

Radiopathological Correlation of Thyroid Masses: A Prospective Study

K P Gupta¹, Anil Gupta², Amita Gupta³

¹Assistant Professor, Department of Radiodiagnosis, Sukh Sagar Medical College, Jabalpur, Madhya Pradesh, India, ²Consultant Pathologist, Department of Pathology, City Hospital and Research Centre, Jabalpur, Madhya Pradesh, India, ³Consultant Pathologist, Advance Pathology Centre, Bhopal, Madhya Pradesh, India

Abstract

Background: Diseases of the thyroid continue to be a common clinical problem having a prevalence rate of 4–7% in the general population. It affects patients in all age groups and the treatment modalities include either a conservative management or a surgical excision of the gland. Fine-needle aspiration cytology (FNAC) is a minimally invasive, accurate diagnostic tool which can differentiate neoplastic from non-neoplastic lesions and, hence, reduces the number of unnecessary thyroidectomy. Ultrasonography (USG) is the most common and the most useful way to image the thyroid gland and its pathology. The study was conducted with the objective of evaluating the applicability of Doppler USG in diagnosing thyroid pathologies, established its superiority over clinical palpation, and correlated histopathologically using FNAC. The type of thyroidectomy can be planned based on the type of the thyroid swelling and thereby preventing the surgical complications. Thyroid gland is afflicted by various pathologies ranging from diffuse enlargement (goiter) to nodular lesions, thyroiditis, and malignancies.

Materials and Methods: This was a prospective study done on 98 patients that came to the outpatient department of the Department of Radiodiagnosis of Sukh Sagar Medical College, Jabalpur, from August 2018 to May 2019. All the patients with thyroid swelling/mass/enlargement were studied under color Doppler USG and then FNAC was performed.

Results: The present study had a total of 98 cases. Cytologic diagnosis was classified under benign, malignant, inconclusive, suspicious, and malignant categories. Among 98 cases, 86 cases were non-neoplastic and 12 were neoplastic. The ratio of non-neoplastic to neoplastic is 7.16:1. Majority of the patients were females in the age group of 41–60 years. USG was found to be more sensitive than clinical palpation. Differences were found when the results of USG were correlated with FNAC.

Conclusion: Ultrasound was found to be more reliable than palpation. The addition of color flow imaging has added value to the prediction of thyroid, but definitive diagnosis can be reached only with FNAC/biopsy. Multinodular goiter was the most common non-neoplastic lesion and papillary carcinoma was the most common neoplastic lesion. Thus, fine-needle aspiration is a very useful and indispensable test in the diagnosis of thyroid lesions.

Key words: Color Doppler, Fine-needle aspiration cytology, Thyroid, Ultrasonography

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]

The incidence of thyroid diseases is increasing in recent years due to goitrogens and changing food habits. Thyroid gland is afflicted by various pathologies ranging from diffuse enlargement (goiter) to nodular lesions, thyroiditis, and malignancies. The development and application of fine-needle aspiration cytology (FNAC) has been helpful in distinguishing benign from malignant nodules and in screening patients for surgery. The fine-needle aspiration method for studying the thyroid was first developed in Sweden in the Rudiunhelmet hospital of Stockholm in the 1950s.^[3] Frable, in 1983, used the FNAC as a means of diagnosing most thyroid masses as either neoplasm or goiter nodules.^[4] Histopathological examination remains

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Corresponding Author: Dr. Anil Gupta, Consultant Pathologist, City Hospital, Jabalpur, MP. E-mail: dr.anilguptaa@gmail.com

the “gold standard” method for the confirmation of the pre-operative diagnosis of FNAC.

At present, high-resolution ultrasound with color Doppler is the primary imaging modality of choice in morphological evaluation of the thyroid gland.^[5,6] Ultrasonography (USG) gives good graphic representation of regional anatomy, has high resolution, small expense, simplicity, and it depicts the internal structure of the thyroid gland and the regional anatomy and pathology without using ionizing radiation or iodine-containing contrast medium.^[7,8]

USG, the most common and the most useful way to image the thyroid gland and its pathology, as recognized in guidelines for managing thyroid disorders, published by the American Thyroid Association.^[9]

It is used to define the nature of the lesion, whether solid or cystic, to differentiate thyroid from extrathyroidal masses, assessment of blood flow pattern in and around lesion, to differentiate between benign and malignant thyroid nodule, invasion in nearby structures, and to identify additional nodular lesions or enlarged lymph nodes.^[5,6]

The drawback of ultrasound is that it may reveal thyroid swellings that are not clinically relevant that leads to unnecessary further investigations, but in experienced hands, USG allows more targeted sampling and is highly reliable.^[10]

Fine-needle aspiration cytology (FNAC) is the investigation of choice in discrete thyroid swellings. FNAC has excellent patient compliance, is simple and quick to perform in the outpatient department (OPD), and is readily repeated. Ultrasound may be used to guide the needle for more accurate sampling. The results of FNAC are reported using the terminology given in Table 1.^[10]

The study was conducted with the objective of evaluating the applicability of Doppler USG in diagnosing thyroid pathologies, establish its superiority over clinical palpation, and correlate histopathologically using FNAC.

Aims and Objectives

The aim of the study is to evaluate the spectrum of diseases in thyroid swellings, to know the accuracy of USG and FNAC in the diagnosis of thyroid swellings.

MATERIALS AND METHODS

This was a prospective study done on 98 patients of thyroid swellings who visited surgical OPD of Sukh Sagar Medical College, Jabalpur, from August 2018 to May 2019. General examination of the patient was done and looked for thyroid

functional abnormality followed by local examination which was carried out to locate and identify the site of the swelling, shape, size, and consistency of the thyroid swelling and clinical diagnosis was made. All thyroid swellings were sent to the Radiodiagnosis Department of Sukh Sagar Medical College for USG. After USG, the patients were sent to the Department of Pathology, City Hospital and Research Centre, Jabalpur, Madhya Pradesh, for FNAC. The cases were subjected to FNAC as outpatient procedure after explaining the details of the procedure to the patient and taking an informed written consent. Several air-dried and wet mount smears were made and are stained with May-Grunwald-Giemsa and papanicolaou stains, respectively.

Inclusion Criteria

Patients with thyroid swelling/mass or thyroid gland enlargement (diffuse or nodular) were included in the study.

Exclusion Criteria

Patients undergoing treatment or recovery after proper diagnosis were not included in the study.

Patients name, age, sex, and presenting complaints were noted.

The investigations were performed using GE VOLUTION P6 USG and GE-VIVID-E USG machine, with a high-frequency probe of 12 MHz. FNAC was done under all aseptic precautions, using a gauge spinal needle and a 10 ml syringe for proper suction.

International ovarian tumor analysis scoring system, RI and PI value, was applied to differentiate benign and malignant masses.

USG of the thyroid gland was performed with the patient in supine position with dorsally extended head. The echotexture of the whole thyroid gland was assessed by subjectively comparing the echo pattern of the lesion with characteristics adjacent neck musculature. Thyroid abnormalities were classified as diffuse or nodular. Vascularity was evaluated using color Doppler flow imaging.

RESULTS

Of the 98 patients that were reviewed in our study, 74 were female (75.5%) and 24 were male (24.5%).

Maximum patients in our study (35%) were found to be in the age group of 41–60 years. The age distribution of patients is shown in Table 2.

Apart from swelling/mass/enlargement, some patients came with the complaints of tremors, weight loss,

menorrhagia, etc. The frequency of such complaints is shown in Table 3.

Of the 98 patients, palpation and clinical examination demonstrated 11 cases of multiple nodules. The number was found to be 41 when USG was performed. Palpation demonstrated 45 cases of solitary nodules and the number of the same on USG was found to be 26. The findings of palpation versus USG are shown in Figure 1. There is gross difference in the findings of USG and clinical examination. Histopathological correlation was done using FNAC samples. The results are shown in Table 4.

The masses that were detected by USG were categorized further based on their echogenicity and color flow patterns. The findings are shown in Figures 2 and 5.

Table 1: Classification of FNAC reports

Thy 1	Non-diagnostic
Thy 1c	Non-diagnostic cystic
Thy 2	Non-neoplastic
Thy 3	Follicular
Thy 4	Suspicious of malignancy
Thy 5	Malignant

FNAC: Fine-needle aspiration cytology

Table 2: Age distribution

Age (years)	Number of patients	Percentage (%)
0–20	09	9.2
21–30	23	23.4
31–40	25	25.5
41–60	32	32.6
61+	07	7.3
	98	100

Table 3: Clinical presentations

Clinical presentation	Number of patients	Percentage (%)
Tremors	3	3
Difficulty in breathing	1	1
Difficulty in swallowing	6	6
Weight gain/menorrhagia	6	6
Weight loss	3	3
Voice change	1	1

Table 4: USG versus FNAC

Pathology	USG	FNAC
Follicular adenoma	14	16
Thyroiditis	32	32
Hyperplastic nodule	3	1
Colloid goiter	40	37
Carcinoma	9	4
Inflammatory cells	-	1
RBS'c only	-	7
Total	98	98

USG: Ultrasonography, FNAC: Fine-needle aspiration cytology

DISCUSSION

The thyroid gland is uniformly hyperechoic on ultrasound in comparison to the adjacent strap muscles and is best seen with the use of high-resolution linear array transducers having frequency ranging from 5 to 10 MHz, and having color flow capability and low flow sensitivity. The use of color flow imaging identifies multiple small vessels within and adjacent to the thyroid.^[11] A total of 100 cases were studied, of which 74 were female (74%) and 2 were male (26%), the female:male ratio is 3:1. Most of the patients were more than 20 years of age and <60 years of age, maximum in the age group of 41–60 years (35%). Ezzat *et al.*,^[16] 1994, in a prospective study of 100 subjects in North America, found abnormal ultrasound findings of the thyroid in 67 patients, with prevalence being greater in women (72%) than in men (41%), and mean age range being 43–50 years.^[8] Ultrasound screening of thyroid gland in a random adult population of 253 subjects in Finland, was goiter, is not endemic, and was carried out by Brander, in 1992. Echo abnormalities were detected in 27.3%. The prevalence showed an increase in the age group of 40–50 years. Women showed significantly more lesions (34.6%) than men (19.5%).^[9] It can be safely said that women, after 40 years of age, are highly prone to developing thyroid abnormalities.

Our study shows significant differences in the findings of USG and palpation. As opposed to an actual of 67% of cases of nodular thyroids, only 56% could be picked up by palpation. Only 11 % of these were appreciated as multiple nodules, in contrast to 44% appreciated by ultrasound. This shows that USG is much more sensitive as compared to clinical palpation, especially multiple small non-palpable nodules. Tan *et al.* showed that clinical palpation is less sensitive than ultrasound in identifying multiple nodules and that a palpable solitary nodule represents a multinodular gland in 50% of patients.^[12] In their study of 72 patients in 1992, Brander found that only one-third of clinically solitary nodules proved to be solitary by ultrasound. Of 77 separate nodules, 43 escaped detection on clinical examination. They reported that nodules smaller than 1 cm in diameter are impossible to detect clinically, unless they are hard and superficial. These observations clearly demonstrate the clinical superiority of USG over clinical palpation.

Forty-one cases of 100 in our study were reported as colloid goiter on USG, of which 39 proved to be colloid goiter on FNAC. The most common echo patterns seen on ultrasound were anechoic, with normal vascularity on color flow imaging. Of 100 cases, 32 came out to

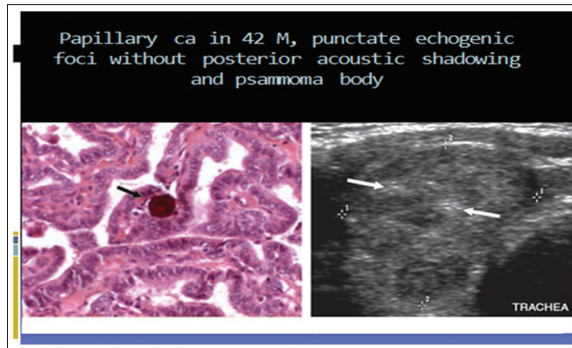


Figure 1: Papillary Ca in 42 M, punctate echogenic foci without posterior acoustic shadowing and psammoma body.

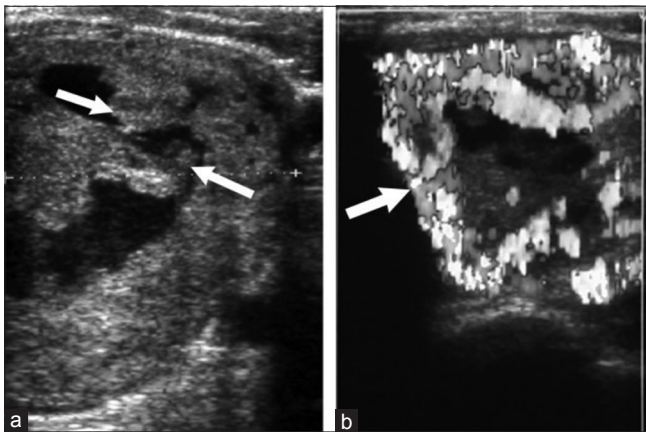


Figure 2: (a and b) Hurthle cell (follicular) carcinoma in a 60-F. Transverse USG of the left lobe of the thyroid shows a partially cystic tumor with solid internal projections and thick walls.

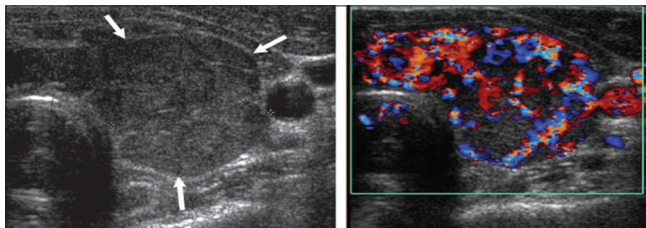


Figure 3: Diffuse follicular variant of papillary thyroid ca in 37 F with thyrotoxicosis mistaken for graves

be thyroiditis on USG and the number was confirmed on FNAC. The most common echo pattern seen on ultrasound was heteroechoic. Langer *et al.* reported that lesion that was lymphocytic thyroiditis on FNAC appears as solid hyperechoic nodules with ill-defined margins on USG.^[13] Hiromastu *et al.* showed that in patients with acute subacute thyroiditis show low echogenicity without increased tissue vascularity in the affected swollen thyroid and in the recovery stage, isoechogenecity with slight increased vascularity.^[14] Diffuse hyperechoic thyroid associated with reduced thyroid volume was found in 53 of 55 (96%) patients with atrophic thyroiditis by Vitti *et al.* These findings correlate with our study that shows the most common

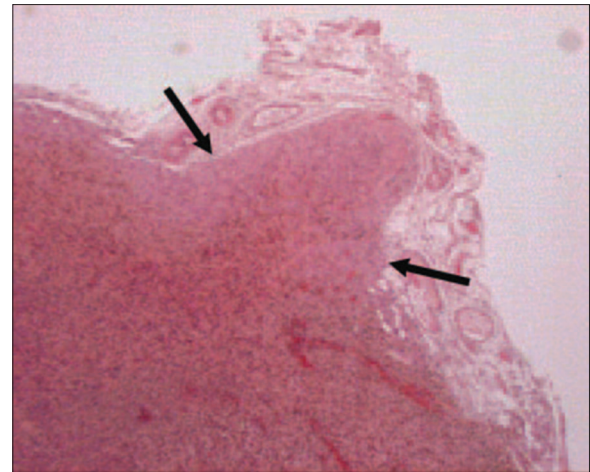


Figure 4: Arrow showing Tumor invasion beyond capsule.

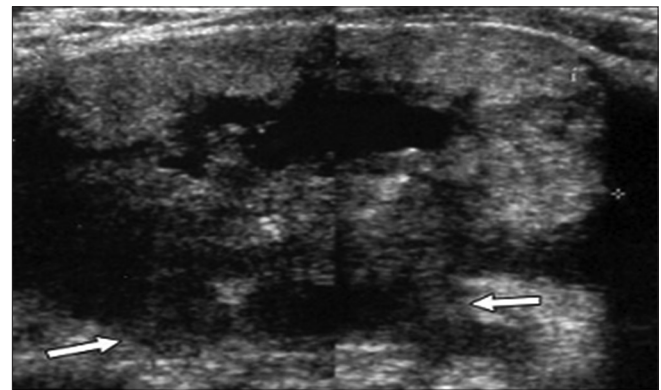


Figure 5: Anaplastic carcinoma in 84 F. Transverse USG of the left lobe of the thyroid shows an advanced tumor with infiltrative posterior margins (arrows) and invasion of prevertebral muscle.

echo pattern seen on ultrasound in thyroiditis was heterogeneous with diffuse vasculature.^[15]

Of 100 thyroid nodules studied, 15 were detected as adenoma on USG (hyperechoic) and 16 were confirmed adenomatous on FNAC. Katz *et al.* (1984) prospectively examined 28 cadaver thyroid glands. The most common echo pattern seen on USG was hypoechogenicity.

CONCLUSION

Ultrasound was found to be more reliable than palpation in differentiating nodular from diffuse gland and especially so for detection of non-palpable nodules. Colloid goiter was the most common presentation on ultrasound and it showed a wide spectrum of appearance, majority being nodular and anechoic. It can reliably differentiate toxic goiter, adenoma, or thyroiditis. The addition of color flow imaging has added value to the prediction of thyroid, but definitive diagnosis can be reached only with FNAC/biopsy.

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