Original Article

Evaluation of Ultrasonography and Fine Needle Aspiration Cytology in Diagnosing Thyroid Nodules

FNAC in Thyroid Nodules

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ABSTRACT

Objective: The present study was conducted to compare diagnostic validity of ultrasonography and fine needle aspiration cytology (FNAC) in thyroid gland swellings.

Study Design: Observational study

Place and Duration of Study: This study was conducted at the Department of Radiology Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad and Department of Pathology Indus Medical College Tando Muhammad Khan, from April 2014 to September 2016

Materials and Methods: A sample of 100 thyroid patients was selected according to the inclusion criteria of age ≥ 20 years, and volunteers, new cases of thyroid neck swellings. Clinical examination was performed followed by sonography and FNAC with 23 G disposable syringe of 10 ml (BD, USA). Data was collected on a structured proforma. Software SPSS 22.0 version (IBM, incorporation, USA) was used for data analysis at 95% Confidence interval (P≤0.05).

Results: Mean ±SD age of study subjects was 49.7±11.5 years. 63% were female and 37% male subjects (p=0.0001). Overall sensitivity, and specificity, PPV and NPV of sonography in identifying malignant thyroid lesions was 69%, 87%, 56% and 58% respectively.

Conclusion: The present study shows thyroid sonography is an extremely useful non-invasive test for ruling out the malignant lesions when combined with FNAC.

Key Words: Sonography, Fine Needle Aspiration Cytology, Thyroid Nodules

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INTRODUCTION

Thyroid gland swellings are very common. Thyroid gland nodules of any nature are termed as the goiter. Goiter is a common endocrine disorder and a surgical problem of routine clinical practice. A prevalence of 3-8% thyroid nodules reported in general population. In persons with >65 years of age, the prevalence reaches to 50%.[1,2] Profile of thyroid nodules is frequently encountered in all age groups particularly, the adolescent age, except for those geographical areas where there is iodine deficiency. Thyroid nodules may present clinically as hypothyroidism, hyperthyroidism or simply as glandular enlargements.[3] A previous study reported 5-10% adult general population proved of having thyroid pathologies and nodular thyroid swellings were most frequent found in 2.5-3% of cases.[4] Prevalence of hyperthyroidism is reported in 2% and 0.6% of male and female populations. While the hypothyroidism and goiter is reported in 4.8% and 0.9% and 2.9% and 0.4% cases respectively. Prevalence of thyroid swellings increases with aging.[5] Sonography for the thyroid lesions was first introduced in the 1966-1967.[6] Since then, it has been widely used and now used as an excellent modality in clinical practice.[7] After clinical examination of thyroid nodules, the sonography is the first imaging modality. Fine needle aspiration cytology (FNAC) is now a well-established, first line, non-invasive and rapid screening and diagnostic tool for thyroid nodules. Major limitation of FNAC is the inadequate sampling of tissue which depends on the experience of clinician and overlapping of cytological features.[8] Sonography is a non-invasive, simple, easy available and cost effective procedure for the screening of thyroid nodules. Sonography helps in detecting thyroid lesions at an earlier age. Hence it helps clinicians for differential diagnosis for a rapid reach to the final diagnosis and institution of medical therapy and or surgical intervention. The sonography has unleashed a multitude of clinically unapparent thyroid lesions in differentiating benign and malignant lesions.[9,10] The present study was conducted to evaluate correlation of diagnostic validity of ultrasonography and fine needle aspiration cytology (FNAC) for thyroid gland nodules at tertiary care hospital.

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MATERIALS AND METHODS

The present observational study was conducted at the Department of Radiology, Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad and Department of Pathology Indus Medical College Tando Muhammad Khan, from April 2014 to September 2016. A sample of 100 thyroid patients (63 female and 37 male) was selected according to the inclusion criteria of age ≥ 20 years, and volunteers, new cases of thyroid neck swellings of both gender presenting for the first time. Diagnosed cases of thyroid lesions and being treated thyroid disorders were exclusion criteria. A structured proforma was used for the data collection, entry and confidentiality. Consent form was signed in advance before entry of study protocol. Clinical examination was performed by the clinicians for making a diagnosis of thyroid swellings and excluding other neck swellings. Sonography was performed by a Consultant Radiologist and fine needle aspiration cytology was interpreted by a Consultant Pathologist. Sonography was performed by "GE LOGIQ P5" with a linear probe of 4-12 MHz. High frequency transducers (7.5 -15.0 MHZ) were used for the deep ultrasound penetration up to 5 cm and images with a resolution of size of 0.7 -1.0 mm. Linear array transducers were preferred compared to sector transducers due to wide near-field of view. 23 G disposable syringe of 10 ml (BD, USA) were used for aspiration of thyroid nodules tissue specimen. The part was sterilized with spirit swabs and patients were taken into confidence that the procedure does not cause any harm and is useful for the patients themselves. Two smears were prepared from the thyroid nodule aspiration. First slide was air dried and stained with MGG stain, while the second slide was fixed in ether and stained with H&E staining. Ethical approval was taken before conducting and planning for the research. Data was collected on a structured proforma as mentioned above. The Data sheet was typed on SPSS 22.0 version (IBM, incorporation, USA) for data analysis. Student t-test analyzed the numerical data and results were presented as mean and standard deviation (SD). Chi square test was used for categorical data analysis, sensitivity, specificity, positive predictive value (PPV) negative predictive value (NPV) were calculated from the data. Data was analyzed at 95% Confidence interval (P≤0.05).

RESULTS

Mean ±SD age of study subjects was 49.7±11.5 years. 69% of subjects were 4th to 7th decade of age (p=0.0001). Most common age category was the 5th decade noted in 35% of subjects. 63% were female and 37% male subjects (p=0.0001). Female to female ratio was 1.7:1 (p=0.0001). Sonography Echogenecity of thyroid lesions is shown in table 2. Majority of thyroid lesions showed hyper echoic features (p=0.0001). Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of ultrasonography are shown in table 3. Of 100 samples, 65 (62 benign lesions and 3 malignant lesions) were hyper echoic, 25 (9 were benign and 16 were malignant) were hypo echoic and 7 were iso echoic and 3 were anechoic. On the basis of hypo echoic nature of the lesion; the sensitivity, specificity, PPV and NPV of sonography was 80%, 86%, 67% and 92% respectively. Of these 100 samples, the 65 lesions (62 benign, 3 malignant) showed well defined tissue architecture by FNAC and 35 lesions (25 malignant, 10 benign) were proved with ill defined margins. Thus, on the basis of ill defined margins of the lesions; the sensitivity, specificity, PPV and NPV of Sonography was 85%, 85%, 65% and 95% respectively. The sensitivity, specificity, PPV and NPV on sonography for the calcification, vascularity and anteroposterior to transverse (A/T) ratio are shown in the table 3. Overall sensitivity, and specificity, PPV and NPV of sonography in identifying malignant thyroid lesions was 69%, 87%, 56% and 58% respectively. The sonography is a good non-invasive test for ruling out the malignant thyroid lesions, this may be used for rapid clinical diagnosis and for surgical procedures.

Table No.1. Characteristics of study population (n=100)

Age	No	%
20- 29.9 years	13	13.0
30- 39.9 years	18	18.0
40- 49.9 years	35	35.0
50- 59.9 years	23	23.0
≥60 years	11	11.0
Male	37	37.0
Female	63	63.0
Urban Male	19	19.0
Urban Female	18	18.0
Rural Male	42	42.0
Rural Female	21	21.0

Table No.2. Sonography findings of thyroid lesions (n=100)

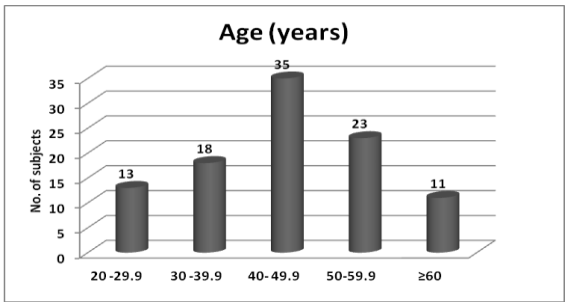
	No	%	P-value
Hyper echoic lesions	65	65.0	0.0001
Hypo echoic lesions	25	25.0	
Iso echoic lesions	7	7.0	
An echoic lesions	3	3.0	

P-value significant, Chi square testing

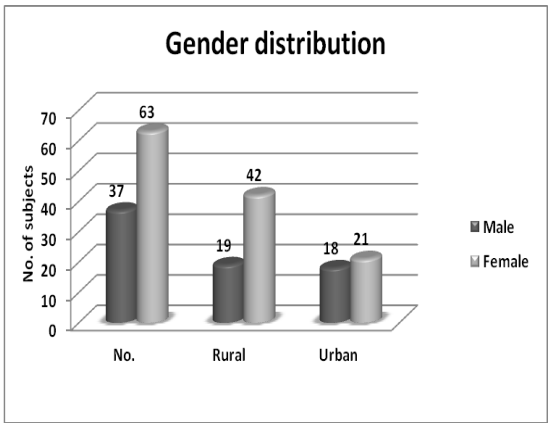
Table No.3: Sensitivity, specificity, PPV and NPV of ultrasonography of thyroid nodules

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Echogenecity	80	86	67	92
Calcification	69	87	65	90
Vascularity	65	83	59	89
A/T ratio	63	80	59	85

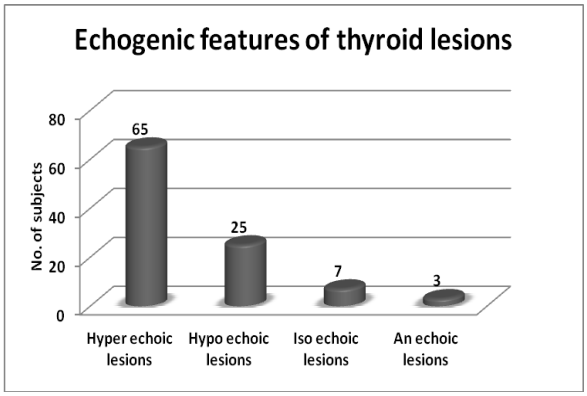
PPV- positive predictive value, NPV- Negative predictive value, A/T ratio- anteroposterior to transverse ratio



Graph No.1. Age distribution of study subjects



Graph No.2: Gender distribution of study subjects



Graph No.3: Echogenecity features of thyroid lesions

DISCUSSION

Ultrasonography (sonography) has occupied its dignity in clinical practice because of being non-Invasive, inexpensive, and authenticity. Sonography is safe as it free of radiations. Now-a-days sonography has become the first line imaging modality for the evaluation of thyroid gland swelling and nodules because of excellent visualization of thyroid parenchyma. Sonography is highly sensitive as it detects vascularity, septations, fibrosis, calcifications, cysts, etc. Fine needle aspiration cytology (FNAC) is another less invasive technique of confirming the diagnosis. The present study evaluated the diagnostic utility of sonography and FNAC of thyroid lesions which is being reported for the first time from our tertiary care hospital. Thyroid nodular lesions are common and a previous study reported 50% prevalence at ultra-sonography in the adult population.[11] Nodular thyroid hyperplasia is the most common cause of benign thyroid lesions and <7% of nodules may prove malignant.[12] The present study compares the ultrasonography in the evaluation of thyroid lesions in correlation with FNAC at our tertiary care hospital. Mean ±SD age of study subjects was 49.7±11.5 years. 69% of subjects were 4th to 7th decade of age (p=0.0001). Most common age category was the 5th decade noted in 35% of subjects. The findings are in agreement with previous studies.[13,14] Of 100 thyroid lesions, 63% were female and 37% male subjects (p=0.0001) proved a female to male ratio of 1.7:1 (p=0.0001). These findings are in full agreement with previous studies.[13-15] Of 100 samples, 65 (62 benign lesions and 3 malignant lesions) were hyper echoic, 25 (9 were benign and 16 were malignant) were hypo echoic and 7 were iso echoic and 3 were anechoic. On the basis of hypo echoic nature of the lesion; the sensitivity, specificity, PPV and NPV of sonography was 80%, 86%, 67% and 92% respectively. The above findings of sonography in comparison to FNAC are in keeping with previous studies,[14-16] as they reported approximately similar results. Of these 100 samples, the 65 lesions (62 benign, 3 malignant) showed well defined tissue architecture by FNAC and 35 lesions (25 malignant, 10 benign) were proved with ill defined margins. Thus, on the basis of ill defined margins of the lesions; the sensitivity, specificity, PPV and NPV of Sonography was 85%, 85%, 65% and 95% respectively. The findings are in accordance with previous studies.[17,18] Overall sensitivity, and specificity, PPV and NPV of sonography in identifying malignant thyroid lesions was 69%, 87%, 56% and 58% respectively. The findings are in full agreement with previous studies[19,20] as the sensivity, specificity; PPV and NPV reported by these previous studies are consistent to the present study. A previous study[21] reported findings of hypo echoic nature (87%), ill-defined margins (48%), micro calcifications (44%), and A/T ratio >1(40%) is in agreement with above study. The findings of calcification of thyroid lesions proved as one of least sensitive marker in predicting the malignancy which is inconsistent finding. However, these findings are in keeping with studies as reported by Mary et al[22] and Enrido et al,[23] they reported highest correlation of malignancy with central vascularity. The Enrido et al[23] reported the sensitivity rates of malignancy by sonography by degree of hypo echoic nature (87%), central vascularity (75%) micro calcifications (29%) and ill-defined margins (77%). The findings are consistent to the present study as the irregular margins

and vascularity showed highest correlation with malignant thyroid lesions on the sonography. Sonography findings suggestive of increased risk of thyroid cancer include hypo echogenicity, vascularity, solid texture, and irregular margins increase the chances of diagnosis of malignancy. However, high controversies have been reported for from study to study and country to country.[24,25] The present study shows sonography is a good non-invasive test for ruling out the malignant thyroid lesions; this may be used for rapid clinical diagnosis and for surgical procedures.

CONCLUSION

The present study shows sonography is an extremely useful non-invasive test for ruling out the malignant thyroid lesions; and this may be used for rapid clinical diagnosis and for the surgical procedures. Overall sensitivity, and specificity, PPV and NPV of sonography in identifying malignant thyroid lesions was 69%, 87%, 56% and 58% respectively compared to fine needle aspiration cytology.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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