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To investigate thyroid lesions using FNAC correlation and sonographic assessment

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Abstract
Introduction: One category of endocrine gland is the thyroid gland. It is the only large gland that can be directly inspected in a clinical setting. The superficial position also facilitates the evaluation of its normal anatomy, normal anatomical variants, and pathological conditions through the use of high resolution real-time grey-scale sonography.
Material and Methods: The pathology and radiodiagnosis departments of Madha Medical College in Chennai, Tamil Nadu, India, conducted this cross-sectional study. The research was conducted between January 2015 and December 2015. Individuals aged between 10 and 75 years who exhibit thyroid lesions on sonograms.
Results: While 30% of the hypoechoic nodules in this investigation turned out to be malignant, the bulk of the hypoechoic nodules in this examination were found to be malignant. Every case that ultrasonography had determined to be malignant was confirmed to be such by the FNAC. Isoechoic lesions were present in both benign and malignant tumors. The echoes were hyperechoic in most benign lesions.
Conclusion: This investigation included FNAC correlation and sonographic assessment of thyroid lesions. It might be concluded that women are more likely to get thyroid lesions. The anechoic nodules were entirely composed of benign lesions.

Keywords: Thyroid lesions, sonography, FNAC correlation, malignant

Introduction
Thyroid glands are visible because of their near proximity to the skin's surface. High-resolution, real-time greyscale sonography can more correctly detect normal anatomy, normal anatomical variants, and pathological states due to its superficial placement [1-3]. USG displays both normal anatomy and thyroid disease with great brilliance. Skeletal growth, thermogenesis, and cardiac output are significant metabolic activities regulated by the thyroid gland. High-resolution sonography is the most effective method for seeing the thyroid. USG can show size, margin, nodule count, and other anatomical features that are normal or abnormal [4-6].
Thyroid hormone levels and palpation are the main methods used in clinical evaluations of the thyroid gland. FNAC may detect malignant cells, surgical intervention may be necessary if a large thyroid lesion results in symptoms such as dysphagia or hoarseness of voice, or if a hypofunctional, or so-called "cold," nodule is present [7, 8]. Ultrasonography is used to examine thyroid nodules. The size, position within the thyroid gland, echotexture, borders, vascularity, calcification, vascularity, accessory nodules, related cervical nodes, and contents of the nodule must all be described in order to distinguish between benign and malignant nodules [9].
Sonography can show thyroid nodules, thyroid masses, and diffuse enlargement of the thyroid gland, all of which can indicate a palpable or non-palpable lesion. Symptoms may or may not be caused by the lesions. Multinodular goiter was the most common pathology, accounting for 40% of patient diagnoses. In women, multinodular goiter patients accounted for 90% of all cases. Additionally, women had a higher incidence of colloid cysts (20% of all cases). In females, diffuse thyroid hyperplasia was reported to impact 87%. Even the smallest, non-palpable lesions can be found with high frequency ultrasonography. A nodule's likelihood of becoming malignant is increased by ultrasound findings such hypoechogenicity, microcalcifications, and fuzzy & nodular borders [10–12]. Thyroid disorders are identified in women more frequently than in males. Comparing the findings of fine-needle aspiration cytology (FNAC) with sonography in the identification of thyroid lesions in people with thyroid disorders was the main objective of the study.

Materials and Methods

50 patients were taken for current study. This cross-sectional investigation was carried out at the pathology and Radiodiagnosis departments of the Madha Medical College, Chennai, Tamil Nadu, India. The study was carried out during the period from January 2015 to December 2015. Patients having thyroid lesions on sonograms in the 10- to 75-year-old age range.

Inclusion criteria

- Age group10-75 years.
- Patients with thyroid disorder with USG showing thyroid lesion.
- Patient giving consent.

Exclusion criteria

- Patients with bleeding disorders.
- Patient refusal for FNAC.

Study Method

The study was approved by the institutional ethical committee, and patients who met the eligibility requirements were clinically symptomatic with abnormal thyroid hormone levels, clinically symptomatic without symptoms but with thyroid lesions on ultrasonography, and clinically suspected without symptoms but with thyroid lesions on ultrasonography.

Sonographic Evaluation

In addition to the Siemens Acuson X 300 and X 600, color Doppler ultrasound scanners equipped with a linear array high-frequency transducer are utilized for every scan. Patients who fulfilled the age and thyroid illness inclusion criteria underwent sonographic testing. Sonography can be used to detect thyroid growth, vascularity, the presence or absence of a nodule, and echogenicity-the degree to which the gland is echogenic, either uniformly or unevenly. If nodules are present, counting them and measuring their size is required. Nodules less than 5 millimeters were not examined. To gain a better understanding of nodules larger than 5 mm, we examined their vascularity, calcifications, morphology, boundaries, contents, and echogenicity. Patients with thyroid lesions underwent FNAC with their knowledge.

Collection of Specimen

The patient is placed in a supine position and has their neck fully extended. The skin is cleaned with povidone iodine before being covered. There should be no deliberate swallowing on the part of the patient. Following that, ultrasonography is used to pinpoint the lesion's center. USG gel is not being used. Povidone iodine is used to achieve coupling. A local anesthetic could be administered if needed. The needle used is a 10 ml syringe with a gauge range of 23 to 27. Once the transducer is positioned above the thyroid gland, the lesion is identified and its link to the surrounding circulatory system ascertained. The transducer may be positioned perpendicular to or parallel to the needle's path. Tissue is recovered after at least two aspirations are made once the needle tip reaches the lesion.

Results

The Radiology Department evaluated patients with thyroid problems for a whole year. The analysis comprised fifty-five individuals; five of them had hemorrhagic samples, and one refused FNAC. Participants in the trial included fifty patients, ages 10 to 75. Both male and female patients took part in the study.

Table 1: Patient distribution

Family history of thyroid	Number	Percentage (%)
Yes	8	16
No	42	84

Only 16% of people have a positive family history of thyroid disease, while 84% of patients have a negative family history, according to Table 1. Based on family histories of thyroid conditions, this data was compiled.

Table 2: Patients are categorized according to the results of their thyroid function tests

Thyroid function test	Number	Percentage (%)
Normal	19	38
Hypothyroidism	21	42
Hyperthyroid	10	20

Table 2 was created using results from the thyroid function test. This procedure was performed on every patient in the study group, and the findings revealed that 38% of the patients had normal thyroid hormone levels, 42% of the study group had hypothyroidism, and 20% of the study population had hyperthyroidism.

Table 3: Thyroid enlargement as a divider of patients

Thyroid swelling	Number	Percentage (%)
Yes	35	70
No	15	30

Thyroid gland enlargement, both diffuse and localized, was present in 70% of the study population, as shown in Table 3. Thirty percent of the people in this study group did not experience any swelling.

Table 4: Patient stratification according to thyroid volume

Size of thyroid gland	Number	Percentage (%)
Normal	14	28
Enlarged	36	72

According to Table 4, only 28% of patients had a normal-sized thyroid gland, while 72% had an enlarged thyroid.

Table 5: Echo texture of the thyroid parenchyma is used to stratify patients

Echo texture of thyroid parenchyma	Number	Percentage (%)
Homogenous	14	28
Heterogeneous	36	72

It was a significant outlier for sonographic diagnosis. Seventy percent of patients in the study group had echotexture of the thyroid gland parenchyma that was homogenous, while thirty percent had echotexture that was heterogeneous.

Table 6: Number of nodules in the thyroid and their distribution

Number of nodules	Number	Percentage (%)
Single	46	92.00
Multiple	4	8.00
Total	50	100.00

Table 6 shows the breakdown of patients by age range. The patients in this study ranged in age from 10 to 75, with the youngest participant being a 17-year-old girl and the oldest participant being a 68-year-old man.

Table 7: Thyroid nodule sizes and their distribution

Size	Number	Percentage (%)
<5 mm	17	34.00
5 mm-1 cm	13	26.00
>1 cm	20	40.00
Total	50	100

Solitary or numerous nodules were classified according to their size. Nodules smaller than 5 millimeters in diameter were classified as micronodules. Out of 50 patients, 17 had micronodulations (34%), 13 had nodules between 5 mm and 1 cm (26%), and 20 had nodules greater than 1 cm (40%) in this study.

Table 8: Thyroid nodule distribution according to echogenicity

Echogenicity	Number	Percentage (%)
Anechoic	5	10
Hypoechogenic	15	30
Isoechogenic	20	40
Hyperechogenic	10	20
Total	50	100

Thyroid nodules greater than 5 millimeters were classified according to their echogenicity. Among the 50 patients with nodules larger than 5 mm, 5 had anechoic nodules, 15 had hypoechogenic nodules, 10 had isoechoic nodules, and 10 had hyper echogenic nodules, for a total of 40% isoechoic and 20% hyper echogenic.

Table 9: Thyroid nodule distribution according to pathology

Contents	Number	Percentage (%)
Predominantly solid	21	42
Predominantly Cystic	19	38
Comet tail artifact	10	20
Total	50	100

Depending on their composition, nodules are categorized as primarily solid, predominantly cystic, or exhibiting comet tail artifact. Only nodules measuring more than 5 mm were considered. The most common lesion observed on USG was thyroiditis, which was diagnosed in 42% of patients, and colloid goiter, which was found in 38% of patients. Twenty percent of the patients had multiple goiters. The remaining lesions included MNG with thyroiditis, adenomatous nodules, medullary carcinoma, and papillary carcinoma.

Discussion

Those who met any of the following criteria-clinical symptoms AND abnormal thyroid hormone levels, clinical symptoms AND normal thyroid hormone levels, or clinical suspicion BUT no specific symptoms-were referred for a thyroid assessment and became study participants. When compared to USG diagnosis and FNAC, the study found that ultrasound had a 92.5% positive predictive value for thyroiditis detection [13, 14]. Yeh *et al*. have proven that micronodulation on sonography is useful in the diagnosis of diffuse lymphocytic thyroiditis, with a positive predictive value of 94.7%. Venkatachalapathy *et al*. found that FNAC had an overall 81.3% sensitivity for benign lesions in their dataset. Ultrasonography demonstrated an 86.2% sensitivity and a 90% specificity in diagnosing thyroiditis. We examined the consequences of increased vascularity and micronodulations in the thyroid parenchyma in this investigation [15–17].

The positive predictive value for detecting medullary cancer was 100%, whereas the positive predictive value for papillary carcinoma was 66%. For adenomatous nodules, ultrasonography has a 94% diagnosis accuracy. MNG was 100% accurate, although colloid goiter had a 94% positive predictive value [18].

According to Vikas *et al*.'s research, thyroid ultrasonography had an overall 83.3% sensitivity for identifying malignant nodules. In this experiment, the sonographic results indicated that ultrasound had an 80% sensitivity and a 75% specificity for identifying malignant nodules. In this study, it was discovered that ultrasonography is a highly sensitive method for detecting multinodular goiter [19, 20].

In 71.8% of cases, FNAC and ultrasound revealed the nodules to be benign with well-defined smooth borders. Moon *et al*.'s study found that more benign nodules than malignant ones had borders that were well defined. The percentage of anechoic nodules in this investigation was 31.25 percent. The safety of each of these anechoic nodules was attested to by the USG and FNAC. In a research by Antti *et al*. 46, 253 patients were randomized to have thyroid ultrasonography screening; 69 of these patients were found to have thyroid lesions and were then monitored for a period of five years. The USG and FNAC found that all of the anechoic nodules were benign even after five years of observation. Many of the lesions had already disappeared without any medical intervention [21, 22].

Pedro Weslley *et al*. conducted a study on 106 nodules and found that 90.5% of them had hypo-echoic characteristics, 59.4% had no calcification, and 26.4% had very small calcification. These findings show that the majority of hypoechoic nodules are malignant. The findings showed that 83% of the hypoechogenic nodules were malignant. Both FNAC and ultrasound confirmed that every case was, in fact, malignant. Both benign and malignant tumors showed isoechoic features. Benign tumors typically have hyperechoic lesions [23, 24].

In this examination, just 5% of the instances were malignant, whereas 95% of the cases were benign. In all, 1232 patients were enrolled in the Bonovita *et al*. trial. Of these patients, only about 3–7% had malignant cases; the remaining patients had benign lesions. Comparably, our investigation discovered 60 benign cases out of 62 patients, while Ankush Danadia *et al*.'s analysis of 100 cases in Gujarat revealed 66 benign cases, 8 malignant cases, and 26 ambiguous cases on USG. On FNAC, a case with well-defined margins and comet tail artifact was identified as papillary carcinoma, despite its hypoechoic appearance. Using FNAC, two of the 66 originally benign cases were later determined to be malignant [25].

In a similar study, Ankush Danadia *et al*. found that in 78.7 percent of patients, the nodule borders were smooth and clearly defined, but in 23.6 percent of cases, they were not. The border of malignant nodules is clearly defined by spiculation. Researchers discovered that 66.6% of malignant nodules had spiculated margins [26].

Solitary nodules larger than 1cm have an increased risk of being malignant, according to an eight-year study by Mary C. Francisco *et al*. on 3200 individuals. In this investigation, all malignant nodules detected by ultrasonography measured more than 1 cm in diameter, with 66.6% of the nodules being

isolated. Additionally, FNAC analysis demonstrated the tumors' aggressiveness. According to Ahuja A *et al*., all patients with comet tail artifact had negative FNAC results. In this study, comet tail artifacts were found to be benign by FNAC in 31.4% of the participants [27].

Conclusion

In this study, there was a correlation between fine-needle aspiration cytology and sonographic assessment of thyroid lesions. The findings might indicate that thyroid cancer is more common in women. Among the anechoic nodules, no malignant tumors were found. Among the benign diseases that ultrasonography is excellent at detecting include medullary carcinoma, multinodular goiter, and thyroiditis. In certain cases, it might be challenging to differentiate between small nodules of papillary carcinoma and small nodules of colloid carcinoma. Papillary thyroid carcinoma accounts for the majority of instances. Ultrasonography is a better noninvasive way to investigate the thyroid gland overall than FNAC. The most precise imaging technique for characterizing the content, size, form, and location of a nodule is ultrasound. Approximately 95% of the lesions were benign, while 5% were malignant. When many nodules were discovered on a thyroid ultrasound, the worrisome lesion was identified using ultrasound guidance, and fine needle aspiration was carried out.

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Conflict of interest

None.

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