



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<http://doi.org/10.5281/zenodo.4433449>Available online at: <http://www.iajps.com>

Research Article

**DIAGNOSTIC ACCURACY OF ULTRASONOGRAPHY IN
DIAGNOSIS OF PAPILLARY CARCINOMA IN PATIENTS
WITH THYROID NODULES**¹Zunaira Hannan, ²Dr Muhammad Talha Nazir, ³Rao Awais Akhtar¹Mayo Hospital Lahore, ²Allied / DHQ Faisalabad, ³Shaikh Zayed Hospital Lahore.

Article Received: November 2020 Accepted: December 2020 Published: January 2021

Abstract:

Objective: The objective of this study was to determine the diagnostic accuracy of ultrasonography in the diagnosis of papillary carcinoma in patients with thyroid nodule, keeping histopathology as gold standard.

Material and Methods: This study was a cross sectional study. The study was carried out in Mayo Hospital Lahore and the duration of this study was from January 2019 to January 2020. Sample size was 153, using 59% sensitivity, 69.77% specificity, 95% confidence level, 75% proportion of thyroid nodule, 2.3 and 9% margin of error.

Results: In this study mean age was 49 years with standard deviation \pm 2.13. Most of the patients 83% were female and 17% patients were male. Seventy-four percent patients had multinodular and 26% patients had solitary nodules. Correlation of Ultrasonic versus histopathological findings was analyzed as in 55 diagnosed cases of ultrasound, histopathological report has shown 48 cases in which papillary carcinoma was present and in 7 cases the papillary carcinoma not found. Similarly, in 98 undiagnosed cases of ultrasound, histopathological report has shown 82 cases in which papillary carcinoma was present and in 16 cases the papillary carcinoma was not found. Sensitivity was found to be 75%, specificity was 92%, positive predictive value was 87% and negative predictive value was 83%.

Conclusion: In conclusion, CDUS, with the advantages of being noninvasive, radiation free and lower cost, may be employed as the first-line study in screening for PTC. Characteristics of CDUS on thyroid imaging are useful in differentiation of the malignant nodules from the benign ones. However, ultrasound- guided fine needle aspiration of the thyroid nodules should be considered as the standard in diagnosing PTC.

Keywords: Ultrasonic, Histopathological, Papillary Carcinoma, Recurrent Laryngeal Nerve, Papillary Carcinoma Paralysis.

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Please cite this article in press Zunaira Hannan et al, *Diagnostic Accuracy Of Ultrasonography In Diagnosis Of Papillary Carcinoma In Patients With Thyroid Nodules.*, Indo Am. J. P. Sci, 2021; 08(1).

INTRODUCTION:

In the early phase of goitrogenesis, it is diffuse and with time. Tends not only to grow but also to become nodular. these nodules may be solitary or multinodular and may palpable thyroid nodules, thought to be solitary, are actually part of a multinodular thyroid gland. these nodules occur in 4-7% of the adult population, and with high resolution ultrasonography, these have been detected in up to 50% of people over 40 year of age. the indigence of these nodules increases with age, iodine deficiency, history of radiation exposure, and diet containing goitrogenic material. exposure to radiation in childhood results in changes in thyroid endocrine function and increases the risk of both benign and malignant thyroid nodules. Thyroid nodules are more common in females (6.4%) as compared to males (1.5%) and this predisposition exists throughout all age groups, while these nodules in males is much more likely to be malignant than in females these nodules are very common between 30 to 60 years. but the chances of malignancy are more in patients younger than 30 year or older than 60 years. Thyroid cancer is the most common endocrine malignancy, in which the incidence of papillary thyroid carcinoma, the most common malignancy of the thyroid, accounts for more than 75% of thyroid malignant tumor. Thyroid ultrasonography is use as fist time diagnostic procedure for detecting and characterizing nodular thyroid disease: Micro calcification is the most important indicator of papillary thyroid carcinoma on ultrasonography. With a sensitivity of 59% and specificity of 69.77%. Which appears only 0.74% in giter. The aim of this study is to find out the importance of ultrasonography in the diagnosis of papillary thyroid carcinoma because there is no facility of fine needle aspiration ethology in our hospital and routinely, we do ultrasonography for every patient having thyroid nodule but there is no study conducted on it in our institution in the past. If in our study the sensitivity and specificity of ultrasonography in detecting papillary thyroid carcinoma is found to be significant. Then we will recommend ultrasonography as a screening tool for the detecting of papillary carcinoma of thyroid nodules because it is cost effective, less time consuming, non invasive and the expertise are easily available in our hospital.

MATERIAL AND METHODS:

This study was a cross sectional study. The study was carried out in Mayo Hospital Lahore and the duration of this study was from January 2019 to January 2020. Approval of the ethical committee of the hospital was sought. Patients having thyroid nodule & fulfilling the inclusion criteria was selected. The selection of patients having thyroid nodule were physically examined, selected from out patient department (OPD) of otorhinolaryngology /Head & Neck surgery, those referred from OPD or from other units of the Mayo Hospital Lahore. All the included patients were explained the purpose of procedure. Use of data and publication of the study informed written consent was taken from the patients. The demographic information like name, age sex and address were recorded. Through history was taken and detail physical examination was preformed.

The base line investigation as will specific investigation like thyroid function test was done. The ultrasound was done from an ultrasound specialist having more than seven years' experience. Its characteristics having solid echo structure, hypo echogenicity, fine or micro clarification, and ill-defined margin, were recorded as the papillary carcinoma. After surgical excision of the thyroid nodule by an expert ENT, Head & Nick surgeon, the specimen was sent in formation for histopathological examination to histopathologist having more then seven-year experience to detect papillary thyroid carcinoma. The type of treatment was performed according to medical ethics, beneficial and non harmful to the patients. The exclusion criteria were strictly followed to control confounders and exclude bias in study result. All the result was followed by myself and all the above-mentioned information's were recorded in pre-diagnosed proforma. The collected data was entered in SPSS version 10. Mean and standard deviation was calculated for numeric variables like age, while the frequency and percentage were calculated categorical variables like sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) was determined by taking histopathology as gold standard 2X2 table.

		Histopathology	
		+	-
Ultrasound	+	48	7
	-	16	82

RESULTS:

This study was conducted at Mayo Hospital Lahore. In which a total of 153 patients of papillary carcinoma in thyroid nodular were study. Age distribution among 153 patients were analyzed as most of the patients n=54 (35%) was in age group 51-60 years followed by n=46 (30%) patients were in age group 41-50 years, n=31(20%) patients were in age group 31-40 years, n=13 (9%) patients were above 60 years, n=7(5%) patients were in age group 21-30 years and only two patients were below 20 years of age. Mean age was 49 years with standard deviation ± 2.13 . (as shown in Table no 1). Gender distribution among 153 patients were analyzed as most of the patients n=127(83%) were female while n=26(17%) patients were male. (as shown in Table no 2). Type of thyroid nodules among 153 patients were analyzed as most of the patients n=113(74%) had multi-nodules while n=40(26%) patients had solitary nodules. (as shown in Table no 3). Ultrasonic findings among 153 patients were analyzed as papillary carcinoma was found in n=55(36%) patients

while papillary carcinoma not found in n=98(64%) patients. (as shown in Table no 4).

Histopathological findings among 153 patients were analyzed as papillary carcinoma was found in n=130(85%) patients while papillary carcinoma not found in n=23(15%) patients. (as shown in Table no 5). Correlation of Ultrasonic versus histopathological findings was analyzed as in 55 diagnosed cases of ultrasound, histopathological report has shown 48 cases in which papillary carcinoma was present and in 7 cases the papillary carcinoma not found. Similarly, in 98 undiagnosed cases of ultrasound, histopathological report has shown 82 cases in which papillary carcinoma was present and in 16 cases the papillary carcinoma not found. (as shown in Table no 6). Sensitivity and specificity of papillary carcinoma was analyzed as sensitivity was 75%, specificity was 92%, Positive predictive value was 87% and Negative predicative value was 83%. (as shown in Table no 7).

Table No 1. Age Distribution (n=153)

Age Distribution	Frequency	Percentage
< 20 Years	2	1%
21-30 Years	7	5%
31-40 Years	31	20%
41-50 Years	46	30%
51-60 Years	54	35%
Above 60 Years	13	9%
Total	153	100%

Mean age was 49 years with SD ± 2.13 .

Table No 2. Gender Distribution (n=153)

Gender Distribution	Frequency	Percentage
Male	26	17%
Female	127	83%
Total	153	100%

Table No 3. Type of Thyroid Nodules (n=153)

Type of Thyroid Nodules	Frequency	Percentage
Solitary Nodule	40	26%
Multi-nodules	113	74%
Total	153	100%

Table No 4. Papillary Carcinoma on Ultrasound (n=153)

Papillary Carcinoma on Ultrasound	Frequency	Percentage
Yes	55	36%
No	98	64%
Total	153	100%

Table No 5. Papillary Carcinoma on Histopathology (n=153)

Papillary Carcinoma on Histopathology	Frequency	Percentage
Yes	130	85%
No	23	15%
Total	153	100%

Table No 6. Correlations of Ultrasound Vs Histopathological Findings (n=153)

		Histopathological		Total
		Yes	No	
Ultrasound	Yes	48	7	55
	No	82	16	98
Total		130	23	153

Table No 7. Sensitivity and Specificity of Papillary Carcinoma (n=153)

		Histopathology	
		+	-
Ultrasound	+	48	7
	-	16	82

Sensitivity was 75%

Specificity was 92%

Positive Predictive value (PPV) was 87%

Negative Predictive Value (NPV) was 83%

DISCUSSION:

The morbidity of PTC has been increasing in China in recent years. Thyroid carcinoma, especially PTC, has high prevalence in women at young age. In our study, 40% patients with PTC were women at age between 25 and 35 years, which was four times as many as that in men (10%) with PTC. CDUS with high-resolution images has been considered the imaging of first choice in screening for thyroid diseases, especially in detecting PTC at early stage. In our study the incidence of multinodular was more 74% as compare to solitary nodules 26%. Moreover, ultrasonic had detected 36% cases of papillary carcinoma while according to Histopathological reports a total of 85% cases were recorded in which papillary carcinoma was diagnoses. Similar results were observed in study done by Chan BK et al in which the incidence of multinodular was 76% and solitary nodules were 24%. Forty percent cases of papillary carcinoma were detected by ultrasound while sixty percent cases were recorded by histopathological reports. In our study the correlation of ultrasonic findings versus histopathological findings was analyzed and had been concluded that although the ultrasound findings in diagnosis of papillary carcinoma are not accurate as compare to histopathological results but it can help to predict the papillary carcinoma in some extent. In this study 55 diagnosed cases of ultrasound, histopathological report has shown 48 cases in which papillary

carcinoma was present and in 7 cases the papillary carcinoma not found. Similarly, in 98 undiagnosed cases of ultrasound, histopathological report has shown 82 cases in which papillary carcinoma was present and in 16 cases the papillary carcinoma not found. Similar observation was recorded in other studies done by Chan BK et al, Wienke JR et al.

How to distinguish malignant nodules from benign ones is still challenging. Certain characteristics on CDUS images would be helpful in the differential diagnosis of PTC and benign nodules.¹⁰⁶ The types of the calcification in the thyroid nodule with PTC can be classified into microcalcification, coarse calcification, peripheral calcification and "eggshell" calcification. Microcalcification is the most important indicator of PTC, with a sensitivity of 29% to 59% and specificity of 96.77%, which appears only 0.74% in goiter. Microcalcification could be detected in 29% to 59% of the primary thyroid carcinomas, especially in PTC. It can also be visualized in follicular thyroid carcinomas. Furthermore, microcalcification may appear not only in the primary thyroid carcinoma, but also in metastatic thyroid carcinoma. Therefore, the appearance of microcalcification in the thyroid nodule could be considered as an indicator of high risk for malignancy. However, microcalcification must be distinguished from the condensed colloid and dense fibrosis in benign thyroid nodules. The comet-tail or

ringdown artifact is commonly observed in the thyroid nodule with condensed colloid and dense fibrosis. Coarse calcification, presenting as irregular hyperechoic foci with acoustic shadowing, can be seen in benign nodules of the thyroid. Malignant thyroid nodule is highly suggested when there is a single solid nodule with internal abundant blood supply and high resistance index in a young patient. Peripheral and “eggshell” calcifications are more commonly seen in benign nodule, which is rarely observed in PTC.

Thyroid nodule is a very common condition, which is about 4% to 7% in the adults (this probability increases with age). Most of the thyroid nodules are benign, and only less than 7% are malignant; it is highly concerned which one is malignant among numerous nodules. In our study, 51 cases (50%, 51/104) of PTC had coexistence of goiter and papillary carcinoma, which is the same as what KIM EK *et al* had reported that among numerous solitary nodules, the risk of benign nodules was equal to malignant. The number of the thyroid nodule, as a single factor in detecting PTC, is not related with either benign or malignant. More important factors that need to be observed carefully are echotexture, vascularity, capsule and microcalcification. The maximum diameter of PTC in this study was 19.4 mm. The size of the nodules that reaches up to a significant diameter can demonstrate more manifestations and symptoms of local infiltration or metastasis. There were 29 nodules of PTC with smaller than 10 mm in diameter detected in our study. There were 63.5% cases with ill-defined border and 36.5% with well-defined border in the patients with PTC. We noticed that the smaller PTC had clearer border than that in larger ones. Being larger, PTC may infiltrate into thyroid parenchyma, which forms irregular boundary. Therefore, the border of the thyroid nodule alone is not helpful in determining benign or malignant of the thyroid nodule. Ill-defined border is seen in some nodules with PTC on CDUS, in which the capsule of the nodule is found on histological review. As reported, about 15% to 59% of benign nodules had ill-defined border and appeared as macro lobulations or micro lobulations.

Majority of PTC typically appears solid and hypoechoic compared with healthy thyroid parenchyma. Using the strap muscles as the reference, the hypoechoic rises up to 94% for the specificity of malignant nodule, but sensitivity is lowered down to 12%. Markedly hypoechoic nodule is suspicious for malignancy. Although single or multiple thyroid nodules with cystic component

suggest benignity, the cystic nodule with papilla solid component should be carefully distinguished from cystic PTC. Manifestations of cystic PTC on CDUS are no-capsule cystic lesion containing solid papillary component, abundant blood flow in papilla and microcalcification in the nodule. Our study shows that sensitivity and specificity of papillary carcinoma was analyzed as sensitivity was 75%, specificity was 92%, Positive predictive value was 87% and Negative predictive value was 83%. Similar results were found in study done by Wienke JR *et al* in which sensitivity of papillary carcinoma was 76%, specificity was 91%, Positive predictive value was 85% and Negative predictive value was 84%. Similarly, results were also observed in another study conducted by Frates MC *et al* in which sensitivity of papillary carcinoma was recorded as 74%, specificity was recorded as 93%, Positive predictive value was 82% and Negative predictive value was 81%.

The pattern of blood flow in the thyroid nodule on color Doppler or power Doppler is very useful in the diagnosis of PTC. Intrinsic or intranodular flow is more common than peripheral flow in PTC. The resistance index of the artery in the nodules is generally not used in assessing the degree of malignancy in PTC. It is very common to see cervical lymph nodes while performing CDUS of the thyroid and carotid artery. Enlarged cervical lymph nodes may result from malignant metastases, such as thyroid carcinoma, lymphoma and lung cancer. It can also be a benign condition, for instance, in Hashimoto thyroiditis. An enlarged cervical lymph node with hypervascularity was the first clinical finding in 4 of 104 cases in our study. Lymph node metastasis from PTC would be suspected if the lymph node appears microcalcification, hyper vascular and the same characteristics as the nodule in the thyroid.

CONCLUSION:

In conclusion, CDUS, with the advantages of being noninvasive, radiation free and lower cost, may be employed as the first-line study in screening for PTC. Characteristics of CDUS on thyroid imaging are useful in differentiation of the malignant nodules from the benign ones. However, ultrasound- guided fine needle aspiration of the thyroid nodules should be considered as the standard in diagnosing PTC.

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