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Original Article

Role of Ultrasound and Colour Doppler in Assessment of Thyroid Nodules

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ABSTRACT

Thyroid nodules, both macroscopic and microscopic, are widespread in the general population with up to 80% of people having them at autopsy. Ultrasonography is now widely available to diagnose thyroid nodules. **Objective:** To determine the role of ultrasound and colour doppler in assessment of thyroid nodule. **Methods:** This cross-sectional study was conducted at Aziz Bhatti Shaheed Teaching Hospital Gujrat, Pakistan from 1st February to 20th June, 2022. In this study total 70 patients with thyroid nodules were included who visited the hospital OPD with the complaint of neck pain and difficulty in swallowing. It included individuals with all ages of wither gender. People with the history of previous neck surgery were excluded. A linear high frequency transducer was used on Toshiba Aplio XG ultrasound machine. Data were analysed by SPSS version 22. **Results:** Total 70 patients were included in this study. Their age ranged from minimum 25 to maximum 74 with median age 47.50 years. As regard age, the mean age of study population was 46.057 ± 11.910. The diagnosis was confirmed by ultrasound and color doppler. As regard ultrasound findings, we classified type of nodule as irregular nodule (n) 2.9%, left solitary nodule (n) 21.4%, right solitary nodule (n) 30.0%, isthmus nodule (n) 7.1%, multi-nodule goiter (n) 18.6%, bilateral nodule (n) 10.0%, heterogenous thyroid nodule (n) 7.1%, complex thyroid nodule (n) 2.9% were present. As regard color doppler flow present in (n) 32.9% and no flow seen in (n) 67.1%. **Conclusions:** Ultrasound is a rapid and secure way to evaluate thyroid nodules. It is the most accurate and cost-effective method for evaluating and monitoring thyroid nodules.

INTRODUCTION

Solid or fluid-filled lumps called thyroid nodules develop in the thyroid gland, which is positioned immediately above the breast bone at the base of neck. The majority of thyroid nodules are benign and do not produce symptoms [1, 2]. Thyroid nodules are malignant in just a small percentage of cases. Thyroid nodules are four times as prevalent in women as they are in males, and they are more common in those who live in iodine-deficient areas [3, 4]. While the majority is benign, roughly 5% of all palpable nodules are cancerous. 4–7% of the population, or 10–18 million people, have palpable thyroid nodules, whereas nodules found by accident during an ultrasonography estimate a prevalence of 19–67% [5, 6]. Thyroid nodules come in many different shapes and sizes. The most common type of nodule is a colloid nodule, which has no elevated risk of cancer. Follicular adenomas, for the most part, are harmless. Follicular malignancies are discovered in about 5% of micro-follicular adenomas [7, 8]. A solitary palpable the most typical sign of thyroid cancer is a thyroid nodule. Thyroid cancer that occurs most frequently is called papillary carcinoma [7, 9]. Nodules less than 1 cm in diameter are typically undetectable unless they are situated in the anterior thyroid lobe. Larger lesions are easier to palpate, with the exception of those deep into the gland. Regardless, nearly half of all ultrasonography-detected nodules are missed on clinical inspection [10, 11]. Ultrasound (US) has emerged as a useful diagnostic tool for the assessment of thyroid nodules. It has a high sensitivity for finding nodules, and it may use the sonographic characteristics of nodules to determine whether further testing is necessary [12]. Because of its safety, non-invasiveness, lack of radioactivity, and effectiveness, the

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best method for identifying thyroid problems is ultrasonography. It can also detect the location, presence, shape, size, and number of thyroid nodules, unilateral or bilateral, marginal, echo structure, echogenicity, and calcifications [13]. The ultrasound shows characteristics malignancy characteristics such as ill-defined margins, irregular shape, hypo-echogenicity, heterogenicity, and the absence of cystic lesions or the appearance of a halo, the presence of calcification, and invasion of nearby organs [14]. Only 4 to 7% of the population has palpable nodules with imaging investigations revealing up to 10 times more nodules, the majority of which are benign [15]. High-resolution ultrasonography, which is able to see small nodules as small as 2mm, can identify them when physical examination cannot [16]. Thyroid nodules are more common in women than in males (4:1), and the prevalence of thyroid nodules rises with age, reaching 50% in women over 70 [17]. With the increased use of neck ultrasonography or other imaging and early identification and treatment, more nodules are discovered by chance [18]. Thyroid nodule can be accessed via Colour Doppler imaging, with the flow pattern of the lesion being characterized into four kinds. In type 0 colour flow absent, type 1 Absent peri-nodular blood flow and slightly intra-nodular blood flow, type 2 prominent blood flow at periphery of nodule, basketlike appearance with or without blood flow at centre (Halo sign), type 3 The nodule has a distinct colour flow across it with inferno Thyroid nodule can be accessed via colour doppler imaging, with the flow pattern of the lesion being categorized pattern [19]. Ultrasound examination of the nodules is a quick and efficient diagnostic way to distinguish between different types of nodules their size, shape, echotexture, unilateral, bilateral as well as a colour doppler assessment of the vascularity of the nodules. This could be extremely beneficial to the patient, since they will be able to begin treatment immediately upon an ultrasound diagnosis, preventing the cancer from spreading to their organs.

METHODS

This cross-sectional study was conducted at Aziz Bhatti Shaheed Teaching Hospital Gujrat, Pakistan. from 1st February to 20th June. It included individuals with all ages of either gender. In this study total 70 patients with thyroid nodules were included who visited the hospital OPD with the complaint of neck pain and difficulty in swallowing. Peoples with a history of previous neck surgery were excluded. A linear high frequency transducer was used on Toshiba Aplio XG ultrasound machine. Data were analysed by SPSS version 22.0. The patient was placed in a supine position with a pillow beneath the shoulders to allow the use of a high frequency probe to help locate pathological conditions and to see the thyroid gland optimally. The exam was done with the neck in a hyperextended position. The thyroid glands right and left lobes was scanned in longitudinal and transverse planes. During the colour doppler examination, the patient was positioned in a supine posture with the neck hyper extended and avoid swallowing during the procedure, and a high frequency linear probe was used. Sagittal and transverse scans along the nodule's maximal diameter were used to determine its vascularity pattern.

RESULTS

Total 70 patients were included in this study, minimum age 25, maximum age 74, mean age 46.057 ± 11.910, shown in Table 1.

	N	Minimum	Maximum	Mean ± SD
Age of Patients	70	25.00	74.00	46.06 ± 11.91

Table 1: Age of patients

As regard ultrasound findings, we classified type of nodule as irregular nodule (n) 2.9%, left solitary nodule (n) 21.4%, right solitary nodule (n) 30.0%, isthmus nodule (n) 7.1%, multi-nodule goitre (n) 18.6%, bilateral nodule (n) 10.0%, heterogeneous thyroid nodule (n) 7.1%, complex thyroid nodule(n)2.9% were present showed in table 2.

Types of thyroid nodules	Frequency (%)
Irregular Nodule	2 (2.9%)
Left Solitary Thyroid Nodule	15 (21.4%)
Right Solitary Thyroid Nodule	21 (30.0%)
Isthmus Nodule	5 (7.1%)
Multi Nodular Goitre	13 (18.6%)
Bilateral Thyroid Nodule	7 (10.0%)
Heterogeneous Thyroid Nodule	5 (7.1%)
Complex Thyroid Nodule	2 (2.9%)
Total	70 (100.0%)

Table 2: Different types of thyroid nodules on ultrasound

As regard colour doppler flow present in (n) 32.9% and no flow seen(n)67.1% showed in table 3.

Findings	Frequency (%)
Flow	23 (32.9%)
No Flow	47 (67.1%)
Total	70 (100.0%)

Table 3: Colour Doppler findings

DISCUSSION

The current study shows right solitary thyroid nodules was present 30% and left solitary nodules was present in 21.4% and multinodular goitre was present in 18.6%. A study done by Kamran M. et al, shows the frequency of thyroid incidentalomas in Karachi population with solitary nodule present in 55% and multiple nodule present in 45% of subjects [20]. This current study showed least patients with irregular margin nodules, only 2 patients had irregular margin nodules. A study done by Sudhir et al, on incidental thyroid nodules an ultrasound screening of the neck region

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prevalence and risk factors their study showed out of 15 patients, 11 had margins that were clearly defined, whereas 4 had ill-defined margins. That study determined that nodules that lost their smooth border were suspicious nodules that need more testing to establish the diagnosis [21, 22]. In the current study, we classified the type of nodule based on ultrasound findings. Irregular nodule, left solitary thyroid nodule, right solitary thyroid nodule, isthmus nodule, multinodular goitre, bilateral thyroid nodule, heterogeneous thyroid nodule and complex thyroid nodule. Irregular nodule 2.9%, left solitary nodule 21.4%, right solitary nodule 30.0%, isthmus nodule 7.1%, multi-nodule goitre 18.6%, bilateral nodule 10.0%, heterogeneous thyroid nodule 7.1%, complex nodule 2.9% were present. In this study classified the type of nodule as solitary nodule were present 64% of all patients and multi-nodule was 12% of all patients [20, 23]. As for the nodular outline in the current study, irregular or ill-defined nodule were present 2,9% in 2 patients. In this study ill-defined or irregular nodule were present 28% in 7 patients. A crucial criterion for distinguishing between malignant and benign nodules was the presence of poorly defined margins in malignant thyroid nodules [24, 25]. In the current study doppler results showed presence of flow in (n) 32.9% and no flow were seen in (n) 67.1%. The value of using the ultrasound (US) is considered as a diagnostic tool for suspected nodules. Additionally, ultrasound can make it simple to distinguish between nodule type, number, size and extent as well as echogenicity, calcification, margin, component and vascular involvement.

CONCLUSIONS

Ultrasound is a rapid and secure way to evaluate thyroid nodules. It is the most accurate and cost-effective method for evaluating and monitoring thyroid nodules. Additionally, ultrasound can differentiate between various nodule types and their sizes, shapes, echotextures and vascularity involvement of nodules with central intra-nodular vascularity are regarded as suspicious nodules in color doppler.

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