



CORRELATION BETWEEN HIGH-RESOLUTION ULTRASONOGRAPHY AND ULTRASOUND-GUIDED FINE-NEEDLE ASPIRATION CYTOLOGY FOR THE DETECTION OF MALIGNANT NODULES

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ABSTRACT

Aims: Our study aims to evaluate the effectiveness of high-resolution real-time gray-scale ultrasonography with ultrasound-guided fine-needle aspiration cytology (FNAC) in identifying thyroid cancer nodules. Thyroid nodules are a frequent medical condition brought on by a number of thyroid problems. By palpating them, they can be detected in 4%–8% of adults, in 10%–41% of adults by ultrasonography (US), and in 50% of people by pathologic examination at autopsy. The thyroid gland's pathological states and thyroid gland morphology can be accurately assessed by using HRUSG. Our study's objective is to evaluate the reliability of HRUSG in identifying malignant nodules with the help of ultrasound-guided fine-needle aspiration cytology. **Settings and Design:** It is a retrospective study of 50 patients (aged 16–63 years) who were examined with high-resolution ultrasound (HRUSG) of the thyroid gland and for ultrasound-guided FNAC between January 2022 till August 31, 2022 **Material and methods** This study comprised 50 patients with thyroid nodules identified by ultrasonography. Each nodule's properties were identified. Following that, the outcomes were differentiated with Ultrasound-guided FNAC. **Statistical Analysis used:** Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were used **Results:** Out of 50 nodules examined, 10 (20%) were found to be malignant on cytology. **Conclusions** In this study with the aid of Gray-scale ultrasound features of thyroid nodules ,malignant thyroid nodules can be differentiated from those with benign ones. HRUSG findings of hypoechogenicity, microcalcification, and poorly defined margins have high diagnostic accuracy for identifying malignant thyroid nodules as mentioned in our study.

KEYWORDS : Nodule, thyroid gland, ultrasonography, FNAC.

INTRODUCTION-

Thyroid nodules are a frequent medical condition brought on by a number of thyroid issues. They are detected by palpation in 4%–8% of adult patients, ultrasound (US) in 10%–41% of adult patients, and pathologic evaluation at autopsy in 50% of adult patients (1,2) Sonography is commonly the first imaging modality after clinical examination. Fine-needle aspiration (FNA) cytology is the primary tool for evaluating thyroid nodules (3)

The nodules were assessed in terms of their margins, shape, echogenicity, presence of calcification, presence of circumferential halo, and internal composition (4)The benefits of HRUSG include being a widely available, economical, noninvasive, and highly sensitive imaging modality for morphological depiction and separating cystic from solid lesions.

Nodules that are benign usually appear as distinct cystic or solid masses with sharp edges. Solid nodules with relation to the remainder of the gland can be iso- or hyperechoic. If there is calcification, it is typically curvilinear (eggshell calcification). Around the nodule, there could be a thin halo (hypoechoic band).

The majority of benign solid nodules are numerous and hypovascular. Colloid nodules on the US may show a comet tail artefact. (5)

Malignant nodules are often solid, hypoechoic, and have irregular, poorly defined borders in relation to the thyroid gland. The most specific sign of malignancy is punctate psammomatous calcifications [6].

Other potent signs of malignancy include hypervascularity and an incomplete halo surrounding the nodule (7) .Our study's objective is to evaluate the reliability of HRUSG in identifying malignant nodules (8)

A retrospective study of 50 patients (16–63 years old) who received HRUSG of the thyroid gland and ultrasound-guided fine-needle aspiration cytology (FNAC) from January 2022 till August 31, 2022 was included.

Table 1 Distribution of HRUSG characteristics in benign and malignant thyroid nodules

	HRUSG findings of thyroid nodules	Histopathology			
		Benign		Malignant	
		Reading	Percentage	Reading	Percentage
1	Single/Multiple nodules				
	Single	8	16	2	4
	Multiple	32	64	8	16
2	Echogenicity				
	Hyperechoic	4	8	2	4
	Hypoechoic	20	40	8	16
	Mixed echoic	16	32	-	-
3	Halo				
	Present	14	28	-	-
	Absent	26	52	10	20
4	Calcification				
	Present	4(Macro)	8	2 (Micro) 4 (Macro)	12
	Absent	36	72	4	8
5	Component				
	Solid	24	48	10	20
	Solid and cystic	16	32	-	-
6	Margins				
	Well defined	24	48	2	4
	Ill defined	16	32	8	16

MATERIAL AND METHODS

Sonographic features of various thyroid lesions					
Sonographic features of various thyroid lesions	Benign			Malignant papillary CA	Total
	Goiter	Thyroiditis	Follicular adenoma		
Hyperechoic	4	-	-	2	6
Hypoechoic	10	4	6	8	28
Mixed echoic	16	-	-	-	16
Single nodule	2	-	6	2	10
Multiple nodules	28	4	-	8	40
Perilesional halo	14	-	-	-	14
Calcification	4	-	-	6	10
Solid	14	4	6	10	34
Solid and cystic	16	-	-	-	16
Well defined	20	2	2	2	26
Ill defined	10	2	4	8	24

Inclusion criteria:

- (1) Patients with thyroid nodule identified by HRUSG.
- (2) Patients with thyroid nodules who have features likely suggestive of malignancy.

Exclusion criteria:

Patients with diffuse thyroid enlargement with no nodules. Equipment: Gray-scale real-time ultrasound examination was done using 7.5–13 MHz linear array transducer. Ultrasound machine used was GE LOGIC 6

The Standard 25-ga, lumbar puncture needles are utilised for thyroid FNACs. Under ultrasound guidance, the needle is then gently inserted into the solid portion of the nodule. The stillette is then pulled out by itself by around 2-4 cm. The needle is moved back and forth so that the tip moves inside the nodule. First, the stillette is removed. Before removing the needle, the operator closes the hub with their thumb. The hub of the needle was connected to a 10-ml syringe, and the contents of the needle were spread out on slides before the slides were ready for cytology. The 25-ga lumbar puncture needle has the benefit of eliminating the requirement for local anaesthetic and decreasing the risk of infection.

RESULTS

Out of the 50 patients who had HRUSG, 8 patients (16%) had malignant nodules, 26 patients (48%) had benign nodules, and 16 patients (36%) had nodules that were indeterminate. Pathologically, 25 (20%) were malignant and 40 (80%) were benign [Table 3]. The four pathologically confirmed malignant nodules were all accurately identified as such by HRUSG. Two of the 26 benign nodules were found on pathology to be papillary carcinoma, indicating they were malignant. A hyperechoic lesion with a clearly defined margin and macrocalcification was described in that case on HRUSG. On HRUSG, it was classified as benign, but on histology, it was discovered to be papillary cancer. Eight hypoechoic, ambiguous nodules on ultrasound were found to be benign on histology.

Table 3 Correlation of radiological diagnosis with pathological diagnosis

Radiological diagnosis	No. of cases	Pathological diagnosis	
		Benign	Malignant
Benign	13	12	1
Indeterminate	8	8	0
Malignant	4	0	4
Total	25	21	4

DISCUSSION

The majority of the patients in our study (52%) were in the 40–49 age range, with the youngest being 16 and the oldest being 63. The average age was 39. 6 men and 44 (88%) women were present (12 percent). Other researchers' studies revealed a significant proportion of female patients. [9]

According to cytology, of the 50 patients, 40% were benign and 10% were malignant. Eight (58.4%) of the 10 malignant patients with an average age between 20 and 44 years old were female, whereas two (4% of the total) were male patients. Males have a malignancy rate of 2 (33.3%) out of 6 and females have a malignancy rate of 8 (18%) out of 44.

In our investigation, benign colloid goitre, which was present in 60% of cases, was the most prevalent benign pathology. Twelve percent of patients had follicular adenoma, and eight percent had thyroiditis. In a research by Bumiya and Roopa, benign pathology was seen in 90% of instances, with goitre patients making up the majority (66%) of those cases. (10)

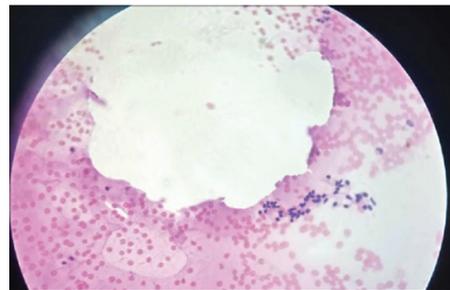


Figure 1. Colloid goitre : scattered and sheets of thyroid follicular epithelial cells lying in colloid

40% of lesions by HRUSG were hypoechoic, 32% had mixed echogenicity, and 8% were hyperechoic [Figure 2]. 20 percent of cases had calcification, and 28 percent had perilesional halo. In 20% of cases, there is a single nodule, and in 80% of cases, there are several nodules. In 52% of the cases, the margin was clearly defined, while in 48%, it wasn't. 38 percent of the lesions were solid-cystic, and 68 percent were solid [Figures 3]. Similar studies demonstrate that well-defined borders, a well-defined thin peripheral halo, a form that is broader than tall, and the absence of microcalcification are sonographic criteria for determining the benign nature of thyroid nodules. [11,12]



Figure 2. HRUSG thyroid – hyperechoic solid nodule with hypoechoic halo



Figure 3. HRUSG – Hyperechoic solid nodule with cystic degeneration

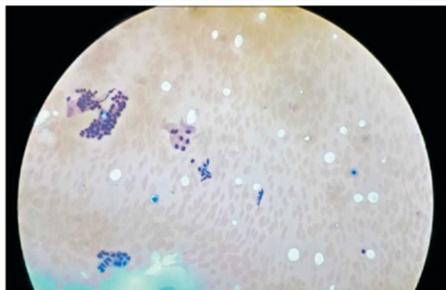


Figure 4. Colloid goitre with cystic degeneration – scattered and sheets of thyroid follicular epithelial cells and hemosiderin laden macrophages

By All three examples of the nodules with a follicular adenoma pathological diagnosis were hypoechoic on ultrasound. One example had well-defined margins, while the other two had ill-defined margins.

In two cases of thyroiditis with pathological proof, the nodules were hypoechoic. One displayed a border that was clearly defined, while the others did not.

The papillary thyroid carcinoma that was found in five patients with malignant thyroid nodules [Figure 5] and who ranged in age from 20 to 44 years old. One nodule was hyperechoic, while four nodules were hypoechoic. Four (80%) of the malignant lesions in our investigation had numerous nodules, compared to one (20%) solitary nodule. Within three malignant nodules (60%) there was calcification (1 microcalcification, 2 macrocalcification). In 20% of malignant instances, the nodule margins were well defined, whereas in 80% of malignant cases, they were not. The perilesional halo did not appear in any of the malignant nodules. Samghabadi et al study .s found that on conventional ultrasonography, the absence of a halo was the best indicator of malignancy. [13] In a study by Hoang et al., microcalcification and hypoechoogenicity are predictive of malignancy.[14] In a study by Sharma et al., predominantly solid composition and hypoechoogenicity of the nodules are predictive of malignancy.[15]

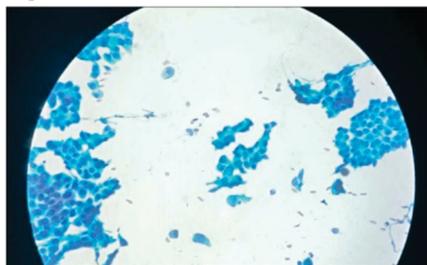


Figure 5.

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