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A STUDY ON THE ROLE OF SHEAR WAVE ELASTOGRAPHY IN CHARACTERIZATION OF THYROID NODULE USING CYTOLOGY AS GOLD STANDARD

Radio-Diagnosis

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ABSTRACT

Background- Sonographic characterisation of thyroid nodular disease has been always challenging for radiologists. Histopathology is the gold standard but it is invasive. Our study aims to assess the role Shear wave Elastography (SWE) in differentiation of benign and malignant thyroid nodules, taking cytology as the gold standard.

Material and method- A Prospesctive study was done on patient with 62 clinically suspected thyroid nodule who were refered for USG . Gray-scale USG and SWE were then performed using 14 MHz linear transducer

Results- Out of 62 nodule 24 were malignent and 38 were benign on cytology . SWE is done and Elasticity values were calculated. SWE values were higher in malignant nodule than benign nodules The cut off value of E_{max} for thyroid nodules is taken as 53.95 kPa with sensitivity of 89.47% . Thus SWE proved significant role in differentiation of benign and malignant thyroid nodules (p value <0.001).

Conclusion- Shear wave elastography being a noninvasive technique can provide quantitative information on differentiating benign and malignant thyroid nodules thus can be used as an adjunct method to ultrasound.

KEYWORDS

Shear wave elastography, Thyroid nodule, B mode ultrasound

INTRODUCTION-

Thyroid nodular disease (TND) is one of the most widespread endocrine disorders. Although conventional ultrasonography (USG) has become the preferred imaging method for diagnosing thyroid diseases, its key limitation includes poor differentiation of benign from malignant nodules. The American Thyroid Association (ATA) describes "**Thyroid nodules**" as discrete lesions in the thyroid gland that can be clinically palpable and radiologically distinguishable from the adjacent parenchyma.[1] Sometimes nodules are identified in asymptomatic persons by the clinician by palpation during routine physical examination or incidentally .These nodules are known as "**Thyroid Incidentalomas.**" Shear Wave Elastography (SWE) is a new, promising technique. It is thought to be more objective, reliable and reproducible than older variants of elastography. In SWE, shear wave emission is induced by a focused ultrasonic beam. Based on the received signals, the elasticity of the tissue is assessed in real-time and may be estimated both qualitatively and quantitatively.[2-3].

MATERIAL & METHOD-

A Prospesctive study was done on patient with 62 clinically suspected thyroid nodule who were refered for USG .TIRADS category 1 lesions, purely cystic lesions and uncooperative patients were excluded from the study. Gray-scale USG and SWE were then performed using 14 MHz linear transducer. Region of interest was placed in the nodule and minimum, maximum and mean elasticity values of the nodules were acquired. USG guided FNAC was performed.

RESULTS-

In our prospective study, 62 thyroid nodules were evaluated with B mode ultrasonography and shear wave elastography. The interpretation with each of the above mentioned modalities were compared with the cytological diagnosis as a gold standard reference. In the study out of 62 patients, 43 were females and remaining 19 were male. This suggests that the prevalence of the thyroid nodules is more common among the females The study population comprised of age group varying from 18- 60 years with most of the patients in the age group of 30-50yrs (46.6%). In our study population the mean age for malignancy was above 50 years and for benign lesions was found to be between 30-50 Years.

In the study population out of 62 nodules, 38(61.29%) lesions were benign and 24 (38.70%) lesions were malignant. Out of the 38 benign lesions, 28 (73.68%) were colloid nodule , 8 (21.05%) were adenomatoid nodule and 2 (5.26%) was follicular adenoma. Out of the 47 malignant lesions, 14 (58.33%) were papillary carcinoma, 8 (33.33%) were follicular carcinoma and 2 (8.33%) were medullary carcinoma. Following clinical evaluation of all patients were referred for ultrasound examination the nodule is categorized with the following features such as size, composition, echogenicity, regularity of the border or margin and calcifications and they were graded according to TI-RADS scoring system. Of the 62 lesions, 25 were assigned TIRADS 2 (40.3%), 15 lesions (24.1 %) that were categorized as TIRADS 3 13 lesions (20.9%) were categorized as TIRADS 4, 9 lesions (14.5%) as TIRADS 5. In our study, the sensitivity, specificity, positive predictive value and negative predictive value for ultrasound findings of thyroid nodules interpreted in TIRADS scoring were 94.73%, 83.33 %, 90.90% and 90.00% respectively.

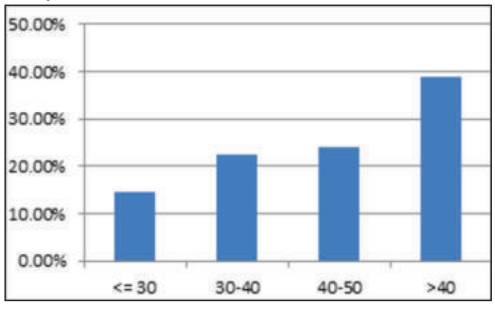

Figure 1 : Age Distribution Of The Study Population.

DISCUSSION-

On Elastography using ROC analysis, the optimal cutoff ratio of E_{max} for differentiating benign and malignant thyroid nodules was found to be 53.95 kpa. Out of 62 nodules 23 lesions were suspected to be malignant, of which 19 lesions turned out to be malignant and the remaining 4 lesions turned out to be benign. Out of the 62 nodules 39 lesions turned out to be benign of which 34 lesions turned out to be benign and the remaining 5 lesions turned out to be malignant. In our study, the sensitivity, specificity, positive predictive value and negative predictive values for elastography findings of thyroid nodules in correlation with cytology in predicting the malignancy were 89.47%, 79.16% , 87.17% and 82.60% respectively. The sensitivity and specificity of the US elastography findings for thyroid diagnosis were 91% and 72% respectively in a study by **L.A.M. Habib et al.** [4]. In our study done in 62 thyroid nodules, elastographic findings are higher in malignant nodules than in benign ones.

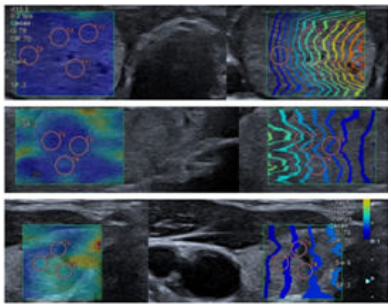

Fig 2 (A): Thyroid nodule category TIRADS 4, E max =112 kpa, Emin = 46kpa, Emean=85 kpa, Emedian = 89 kpa. (B) Another category TIRADS 4 nodule, E max =98 kpa , Emin = 35kpa , Emean=75 kpa,Emedian = 76 kpa. These findings are highly suggestive of malignancy. FNAC report came as papillary & medullary carcinoma respectively.

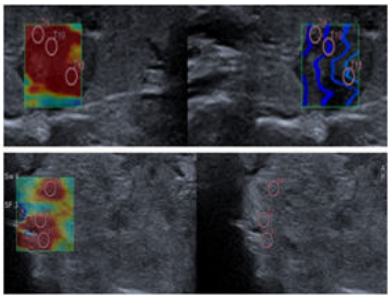

Fig 3 (A); TIRADS 2 thyroid nodule , E max = 29.3 kpa, Emin = 11 kpa, Emean= 15 kpa , Emedian = 16 kpa. (B) TIRADS 3 Nodule, E max = 26 kpa, Emin = 11 kpa, Emean= 17 kpa , E median = 20 kpa. (C) TIRADS - 3, E max = 29 kpa, Emin = 16 kpa, Emean= 18 kpa =,Emedian = 21 kpa.These findings are suggestive of benign disease. FNAC report came as Colloid, adenomatoid & Follicular adenoma respectively.

CONCLUSION-

Elastography directly reflects the overall elastic properties of thyroid nodules, and higher the SWE values, higher is the chances of malignancy. SWE can serve as noninvasive alternative in stratification of thyroid nodules and provide a new dimension to sonographic evaluation of thyroid nodular disease.

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