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CYTOMORPHOLOGICAL EVALUATION OF THYROID LESIONS USING THE BETHESDA SYSTEM: A STUDY OF 320 CASES

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ABSTRACT

Introduction: Thyroid nodules are common clinical findings and require accurate evaluation to differentiate benign from malignant lesions. Fine Needle Aspiration Cytology (FNAC) is widely used as a first-line diagnostic tool. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) provides a standardized reporting system.
Aim: To evaluate thyroid lesions using FNAC and classify them according to the Bethesda system.
Materials and Methods: This study included 320 patients presenting with thyroid swelling. FNAC was performed and smears were categorized according to the Bethesda system.
Results: Out of 320 cases, satisfactory cytological smears were obtained in 310 cases (96.8%) while 10 cases (3.1%) were non-diagnostic. The majority of cases belonged to Bethesda Category II (Benign) accounting for 89.3% cases. Category III (AUS) constituted 0.6% cases, Category IV (Follicular Neoplasm) 1.25%, Category V (Suspicious for Malignancy) 3.4%, and Category VI (Malignant) 2.18%.
Conclusion: FNAC using the Bethesda system is a reliable, simple, and cost-effective diagnostic modality for the evaluation of thyroid lesions.

Keywords: Thyroid Nodules, FNAC, Bethesda System, Thyroid Cytology, Thyroid Lesions

1. INTRODUCTION

The word 'Thyroid' originated from 'Thyreos', a Greek word meaning shield.1 Diseases of the thyroid gland are common and comprise a spectrum of entities causing systemic disease (Grave's disease) or a localized abnormality in the thyroid gland such as nodular enlargement (goitre) or a tumour mass. After diabetes mellitus, the thyroid gland is the most common organ to cause endocrine disorders.2

Thyroid nodules are common clinical findings and require accurate evaluation to differentiate benign from malignant lesions.

Thyroid fine needle aspiration cytology (FNAC) has been an effective tool for the evaluation of thyroid nodules and thyroid diseases. To address terminology and other issues related to thyroid FNAC, THE NATIONAL CANCER INSTITUTE (NCI) proposed the six tiered "The Bethesda System for Reporting Thyroid Cytopathology"

(TBSRTC).3

The present study was undertaken to evaluate thyroid lesions using FNAC and categorize them according to the Bethesda system.

2. MATERIALS AND METHODS

2.1. SOURCE OF DATA

All patients referred to cytology section of the Department of Pathology, KIMS Hospital, Hubballi for FNAC of Thyroid lesion.

2.2. METHOD OF DATA COLLECTION

After taking informed consent from the patient, clinical history, physical findings will be noted. The thyroid lesion will be localized, and with 23 gauge needle aspiration will be done under negative pressure. On an average 2-3 passes will be given. Smears will be prepared for routine staining (Hematoxylin and Eosin, Papanicolaou and Wright's stain) and for special stains if necessary.

2.3. INCLUSION CRITERIA

All patients irrespective of age and sex with enlarged thyroid gland referred to department of pathology KIMS Hubballi, who give consent for the procedure.

2.4. EXCLUSION CRITERIA

1) Neck swelling other than thyroid.
2) Bleeding disorder.
3) Patients with skin infection at the site of aspiration.
4) Critically ill or anxious patients.

Type of study: Prospective study. (November 2018 to April 2020).

Study period 18 Months.

Data analysis: Sample size was calculated to estimate the sensitivity of FNAC for diagnosis of malignant thyroid lesions .Based on literature sensitivity of FNAC was 72.72%, and based on records the proportion of malignancy out of total thyroid lesions was 25%.So to estimate the sensitivity of FNAC with 95% confidence and 10% error we require minimum of 312 thyroid cases.

Ethical clearance: Taken.

3. RESULTS

The present study was carried out over 18 months, KIMS Hospital Hubballi, in the Department of Pathology from November 2018 to April 2020. It was a prospective analysis of 320 cases with thyroid lesions referred to cytology section. As per the proforma mentioned in Materials and Methods, detail clinical history was procured before obtaining a sample for cytological study. Based on clinical histories, the following observations were made. A total of 320 thyroid FNAC cases were studied.

3.1. PERCENTAGE OF CONCLUSIVE AND NONCONCLUSIVE SMEARS OF FNAC

Out of 320 cases, satisfactory cytological smears were obtained in maximum, 310 cases, (96.8%) and in 10 cases (3.12%) FNAC results could not be concluded because of low cellularity. Mulje (2026)

Table 1

Table 1 Percentage of Conclusive and Non Conclusive Smears of Fnac from Different Study

STUDY	TOTAL CASES	CONCLUSIVE SMEARS		NON CONCLUSIVE SMEARS	
		No.	%	No.	%
Mondal SK et al.[4](2013)	1020	1008	98.8	12	1.2
Guhamallick M et al.[5](2008)	288	249	86	39	14
Present study	320	310	96.8	10	3.12

Study done by Mondal SK et al. (2013) maximum, 98.8% FNAC smears were conclusive. And also Guhamallick M et al. showed that maximum,86%FNAC smears wereconclusive.whicharecomparabletothepresentstudyshowingmaximum, 96.8% were conclusive as shown in the above table 1.

Table 2

Table 2 Comparison of FNAC Diagnosis Based on the Bethesda System of Reporting Thyroid Cytopathology in Different Studies

Diagnostic Category	NayarRand IvanovicMet al. (2009)[6] (n=5194) (%)	Jo VY et al.(2010)[7] (n=3080) (%)	Mondal SK et al.(2013)[4] (n=1020) (%)	Present study (n=320) (%)
Non Diagnostic(C- 1)	5	18.6	1.2	3.1
Benign(C-2)	64	59	87.5	89.3
AUS(C-3)	18	3.4	1	0.6
Follicuar Neoplasm(C-4)	6	9.7	4.2	1.25
Suspiciousfor malignancy(C-5)	2	2.3	1.4	3.4
Malignancy(C-6)	5	7	4.7	2.18

It seen that incidence of **Category-1(NonDiagnostic)** in the present study were10 cases (3.1%)which is comparable to the study done by Mondal SK et al.(2013)Nayar R and Ivanovic M et al. (2009). And it is far lower than the study done by Jo VY et al.(2010).

The incidence of **Category-2 (Benign)** in the present study were 286 cases (89.3%) which is comparable to the study done by Mondal SK et al. (2013) which is slightly higher than the study done by Nayar R and Ivanovic M et al. (2009) andJo VY et al.(2010).

The incidence of **Category-3(AUS)** in the present study were 2cases (0.6%) which is comparable to the study done by Mondal SK et al. (2013)and which is lower than the study done by Nayar R and Ivanovic M et al. (2009) andJo VY et al.(2010).

The incidence of **Category-4(FollicularNeoplasm)** in the present study were 4cases (1.25%) which is lower study done by Mondal SK et al. (2013),NayarRandIvanovic M et al. (2009) and Jo VY et al.(2010).

The incidence of **Category-5 (Suspicious for malignancy)** in the present study were 11 cases (3.4%) which is slightly higher than the study done by Mondal SK et al. (2013)4, Nayar R and Ivanovic M et al. (2009) and Jo VY et al.(2010).

The incidence of **Category-6(Malignancy)** in the present study were7 cases(2.18%) which is lower than the study done by Mondal SK et al. (2013),Nayar RandIvanovic M et al. (2009) and Jo VY et al. (2010) as shown in the above table 2.

3.2. FOLLICULAR CELL DESCRIPTION:

The follicular cells were studied based on the arrangement of follicular cells, follicular cell morphology, distribution of chromatin, nuclear grooving, and nuclear clearing as shown in the table 3.

Table 3

Table 3 Follicular Cell Description of Patients Studied

FOLLICULAR CELL DESCRIPTION	No.of Patients	%
ARRANGEMENT		
· FOLLICLES	1	0.3
· GROUPS/CLUSTERS/SHEETS/SINGLES.	308	96.2
· PAPILLAE	4	1.2
· FOLLICLES+GROUPS/SHEETS	3	0.9
· PAPILLAE+GROUPS/SHEETS	4	1.2
FOLLICULAR CELL MORPHOLOGY		
· MONOMORPHIC	3	0.9
· MILDLYPLEOMORPHIC	315	98.4
· MODERATELYPLEOMORPHIC	2	0.6
CHROMATIN		
· NORMAL	307	95.9
· POWDERY	8	2.5
· STIPPLED	5	1.5
NUCLEOLI		
· PRESENT	0	0
· ABSENT	320	100.0
NUCLEAR GROOVING		
· PRESENT	10	3.1
· ABSENT	310	96.8
INTRANUCLEAR INCLUSIONS		
· PRESENT	9	2.8
· ABSENT	311	97.1
NUCLEAR CLEARING		
· PRESENT	5	1.5
· **ABSENT**	**315**	**98.5**
AMYLOID		
· PRESENT	2	0.6
· ABSENT	318	99.3
TOTAL	320	100.0

3.4. ARRANGEMENT OF FOLLICULAR CELLS: (AS SHOWN IN THE ABOVE TABLE 3)

Follicular cells with maximum, 308cases (96.2%) were arranged in groups, clusters, sheets, and in singles. 4cases (1.2%) were arranged in papillae. 1 case (0.3%) was showing arrangement only in micro follicles.

FOLLICULAR CELL MORPHOLOGY

In 315cases (98.4%) Follicular cells had mild pleomorphism, 2cases (0.6%) had moderate pleomorphism. Whereas 3cases (0.9%) had monomorphic cells.

DISTRIBUTION OF CHROMATIN

Distribution of normal Chromatin was seen in maximum no of cases, 307cases (95.9%). 8cases (2.5%) were having powdery chromatin. And 5cases (1.5%) were having stippled chromatin.

NUCLEAR GROOVING

Nuclear grooving was present in 10 cases (3.1%).

INTRANUCLEAR INCLUSIONS

Intranuclear inclusions were seen in 9cases (2.8%) .

NUCLEAR CLEARING

Nuclear clearing was seen in 5cases (1.5%). These cases were diagnosed as PTC.

AMYLOID

Amyloid was seen in 0.6% (2cases). And these two cases were reported as MTC.

3.5. DIAGNOSTIC SUCCESS RATE ON CYTOLOGY:

Out of 320 cases, satisfactory cytological smears were obtained in maximum, 310 cases, (96.8%) and in 10cases (3.12%) FNAC results could not be concluded because of low cellularity as shown in the below table 4.

Table 4

Table 4 Diagnostic Success Rate on Cytology of Patient Studied

Diagnostic success rate on cytology	No.of Patients	%
CONCLUSIVE	310	96.80%
NON-CONCLUSIVE	10	3.12%
TOTAL	320	100.0

3.6. DISTRIBUTION OF CASES BASED ON THE BETHESDA SYSTEM FOR REPORTING THYROID CYTOPATHOLOGY

Out of the 320 cases studied maximum cases, 286cases (89.3%) were diagnosed as Category 2- Benign. 2 cases (0.6%) were diagnosed as Category 3- Atypia of undetermined significance. 4 cases (1.25%) were diagnosed as Category 4- Follicular neoplasm. 11cases (3.4%) were diagnosed as Category 5- Suspicious for Malignancy. And 7 cases (2.18%) were diagnosed as Category 6- Malignancy.10 cases (3.1%) were diagnosed as category 1- inadequate/non diagnostic as shown in the below Table 4.

Table 5

Table 5 Distribution of Cases Based on the Bethesda System for Reporting Thyroid Cytopathology of the Patients Studied

BETESDA SYSTEM	No. of Patients	%
INADEQUATE/NONDIAGNOSTIC	10	3.1
BENIGN	286	89.3
ATYPIA OF UNDETERMINEDSIG	2	0.6
SUSPICIOUS OF FOLLICULAR NEOPLASM/FN	4	1.25
SUSPICIOUS FOR MALIGNANCY	11	3.4
MAIGNANCY	7	2.18
TOTAL	320	100.0

4. DISCUSSION

FNAC plays a crucial role in the preoperative evaluation of thyroid nodules. In the present study, the majority of lesions were benign which is consistent with other studies.

Nayar and Ivanovic reported benign lesions in 64% cases, while Mondal SK et al. reported 87.5% benign lesions. In the present study, benign lesions accounted for 89.3% cases.

Non-diagnostic smears constituted 3.1% cases in the present study, which is comparable with previous studies. The Bethesda system helps in risk stratification and appropriate clinical management of thyroid nodules.

The findings of this study highlight the usefulness of FNAC as a reliable diagnostic method for thyroid lesions.

Figure 1

Figure 1 Patient Photo-Solitary Thyroid Nodule in An Old Aged Female Patient of Nodular Goiter.

Figure 2

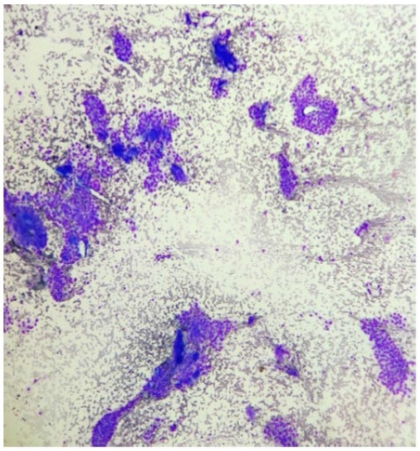

Figure 2 Nodular Goitrephotomicrograph FNAC Showing Follicular Cells Arranged in Group Sheets & Clustures with Fragile Cytoplasm and Colloid (Wrights Stain, 10x).

Figure 3

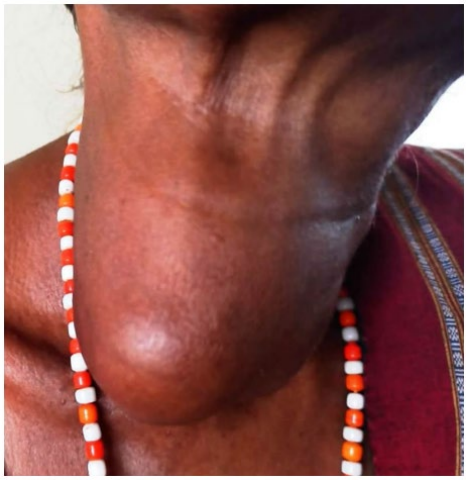

Figure 3 Patient Photo-Right Sided Solitary Thyroid Nodule in A Old Age Female Patient of Follicular Neoplasm.

Figure 4

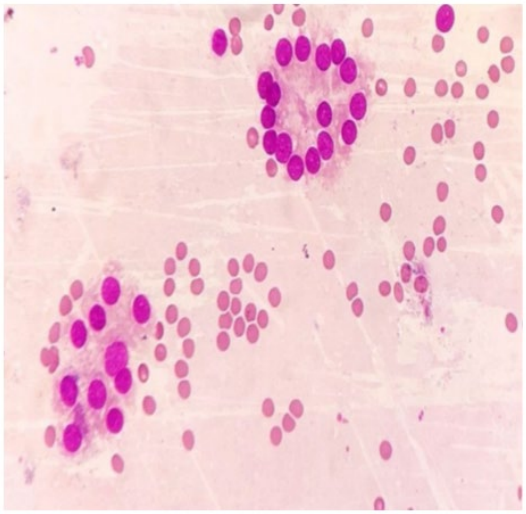

Figure 4 Follicular Neoplasm Photomicrograph-FNAC Showing Follicular Ephithelial Cells with Scanty Colloid (H&E, 40x)

Figure 5

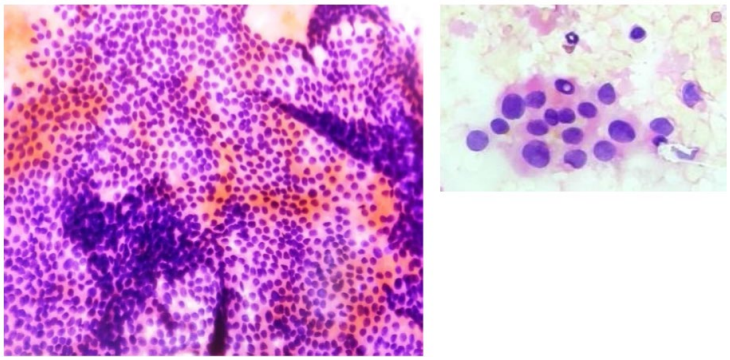

Figure 5 Papillary Carcinoma- Photomicrograph: FNAC Showing Cells Arranged in Sheets. Arrow Showing Nuclear Grooving, Insight Showing Intranuclear Inclusions (Wrights, 40x)

5. CONCLUSION

FNAC is an effective, minimally invasive, and economical diagnostic technique for evaluating thyroid nodules. The Bethesda system provides a standardized reporting format which improves diagnostic accuracy and clinical decision making.

CONFLICT OF INTERESTS

None.

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None.

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