Original research article

STUDY ON EVALUATION OF TYPE OF THYROID LESIONS ON FNAC USING BETHESDA SYSTEM

**[1]Dr. D. Nagendra Prasad Naik, [2]Dr. N.V.H. Rajesh Krishna, [3]Dr. Byrappagari Spandana,
[4]Dr. Suneetha Kona**

[1]Associate professor, Department of Pathology, Government Medical College, Madanapalli,
Andhra Pradesh, India

[2]Associate Professor, Department of Pathology, Government Medical College, Kadapa,
Andhra Pradesh, India

[3]Associate professor, Department of Pathology, Government Medical College, Madanapalli,
Andhra Pradesh, India

[4]Associate professor, Department of Pathology, Government Medical College, Madanapalli,
Andhra Pradesh, India

Corresponding Author:
Dr. Suneetha Kona
Associate professor,
Department of Pathology,
Government Medical College,
Madanapalli,
Andhra Pradesh, India

Abstract

Background: Fine needle aspiration cytology [FNAC] is a valuable screening tool available for distinguishing between benign and malignant thyroid swelling. Thyroid lesions subjected to FNAC are categorized under Bethesda system to ensure standardization amongst reporting.

Methods and Material: This prospective study was done over a period of 2 years, i.e., April 2021 to March 2023 in the Department of Pathology, Sri Venkateswara Medical College, Tirupati. A total of 600 patients with thyroid lesions attending the OPD's of Surgery, Medicine and ENT were included in this study.

Results: Benign lesions were the most commonly found lesions. In present study, females are most commonly involved. Among follow-up malignancy prevalence was increased amongst those with Category V and Category 6.

Conclusions: FNAC is a cost-effective system for screening malignant lesions. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) helps in the

interpretations of cytological findings of thyroid using FNAC.
Keywords: Bethesda, aspiration, thyroid, cytology

Introduction:-

Thyroid nodule as defined by the American Thyroid Association (ATA) is "a discrete lesion within the thyroid gland which is radiologically distinct from the surrounding thyroid parenchymal tissue". Thyroid nodules may be solitary or multiple and are detected in 5-7% of the adult population worldwide. With the increased use of ultrasound, thyroid nodules are found at an increasing frequency [1, 2].

Greater than 90% of the detected thyroid nodules are benign lesions, while the rest are malignant. Ionizing radiation is the most commonly associated risk factor for both benign and malignant nodules of the thyroid. Other factors that lead to an increased risk of thyroid nodules and goiter include smoking, obesity, metabolic syndrome, alcohol consumption, increased levels of insulin-like growth factor-1, and uterine fibroids. Factors associated with possible decreased risk may include the use of oral contraceptives and statins [3-5].

Fine-needle aspiration cytology (FNAC) is a diagnostic test used routinely in the initial evaluation of thyroid nodule. The first needle biopsy was performed in 1930 by Martin and Ellis using an 18 G needle. By 1980's, the needle size was reduced to 22-27 G and is being in use ever since then [6, 7].

In 2007, the National Cancer Institute Thyroid proposed The Bethesda System for Reporting Thyroid Cytology (TBSRTC) in the Fine Needle Aspiration State of the Art and Science Conference held in Bethesda, Maryland and was published in January 2010. The TBSRTC consists of 6 diagnostic categories (DCs), and each diagnostic category is associated with a specific risk of malignancy (ROM) and a recommendation for clinical management.

This study attempts to stratify the malignancy risks in thyroid nodules in a tertiary care referral center South India utilizing the Bethesda system.

Materials & Methodology

This prospective observational study was conducted in the Department of Pathology, Sri Venkateswara Medical College, Tirupati, over 2 years period, i.e., April 2021 to March 2023. 600 patients presenting with history of swelling of thyroid to departments of Surgery, Medicine, and ENT were included in the study.

A detailed history was taken and thorough general and local examination of the thyroid gland was done. The procedure was explained to the patient in detail. After taking a written informed consent, the procedure was started.

The patient was made to lie down in supine position. Under aseptic precautions a 23 G needle was inserted into the lesion. 2-3 attempts were done to collect sufficient material for cytopathological study. The aspirate was spread on a clean glass slide and fixed using 95% alcohol. The slides were stained using Hematoxylin and Eosin and Papanicolaou stains and sent for examination.

All the smears were reported based on The Bethesda system and divided in to 6 major categories. Recommended cases were then followed up.

Results

The mean age of study population was 31.5 years, with the majority of patients belonging to 21-30 years of age (35.2%).

Majority of the patients were females (n = 520; 86.6%) and the female to male ratio was 6.5:1.

Most of the patients had presented with complaint of midline neck swelling (54.3%). Pain during swallowing was seen in 60 cases (10%).

Majority of the patients were euthyroid (53.3%). Hypothyroidism was seen in (34.6%), and Hyperthyroidism in (2.1%). Thyroid hormone status was not checked in 10%.
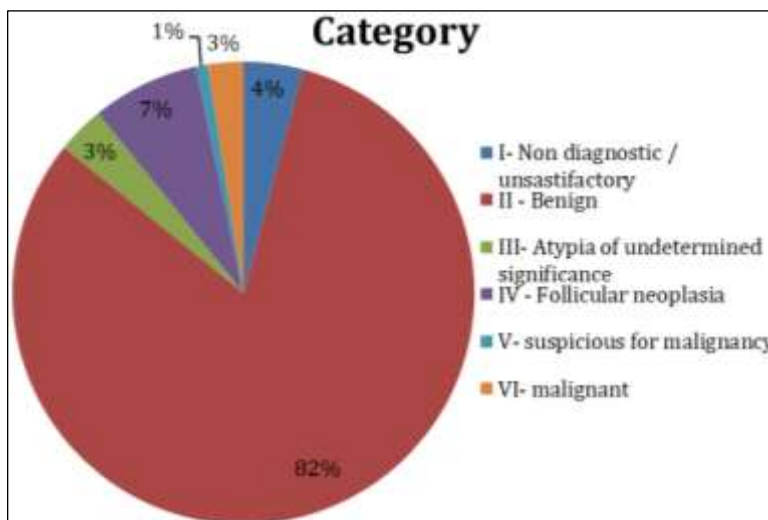

Fig 1: Category distribution

Most of the patients had category II lesions (82%). Hashimoto's thyroiditis (30.6%) was the most common finding, followed by benign follicular nodule (24.5%). 2.5% of patients had malignancy detected.

Table 1: Type of lesions based on Bethesda classification

	Category	Type of lesion	No. of lesions
I.	Non-diagnostic/unsatisfactory (n = 25)		25 (4.1%)
II.	Benign (n = 490)	Benign follicular nodule	147 (24.5%)
		Grave's disease	4 (0.6%)
		Hashimoto's thyroiditis	184 (30.6%)
		Nodular hyperplasia of thyroid	45 (7.5%)
		Acute suppurative thyroiditis	2 (0.3%)
		Goitre	96 (16%)
		Colloid cyst	12 (2%)

III.	Atypia of undetermined significance/follicular lesion of undetermined significance (n = 20)		20 (3.3%)
IV.	Follicular neoplasm/suspicious of follicular neoplasm/Hurtle cell type (n = 45)	Hurtle cell neoplasm	5 (0.83%)
		Follicular neoplasm	40 (6.7%)
V.	Suspicious of malignancy (n = 5)		5 (0.8%)
VI.	Malignancy (n = 15)	Papillary carcinoma	9 (1.5%)
		Medullary carcinoma	6 (1%)

Table 2: Conventional reporting of thyroid lesions

	Type of lesion	No. of cases
Non diagnostic (n=25)		25 (4.1%)
Non neoplastic	Colloid goitre	10 (1.6%)
	Diffuse goitre	5 (0.8%)
	Multinodular goitre	75 (12.5%)
	Nodular hyperplasia with anaplastic features	45 (7.5%)
	Simple colloid goitre	76 (12.6%)
	Adenomatoid goitre	5 (0.8%)
	Nodular goitre	84 (14%)
	Hashimoto's thyroiditis	184 (30.6%)
	Acute suppurative thyroiditis	2 (0.3%)
	Grave's disease	4 (0.6%)
Neoplastic (Benign)	Follicular neoplasm	40 (6.7%)
	Follicular cells with atypia	20 (3.3%)
	Hurtle cell neoplasm	5 (0.83%)
Neoplastic (suspicious of carcinoma)	Suspicious of papillary carcinoma	5 (0.8%)
Neoplastic (malignant)	Papillary carcinoma thyroid	9 (1.5%)
	Medullary carcinoma thyroid	6 (1%)

Table 3: Comparison of conventional vs Bethesda classification system

Conventional classification		No. of cases		Bethesda classification
Non diagnostic (n=25)		25 (4.1%)	I	Non-diagnostic/unsatisfactory (n = 25)
Non neoplastic	Colloid cyst	12 (2%)	II	Benign (n = 490)
	Diffuse goitre	5 (0.8%)		
	Multinodular goitre	75 (12.5%)		
	Nodular hyperplasia with anaplastic features	45 (7.5%)		

	Simple colloid goitre	76 (12.6%)	III	
	Adenomatoid goitre	5 (0.8%)		
	Nodular goitre	84 (14%)		
	Hashimoto's thyroiditis	184 (30.6%)		
	Acute suppurative thyroiditis	2 (0.3%)		
	Grave's disease	4 (0.6%)		
Neoplastic (Benign)	Follicular cells with atypia	20 (3.3%)	III	Atypia of undetermined significance/follicular lesion of undetermined significance (n = 20)
	Follicular neoplasm	40 (6.7%)	IV	Follicular neoplasm/suspicious of follicular neoplasm/Hurtle cell type (n = 45)
	Hurtle cell neoplasm	5 (0.83%)		
Neoplastic (suspicious of carcinoma)	Suspicious of papillary carcinoma	5 (0.8%)	V	Suspicious of malignancy (n = 3)
Neoplastic (malignant)	Papillary carcinoma thyroid	9 (1.5%)	VI	Malignancy (n = 15)
	Medullary carcinoma thyroid	6 (1%)		

Discussion

FNAC is a low cost, effective diagnostic tool used in screening thyroid nodules. Due to variability in the reporting and diagnostic criteria of cytopathological findings, the National Cancer Institute Thyroid proposed The Bethesda System for Reporting Thyroid Cytology (TBSRTC) for ensuring uniformity in reporting cytopathological changes worldwide.

The present study was done to evaluate the cytopathological changes in patients presenting with thyroid lesions using Bethesda system and to assess the risk of malignancy.

The six categories described by Bethesda system are: Non diagnostic/unsatisfactory, benign, atypical follicular lesion of undetermined significance (AFLUS), "suspicious" for follicular neoplasm (SFN), suspicious for malignancy (SM), and malignant.

In present study, 600 patients who presented with thyroid lesions were evaluated and FNAC was done. There were no samples which were insufficient for reporting.

Table 4: Comparison of the percentages of distribution of fine needle aspiration of present study with other studies

Category	Diagnostic category	Present study	Santhosh et al. [9]	Jo et al. [10]	Yassa et al. [11]	Theoharis et al. [12]	Yang et al. [13]	Nayar et al. [14]
I	Non-diagnostic	4.1%	1.2%	18.6%	7%	9.3%	10.7%	5%
II	Benign	81.6%	87.5%	59%	66%	73.5%	64.6%	64%
III	AFLUS	3.3%	1%	3.4%	4%	3.6%	3.2%	18%
IV	SFN	7.5%	4.2%	9.7%	9%	6.7%	11.6%	6%
V	SM	0.8%	1.4%	2.3%	9%	1.6%	2.6%	2%
VI	Malignant	2.5%	4.7%	7%	5%	5.9%	7.6%	5%

Table 4 shows the distribution of thyroid lesions in present study and studies done by Santhosh et al. [9], Jo et al. [10], Yassa et al. [11], Nayar et al. [14], Yang et al. [13] and Theoharis et al. [12] In all the above studies, lesions belonging to Category II (Benign) are the most common. The prevalence of benign lesions was highest in present study and study by Santhosh et al. [9].

The percentage of non-diagnostic lesions in present study is similar to Nayar et al. [14].

Table 5: Comparison of the percentages of follow-up malignancy of present study with other studies

Category	Diagnostic category	Present study	Santhosh et al. [9]	Jo et al. [10]	Yassa et al. [11]	Theoharis et al. [12]	Yang et al. [13]	Nayar et al. [14]
I	Non-diagnostic	0	0	8.9%	10%	32%	10.7%	9%
II	Benign	4%	4.5%	11%	0.3%	10%	0.7%	2%
III	AFLUS	0	20%	17%	24%	48%	19.2%	6%
IV	SFN	20%	30.6%	25.4%	28%	34%	32.2%	14%
V	SM	67%	75%	70%	60%	87%	64.8%	53%
VI	Malignant	100%	97.8%	98.1%	97%	100%	98.4%	97%

The malignancy rates upon follow-up are highest in Categories V and IV. Unlike the present study, Santhosh et al. [9] in which category I has 0% malignancy rates, other studies have reported malignancy with the highest observed by Theoharis et al. [12].

Conclusion

The Bethesda system is valuable for uniform and standardized system of reporting thyroid cytopathology. The high malignancy risk for the AFLUS, SM and malignancy categories reflects the importance of these categories in the six-tier Bethesda system.

Acknowledgements

Conflict of Interest: Nil.

References

1. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, *et al*. American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid. 2016 Jan;26(1):1-133.

2. Pemayun TG. Current Diagnosis and Management of Thyroid Nodules. Acta Med Indones. 2016 Jul;48(3):247-257.

3. Durante C, Costante G, Lucisano G, Bruno R, Meringolo D, Paciaroni A, *et al*. The natural history of benign thyroid nodules. JAMA. 2015 Mar;313(9):926-35.

4. Welker MJ, Orlov D. Thyroid nodules. Am Fam Physician. 2003 Feb;67(3):559-66.

5. Yeung MJ, Serpell JW. Management of the solitary thyroid nodule. Oncologist. 2008 Feb;13(2):105-12.

6. Mazzaferri EL. Management of a solitary thyroid nodule. The New England journal of medicine. 1993;328:553-559.

7. Martin HE, Ellis EB. Biopsy by Needle Puncture and Aspiration. Annals of surgery. 1930;92:169-181.

8. Ali SZ, Cibas ES. The Bethesda system for reporting thyroid cytopathology: definitions, criteria and explanatory notes. Berlin: Springer, 2010.

9. Mondal SK, Sinha S, Basak B, Roy DN, Sinha SK. The Bethesda system for reporting thyroid fine needle aspirates: A cytologic study with histologic follow-up. J Cytol. 2013 Apr;30(2):94-9. Doi: 10.4103/0970-9371.112650. PMID: 23833397; PMCID: PMC3701345.

10. Jo VY, Stelow EB, Dustin SM, Hanley KZ. Malignancy risk for fine-needle aspiration of thyroid lesions according to the Bethesda system for reporting thyroid cytopathology. Am J Clin Pathol. 2010;134:450-6.

11. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA, *et al*. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer. 2007;111:508-16.

12. Theoharis CG, Schofield KM, Hammers L, Udelsman R, Chhieng DC. The Bethesda thyroid fine-needle aspiration classification system: year 1 at an academic institution. Thyroid. 2009;19:1215-23. https://doi.org/10.1089/thy.2009.0155.

13. Yang J, Schnadig V, Logrono R, Wasserman PG. Fine-needle aspiration of thyroid nodules: A study of 4703 patients with histologic and clinical correlations. Cancer. 2007;111:306-15.

14. Nayar R, Ivanovic M. The indeterminate thyroid fine-needle aspiration: Experience from an academic center using terminology similar to that proposed in the 2007 national cancer institute thyroid fine needle aspiration state of the science conference. Cancer. 2009;117:195-202.

15.