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Original Research Article

Use of Multiparametric Ultrasonography in Determining Parenchymal Thyroid Diseases

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Abstract

Aim: The aim of the study was to evaluate of Parenchymal Thyroid Diseases with multiparametric Ultrasonography.

Material and Methods: This study was conducted in the Department of Radiology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India for one year. Patients were divided into five groups such as group I (normal); group II had first detected, early untreated Hashimoto disease (EH); group III comprised of chronic Hashimoto patients that are under treatment and/or follow up (H); group IV had multinodular parenchymal hyperplasia (M); and group V had nodular hyperplasia with Hashimoto (HM). They underwent spectral Doppler ultrasound and acoustic radiation force impulse using Siemens ACUSON S 2000 machine. Quantitative spectral doppler parameters such as resistivity index (RI), acceleration time (AT) and quantitative elastography such as shear wave velocity (SWV) was recorded.

Results: Out of 250, 60% were male and 40% female most of the patients between 30-40 years 42% and followed by 40-50 years was 32% shows in table1. The Distribution of patients based on diseases and each group had 50 patients show in table 2.The mean RI in group I was 0.59, in group II was 0.62, in group III was 0.47, in group IV was 0.53 and in group V was 0.55 mean AT in group I was 27.9, in group II was 26.8, in group III was 71.5, in group IV was 47.8 and in group V was 46.5, mean SWV in group I was 1.53, in group II was 1.72, in group III was 1.22, in group IV was 1.46 and in group V was 1.71. The difference was significant (P< 0.05).

Conclusion: The resistivity index, acceleration time and shear wave velocity together are reliable for differential diagnosis of parenchymal thyroid diseases.

Keywords: Elastography, Hashimoto disease, thyroid gland, ultrasonography.

Introduction

Thyroid diseases are among the most common endocrine disorders seen in all age groups. They have great impact patients' health.[1]. Most of diseases are benign and often necessitate lifelong treatment and monitoring[2] Hyperthyroidism, hypothyroidism, subclinical hypothyroid-ism, congenital hypothyroid-dism, graves' disease, thyrotoxic nodule, thyroiditis, hashimoto's thyroiditis and thyroid cancer etc. are commonly occurring thyroid diseases. The common symptoms are nervousness, weight loss, dyspnea, palpitation, increased sweating, fatigue,

tachycardia, eye complaints, weakness, increased appetite, vomiting, swelling of legs, chest pain etc[3] Globally, thyroid cancer is increasing rapidly and resulted in 36,000 fatalities in 2010, an increase from 24,000 in 1990, although 5 year survival rates are high following treatment[4,5] A previous study state that, between 1992 and 2006, a total of 43,644 thyroid cancer cases were diagnosed in the United States[6] In China, thyroid cancer is the 8th most frequent cancer, and the rapid increase in thyroid cancer incidence represents a substantial health burden[7,8] Ultrasound (US) is an accepted standard diagnostic method for the detection of thyroid nodules worldwide[9]

Differential diagnosis in advanced stages of diffuse and nodular thyroid parenchymal diseases is quite difficult with gray-scale ultrasonography because findings are usually very similar to each other. Also, nodular changes in multinodular (M) form and a chronic autoimmune disease Hashimoto (H) could be seen together in clinical practice[10] Actually, chronic autoimmune disease may show different radiologic characteristics depending on its stage: for early-stage disease (Early Hashimoto, EH) ultrasonography is done at the beginning, and for chronic-stage disease (Chronic Hashimoto, H) ultrasonography is done when the patient is under a medical treatment. Different pathologic stages during progression of the disease are hard to differentiate from each other with the conventional ultrasound (US)[11,12] Although there are many studies regarding radiological differential diagnosis of nodules (nodule–pseudo-nodule or benign–malignant nodule) in the literature, there are not enough studies on differential diagnosis of parenchymal changes in heterogeneous parenchyma of H, due to diffuse or other nodular parenchymal diseases with multinodular dysplasia.

Material and methods

This study was conducted in the Department of Radiology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India for one year, after taking the approval of the protocol review committee and institutional ethics committee. Total 250 adults' patients with age range 18-62 years the gender was include in this study. All patients were informed regarding the study and their consent was obtained. Particulars such as name, age, gender was recorded in case history performa.

Methodology

A thorough clinical examination was performed in all patients. Patients were divided into five groups such as group I (normal); group II had first detected, early untreated Hashimoto disease (EH); group III comprised of chronic Hashimoto patients that are under treatment and/or follow up (H); group IV had multinodular parenchymal hyperplasia (M); and group V had nodular hyperplasia with Hashimoto (HM). They underwent spectral Doppler ultrasound and acoustic radiation force impulse using Siemens ACUSON S2000 machine. Quantitative spectral doppler parameters such as resistivity index (RI), acceleration time (AT) and quantitative elastography such as shear wave velocity (SWV) was recorded. Results were subjected to statistical analysis for correct inference. P value less than 0.05 was considered significant.

Results

Out of 250, 60% were male and 40% female most of the patients between 30-40 years 42% and followed by 40-50 years was 32% shows in table1. The Distribution of patients based on diseases and each group had 50 patients show in table 2.The mean RI in group I was 0.59, in group II was 0.62, in group III was 0.47, in group IV was 0.53 and in group V was 0.55 mean AT in group I was 27.9, in group II was 26.8, in group III was 71.5, in group IV was 47.8 and in group V was 46.5, mean SWV in group I was 1.53, in group II was 1.72, in group III

was 1.22, in group IV was 1.46 and in group V was 1.71. The difference was significant (P< 0.05). table.

Table 1: Age and gender distribution of patients

Gender	**N=250**	**%**
Male	150	60
Female	100	40
Age		
Below 30	9	3.6
30-40	105	42
40-50	80	32
Above 50	56	22.4

Table 2: Distribution of patients

Groups	**Group I**	**Group II**	**Group III**	**Group IV**	**Group V**
Diseases	Normal	Early untreated Hashimoto disease (EH)	Chronic Hashimoto (H)	Multinodular parenchymal hyperplasia (M)	Nodular hyperplasia with Hashimoto (HM)
Number	**50**	**50**	**50**	**50**	**50**

Table 3: Assessment of spectral Doppler parameters group

Parameters	**Group I**	**Group II**	**Group III**	**Group IV**	**Group V**	**P-value**
RI	0.59	0.62	0.47	0.53	0.55	0.01
AT	27.9	26.8	71.5	47.8	46.5	0.001
SWV	1.53	1.72	1.22	1.46	1.71	0.01

Discussion

The application of color and power doppler modes has huge benefit to determine thyroid gland vascularity. This can evaluate the disease progression, specifically with Graves' disease and thyroiditis. Moreover, it is also capable of assessing vascularity within septations in thyroid cystic lesions which RI in different groups. Assessment of AT in groups and assessment of SWV in different groups differentiates benign and malignant cysts[13]. USG is better for postoperative follow up and for FNA and Tru-cut needle biopsy guidance. However, it is still considered to be operator dependent, poorly identify the retrosternal and laryngeal extension and lack of sensitivity and specificity for some cases.[14] Thyroid USG is used for the measurement of parenchymal volume, assessing vascular characteristic of gland, screening, and differentiation of the nodules.[15] After the technologic developments about the transducers and high resolution screens, gray scale and Doppler examinations became easier.[16] Additionally, SWV expensed the scope of elastography and enabled the quantitative examination of the nodules and the thyroid parenchyma with the help of hardware and software. Besides thyroid nodule evaluations, many works reported value of elastography to detect changes of thyroid parenchyma in diseases that affects thyroid parenchyma including HT[17]. The present study was conducted to determine parenchymal thyroid diseases using.

Ultrasonography (USG) in adult patients. In present study, we included 250 adult patients. Patients were divided into five groups such as group I (normal); group II had first detected, early untreated Hashimoto disease (EH); group III comprised of chronic Hashimoto patients that are under treatment and/or follow up (H); group IV had multinodular parenchymal hyperplasia (M); and group V had nodular hyperplasia with Hashimoto (HM). Yildirim et al[18] in their study evaluated findings of 227 patients (179 females, 48 males) that underwent spectral Doppler ultrasound and acoustic radiation force impulse. Authors found no significant effect of gender or volume on the differentiation of disease pattern. RI (0.41 ± 0.06) and SWV values (1.19 ± 0.18 m/s) were the lowest. AT values (>55 ms) were the highest in EH group. Existence of H decreased RI and SWV values, while it extended AT in a different thyroid disease. We found that the mean RI in group I was 0.59, in group II was 0.62, in group III was 0.47, in group IV was 0.53 and in group V was 0.55 mean AT in group I was 27.9, in group II was 26.8, in group III was 71.5, in group IV was 47.8 and in group V was 46.5, mean SWV in group I was 1.53, in group II was 1.72, in group III was 1.22, in group IV was 1.46 and in group V was 1.71. The difference was significant (P< 0.05). Popoveniuc G, et al[19] in their study assessed of thyroid diseases by ultrasound in 167 patients. The study groups were classified into 9 groups. Authors found that thyroid USG has great role in assessment of thyroid disease and in their follow up.

Conclusion

We concluded that the resistivity index, acceleration time and shear wave velocity together are reliable for differential diagnosis of parenchymal thyroid diseases.

Reference

1. Surks MI, Chopre IJ, Mariash CN, Nicoloff JT, Solomon DH. American Thyroid Association guidelines for use of laboratory tests in thyroid disorders. JAMA. 1990;263(11):1529–1561.
2. Bagchi N, Brown TR, Parish RF. Thyroid dysfunction in adults over age 55 years. Arch Intern Med. 1990;150(4):785– 787.
3. Sarkis LM, Norlen O, Aniss A, Watson N, Delbridge LW, Sidhu SB, et al. The Australian experience with the Bethesda classification system for thyroid fine needle aspiration biopsies. Pathology. 2014;46(7):592–595.
4. Vigneri R, Malandrino P and Vigneri P: The changing epidemiology of thyroid cancer: Why is incidence increasing? Curr Opin Oncol 27: 1-7, 2015.
5. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn SY, et al: Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. Lancet 380: 2095-2128, 2012.
6. Aschebrook-Kilfoy B, Ward MH, Sabra MM and Devesa SS: Thyroid cancer incidence patterns in the United States by histologic type, 1992-2006. Thyroid 21: 125-134, 2011.
7. Chen W, Zheng R, Zeng H, Zhang S and He J: Annual report on status of cancer in China, 2011. Chin J Cancer Res 27: 2-12, 2015.
8. Wang Y and Wang W: Increasing incidence of thyroid cancer in Shanghai, China, 1983-2007. Asia Pac J Public Health 27: NP223-NP229, 2015.
9. Morris LF, Ragavendra N and Yeh MW: Evidence-based assessment of the role of ultrasonography in the management of benign thyroid nodules. World J Surg 32: 1253-1263, 2008.
10. Liang XN, Guo RJ, Li S, Zheng ZM, Liang HD. Binary logistic regression analysis of solid thyroid nodules imaged by high-frequency ultrasonography, acoustic radiation force impulse, and contrast-enhanced ultrasonography. Eur Rev Med Pharmacol Sci. 2014; 18:3601–10.

11. Russ G, Leboulleux S, Leenhardt L, Hegedüs L. Thyroid incidentalomas: Epidemiology, risk stratification with ultrasound workup. Eur Thyroid J. 2014; 3:154–63.
12. Nam-Goong IS, Kim HY, Gong G, Lee HK, Hong SJ, Kim WB, et al. Ultrasonography-guided fine-needle aspiration of thyroid incidentaloma: Correlation with pathological findings. Clin Endocrinol. 2004; 60:21–8.
13. Woliński K, Szczepanek-Parulska E, Stangierski A, Gurgul E, Rewaj-Łosyk M, Ruchała M. How to select nodules for fine needle aspiration biopsy in multinodular goitre. Role of conventional ultrasonography and shear wave elastography - A preliminary study. Endokrynol Pol. 2014;65(2):114–118.
14. Jung WS, Kim JA, Son EJ, Youk JH, Park CS. Shear wave elastography in evaluation of cervical lymph node metastasis of papillary thyroid carcinoma: Elasticity index as a prognostic implication. Ann Surg Oncol. 2015;22(1):111–116.
15. Szczepanek-Parulska E, Woliński K, Stangierski A, Gurgul E, Biczysko M, Majewski P. Comparison of Diagnostic Value of Conventional Ultrasonography and Shear Wave Elastography in the Prediction of Thyroid Lesions Malignancy. PLoS One. 2013;8(11):e81532.
16. Colakoglu B, Yildirim D, Alis D, Ucar G, Samanci C, Ustabasioglu FE, et al. Elastography in Distinguishing Benign from Malignant Thyroid Nodules. J Clin Imaging Sci. 2016; 6:51–56.
17. Calvete AC, Mestre JDB, Gonzalez JMR, Martinez ES, Sala BT, Zambudio AR. Acoustic Radiation Force Impulse Imaging for Evaluation of the Thyroid Gland. J Ultrasound Med. 2014;33(6):1031–1040.
18. Yildirim D, Alis D, Bakir A, Ustabasioglu F, Samanci C, Colakoglu B. Evaluation of parenchymal thyroid diseases with multiparametric ultrasonography. Indian J Radiol Imaging. 2017;27(4):463–463.
19. Popoveniuc G, Jonklaas J. Thyroid Nodules. Med Clin North Am. 2015;96(2):329– 349