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BETHESDA CLASSIFICATION OF FINE NEEDLE ASPIRATION CYTOLOGY OF THYROID LESIONS AND ITS HISTOPATHOLOGICAL CORRELATION: STUDY FROM A TERTIARY CARE HOSPITAL OF WESTERN INDIA

Pathology

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ABSTRACT

Background: Thyroid lesions are commonly encountered in day to day practice. Thyroid lesions in general population accounting for 4-10% in adults and 0.2-1.2% in children. FNAC is an effective diagnostic tool in distinguishing benign and malignant lesions, provides an early diagnosis and avoid unnecessary surgery. **Aims:** Thyroid cytopathology reporting by The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) and its correlation with histopathology to evaluate the specificity and sensitivity of fine needle aspiration cytology in the diagnosis of thyroid swellings. **Materials and Methods:** A retrospective study was done during the period from January 2015 to December 2020. The cases of thyroid swellings investigated with FNAC and biopsy were selected for study. All the thyroid lesions were classified by Bethesda system and correlations of cytology and histopathological diagnosis was done. **Results:** A total 66 cases were taken. In present study sensitivity, specificity and diagnostic accuracy of FNAC in diagnosing malignant thyroid neoplasms are 68.75%, 97.87% and 90.47% respectively. **Conclusions:** FNAC is easily approachable, a very reliable, safe, simple and cost effective method which causes minimum discomfort to the patients with least and minor complications. Application of FNAC has remarkably reduced the unnecessary surgical resection of thyroid.

KEYWORDS

Thyroid, FNAC, Bethesda, Sensitivity, Specificity, Diagnostic accuracy

INTRODUCTION

Thyroid lesions are commonly encountered in day to day practice. Thyroid lesions in general population accounting for 4-10% in adults and 0.2-1.2% in children; especially benign thyroid lesions are more encountered than malignant lesions.[1 2 3] FNAC is widely used and first line diagnostic test in evaluation of thyroid lesions because of its rapidity, simplicity, cost effectiveness and diagnostic accuracy.[2] The accuracy of FNAC analysis approaches 95% in the differentiation of the benign thyroid nodules from the malignant thyroid nodules.[4] FNAC plays an important role in screening and selecting cases that need surgical resection. Application of FNAC has remarkably reduced the unnecessary surgical resection of thyroid.[5] The present study had been conducted to compare the cytological and histopathological diagnosis of thyroid lesions to assess the accuracy of FNAC in diagnosing the thyroid lesions, considering histopathological diagnosis as gold standard.

MATERIALS AND METHODS

A retrospective study was done during the period from January 2015 to December 2020. In the present study, total 66 cases were taken. The cases of thyroid swellings investigated with FNAC and biopsy were selected for study. FNA slides of thyroid swelling cases stained with H&E and Giemsa and H&E stained histopathology slides were retrieved from their respective sections in the Department of Pathology. Faded histopathology slides and misplaced or broken histopathology slides were re-stained with H&E after re-cutting sections from their blocks. The cytology and corresponding histopathology slides were reviewed. All the thyroid lesions were classified by Bethesda system and correlations of cytology and histopathological diagnosis was done. The collected data analysed using statistical methods such as sensitivity, specificity, positive predictive value, negative predictive value and accuracy.

RESULTS

In the department of pathology, GMERS Medical College and Hospital, Gotri, 66 specimens of thyroid were received post surgically for histopathological examination from all the FNA done during the period of January 2015 to December 2020. Table 1 shows age distribution of all patients of thyroid lesions.

Table 1: Age distribution of patients

Age group (years)	Number of cases (N)	(%)
<21	5	7.6
21-30	17	25.7
31-40	21	31.8
41-50	15	22.7
51-60	4	6.1
>60	4	6.1
Total	66	100

Among 66 patients, 62 (93.94%) were females and 4 (6.06%) were males. Female to male ratio is 15.5:1, showing a female predominance.

Table 2: Cytologic evaluation of all thyroid lesions using TBSRTC category

Bethesda classification	Number of cases(N)	(%)
Category I	3	4.5
Category II	51	77.3
Category III	-	-
Category IV	7	10.6
Category V	5	7.6
Category VI	-	-
Total	66	100

Among 66 cases, 51 cases were reported as category II which is benign, followed by 7 cases as category IV which is suspicious of follicular neoplasm and 5 cases as category V which is suspicious of malignancy.

While 3 cases were reported as category I which is non-diagnostic. (Table 2)

In this study 49 (74.2%) cases were non-neoplastic while 17 (25.8%) cases were neoplastic including benign and malignant cases.

Table 3: Distribution of Non-Neoplastic lesions based on histopathology diagnosis

Diagnosis	Number of cases (N)	(%)
Colloid goiter	20	40.8
Colloid cyst	1	2
Multinodular goiter	23	47
Hashimoto Thyroiditis	3	6.1
Thyroglossal cyst	2	4.1
Total	49	100

Out of 49 cases, 23 cases were reported as multinodular goiter, 20 cases as colloid goiter, 3 cases as hashimoto thyroiditis, 2 cases as thyroglossal cyst and 1 case as colloid cyst. (Table 3)

Table 4: Distribution of Neoplastic lesions based on histopathology diagnosis

	Number of cases(N)	(%)
Benign neoplastic lesions		
Follicular adenoma	4	40
Hurthle cell adenoma	3	30
Hyalinizing trabecular adenoma	1	10
NIFTP	2	20
Total	10	100
Malignant neoplastic lesions		
Papillary thyroid carcinoma	6	85.7
Medullary thyroid carcinoma	1	14.3
Total	7	100

Out of 66 cases, 10 were reported as benign neoplastic thyroid lesion and 7 cases were reported as malignant neoplastic thyroid lesion. (Table 4)

Table 5: Correlation between cytological and histopathological diagnosis

FNA and Histopathological correlation	Number of cases (N)	(%)
Correlated	57	90.5
Uncorrelated	6	9.5

In this study, out of 66 cases, 3 cases were non-diagnostic in cytology. Out of 63 cases 57 FNA reports were well correlated with histopathological report. (Table 5)

Table 6: Cytological diagnosis of thyroid lesions using TBSRTC category and its histopathological correlation

TBSRTC Category		HPE diagnosis		Total
		Benign	Malignant	
I	Non-diagnostic	3	-	3
II	Benign	49	2	51
III	Atypia of undetermined significance	-	-	0
IV	Follicular neoplasm or suspicious for a follicular neoplasm, hurthle cell type	7	-	7
V	Suspicious for malignancy	-	5	5
VI	Malignant	-	-	0
Total				66

Table 7: Sensitivity, Specificity, Positive predictive value, Negative predictive value and Efficacy

Sensitivity	68.75%
Specificity	97.87%
Positive predictive value	91.66%
Negative predictive value	90.19%
Efficacy	90.47%

In present study sensitivity, specificity and diagnostic accuracy of FNAC in diagnosing malignant thyroid neoplasms are 68.75%, 97.87% and 90.47% respectively. (Table 7)

DISCUSSION

Total 66 specimens of thyroid subjected to FNAC screening were received in Histopathology Section of the Department of Pathology, GMERS Medical Collage and Hospital, Gotri, Vadodara during the study period from January 2015 to December 2020 and a correlation of cytological and histopathological diagnosis was done.

In present study, age range was 12-70 years of age which is comparable to the study done by Handa et al with age range of 5-80 years[6], Ramteke DJ et al with age range of 7-80 years[7] and Monika Modi et al with age range of 7-71 years[8]. In present study, out of total 66 cases, 62 were females and 4 were males. Thus, female to male ratio is 15.5:1 which is comparable to studies done by Sameep Garg et al with female to male ratio of 11.5:1[9] and Handa et al with female to male ratio of 6.35:1[6].

In present study, out of 66 cases 49 were non-neoplastic and 17 were neoplastic lesions. Thus, non-neoplastic to neoplastic lesion ratio is 2.88:1 which is comparable to studies done by Parikh U.R. et al with 100 cases were non-neoplastic and 23 cases were neoplastic lesions with ratio of 4.3:1[10], Malliga et al with 80 cases were non-neoplastic and 17 cases were neoplastic lesions with ratio of 4.7:1[11] and Ramteke D.J. et al with 253 cases were non-neoplastic and 67 cases were neoplastic lesions with ratio of 3.7:1[7].

In present study most commonly observed non-neoplastic thyroid lesion was multinodular goiter followed by colloid goiter. Least commonly observed non-neoplastic lesion was colloid cyst followed by thyroglossal cyst.

In present study, out of 17 neoplastic lesions 4 were follicular adenoma which is most commonly observed benign neoplastic lesion according to this study. Similar observation was noticed by studies done by Gulia S et al[12], Ramteke DJ[7] et al and Abdulkader A et al[13]. In malignant neoplastic thyroid lesion most common lesion was papillary thyroid carcinoma attributing 6 cases out of total 7 cases of malignant neoplastic lesion. Similar results were observed in studies done by Ramteke DJ et al in which 4 cases of PTC were found out of total 7 cases of malignant neoplastic lesions[7], Sameep Garg et al accounting for 6 cases of PTC out of total 9 cases of malignant neoplastic lesion[9], Khageswar Rout et al in which all 5 cases of malignant neoplasm were diagnosed as PTC[14].

In present study, concordance between cytology and histopathology diagnosis is 90.47% which is comparable with studies done by Das et al[15] and Hag et al[16] with a concordance 90% and 91% respectively. Other studies done by Harach et al[17] and Sivaelengovan R et al[18] showed concordance of 53% and 64% respectively. The study done by Kunori et al[19] showed consonance of 98% because of use of USG guided aspiration, it improved the diagnostic accuracy of FNAC.

In present study, out of total 66 cases, 3 were non-diagnostic. Out of total 63 cases, 11 cases are true positive, 46 cases are true negative, 1 case is false positive and 5 cases are false negative.

Table 8: Comparison of statistical data with other studies

Sr. No.	Studies	Sensitivity	Specificity	PPV	NPV	Efficacy
1	Harsoulis P et al 1986[20]	89.4%	95.4%	92.5%	88.33%	94.2%
2	Hawkins F et al 1987[21]	86.3%	95.3%	85.4%	92.3%	93.7%
3	Afroze N et al 2002[22]	80.9%	99.3%	92.8%	94.5%	94.5%
4	Gulia S et al 2010[12]	100%	90%	100%	97.67%	92.3%
5	Ramteke et al 2017[7]	92.31%	97.01%	85.61%	98.48%	96.25%
6	Present study	68.75%	97.87%	91.66%	90.19%	90.47%

In the present study sensitivity, specificity, positive predictive value, negative predictive value and diagnostic efficacy are 68.75%, 97.87%, 91.66%, 90.19% and 90.47% respectively.

Correlation Between Cytology And Histopathology

Category I:

Non-diagnostic- In present study, out of total 66 cases, 3 cases were categorized as non-diagnostic in cytology because of presence of occasional cystic macrophages, scanty cellular smears with excessive haemorrhage in background. One should kept in mind that non-diagnostic does not mean negative sample thus management for this category is to re-aspirate from the lesion after a gap of few months which is necessary to provide time for resolution of inflammation induced by FNA procedure.

Category II:

Benign- Out of total 66 cases, 51 cases were categorized under category II which is benign. 46 cases were proven to be benign by histopathology. 5 cases did not show concordance. Problems which are faced during diagnosis are mentioned below:

Out of 5 cases 2 cases were diagnosed as follicular adenoma by histopathology. It was because cytomorphological features of benign thyroid lesion (e.g. colloid goiter and nodular goiter) and follicular adenoma shares few same characteristics like presence of moderate amount of follicular cells and abundant colloid has preceded the diagnosis towards benign category and were resulted in 2 false negative reporting.

2 cases of benign thyroid lesion were diagnosed as PTC by histopathology. Cytology smears show presence of follicular cells which are arranged in sheets and clusters without any PTC-like nuclear features with background shows abundant colloid. Since there were absence of nuclear crowding, overlapping and PTC-like nuclear features which are necessities of diagnosis of PTC in cytology and presence of abundant brownish colloid directed towards the diagnosis

of benign thyroid lesion and were resulted in 2 false negative reporting. One case of benign thyroid lesion was diagnosed as NIFTP by histopathology. As cytology smears were composed of benign follicular cells which are arranged in monolayered sheets with background of colloid, thus the diagnosis of benign thyroid lesion was given based on cytology features.

Due to strict adherence to the diagnostic criteria and prevention from overdiagnosis above mentioned cases were misdiagnosed under TBSRTC category II and has led to 5 false negative cases in present study.

Category III:

Atypia of undetermined significance- Not a single case was categorized under this category to avoid ambiguity and to stick with strict diagnostic criteria according to TBSRTC 2018.

Category IV:

Follicular neoplasm or suspicious for a follicular neoplasm, hurthle cell type- 7 cases were categorized under this category. Out of those, 2 cases were diagnosed as follicular adenoma, 3 cases as hurthle cell adenoma, 1 case as NIFTP and 1 case did not show concordance. Problems which are faced during diagnosis are mentioned below:

One case was diagnosed as colloid goiter by histopathology. As cytology smears were highly cellular and show benign follicular cells arranged in sheets and clusters with follicular configuration and background shows few areas of colloid, thus the diagnosis of follicular neoplasm was given in cytology and resulted in one false positive case.

Category V:

Suspicious for malignancy- 5 cases under this category were well recognized and out of those 5 cases, 4 cases were diagnosed as PTC and 1 case as medullary thyroid carcinoma by histopathology.

Category VI:

Malignant- No cases were categorized under this category.

CONCLUSIONS

As far as thyroid lesions are concerned, FNAC is sensitive and specific in detection of the thyroid pathologies. FNAC plays an important role in screening and selecting cases that need surgical resection. Application of FNAC has remarkably reduced the unnecessary surgical resection of thyroid.

The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) provided a universal classification system. In which diagnostic criteria of every thyroid lesions are mentioned in details. Using TBSRTC, categorization and treatment modality for the various thyroid lesions can be recognized and can also serve more benefit to the patients.

FNAC has high sensitivity and specificity, still false negative and false positive cases can be present which can be reduced by using various methods like meticulous examination of patient, USG guidance, correct sampling, using liquid based cytology and IHC. FNAC has great importance in deciding treatment modality for patients using TBSTRTC.

Thus, FNAC is easily approachable, a very reliable, safe, simple and cost effective method which causes minimum discomfort to the patients with least and minor complications.

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