International Journal of Applied
and Natural Sciences (IJANS)
ISSN(P): 2319-4014; ISSN(E): 2319-4022
Vol. 5, Issue 2, Feb - Mar 2016; 15-20

International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

ROLE OF COLOR DOPPLER ULTRASONOGRAPHY IN DIFFERENTIATING MALIGNANT FROM BENIGN THYROID NODULES

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ABSTRACT

Aim

To evaluate the role of color Doppler ultrasonography in differentiating malignant from benign thyroid nodules

Materials and Methods

This is a retrospective study over 1 year, involving 51 patients. All patients underwent CDUSG, followed by FNAC. CDUSG findings were evaluated taking FNAC as standard.

Results

Of the 10 patients who were found to be having malignant thyroid nodules on FNAC, color Doppler was true positive in 4 cases and false negative in 2 cases. Thus, CDUSG showed a Sensitivity= 66.6%; specificity= 93.3%; negative predictive value= 95.4%; positive predictive value=57.1%.

Conclusions

The color Doppler characteristics of thyroid nodule cannot be used as an independent diagnostic tool to differentiate malignant thyroid nodules from benign. FNAC is a must needed diagnostic tool to know the nature of these nodules.

KEYWORDS: Thyoid Nodule, FNAC, Color Doppler

INTRODUCTION

Thyroid nodules are common in adults, with a reported prevalence of up to 50% [1-3]. Furthermore, 9% to 15% of nodules identified during clinical examinations are diagnosed as malignant [4, 5]. In Indian population, thyroid nodules are seen in about 8.5% of the population [6]. Ultrasonography (US) being the primary imaging investigation, is easily tolerated by patients and is cheaper and faster to perform than other methods. Additionally, it provides the ability to perform ultrasonographically guided fine-needle aspiration biopsy (FNAB). Many sonographic features including size, shape, location, echogenicity, outline, presence of a halo and micro calcifications are evaluated for differentiation between benign and malignant thyroid nodules [7, 8]. With the advent of US with Colour Doppler, type of vascularity is being studied as predictor for thyroid malignancy [9]. This study evaluates the role of Colour Doppler Ultrasonography (CDUS) in formulating a predictive criterion for differentiating benign and malignant thyroid nodules.

MATERIALS AND METHODS

This study was carried out from August 2012 to August 2013. A total of 51 patients with clinically suspected

thyroid swelling were included in this study, with no gender or age discrimination. Thyroid ultrasound with color Doppler study was performed by radiologists using Toshiba Xerio 30 at 7-14 MHz, with special emphasis on vascular pattern. This was followed by fine needle aspiration cytology (FNAC) from the thyroid swelling. Color Doppler findings were analyzed in the light of pathology reports. Descriptive statistics were used to describe the data i.e. Mean and SD for quantitative variable while frequency and percentages for qualitative variables. Sensitivity, specificity, positive predictive, negative predictive values were calculated for CDUS taking FNAC as gold standard.

RESULTS

A total of 51 patients were included in the study, of which 9 were male (17.6 %) and 42 were female (82.3%). Of these 51 patients, 10 were diagnosed as having malignant disease on FNAC. 7 patients were reported as having malignant thyroid nodule on CDUSG, of which 3 patients did not show any malignant change on FNAC. Color Doppler was unable to pick up 2 cases of malignant thyroid nodule.

Statistical study of our findings showed the following results:

Sensitivity= 66.6%; specificity= 93.3%; negative predictive value= 95.4%; positive predictive value=57.1%.

Table 1: N=51

Diagnosis	CDUSG	FNAC
Malignant	07	06
Benign	44	45

DISCUSSIONS

Thyroid nodule is defined as a discrete swelling within an otherwise apparently normal gland. FNAC is considered to be the gold standard for diagnosing thyroid malignancy within these thyroid nodules which may later on be substantiated by histopathological report of the excised surgical specimen. Although FNAC is relatively safe it is still associated with patient discomfort. In addition FNAB examinations may lead to false negative results due to inadequate or inappropriate thyroid tissue sampling. Therefore, there is a need to develop a simple, reliable and non-invasive technique in order to assess the thyroid nodules. Sonography depicts the internal structure of the thyroid gland and the regional anatomy and pathology without using ionizing radiation or iodine containing contrast medium [10]. The procedure is safe and is less costly than any other imaging procedure. The patient remains comfortable during the test, which takes only a few minutes, does not require discontinuation of any medication, or preparation of the patient. Doppler ultrasonography being a non-invasive, inexpensive and repeatable modality can be used as a valuable tool during the diagnosis and follow up of patients with thyroid nodules. Reports in literature underline the usefulness of colour flow Doppler in the diagnosis of certain forms of malignant tumors in various organs, such as liver, breast, parotid gland, ovary, kidney, prostate tumors, as well as in the differential diagnosis of lymph nodes enlargement. Our study showed that patients harboring thyroid nodules were mainly females (82%). This is very much in accordance with international studies, which favor female predilection for the disease. The overall percentage of malignancy in our series (11.6%) is higher than that recently observed by Cappelli ET al16 (4.6%) and Lin ET al17 (3.6%). Many studies have investigated whether the ultrasonographic characteristics of thyroid nodules are useful indicators of histological malignancy. There is almost unanimous agreement that the presence of micro calcifications within a nodule is associated with thyroid cancer [7, 11]. The aim of this study was to stress the importance of Doppler ultrasound to assess the differentiation of benign from malignant thyroid nodules in

patients with thyroid swelling. This is also mentioned in many international studies. Varverakis et al concluded that reports published in the literature to date have shown that all patients with thyroid nodules should be studied in the first stage of their illness and in follow-up by using Doppler techniques. With new ultrasound software, one can obtain a better and more complete vascular study of the thyroid gland. Resistance and pulsatility indices, diameter of inferior thyroid artery and its flow velocity are parameters prone to pathologic and morphologic changes [12-14, 4]. In our study, one of these parameters: types of vascularity were noted which others have also described [15]. A number of studies done with Colour-flow Doppler (CFD) sonography have disclosed intense vascularization of malignant thyroid nodules, as this method might be able to provide important reference data to enable differentiation between benign and malignant nodular pathology. In thyroid malignancy, the most common pattern of vascularity is marked intrinsic hypervascularity, defined as central flow in the tumor [16].

Varverakis et al suggested that the absence of vascularization correlates with the size of the nodules, but not with their benign or malignant feature which also supports findings of the study [17]. Moreover, Shiamamoto et al found that the detection of Colour signals inside the thyroid nodule depends on its size but not on its histologic features [18]. Most studies evaluating the role of Colour Doppler sonography for the prediction of malignancy have limited the study population to nodules that are cold on radionuclide scans (i.e., nodules that do not take up a radioisotope) [19]. In a larger study of more than 100 patients with cold nodules, a hypervascular pattern alone was not a statistically significant finding for the prediction of malignancy [20]. In our study, scintigraphy was not performed routinely. Our study shows that although the degree of vascularity as determined by Colour Doppler imaging differs in malignant and benign nodules, the role of Colour Doppler sonography in the evaluation and treatment of malignant thyroid nodules is limited. Characteristics revealed by ultrasonography — such as hypoechogenicity, micro calcifications, irregular margins, increased nodular flow visualized by Doppler, and, especially, the evidence of invasion or regional lymphadenopathy — are associated with an increased risk of cancer; however, sonographic findings cannot reliably distinguish between benign and cancerous lesions on the basis of the sonographic appearance, Colour Doppler characteristics, or both [21,22]. One large study that included 30 cases of papillary cancer found no significant difference in the Colour flow patterns of benign versus malignant nodules [20]. Argalia et al pointed out that the measurement of Peak Velocity and Resistance Index may be useful in the characterization of solid nodules and the selection of patients to undertake FNA33. The difference in color Doppler findings of benign and malignant thyroid nodule scan is helpful in patients with a large number of thyroid nodules who might otherwise be subjected to multiple FNAs. In such a patient, the presence of type 3 vascularity in a solid nodule could direct the choice of the lesion to sample.

CONCLUSIONS

The color Doppler characteristics of thyroid nodule cannot be used as an independent diagnostic tool to differentiate malignant thyroid nodules from benign. FNAC is a must needed diagnostic tool to know the nature of these nodules. However, color Doppler can be useful in patients with multiple thyroid nodules where it can aid in deciding the dominant nodule from which FNA should be done. More studies are needed to evaluate the role of duplex scan in thyroid malignancy.

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