CYTOMORPHOLOGICAL SPECTRUM OF PALPABLE THYROID LESIONS AND THEIR CORRELATION WITH SONOGRAPHIC FINDINGS

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ABSTRACT

In many thyroid disorders, the size of the gland tends to increase presenting as a swelling (1). The thyroid swelling can be diffuse, multinodular or appear as a solitary nodule (2). It is imperative to differentiate the types of thyroid swelling based on etiology and character because nature of the lesion will decide the treatment and prognosis of these swellings (3). Proper nature of the solitary nodules needs to be ascertained as best as possible as only a small fraction of these nodules is malignant and thereby unnecessary surgery can be avoided (4,5). 66 patients including both male and female were selected after applying inclusion and exclusion criteria. The study participants presented with palpable thyroid swelling in the department of ENT and Surgery. They underwent FNAC, Ultrasonography and Histology if the swelling was surgically resected. Findings were correlated with each other. Most of the sample belonged to female gender 80.3% and were of young age (Mean age-37.38 years). On Ultrasonography majority of the cases were of Benign cystic nodule (60.6%). 71.2 % patients belonged to TIRADS grade-1. On FNAC adenomatous nodules were found in 50% of cases. On Bethesda class 66.7% were of Bethesda class 2. Out of 66 cases 15 had Histology report available. Out of 15 cases colloid nodule was found in 53.3% cases. FNAC results confirmed adenomatous nodules predominantly across various USG findings, especially in cases of benign cystic nodules (62.5%) and hypoechoic nodules with irregular margins (50.0%). Lymphocytic thyroiditis was associated with USG findings suggestive of inflammation, notably thyroiditis (50.0%). These findings were statistically significant (P=0.028). When evaluating thyroid swellings, FNAC and ultrasonography are essential diagnostic techniques. Ultrasonography predicts benign and malignant lesions significantly.

KEYWORDS: Palpable thyroid swelling, Fine Needle Aspiration Cytology, Thyroid cancer, Thyroid nodule.

INTRODUCTION

The thyroid gland is made up of two lobes joined by an isthmus, and it weighs between 20 and 25 grams (7). In many thyroid disorders, the size of the gland tends to increase presenting as a swelling (2). The thyroid swelling can be diffuse, multinodular or appear as nodule (3).

It is imperative to differentiate the types of thyroid swelling based on etiology and character because nature of the lesion will decide the treatment and prognosis of these swellings (4).

Proper nature of the solitary nodules needs to be ascertained as best as possible as only a small fraction of these nodules is malignant and thereby unnecessary surgery can be avoided (5,6).

Thus, it becomes very important to search for a diagnostic test which not only differentiate thyroid nodules as benign or malignant as accurately and precisely as possible, but also is non-invasive, cost-effective & easily accessible.A non-invasive, economical diagnostic method that can distinguish between solid and cystic lesions is ultrasonography (7, 8). When diagnosing thyroid lesions,FNAC is thought to be the best investigative technique. **(9).** FNAC as a procedure can detect malignancy with great accuracy and precision. However, it has few drawbacks such as it is minimally invasive and cannot differentiate between follicular adenoma and carcinoma (10,11). There are always chances of inadequate and suspicious (i.e., sample being of thyroid gland) sample (12). Additionally, FNAC has trouble accurately interpreting lymphocytic lesions, hurthle cell lesions, follicular lesions, and cysts. (13).

AIM

To study the cytomorphological spectrum of palpable thyroid lesions.

OBJECTIVES

1. Cytohistological correlation of thyroid lesions wherever surgical resection has been performed.
2. To correlate USG findings of thyroid lesions with cytological diagnosis.

MATERIALAND METHODS

The study was conducted between September 2022 and May 2024 in a tertiary care hospital of northern part of India. Its an observational analytical study. Sample size consisted of 66 patients who presented as palpable thyroid swelling in the department of ENT and Surgery. Serial and purposive sampling method was used. Patients previously diagnosed and treated for thyroid lesions, including those with a history of thyroid surgery, Patients with bleeding diathesis, Patients who did not provide informed consent for FNAC and Patients with unsatisfactory or inadequate FNAC samples were excluded.

Data collection was done from the patients after obtaining written informed consent. Demographic data such as age, gender, size of nodule, laterality and duration of nodule were recorded. Patients also underwent thorough physical examination by a health care professional. Physical examination findings, including palpation of the thyroid gland, assessment of gland size, nodularity, tenderness, and presence of associated lymphadenopathy, were documented.

Fine-Needle Aspiration Cytology (FNAC)

A 10-milliliter disposable syringe and a 23-gauge needle were used for FNAC, and four to five slides were prepared for each patient. Two smears were air-dried and stained using the MGG technique (May Grunwald-Giemsa stain), while the other two smears were fixed with 95% alcohol and H&E stain. FNAC results, including cytological findings such as cell morphology, presence of colloid, follicular cells, Hurthle cells, lymphocytes, macrophages, and any suspicious or malignant features, were recorded.

Ultrasonography (USG) Findings:

USG of the thyroid gland was performed to assess the size, shape, echogenicity, vascularity, and presence of nodules or masses. USG findings, including features suggestive of benign or malignant lesions such as hypoechoic nodules, microcalcifications, irregular margins, and increased vascularity, were documented.

Histopathology Findings (if available):

For patients who underwent surgical resection of thyroid lesions, histopathological examination of the excised tissue was conducted. The biopsy specimen was fixed in 10% formalin & grossing was done in the department. Relevant sections were taken & given for processing. Sections of each block were cut at a thickness of 4-5 microns and stained with H&E. Histopathology findings, including the type of lesion (e.g., adenoma, carcinoma, goitre), tumour grade and stage (if applicable), presence of vascular or capsular invasion, and lymph node involvement, were documented.

STATISTICALANALYSIS

Descriptive statistics summarized demographic and clinical information, while bivariate analysis assessed associations between different variables using chi-square tests and Pearson's correlation. Logistic regression helped identify factors that predict malignancy in thyroid lesions, and subgroup analyses explored variations based on age, sex, and diagnostic results. Microsoft Excel was used to enter the data, and SPSS version 26 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis., ensuring data quality and handling missing values.

RESULTS

The sample has a mean age of 37.38 years and a standard deviation of 16.55 years. The age range is 12 to 95 years old, with 35 being the median age. Out of 66 valid responses, 19.7% identified as male, while 80.3% identified as female. Of the 66 patients, 18.2% exhibited diffuse swelling, 15.2% were left-lateralized, 33.3% were midline, and another 33.3% were right-lateralized.

Thyroid nodule sizes range in size from 3.09 cm on average to 1.90 cm on average, suggesting a moderate degree of variability. Out of the 66 respondents, 51.5% reported a duration of swelling up to 1 year, indicating relatively recent onset of symptoms. Meanwhile, 34.8% reported a duration of 1 to 5 years, suggesting a more established condition.

Ultrasonography (USG) Findings

Table 1 displays the findings from ultrasonography (USG) examinations within the sample. Among the 66 total observations, 1.5% showed normal results. The

USG Finding	N	%
Normal	1	1.5%
Benign cystic nodule	40	60.6%
Thyroiditis	6	9.1%
Isoechoic nodules with regular margins	4	6.1%
Hypoechoic nodule with irregular margins	8	12.1%
Hypoechoic nodules with microcalcification	7	10.6%
Total	**66**	**100.0%**

Table 1: Ultrasonography (USG) Findings

most common finding was benign cystic nodules, accounting for 60.6% of the cases. Thyroiditis was observed in 9.1% of the cases, while isoechoic nodules with regular margins were found in 6.1% of cases.

Thyroid Imaging Reporting and Data System (TIRADS) Grading

Table 2 presents the distribution of TIRADS grading within the sample. Out of the 66 total observations, the majority, comprising 71.2%, were classified as TIRADS grade 1. Grade 2 was observed in 6.1% of cases, grade 3 in 12.1% of cases, and grade 4 in 10.6% of cases. This indicates that a significant portion of the sample had a low TIRADS grading, suggesting a lower likelihood of malignancy according to the TIRADS classification system.

TIRADS Grading	N	%
1	47	71.2%
2	4	6.1%
3	8	12.1%
4	7	10.6%
5	0	0%
Total	66	100.0%

Table 2: TIRADS Grading

FNAC findings	N	%
Inconclusive	2	3.0
Colloid Cyst	5	7.6
Adenomatous Nodule	33	50
Lymphocytic thyroiditis	11	16.7
Follicular lesion of undetermined significance	6	9.1
Follicular Neoplasm	7	10.6
Suspicious of papillary carcinoma	1	1.5
Malignant (Anaplastic carcinoma)	1	1.5
Total	**66**	**100.0%**

Table 3: Fine Needle Aspiration Cytology Findings

FNAC Findings

Table 3 display that among the 66 total observations, 3.0% were inconclusive. Colloid cysts were found in 7.6% of cases, while adenomatous nodules were the most common finding at 50% of cases. Lymphocytic thyroiditis was observed in 16.7% of cases, followed by follicular lesions of undetermined significance at 9.1% and follicular neoplasms at 10.6%. Suspicion of papillary carcinoma and malignant (anaplastic carcinoma) findings each accounted for 1.5% of cases.

Bethesda Classification

Table 4 presents the distribution of Bethesda classes within the sample. Out of the 66 total observations, 10.6% were classified as Bethesda class 1, 66.7% as class 2, 9.1% as class 3, and another 10.6% as class 4. Only a small proportion, 1.5% each, were classified as class 5 or 6. This classification system provides insights into the likelihood of malignancy based on cytological findings, with the majority falling into Bethesda class 2, which typically indicates benign or non-neoplastic conditions.

Bethesda class	N	%
1	7	10.6
2	44	66.7
3	6	9.1
4	7	10.6
5	1	1.5
6	1	1.5
Total	**66**	**100.0%**

Table 4: Bethesda Classification.

Histological Examination

Out of the 66 patients 15 (22.7%) had undergone histological examination. Histological examination was suggested only when there was any suspicion of malignancy on FNAC. This suggests that a significant portion of the sample had their diagnosis derived from clinical, radiological, and cytological studies.

Distribution of Histological Types

In Table 5, the distribution of histological types among cases that underwent histological examination is presented. Among the 15 cases studied, various histological types were identified: Colloid Nodule in 53.3% of the cases, Follicular Adenoma in 33.3% of cases, Papillary Carcinoma in one case (6.66%), Similarly, one case (6.66%) was diagnosed as anaplastic carcinoma, an aggressive and less common type of thyroid cancer associated with poorer outcomes.

Histology type	N=15	% =100
Colloid Nodule	8	53.3
Follicular adenoma	5	33.3
Papillary carcinoma	1	6.66
Anaplastic carcinoma	1	6.66

Table 5: Distribution of Histological Types.

FNAC findings	USG Finding											
	Normal		Benign cystic nodule		Thyroiditis		Isoechoic nodules with regular margins		Hypoechoic nodule with irregular margins		Hypoechoic nodules with microcalcification	
	N	%	N	%	N	%	N	%	N	%	N	%
Inconclusive	0	.0%	0	.0%	1	16.7%	0	.0%	1	12.5%	0	.0%
Colloid Cyst	0	.0%	4	10.0%	0	.0%	1	25.0 %	0	.0%	0	.0%
Adenomatous Nodule	1	100.0 %	25	62.5%	1	16.7%	2	50.0 %	2	25.0%	2	28.6%
Follicular lesion of undetermined significance	0	.0%	1	2.5%	1	16.7%	1	25.0 %	3	37.5%	0	.0%
Follicular Neoplasm	0	.0%	3	7.5%	0	.0%	0	.0%	1	12.5%	3	42.9%
Lymphocytic thyroiditis	0	.0%	7	17.5%	3	50.0%	0	.0%	1	12.5%	0	.0%
Suspicious of papillary carcinoma	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	1	14.3%
Malignant (Anaplastic carcinoma)	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	1	14.3%

Table 6: Correlation between FNAC and USG Findings.

Applied $\chi 2$ test for significance. $\chi 2$ value=58.84; df=40; **p-value=0.028; Significant**

DISCUSSION

First, the age distribution of the respondents shows that the majority of them (45.5%) are between the ages of 18 and 35, suggesting that the sample contains a sizable proportion of younger adults. Secondly, gender distribution within sample shows a substantial majority of female respondents, accounting for 80.3% of the valid responses. Lastly, the distribution of laterality among respondents shows a relatively balanced pattern. About one-third of the sample exhibits midline laterality (33.3%), while another one-third is right-lateralized (33.3%). Malakzai HA et al. (2023) examined 686 thyroid nodule patients, and found similar demography in sample size (14)

This study also found the distribution of thyroid nodule sizes, with 43.9% in the 0-2 cm range, 48.5% in the 2.01-5 cm range, and 7.6% in the 5.01-10 cm range, indicating prevalence across small, medium, and larger nodules among 66 observations. According to Majister MJ's research, thyroid nodules ranged in size from 0.5 to 8.8 cm. with an average (standard deviation) size of 2.0 (1.4) cm. (15)

Our result also found that out of the 66 total observations, the majority, comprising 71.2%, were classified as TIRADS grade 1. Grade 2 was observed in 6.1% of cases, grade 3 in 12.1% of cases, and grade 4 in 10.6% of cases. This indicates that a significant portion of the sample had a low TIRADS grading, suggesting a lower likelihood of malignancy according to the TIRADS classification system. Periakaruppan G et al. (2018) assessed 184 thyroid nodules for FNAC using ultrasound and TIRADS scoring, excluding TIRADS 6 (proven malignancies). Their results showed 117 nodules as TIRADS-2, 45 as TIRADS-3, 13 as TIRADS-4, and 9 as TIRAD- 5. (16)

Our study also found that FNAC of thyroid samples, revealing a range of conditions: 3.0% inconclusive, 7.6% colloid cysts, 50% adenomatous nodules, 16.7% lymphocytic thyroiditis, 9.1% follicular lesions, 10.6% follicular neoplasms, and 1.5% each for suspicion of

papillary carcinoma and anaplastic carcinoma.

The distribution of FNAC cases according to Bethesda categories was reported by Hajmanoochehri F et al. as follows: Three cases of chronic lymphocytic thyroiditis and 26 cases of nodular goiter were among the 29 cases (28.7%) that were benign and nonneoplastic. Four cases (4%) were classified as AUS/FLUS. Furthermore, 27 cases (26.7%) were classified as FN/SFN, consisting of 24 follicular cell types and 3 Hürthle cell types. A total of sixteen cases (15.8%) were considered suspicious for malignancy; these cases included one case each of medullary carcinoma, undifferentiated carcinoma, and malignant lymphoma, and thirteen cases suspicious for papillary carcinoma. Finally, 25 cases (24.8%) were malignant; these included 2 cases of undifferentiated carcinoma, 1 case of medullary carcinoma, and 22 cases of papillary carcinoma (17).

Our findings also elucidated that out of the 66 total observations, 10.6% were classified as Bethesda class 1, 66.7% as class 2, 9.1% as class 3, and another 10.6% as class 4. Only a small proportion, 1.5% each, were classified as class 5 or 6. This classification system provides insights into the likelihood of malignancy based on cytological findings, with the majority falling into Bethesda class 2, which typically indicates benign or non-neoplastic conditions.

This study also found correlation between FNAC findings and Ultrasound (USG) findings in thyroid assessments. Adenomatous nodules were confirmed across various USG findings, notably benign cystic nodules (62.5%) and hypoechoic nodules with irregular margins (50.0%). Lymphocytic thyroiditis correlated with USG findings indicative of inflammation, especially thyroiditis (50.0%). Colloid cysts were associated with benign cystic nodules (10.0%) and thyroiditis (25.0%). FNAC also identified follicular neoplasms in hypoechoic nodules with microcalcification (42.9%) and benign cystic nodules (7.5%). These correlations emphasize the importance of integrating FNAC and USG for a thorough assessment of thyroid conditions, offering detailed insights into nodule composition and characteristics detected via USG imaging.

According to Popli et al., the ultrasound diagnosis of benign and malignant thyroid nodules had overall sensitivity, specificity, positive predictive value, and negative predictive value of 81.8%, 87.2%, 59.0%, and 95.5%, respectively. (18)

The study also investigated histological types in thyroid-related cases that underwent examination, revealing a diverse spectrum of findings. Among the 15 cases studied, colloid nodules were the most common (53.3%), representing benign thyroid conditions characterized by colloid-filled follicles. Follicular adenomas, benign tumours arising from thyroid follicular cells, were diagnosed in 33.3% of cases.

These correlations emphasize the importance of integrating FNAC and USG for a thorough assessment of thyroid conditions, offering detailed insights into nodule composition and characteristics detected via USG imaging.

CONCLUSION

The TIRADS classification system emerged as a valuable tool for assessing thyroid nodule malignancy risk, with higher TIRADS grades correlating with increased malignancy probabilities. This classification's utility in reducing unnecessary biopsies and aiding clinical decision-making was evident across various studies.

The spectrum of thyroid pathologies revealed by FNAC results ranged from benign to malignant diseases, with correlations observed among FNAC results, histopathological outcomes, and thyroid function tests. Noteworthy findings included the prevalence of colloid goitre and follicular adenoma. The associations between FNAC results and USG findings emphasized the complementary roles of these diagnostic modalities.

In summary, our study contributes to a nuanced understanding of thyroid nodules, emphasizing the importance of integrating clinical, radiological, cytological, and histopathological assessments for comprehensive thyroid disorder evaluation and management. Future research could explore genetic, environmental, and lifestyle factors influencing thyroid pathology, enhancing personalized approaches to thyroid disease management.

Conflicts of Interest:

The authors declare no conflicts of interest regarding this study.

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