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Original Research Article

Evaluation of color Doppler study of thyroid swellings: a prospective study at JSS hospital, India

Shivakumar S., Ravishankar N., Vamseedhar Reddy Chapparapu*

Department of Surgery, JSS Medical College, Mysuru, Karnataka, India

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***Correspondence:**
Dr. Vamseedhar Reddy Chapparapu,
E-mail: vamseedhar.ch@gmail.com

ABSTRACT

Background: Color Doppler sonography of thyroid is an emerging and promising pre-operative investigatory modality for thyroid diseases at present. Because of superficial location and good vascularisation of thyroid gland high resolution real time grey scale and color Doppler sonography can delineate and demonstrate the normal thyroid anatomy and pathological conditions with remarkable clarity.
Methods: Present study includes total number of 50 cases admitted in JSS Hospital, Mysore, India from September 2014 to September 2016. Color assisted duplex sonography was performed following a detailed history and physical examination. All routine investigations and specific investigations like thyroid function tests and FNAC were done. Later on patients were subjected to thyroid surgery as required, based on the diagnosis. The histopathological findings obtained for the resected thyroid specimens were compared with the previously scan findings.
Results: Thyroid ultrasound was efficient in picking up all 50 cases in our study. The most common benign lesion determined in our study were adenomatous nodules which was the most common benign lesion, we were able to detect malignant nodules with a better specificity. According to several reports, for the differentiation of benign versus malignant thyroid nodules, sonography has sensitivity rates ranging from 63% to 94%, specificity from 61% to 95% and an overall accuracy from 80% to 94%. In our study we found sensitivity of 55.56%, specificity of 90.24%, positive predictive value of 55.56%, and negative predictive value of 90.24% and overall diagnostic efficiency of 84%.
Conclusions: Ultrasound is valuable for identifying many malignant or potentially malignant thyroid nodules. Although there is some overlap between the ultrasound appearance of benign nodules and that of malignant nodules, certain features are helpful in differentiating between the two. The newly developed high resolution ultrasonography with color Doppler flow mapping function can reveal fine details of the thyroid gland and the haemodynamic features of thyroid neoplasms.

Keywords: Colour Doppler ultrasonography, Echogenicity, Microclacifications, Thyroid nodules, Vascularity pattern

INTRODUCTION

Thyroid ultrasound differentiates solid from cystic lesions, solitary nodules from multinodular and diffuse enlargement, and extrathyroidal lesions. The newly developed high resolution ultrasonography with color Doppler flow mapping can reveal fine details of the thyroid gland and the haemodynamic features of thyroid neoplasms.[1]

Thus the combination of conventional sonography and color flow Doppler provides benefits in increasing the screening sensitivity and accuracy in distinguishing malignant thyroid nodules.[2]

METHODS

Present study includes total number of 50 cases admitted in JSS Hospital, Mysore from September 2014 to September 2016. Color assisted duplex sonography was performed following a detailed history and physical examination. All routine investigations and specific investigations like Thyroid function tests and FNAC were done. Later on patients were subjected to thyroid surgery as required, based on the diagnosis. The histopathological findings obtained for the resected thyroid specimens were compared with the previously scan findings.

RESULTS

Summary statistics are done by using sensitivity, specificity, positive predictive value and negative predictive value. Graphical representation is done using Microsoft Excel. Majority of the patients belonged to age group of 31-50 years with a mean of 44.9 years. Second most common age group was more than 51 years. 82% of the patients were female. Thyroid lesions are most commonly seen in female patients.

Table 1: Vascularisation pattern of thyroid lesions.

Vascularisation pattern	n	Percent
Peripheral vascularity	7	14.0
Internal vascularity	5	10.0
Both peripheral and internal vascularity	26	52.0
No significant vascularity	10	20.0

Out of 50 cases,7 cases showing peripheral vascularity, 5 cases showing internal vascularity, 26 cases showing both peripheral and internal vascularity and 10 cases showing no significant vascularity.

Table 2: Color Doppler findings of thyroid lesions.

Colour Doppler finding	Count	Column N %
Ca thyroid	9	18.0%
MNG	13	26.0%
Nodular goitre	10	20.0%
Solitary nodule	16	32.0%
Thyroiditis	2	4.0%

Out of 50 cases, 9 cases showing carcinoma thyroid,13 cases showing multi-nodular goiter,10 cases showing nodular goiter,16 cases showing solitary nodule and 2 cases showing thyroiditis (Table 2).

Out of 50 cases, 25 cases showing colloid goiter, 6 cases showing follicular adenoma, 4 cases showing hashimotos thyroiditis, 1 case was medullary carcinoma, 6 cases showing nodular goiter and 8 cases showing papillary carcinoma (Table 3).

Table 3: Histopathology findings of present cases.

Histopathology finding	Count	Column N %
Colloid goiter	25	50.0%
Follicular adenoma	6	12.0%
Hashimotos thyroiditis	4	8.0%
Medullary Ca	1	2.0%
Nodular goitre	6	12.0%
Papillary ca	8	16.0%

Table 4: Diagnostic validity of Doppler study with correlation to histopathology.

		Histopathology	
		Malignant	Benign
		n	n
Doppler	Malignant	5	4
	Benign	4	37

Out of 50 cases, 41 cases showing benign lesions, 9 cases showing malignant lesions in both doppler and histopathology.

Table 5: Statistical analysis of present study.

Parameter	Percent
Sensitivity	55.56
Specificity	90.24
Positive predictive value	55.56
Negative predictive value	90.24
Diagnostic accuracy	84

DISCUSSION

The present series of study consisted of 50 cases who presented with thyroid diseases. Certain points related to the subject are considered in the discussion.

Colloid goiter

This study found colloid goitres the commonest lesion with 25cases out of 50 cases (50%). Almost 11 of these lesions were hyperechoic, 2 cases` were isoechoic. 4 cases were cystic in nature, 4 cases were hypoechoic.

Table 6: Findings of other studies.

Study	Percentage
Scheible W et al	52%
Mehta N et al	71.2%
Present study	50%

William Scheible has seen peripheral ‘’halo’’ rim in 4 of 13 cases and incomplete ‘’halo’’ in another 4 cases.[3] In our study we saw 3 cases with complete peripheral halo and no case showing such peripheral or egg shell calcification.

Follicular neoplasm

The echogencity of thyroid adenomas vary considerably but the majorities are more echogenic than normal thyroid parenchyma and are solitary whereas adenomatous nodules are usually multinodular.

In this study, 5 out of the 50 cases were found to be thyroid neoplasm. On ultrasound 4 cases were hyperechoic and 1 case heterogenous echotexture.

Table 7: Comparison with Simone et al study.

Simeone et al	**68%**
Present study	12%

Thyroiditis

There are different types of thyroiditis. The most common type is chronic autoimmune lymphocytic thyroiditis (Hashimoto's thyroiditis). The typical sonographic appearance of Hashimoto's thyroiditis is diffusing coarsened parenchymal echotexture generally more hypoechoic than the normal thyroid. Micronodulation is a highly sensitive sign of `chronic thyroiditis with a positive predictive value of 94.7%.[4] In our study, we found 4 cases are being Hashimoto's thyroiditis and 2 out of 4 showed diffuse enlarged gland with diffuse hypoechogenicity.

Thyroid malignancy

Most of the primary thyroid cancers are epithelial in origin and most of them are well differentiated and papillary carcinoma accounts for 75-90% of all cases. Thyroid microcalcifications are one of the most specific features of thyroid malignancy. With ultrasound microcalcifications appear as punctate hyperechoic foci without acoustic shadowing.

Coarse calcifications are the most common type of calcification is commonly associated with medullary carcinomas. They may be seen in multinodular goiters also ultrasound is valuable for identifying many malignant or potentially malignant thyroid nodules. Although there is some overlap between the ultrasound appearance of benign nodules and that of malignant nodules, certain ultrasound features are helpful in differentiating between the two.

These features include micro-calcifications, local invasion, lymph node metastases, and a nodule that is taller than it is wide and markedly reduced echogencity. Other features, such as absence of halo, ill-defined irregular margins, solid composition and vascularity are less specific but may be useful ancillary signs.

Distinction between follicular adenoma and well differentiated follicular carcinoma is based solely on microscopic evidence of vascular invasion which is often over difficult to determine pathologically, much less sonographically as observed by Gershengover M et al, Walters et al in a study had found out 26% of cystic lesions are malignant.[5] However in our study we did not find any cystic lesion with malignant changes. Most of the authors agree that absolutely specific echographic features of thyroid carcinoma do not exist, but literature data are very variable.[6] Solbiati et al found out only 68% of the malignant lesions were hypoechogenic.[7]

In this study out of 50 a total of 9 patients showing Ca malignancy on color Doppler study. 1 patient pre-operative ultrasonography diagnosis as ? Solitary nodule? Malignancy which was not included as Ca malignancy. Out of 9 patients 5 patients histopathology report confirmed as malignancy In our study we found 4 cases of malignancy showing predominantly hypoechogenic lesions.

Table 8: Comparison with Solbiati et al study.

Workers	Percentage of malignancy showing hypoechogencity
Solbiati et al	68%
Present study	36%

In a study conducted by Hoang JK, MBBS, FRANZCR, Lee WK et al showed that microcalcifications are one of the most specific ultrasound findings of a thyroid malignancy. Microcalcifications were found in 29%-59% of all primary thyroid carcinomas.[8] In our study we detected only 4 cases of malignancy showing micro calcifications.

Table 9: Comparison with Hoang JK et al study.

Workers	Percentage of malignancy showing microcalcification
Hoang JK et al	59%
Present study	36%

Rago T, Vitti P et al showed in their study that the combination of absent halo sign plus microcalcification plus intranodal flow pattern achieved a 97.2% specificity for the diagnosis of thyroid malignancy.9 In our study we obtained a specificity of 100% using these parameters to evaluate malignancy.

Table 10: Comparison with Rago T et al study.

Workers	Specificity in detection of malignancy using absent halo sign plus micro calcification plus intranodal flow pattern
Rago T et al	97.2%
Present study	100%

Diagnostic validity of duplex sonography with its histopathological correlation

This study found sensitivity of 55.96, specificity of 90.24%

Table 11: Comparision of present study with other studies.

	Lin JH et al[10]	Present study
Sensitivity	51.9%	55.56%
Specificity	93.9%	90.24%

Table 12: Diagnostic efficiency.

Present Study	84%
Lin JH et al[10]	86.8%
Tae HJ et al[11]	86.5%

CONCLUSION

Ultrasound is valuable for identifying many malignant or potentially malignant thyroid nodules. Although there is some overlap between the ultrasound appearance of benign nodules and that of malignant nodules, certain features are helpful in differentiating between the two. The newly developed high resolution ultrasonography with color Doppler flow mapping function can reveal fine details of the thyroid gland and the haemodynamic features of thyroid neoplasms.

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