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Original Research Paper

Pathology

RETROSPECTIVE STUDY OF ULTRASONOGRAPHIC AND FNAC CORRELATION OF THYROID LESIONS WITH HISTOPATHOLOGY

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ABSTRACT

INTRODUCTION: Thyroid diseases, a common clinical problem have prevalence rate of 4–7% in the general population. Fine-needle aspiration cytology (FNAC) is a minimally invasive, accurate diagnostic tool which can differentiate neoplastic from non-neoplastic lesions and reduces the number of unnecessary thyroidectomies, but has limitations . **METHODOLOGY:** Our study was a retrospective analysis of 124 cases of thyroid lesions over a period of 3 years from April2019 to April 2022. The FNAC findings were reviewed and data was compared with the histopathological, imaging findings and data was analysed. **RESULTS:** Majority of the patients were females in the age group of 41–60 years with a mean age of 42 years and most were non-neoplastic lesions. 76 cases were diagnosed as colloid nodular goitre and benign cystic lesions by FNAC. 44 cases were diagnosed as neoplastic lesions (follicular neoplasm, papillary carcinoma, and suspected malignancy) by FNAC. 18 of these cases were non neoplastic lesions, 24 were papillary carcinoma, 2 were follicular carcinoma on histopathological examination . Statistical analysis of neoplastic lesions showed sensitivity, specificity, accuracy, false positive rate, false negative rate, positive predictive value, and negative predictive value of FNAC to be 69.09%, 90.7%, 80.8%, 9.2%, 30.9%, 86.3% and 77.6% respectively. **CONCLUSION:** Ultrasound was found to be more reliable than palpation, but definitive diagnosis can be reached only with FNAC/Biopsy. Bethesda system of reporting thyroid cytology should be meticulously followed to minimize errors and a repeat FNAC asked for discordant cases after a multidisciplinary team conference.

KEYWORDS : Fine needle aspiration cytology, Thyroid lesions, Bethesda system.

INTRODUCTION:

Thomas Wharton first coined the term "Thyroid" due to the organ's close proximity to the thyroid cartilage (120–200 A.D). The word thyroid is derived from the Greek "thyros" meaning "shield" because it was originally considered to protect the larynx.[1]Thyroid disease indicated by the presence of single or multiple nodules within the thyroid gland remains a common clinical problem and has a reported prevalence of 4%–7% in the general population.[2]USG, the most common to image the thyroid gland and its pathology, as recognized in guidelines for managing thyroid disorders, published by the American Thyroid Association.[3]Fine needle aspiration cytology (FNAC) is a simple, safe, reliable and cost-effective tool with a high degree of sensitivity and specificity for detecting malignancies.[4]FNAC is helpful in distinguishing benign from malignant nodules and screening patients for surgery. Histopathological examination remains the "gold standard" method for the confirmation of the pre-operative diagnosis of FNAC.

The aims and objectives are to study the spectrum of thyroid lesions and correlate FNAC findings with imaging and histopathology of excised specimens and find out the accuracy of FNAC in the diagnosis of thyroid pathology.

METHODOLOGY:

The current study was a descriptive (record based) retrospective study conducted in the Department of Pathology, Alluri Sita Ramaraju Academy of Medical Sciences, a tertiary care centre, which caters to the patients attending and referred from periphery. This article studies about thyroid lesions over a period of 3 years from April2019 to April 2022. All patients history was recorded for their demographic features, that is age, sex, and address. Ultrasound, FNAC and histopathology reports were collected and data was analyzed.

Inclusion Criteria:

All patients who presented with thyroid swellings, irrespective of age, and who have undergone FNAC followed by surgery were included in the study.

Exclusion Criteria:

Patients in whom either one (FNAC/histopathology/Imaging findings) was not available were excluded from the study.
Ethical approval was obtained from ethics and institutional review committee of the hospital.

Statistical analysis:

Data were entered into the computer and analysed using software SPSS(Stastical package for social science) trial version 26.0. The spectrum of thyroid lesions and categorization of thyroid lesions according to Bethesda system was done.

The sensitivity, specificity, Accuracy, False positive rate, False negative rate, Positive predictive value and Negative predictive value were calculated.Results were presented in table and charts.

RESULTS:

During the 3-year study period, a total of 124 diagnosed thyroid lesions (including both benign and malignant) formed the study group. Due to covid only less number of cases were included. Out of which 119 were females and 5 were males with a female:male ratio of 23.8:1.

Age of the patients ranged from 41 to 60 years, with a mean age of 42 years. The clinical presentation of lesion was either a nodule or diffuse enlargement. Thyroid lesions were classified according to Bethesda system by FNAC report.[Table 1]

Table 1. Clinicopathological profile of Thyroid lesions

1.Bethesda category diagnosis	Number of cases	Percentage
II Benign	76	61.2
III Atypia of undetermined significance	1	0.8
IV Follicular neoplasm	20	16.2
V Suspicious for malignancy	5	4.1
VI Malignant	19	15.3
Suboptimal	3	2.4
2. Histopathological diagnosis	Number of cases	Percentage
Benign	83	66.9
Malignant	41	33.1
3.Age distribution	Number of cases	Percentage
< 20 Years	1	0.8
21-40 Years	66	53.2
41-60 Years	53	42.8
>60 Years	4	3.2
4. Sex	Number of cases	Percentage
Females	119	95.9
Males	5	4.1

FNAC reports revealed, more than half the numbers of cases in the present study were diagnosed as goitre 46.7%(n = 58) which also included goitre with cystic degeneration or other secondary change as well as nodular goitre. In the remaining lesions, adenomatous goiter/hyperplastic nodule 6.4% (n = 08), Hurthle cell nodule 0.2%(n=04), Hashimoto's thyroiditis 6.4% (n = 08).Among malignant lesions, 15.3% cases (n = 19) were diagnosed as papillary carcinoma , 14.5% (n = 18) as follicular neoplasms.

Histopathological examination of excised specimens showed 59 (47.5%) cases as colloid nodular goitre, 15 (12.1%) as follicular adenoma,07 (5.6%) as hashimoto's thyroiditis, 41 (33.2%) as papillary carcinoma, 02 (1.6%) as follicular carcinoma.

Comparison of FNAC with histopathological findings was performed. 76 cases were diagnosed as colloid nodular goitre and benign cystic lesions by FNAC. 59 of these cases were non neoplastic lesions, 11 as papillary carcinoma and 06 as follicular adenoma in histopathological examination (Table 2). 44 cases were diagnosed as neoplastic lesions (follicular neoplasm, papillary carcinoma, and suspected malignancy) by FNAC. 18 of these cases were non neoplastic lesions, 24 were papillary carcinoma, 2 were follicular carcinoma on histopathological examination (Table 3).

False positive and false negative results were shown in Table 4.

Statistical analysis of neoplastic lesions (Table 5) showed sensitivity, specificity, accuracy, false positive rate, false negative rate, positive predictive value, and negative predictive value of FNAC to be 69.09%,90.7%,80.8%,9.2%, 30.9%,86.3% and 77.6% respectively.

Table 2: Nonneoplastic lesions diagnosed by FNAC and their comparison with histopathological diagnosis.

FNAC	No.of patients	Histopathology report	No.of patients	
Colloid nodular goitre and other lesions	76	Goitre and other lesions	59	True negative
		Follicular adenoma	06	False negative
		Papillary carcinoma	11	False negative

Table 3: Benign or suspicious neoplastic lesions diagnosed by FNAC and their comparison with histopathological diagnosis.

FNAC	No. of patients	Histopathology report	No.of patients	
Follicular neoplasm	20	Follicular adenoma	12	True positive
		Follicular carcinoma	2	True positive
		Colloid nodular goitre	6	False positive
Papillary carcinoma	19	Papillary carcinoma	24	True positive
Suspected malignancy	5			False positive

Table 4: Summary of false positive and false negative results of FNAC

FNAC findings	Histopathology report
False positive	
Follicular neoplasm	Colloid nodular goitre
False negative	
Colloid nodular goitre	Follicular adenoma
Colloid nodular goitre	Papillary carcinoma

Table 5 Statistical analysis for Neoplastic lesions

Test being evaluated (FNAC)	Reference standard test (Histopathology)	
	Positive	Negative
Positive+suspicious	38	6
Negative	59	17

Sensitivity = 69.09 %, specificity = 90.7 %, accuracy =80.8 %, false positive rate=9.2 %, false negative rate =30.9%, positive predictive value =86.3 %, and negative predictive value =77.6%.

Thyroid imaging reporting and data systems (TIRADS) classification was followed according to The American College of Radiology (ACR) to determine the risk of cancer in thyroid nodules[5]. According to the ACR classification, TIRADS 1 – Normal thyroid gland; TIRADS 2 – Benign lesion; TIRADS 3 – Probably benign lesions; TIRADS 4 – Suspicious lesions; TIRADS 5 – Probably malignant lesions; and TIRADS 6 – Biopsy proven malignancy

Table 6 shows categorisation of thyroid lesions by radiological diagnosis.

Radiological diagnosis	Number of cases	Percentage
Benign lesions	33	26.6
Goitre	52	41.9
Malignant	22	17.7
Indeterminate lesions	17	13.7

Table 7: Benign and malignant lesions diagnosed by USG and their comparison with histopathological diagnosis

USG	No. of Patients	Histopathology	No.of patients	
Benign lesions	85	Goitre and benign	74	True negative
		Papillary carcinoma	11	False negative
Malignant lesions	39	Papillary carcinoma	29	True positive
		Nodular goitre and other benign	10	False positive

Table 8 Statistical analysis for Neoplastic lesions

Test being evaluated (USG)	Reference standard test (Histopathology)	
	Positive	Negative
Positive+suspicious	29	10
Negative	74	11

Sensitivity = 72.5%, specificity = 88.09 %, accuracy =83.06%, false positive rate=11.9 %, false negative rate =13.09%, positive predictive value =74.3 %, and negative predictive value =87.05 %.

DISCUSSION:

In present study, the age of patients ranged from 19 to 71 years with mean age of 42 years. Solitary thyroid nodules were 4–9 times more common in females as compared to males. The false negative rate was 30.9 % in cases of neoplastic lesions. It constitutes a serious limitation of this technique since these malignant lesions would go untreated. The incidence of false negative results is as low as 1%to as high as 30% [6,7]. The false positive rate was 9.2 % for neoplastic lesions but none of these lesions were malignant. The methods used for the calculation of sensitivity, specificity, accuracy, positive predictive value, and negative predictive value were similar to previous studies [13,14].

Table 9: Comparing FNAC results with previous studies

Study	Year	No.of Patients	Sensitivity	Specificity	Accuracy	PPV	NPV
Afroze et al[9]	2000	170	61.9	99.3	94.5	92.8	94.7
Kessler et al [10]	2005	170	79	98.5	87	98.7	76.6
Manoj gupta et al [11]	2010	75	80	86.8	84	80	86.6
Present study	2020	124	69.09	90.7	80.8	86.3	77.6

The sensitivity, specificity, and accuracy of FNAC for solitary thyroid nodules were 69.09 %, 90.7 %, and 80.8 %,respectively, in our study whereas sensitivity, specificity, and accuracy of FNAC were 79%, 98.5%, and 87%, respectively in a study by Kessler et al [15]. Cytologic and histologic diagnoses were compared in 4069 patients and the sensitivity and specificity of FNAC were found to be 91.8% and 75.5%, respectively[12].In present study cytohistological correlation was seen in 103 cases (83.06 %) and non-correlation seen in 21 cases(16.9 %). Cytoimaging concordance seen in 101 cases (81.4%) and non-cordance seen in 23cases (18.5%).K.Gayatri et al, study in 179 cases showed cytohistological correlation was seen in 151 (84%) cases and non-correlation was observed in 28 (15.6%) cases.[8].In present study, among the discordant cases, noted papillary carcinoma in 11 cases (8.8 %) include variants like follicular and encapsulated, papillary microcarcinoma in 2 cases (1.6 %), nodular goitre with cystic degeneration in 06 cases(4.8 %),Hyperplastic nodular goitre in 02 case(1.6 %).Reasons for discordance mainly due to inadequate sampling and cystic nature of the lesion.

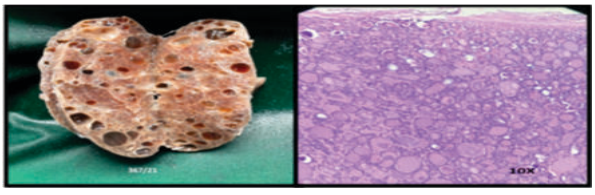

Fig 1 shows Total thyroidectomy specimen Grossly shows colloid filled cystic lesions and Microscopically shows nodules with varying size follicles filled with colloid diagnosed as Multinodular goitre

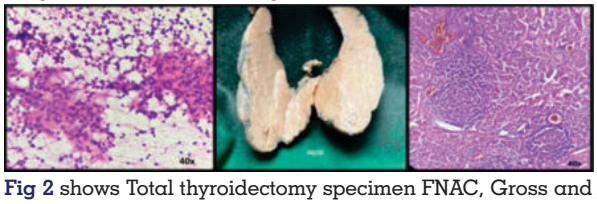

Fig 2 shows Total thyroidectomy specimen FNAC, Gross and Microscopic picture of Hashimoto thyroiditis respectively. On FNAC shows scattered lymphoid cells with follicular cells, cut section of gross specimen resembles lymphnode, microscopic shows lymphocytic infiltrate with germinal centre formation and hurthle cells.

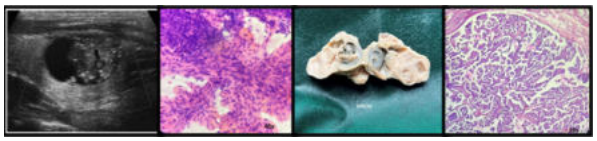

Fig 3 shows total thyroidectomy specimen of USG, FNAC, Gross and Microscopic picture of papillary carcinoma of thyroid respectively. On FNAC, gross and microscopic showing papillary structure with microscopic picture of optical clear nuclei, few shows nuclear groves and inclusions.

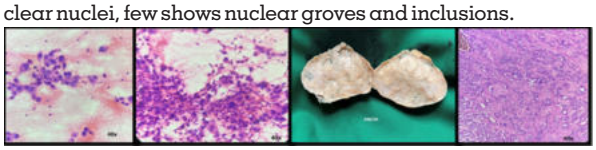

Fig 4 shows Total thyroidectomy specimen FNAC, Gross and Microscopic picture of medullary carcinoma . On FNAC shows plasmacytoid follicular cells as scatters or small clusters, grossly single ,gray-tan flesh like mass, microscopic shows polygonal to spindled cells arranged in nests and follicles with amyloid deposition in stroma.

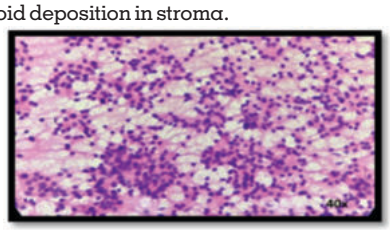

Fig 5 shows FNAC from thyroid and swelling over scalp shows high cellularity, follicular cells with repeated acinar pattern and high mitotic figures diagnosed as follicular carcinoma as it was been metastasised to scalp.

CONCLUSION:

We concluded that FNAC diagnosis of malignancy is highly significant and such patients should be subjected to surgery. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery. The possibility of neoplastic etiology should be considered in cystic lesions and these cases require USG-guided FNAC to ensure cellular adequacy, thus, preventing a sampling error. A multidisciplinary team discussion involving the surgeon, oncologist, radiologist, and pathologist is warranted in discordant cases for planning and instituting optimal management.

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