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Evaluation of Thyroid Nodule by Ultrasonography (USG Thyroid): Our Experience

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Abstract*: thyroid swellings are common clinical problem and it is important to know exact pathology before treating such conditions. USG is now a well-established, cheap, reliable and safe first line diagnostic test for the evaluation of diffuse thyroid lesions. Although FNAC has been recommended as best diagnostic tool for evaluation of thyroid nodule, however with advent of USG evaluation of thyroid nodule has become much easier and safe painless procedure.it not only helps to differentiate different neck swellings but also can give information about origin of different neck swellings along with their contents and thus helps in diagnosing benign as well malignant lesions.*

Objective*: To compare the efficacy of USG of thyroid swellings and to find out the diagnostic reliability of USG alone in evaluation of thyroid nodule using histological diagnosis as the gold standard.*

Methods*: Hundred patients with thyroid swelling who presented to our department of ENT and HNS SMHS Srinagar were subjected to FNAC and USG and among them those who were operated over period of 18months(December 2014 to june 2016) were included in this study. Among hundred Patients 80 cases were operated and study was conducted among these operated 80 cases. Rest cases were excluded.one case was medullary carcinoma on USG but was not operated on patient grounds.*

Results*: USG thyroid as a diagnostic modality alone in evaluation of thyroid nodule has high sensitivity and specificity in diagnosing both benign and malignant thyroid lesions in our study benign lesions has sensitivity of 53.9-96.05% and specificity of 56.5-96.05%,while malignant lesions has sensitivity of 78.8-96.4% and specificity of 62-88.61%respectively.hence showing USG has high sensitivity and specificity in evaluating thyroid nodule.it also helps in evaluating other neck lesions and also origin of various neck lesions including thyroid.*

Conclusion*: USG thyroid for evaluation of thyroid lesions is a safe and reliable diagnostic tool for evaluation of thyroid nodule. It can be used as single diagnostic tool alone for not only evaluation but also for diagnosis and management of thyroid nodule.*

Introduction:

Thyroid nodules represent a common problem in ENT & HNS, with an estimated prevalence of 4–7%[11] in the adult population for palpable nodules. The prevalence is higher in women (5%) than in men (1%) [1]. The prevalence of nodules found during autopsies, operations or ultrasound examinations is considerably higher and increases with age [(2–4).] The majority of nodules are benign. Cancer can be present in 3–10% of nodules, depending on age, gender, radiation exposure history, family history, and other factors [(5).] Over the last few years, many advances have been achieved in diagnosing thyroid nodules. In addition, various clinical and radiological features have been studied to increase detection rate of differentiated thyroid carcinoma. Unfortunately, these features lack specificity and sensitivity [(6–9)] and none have been so far recommended for a routine use [(10)]

Thyroid gland is affected by a vast array of developmental, inflammatory, hyper plastic, benign and neoplastic disorders.The incidence of palpable thyroid swelling is 4-7%[11]. As there is a 10% lifetime risk of developing thyroid nodule[12]. A thyroid enlargement whether diffuses or in the form of a nodule has to be investigated to rule out neoplasm. Only 1 in 29 clinically identified swelling is malignant. This corresponds to approximately 2-4%[12].Ultra-sonography is far more sensitive than palpation, as it detects nodules of any size in up to 67% of the general population[8]. Thyroid nodules warrants removal when they are large enough to be symptomatic, or if there is a concern for malignancy. The majority of nodules are asymptomatic, and with only 5 to 10% of nodules being malignant, the decision to operate is made on therapeutic or diagnostic grounds[9,10]. Ultrasound imaging studies and cytology from fine-needle aspiration are the main tools used by the clinicians to decide whether surgical excision of a thyroid nodule is warranted.The use of ultrasound as a diagnostic modality is relatively new practice.The idea came after langevin[13] made use of

a pulse-echo technique called SONAR[sound navigation and ranging]in 1916. An Australian researcher named Dussik [13]who had begun experiments in late 1930s,is generally regarded as the first physician to apply ultrasound to medicine.In head and neck ultrasound was first used by Fujimoto et al[14] to study the thyroid gland in 1967, primarily to distinguish solid lesions from cystic lesion. Since then the role of ultrasound in head and neck has expanded dramatically. In fact ultrasound now a days is being considered as an extension of the surgeons physical examination[28].

According to several reports for the differentiation of benign and malignant thyroid nodule, sonography has sensitivity rates ranging from 63% to 94% specificity from 61% to 95% and overall accuracy from 80% to 94%[16,17,18]. kim et al[16] have reported sonographic features predictive of thyroid cancer and also indicated the need of fine needle aspiration cytology.

USG is broadly used for:

- Detection of thyroid nodules.
- Differentiation of benign from malignant nodules.

Ultrasound features of thyroid nodules

The vast majority of thyroid nodules are benign, and the role of a radiologist in assessment of the thyroid gland is to differentiate a malignant thyroid nodule from the more commonly seen benign ones. It is therefore important to evaluate the sonographic features of thyroid nodules as these aid in their characterization.

Echogenicity The incidence of malignancy is 4% when a solid thyroid nodule is hyperechoic.If the lesion is hypoechoic, the incidence of malignancy rises to 26%[17].However, hypoechogenicity alone is inaccurate in predicting malignancy, using this as sole predictor of malignancy sign, it has a relatively poor specificity (49%) and positive value (40%)[18].

Margins A malignant thyroid nodule tends to have ill-defined margins on ultrasound. A peripheral halo of decreased echogenicity is seen around hypoechoic and isoechoic nodules and is caused by either the capsule of the nodule or compressed thyriod tissues and vessels[19] The absence of a halo has a specificity of 77% and sensitivity of 67% in predicting malignancy[20].

Calcification Fine punctate calcification due to calcified psammoma bodies within the nodule is seen in papillary carcinoma in 25%-40% of cases. If used as the sole predictive sign of malignancy. Micro calcification is the most reliable one with an accuracy of 76%, specificity of 93% and a positive predictive value of 70%.Coarse dysmorphic or curvilinear calcification commonly indicates benignity.

Comet tail sign The presence of a comet tail sign in a thyroid nodule indicates the presence of colloid within a benign colloid nodule and is a strong predictor of benignity.

Solid/cystic It is generally believed that thyroid nodules with large cystic components are usually benign nodules that have undergone cystic degeneration or hemorrhage.However, papillary carcinoma occasionally demonstrates a cystic component and may mimic a benign nodule through the presence of punctate calcification within the solid component helps in its identification.

Multinodularity It is a myth that Multinodularity implies benignity, as approximately 10%-20% of papillary carcinomas may be multicentric[19,22]. In those with true solitary nodules confirmed at surgery the risk of cancer is the same as in those with multinodular goiters[23] .Therefore against a background of multinodular changes, extra caution should be taken not to miss a suspicious nodule.

Colour flow patterns In general there are three patterns of vascular distribution within a thyroid nodule[24]:

Type I: complete absence of flow signal within the nodule

Type II: exclusive perinodular flow signals

Type III: Intranodular flow with multiple vascular poles chaotically arranged, with or without significant perinodular vesssels

Type III: pattern is generally associated with malignancy. Types I and 2are more commonly seen in benign hyperplastic nodules[24]. Unfortunately if used as the sole predictor of malignancy, colour flow characteristics are not accurate[20], and have to be used in combination with each other features seen on grey scale ultrasound.It is well recognised that the predictive ability of ultrasound for malignancy is effective only when multiple signs are present in the same nodule. Although their predictive value increases in summation, it is at the cost of sensitivity[20].

Table 1 showing different lesions in overall patients with thyroid nodule also showing male female ratio.

Lesions	Female	Male	Grand Total
Colloid	7(87.5%)	1(12.5%)	8
Follicularcarcinoma	1(50%)	1(50%)	2
Follicularneoplasm	16(61.5%)	10(38.5%)	26
Medullarycarcinoma	1(100%)		1
PTC	35(79.5%)	9(20.5%0	44
Others thyroditis [granulomatous, sub acute] colloid, blood aspirate	13(68.4%)	6(22.6%)	19
Grand Total	73%	27%	100

Table 2: distribution of different thyroid lesions using USG as diagnostic modality(histopath as control)

Count of USG	Column Labels	Histopathology	,……	,…….	,…….	
Row Labels	Colloid	follicular carcinoma	follicular neoplasm	medullary carcinoma	PTC	Grand Total
Colloid	8				1	9
follicular neoplasm		2	19		3	24
PTC			7	1	40	48
USG	8	2	26	1	44	81

Table 3: Efficacy of USG in diagonosing various thyroid lesions

EFFICACY OF USG AS DIAGNOSTIC MODILITY IN VARIOUS THYROID LESIONS					
	Sensitivity	Specificity	Positive predictive	Negative predictive	Diagnostic accuracy
	95% CI	95% CI	value 95% CI	value 95% CI	95% CI
Colloid	100.00%	98.63%	88.89%	100.00%	98.77%
	92.64-99.76%	56.5-98.01%	56.5-98.01%	94.9-100%	93.3-99.7%
follicular neoplasm	73.08%	90.91%	79.17%	87.72%	85.19%
	53.9-86.3%	80.4-96.05%	59.53-90.76%	76.75-93.92%	75.87-91.32%
PTC	90.91%	78.38%	83.33%	87.88%	85.19%
	78.84-96.41%	62.8-88.61%	70.42-91.3%	72.67-95.18%	75.87-91.32%

Discussion:

This study was conducted in GMC SMHS Srinagar for a period of 18 months. Main motive was to find diagnostic reliability of USG thyroid in diagnosing different lesion of thyroid. In 100 patients USG thyroid was done who presented with thyroid swelling along with USG neck after proper consent. However patients with lesions like thyroiditis or non specific lesions TBSRTC (cat 1 and 11were excluded from study.so total of 81 patients were included all were operated (except for one who was having medullary ca thyroid) and histopathological report was compared with pre operative USG findings. Various benign and malignant lesions diagnosed by USG (done by single radiologist) were compared with histopathogical reports and sensitivity and specificity and correlation was found. In our study colloid lesions had sensitivity of 92.04-99.76% and

specificity of 56.5-98.01%.similarly follicular lesions has sensitivity of 53.9-86.3% and specificity of 80.4-96.05%.however in diagnosing papillary thyroid carcinoma USG has sensitivity of 78.84-96.41% and specificity of 62.8-88.61%. Similar study done By Ankosh Dhanadia[25] et al ultrasonographic and FNAC correlation of thyroid lesions included 100 patients in there study concluded high resolution gray scale ultrasound has emerged as an imaging.Modality of choice for the evaluation of patients with solitary Thyroid nodule. They found sensitivity of 83.3% specificity72.7%, ppv 29.4%, Npv 96.9% and accuracy of 74%.Fujmoto et al in 1967[14]were the first to use ultrasound in head and neck in the evaluation of tyroid gland primarily to distinguish cystic from solid lesions.Rosen et al in 1975[19]studied the ultrasonographic characteristics of 450 cases of thyroid enlargement.They could establish specific ultrasonographic patterns for cystic,solid tumors,multinodular goitre,cystadenoma and thyroiditis.However benign and malignant tissues couldn't be differentiated.The reliability of ultrasonographic diagnosis for thyroid lesions was stated as 94%.Wiley et al in1975[20]used ultrasound B-scan in evaluation of neoplastic neck nodes.He proposed that ultrasound B-scan are of value in establishing lymph node boundaries and position with respect to other lymph nodes.Propper et al in 1980[21],in their evaluation of 28 cases of thyroid nodules by ultrasound found the "halo" sign{echo free rim surrounding a mass} in 10 patients,8 of whom were benign either adenomas or benign nodules and 2 were histologically proven carcinomas.They stated that the "halo"sign was a nonspecific sign of benign thyroid disease.Ciatti et al in 1983[22]studied the role of ultrasound guided biopsy of thyroid nodules.They suggested that ultrasound guided biopsy offered a remarkable gain in the diagnosis of thyroid swelling.Vassallo et al in 1992[23]described the different characteristics for differentiation of benign from malignant superficial lymadenopathy.He observed marked differences among the proportion of benign and malignant nodes in terms of longitudinal/transverse ratio,hilus,and cortex.Kakkas et al in 2000[24]reported a series of 82 solitary thyroid nodules that were with ultrasound and managed with surgical excision.Ultrasound showed that 22 patients had calcification in their thyroid gland,they noted a malignancy rate of 55% in patients with solitary nodules with calcification verses 23% for patients with non calcified nodules.

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