duration	<1 month	7	7%
	1-12 months	43	43%
	1-2 years	36	36%
	>2 years	14	14%
Hormonal status	euthyroid	76	76%
	hypothyroid	22	22%
	hyperthyroid	2	2%

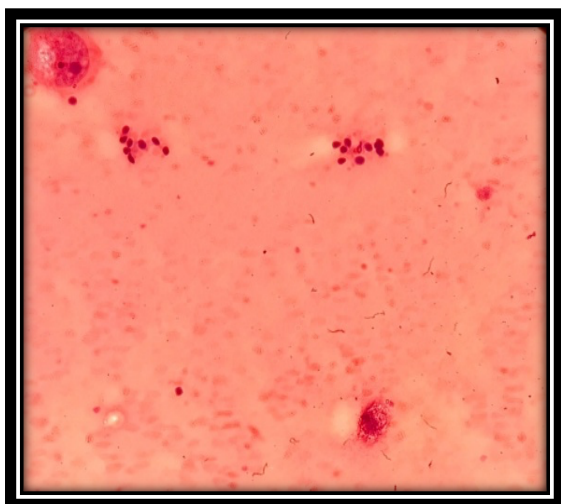
Among 100 subjects of FNAC, neoplastic lesions were solitary colloid nodule (SCN) was 24

(24%) cases, followed by multinodular goiter (MNG) showing 57 (57%) cases, chronic lymphocytic thyroiditis (CLT) showing 17 (17%) cases and malignant lesion were anaplastic carcinoma (AC) accounting to 1 (1%) case. Among 100 subjects based on diagnosis of cell block, neoplastic lesions where solitary colloid

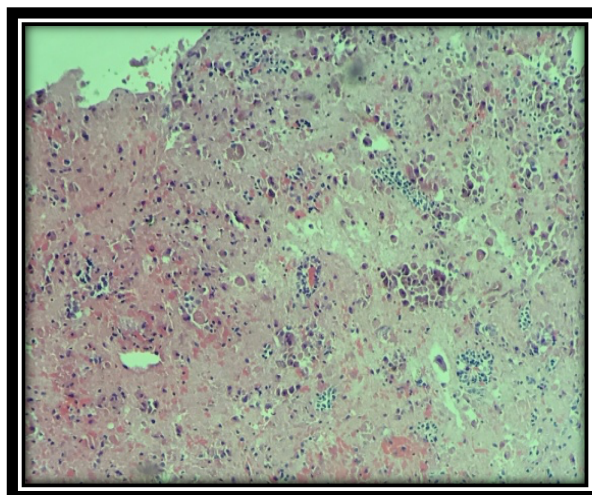
nodule was 34 (34%) cases, followed by multinodular goiter showing 55 (55%) cases, acute thyroiditis (AT) 2 (2%) cases, chronic lymphocytic thyroiditis showing 7 (7%) cases and malignant (M) lesions were anaplastic carcinoma (AC) accounting to 1 (1%) case, followed by papillary carcinoma accounting to 1 (1%) case.(Table 2) The FNAC and Cell block of thyroid swelling stained by H & E are illustrated in Figure 1.

Table 2: Distribution of cases diagnosed according to FNAC and Cell block

Category	FNAC (Frequency and percentage)	CB (Frequency and percentage)
SCN (non-neoplastic)	24 (24%)	34 (34%)
MNG (non-neoplastic)	58 (58%)	55 (55%)
CLTAT (non-neoplastic)	17 (17%)	2 (2%)
AT (non-neoplastic)	-	2 (2%)
AC (neoplastic)	1 (1%)	-
M	-	2 (2%)



A



B

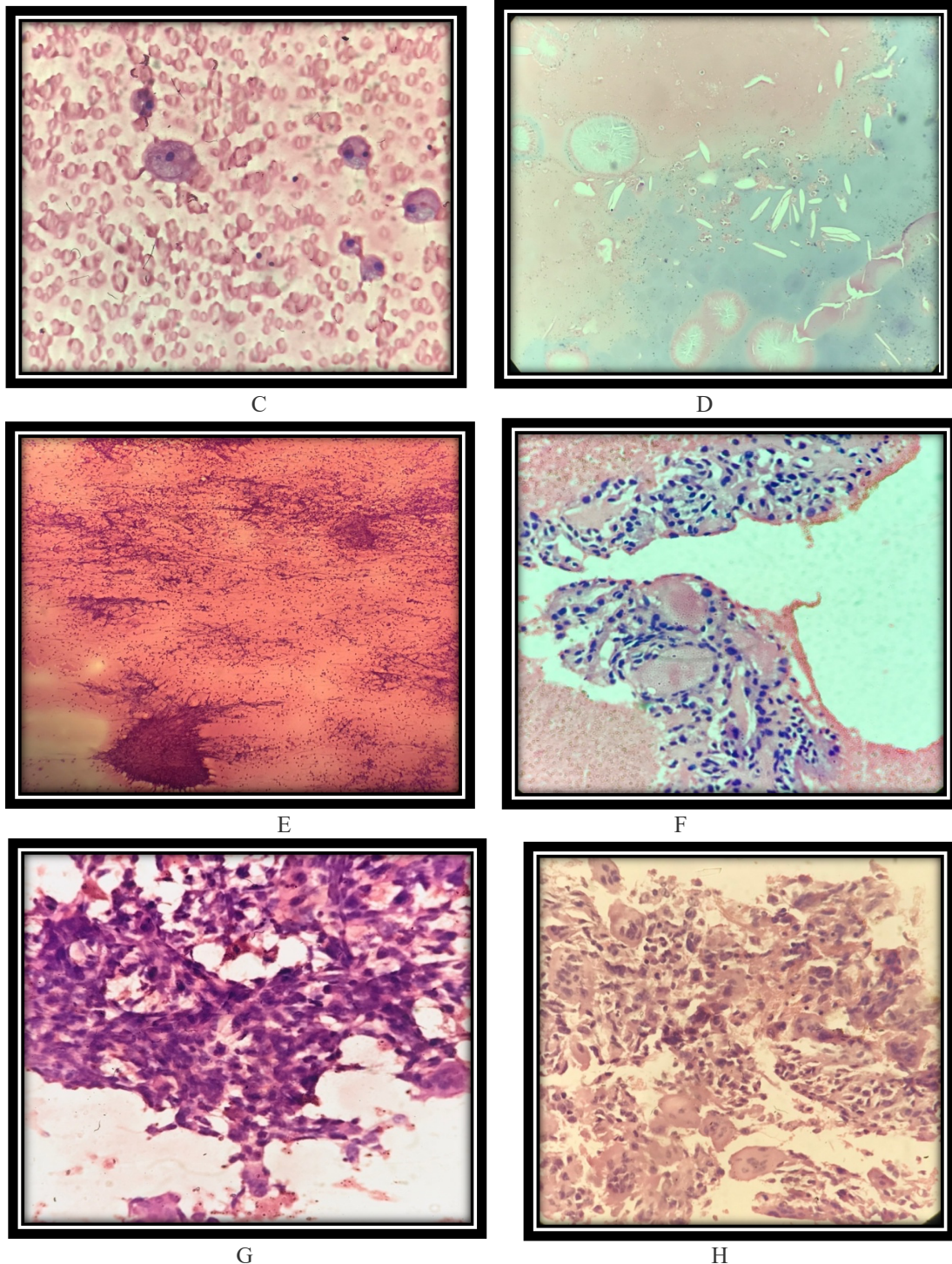


Figure 1: A- FNAC features of nodular goiter with benign thyroid follicular cells, cystic macrophages and colloid in background (100xH&E); B- CB features of Nodular goiter i.e. benign thyroid follicular cells, hemosiderin pigment macrophages(arrow) and colloid mixed hemorrhage in background (100xH&E); C- FNAC features of colloid goiter-cystic macrophages(arrow) and colloid mixed with hemorrhage in the background (100xH&E); D- CB features of colloid goiter with cholesterol crystals (100xH&E); E- FNAC features of chronic lymphocytic thyroiditis with thyroid follicle, lymphocyte, hemorrhage and colloid in background (100xH&E); F- CB features of chronic lymphocytic thyroiditis - benign thyroid follicular cells, with lymphocytes impinging on follicles with hemorrhagic background (100xH&E); G- FNAC features of Anaplastic carcinoma with pleomorphic cells,(blue arrow) and giant cells(red arrow) (100xH&E) and H- CB features of Anaplastic carcinoma- highly pleomorphic spindle cells(blue arrow) and osteoclastic like giant cells.(red arrow) (100xH&E).

On comparison of results of FNAC with histopathology taken as gold standard, non-neoplastic cases were 99 (99%) and neoplastic cases were 1 (1%). The sensitivity of FNAC was 50%, specificity was 100%, positive predictive value (PPV) was 100% and negative predictive

value (NNV) was 99%. On comparison of results of CB with histopathology taken as gold standard, non-neoplastic cases were 98 (98%) and neoplastic cases were 2(2%). The sensitivity of cell block was 100%, specificity was 100%, PPV was 100% and NPV was 100%. (Table 3)

Table 5: Diagnostic Accuracy of thyroid lesion based on FNAC and Cell Block

FNAC				
Statistics	Sensitivity	Specificity	PPV	NPV
CN	63%	95%	87.9%	84.2%
MNG	98%	93%	94%	97.6%
CLT	85.7%	82.2%	35.3%	98.8%
M	50%	100%	100%	99%
Cell block				
CN	100%	98.5%	97%	100%
MNG	98.2%	100%	100%	92%
AT	100%	100%	100%	100%
CLT	100%	100%	100%	100%
M	100%	100%	100%	100%

Discussion

Thyroid nodule causes apprehension because their behavior is unpredictable. Thyroid enlargement, whether diffuse or in the form of nodule, must be investigated to rule out neoplasm. [8] Estimated that about 42 million people in India suffers from thyroid disorder. FNAC is usually the first line of investigation.

In addition, cell block preparation is a useful complementary method for cytological diagnosis. CB is generally prepared with tiny tissue fragments or from syringe and needle rinses. The fluid aspiration on FNAC either from cystic swellings or when accomplished by blood, often show scanty cells, or do not exhibit satisfactory cytological patterns and therefore are confounded with diagnostic dilemmas at microscopy and to arrive at a reasonable diagnosis. Such aspirates can be subjected for cell block preparation which will harvest cells by providing adequate diagnostic material. This study mainly concentrates on the utility of cell blocks in diagnosing cases that yield aspirates on FNAC.

In the present study maximum number of cases were seen in the age group 21-30 years 31 cases (31%) with, mean age 38.93. Similar observation was seen by Parikh et al., Basharat et al., and Dinesh et al., which included 72 cases (30%), 22 cases (44%) and 49 cases (35%) respectively. [9-11] Maximum thyroid swelling was seen in female patients 88 cases (88%) in the present study which correlates with other observational studies like Tagore et al where 91% of them were Female, Basharat et al where 82 % of them were female where 83.6% of the subjects were female which was comparable to our study findings. [10,12]

Maximum thyroid swelling presented with duration of 1-2 years in our study which correlates with other studies done by Jajodia et al., [13]

The maximum thyroid swellings were seen in size group of 1-5cm in our study which are in line with other findings of the study done by Basharat et al., where 70% of them were sized between 1 to 5 cm.¹⁰ More patients in present study presented with right thyroid swelling comprising of 42 cases (42%). According to the study done by Manoj et al., and Guptha et al., patients with right lobe swelling 45 cases (60%), 49 cases (49%) and 56 cases (56%) respectively which is concordant with present study. [14, 15]

In the present study maximum number of patients presented with non –neoplastic lesions of 99 cases (99%) and neoplastic lesions comprising of 1 case (1%). According to the study done by Tagore et al. and Guptha et al., the patients were also presented with maximum number of cases in neoplastic lesions with 84 cases (84%), and 72 cases (72%) respectively. [12,15] Euthyroid 76 cases (76%), were more in our study followed by hypothyroid in 22 cases (22%) and few were hyperthyroid cases (2%). According to the study done by Tagore et al., Basharat et al., and Gupta et al., showed that maximum number of patients presented with euthyroid state with 113 cases (56%), 48 cases (96%) and 81 cases (81%) respectively. Our study findings are in accordance with Tagore et al., Basharat and Gupta et al. study. [10, 12, 15]

Maximum number of patients in present study presented with non – neoplastic lesions 99 cases (99%), neoplastic lesions of 1 case (1%) and non-diagnostic cases were nil. According to the study done by Ahmed et al., also showed that non –

neoplastic cases were maximum in his study accounting to 75 cases (83.33%), neoplastic cases were 13(14.44%), but non –diagnostic cases were 2(2.22%) which shows discordance which correlated with our study in non-neoplastic lesions. [16] Most patients in present study presented with non – neoplastic lesions cases (98%), neoplastic lesions of 2 cases (2%). According to the study done by Ahmed et al., also showed maximum non –neoplastic cases were maximum in his study accounting to 69 cases (76.67%), neoplastic cases of 21 (23.3%). In both the studies non –diagnostic category is nil. In present study, by FNAC diagnosis, non-neoplastic lesions cases were 99(99%) of which colloid goiter 24cases (24%), multinodular goiter 58cases (58%), and Hashimoto’s thyroiditis 17cases (17%). In Ahmed et al., study, by FNAC diagnosis, non-neoplastic lesions cases were 75(83.3%) of which colloid goiter 67cases (74.44%), adenomatoid goiter 5cases (5.56%), thyroid cyst (2.22%) and Hashimoto’s thyroiditis 1cases (1%). [16]

Among non-neoplastic lesions in present study multinodular goiter cases were maximum where has in Ahmed et al study maximum cases were in colloid goiter. The neoplastic cases in present study were 1 case seen in anaplastic carcinoma. In Ahmed et al., study neoplastic cases were 13(14.44%), follicular neoplasm 9 cases (10%), papillary carcinoma 3 (3.33%) and anaplastic carcinoma 1 cases (1.11%) and 2 cases were non diagnostic as mentioned above. Common neoplastic lesion in present study and Ahmed et al., study is anaplastic carcinoma on FNAC.¹⁶

In present study, by CB diagnosis, non-neoplastic lesions cases were 98(98%) of which colloid goiter 34cases (34%), multinodular goiter 55cases (55%), acute thyroiditis 2cases (2%) and Hashimoto’s thyroiditis 7cases (7%). In Ahmed et al., study, by CB diagnosis, non-neoplastic lesions cases were 69(76.6%) of which colloid goiter 58cases (64.44%), adenomatoid goiter 6cases (6.67%), multinodular goiter 1case (1.11%), thyroid cyst3(3.33%) and Hashimoto’s thyroiditis 1cases (1.11%).Among non-neoplastic lesions in present study multinodular goiter cases were maximum whereas in Ahmed et al., study maximum cases were in colloid goiter. [16] The neoplastic cases in present study were 2 cases seen 1 each in anaplastic carcinoma and papillary carcinoma. In Ahmed et al., study neoplastic cases were 21(14.44%), follicular neoplasm 15 cases (11.11%), papillary carcinoma4cases (4.44%), medullary carcinoma 1 case (1.11%) and anaplastic carcinoma 1 cases (1.11%). Most common neoplastic lesion in present study and Ahmed et al., study is anaplastic carcinoma and medullary carcinoma by cell block diagnosis. [16]

The present study shows sensitivity and specificity is better in cell block than FNAC. It also correlates with other studies, by Mathew et al., with a sensitivity of 62.2% and specificity of 100% for FNAC and 71.1% of sensitivity with 100% Specificity for Cell block Technique and Patil et al., study the sensitivity for FNAC was 94.9% and Specificity was 93.75% and Cell Block technique the sensitivity was 98.9% and specificity was 96.3%. [17, 18] Therefore, cell block method is better in comparison with conventional FNAC in diagnosing thyroid aspirate lesions.

Limitations of the Study: The limitation of the present study was that it is a single center study. Furthermore, all samples were collected by blind sampling. Exclusion of non-diagnostic cases shows a falsely high value of specificity.

Conclusion

Thyroid swellings are far common among the neck swellings. On FNAC majority of the cases were multinodular goiter and neoplastic lesion being anaplastic carcinoma. On cell block diagnosis majority of the cases were multinodular goiter and neoplastic lesion being anaplastic carcinoma and papillary carcinoma. The overall sensitivity was 50% and specificity was 100% on FNAC and cell block sensitivity was 100%, and specificity was 100% respectively, which correlates with other comparative studies.

Hence FNAC is considered as simple safe rapid cost-effective diagnostic method. The cell block technique enhances the diagnostic accuracy of thyroid lesions to prevent unnecessary treatment and surgical intervention. It is advisable to perform cell block for all cases of FNAC of thyroid lesions to reduce the pitfalls, in diagnosis. Therefore, helping the surgeon to plan appropriate.

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