# DIFFERENTIATION OF THYROID MALIGNANCIES- AN ULTRASONOGRAPHIC CRITERIA

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**ABSTRACT:** Numerous studies on Ultrasonographic (US) findings of Thyroid malignancy have been conducted (1-6). The main pathologic types of thyroid carcinoma are papillary, follicular, medullary, and anaplastic. Papillary and follicular thyroid carcinomas both have an excellent prognosis, with a 20-year survival of 90%–95% and 75%, respectively (7-9). Medullary thyroid carcinoma is more aggressive, with a 10-year survival of 42%–90% (10-11). Anaplastic thyroid carcinoma has an extremely poor prognosis, with a 5-year survival of 5% (10-11). Risk factors for thyroid carcinoma include age of less than 20 years or more than 60 years, a history of neck irradiation, and a family history of thyroid cancer (11.).Thyroid lymphoma, usually of the non-Hodgkin type, is uncommon. It may occur as part of generalized lymphoma or as a primary tumor, usually in the setting of Hashimoto thyroiditis. Metastases to the thyroid are rare and usually originate from primary lung, breast, and renal cell carcinomas. Metastatic disease should be suspected when a solid thyroid nodule is found in a patient with a known non-thyroid malignancy. **AIMS & OBJECTIVE:** In this study we planned to differentiate different type of thyroid malignancies based on Ultrasonography from one another due their different prognosis. **MATERIAL & METHOD:** We took 120 patients showing palpable neck masses out of which 40 patients were found to have malignant neoplasm of Thyroid gland. Further differentiation of different type of Thyroid neoplasm was done by Ultrasonography. **RESULT**: Out of 40 malignant neoplasm, 24 patients had papillary carcinoma and 4 patients had medullary carcinoma Thyroid. Rest 16 patients were kept in other type of thyroid malignancies. **CONCLUSION**: We concluded our study with the fact that just keeping the patient under category of thyroid neoplasm is just not sufficient, rather we should be able to differentiate each type of thyroid malignancy from one another due to different prognosis of each type.
**KEYWORDS:** ULTRASONOGRAPHY, PAPILLARY CARCINOMA, MEDULLARY CARCINOMA.

**INTRODUCTION:** Neck masses form a wide and varied pathologic spectrum, ranging from benign inflammatory conditions to frankly ominous malignant lesions. The neck mass may be the presenting complaint or an incidental finding on the general physical examination. Clinical examination alone does not reliably indicate the true nature and extent of a neck lesion.' Imaging plays an essential role in the management of neck disease. (12). Radiological imaging has become a mainstay in the diagnoses and in planning of the management of neck lesions. Conventional radiological techniques have been largely replaced by modern imaging modalities. Ultrasonography (US) and computed tomography (CT) enable radiological characterization of normal and diseased structures in the neck in ways that were previously not possible. With the advent of high frequency ultrasound (US) probes, superficial structures are visualized very conveniently and with great spatial solution. The probes are easy to handle and patient acceptability is very high. (13) predicted an important role of sonography in visualization of benign and malignant tumors of the neck.US is often the first modality used in diagnostic work up of a thyroid nodule. (14). (15) stated the

importance of imaging with US in defining the morphology, size, extension and infiltration of adjacent structure in staging of thyroid masses.

**Features suggestive of normal Thyroid:** Normal Thyroid is homogeneous and more echogenic than surrounding muscles.

Sonographic features suggestive of benign and malignant nodules were listed by various authors. (16-19).

**Features suggestive of benign nature**

Anechoic: Totally anechoic 20-25% of all lesions.
Hyperechoic: 15-20% of thyroid nodules
Hypoechoic: with distal enhancement and possible lateral acoustic shadows.
Calcifications: egg shell type surrounding whole nodule.

**Features suggestive of malignant nature**

Hypoechoic without distal enhancement (85-95% of all neoplasms).
Incomplete, irregularly thickened (<2mm) peripheral halo.
Irregular or poorly defined margin.
Microcalcifications (hyperechoc dots of <2mm diameter with or without posterior shadowing).
Invasion of anatomical structures around the thyroid.
Presence of cervical metastatic nodes

**MATERIALS & METHODS:** Subjects made available in this study is the result of profound interaction of the faculty of various clinical & Pre-clinical departments, who used to discuss the patients in regular CME'S held almost every week in TMMC & RC, TMU, Moradabad, and continuous discussion on every forum for planning and management of patients welfare in terms of investigations (radiological, pathological, and biochemical) and surgical (whether conservative or operational). As a whole we took consideration of 120 patients showing palpable neck masses out of which 40 patients were found to have malignant neoplasm of Thyroid gland. Further differentiation of different type of Thyroid neoplasm was done by Ultrasonography using Scanners with 7-10 MHz transducers on MEDISON Diagnostic ultrasound system installed in Department of Radiodiagnosis TMMC&RC, TMU, Moradabad.

Institutional Ethical and research committee approval was taken prior to start the study.
Female subjects were examined in presence of female nursing staff and one female attendant.
In case of minor consent from guardians was taken.
Every patient examined in this study gave his/her consent. (Scanned copy of consent form attached (Annexure-1).

**RESULT**:

| Imaging Features | No. of cases | Percentage |
|---|---|---|
| **CONSISTENCY** | | |
| Solid | 20 | 50% |
| Mixed | 10 | 25% |
| Predominantly Cystic | 10 | 25% |
| **ECHOGENECITY** | | |
| Isoechoic | - | - |
| Hypoechoic | 20 | 50% |
| Heteroechoic | 20 | 50% |
| Anechoic | - | - |
| **HALO** | | |
| Complete, thin well defined | - | - |
| Incomplete, thick ill-defined | 20 | 50% |
| Absent. | 20 | 50% |
| **CALCIFICATION** | | |
| Coarse | 20 | 50% |
| Micro calcification | 10 | 25% |
| Rim calcification | - | - |
| Absent | 10 | 25% |
| **ATTENUATION** | | |
| Hypodense | 40 | 100% |
| Isodense | - | - |
| Hyperdense | - | - |
| **ENHANCEMENT** | | |
| Homogeneous | 10 | 25% |
| Heterogeneous | 30 | 75% |
| **RIM ENHANCEMENT** | 10 | 25% |
| **EXTRATHYROIDAL EXTENSION** | 20 | 75% |
| **LYMPHADENOPATHY** | 10 | 25% |
| **MULTINODULARITY** | 20 | 50% |
| **MARGINS** | | |
| Well defined | 10 | 25% |
| Ill defined | 30 | 75% |

Table 1:- Imaging Features of Thyroid neoplasm (40 cases)

| S.N. | ULTRASONOGRAPHIC FINDINGS | PAPILLARY CARCINOMA N=24 | MEDULLARY CARCINOMA N=4 |
|---|---|---|---|
| 1. | **INTERNAL CONTENT** | | |
| | a. Solid | 20 | 3 |
| | b. predominantly solid | 4 | 1 |
| | c. predominantly cystic | 0 | 0 |
| | d. cystic | 0 | 0 |
| 2. | **SHAPE** | | |
| | a. ovoid to round | 6 | 2 |
| | b. taller than wide | 8 | 1 |
| | c. irregular | 10 | 1 |
| 3. | **MARGIN** | | |
| | a. smooth | 6 | 1 |
| | b. spiculated | 10 | 2 |
| | c. ill defined | 8 | 1 |
| 4. | **ECHOGENICITY** | | |
| | a. markedly hypoechoic | 13 | 2 |
| | b. hypoechoic | 6 | 1 |
| | c. isoechoic | 3 | 1 |
| | d. hyperechoic | 2 | 0 |
| 5. | **CALCIFICATIONS** | | |
| | a. no calcifications | 5 | 2 |
| | b. microcalcifications | 12 | 1 |
| | c. macrocalcifications | 5 | 1 |
| | d. rim calcifications | 2 | 0 |

Table-2:- Imaging Features of Papillary and Medullary Thyroid neoplasm compared (24 cases)

**Ultrasonographic differentiation of different thyroid neoplasm was found as under**
**Ultrasound features of papillary carcinoma include:**
predominantly solid and hypoechoic
presence of punctate microcalcification correspond to psammomas bodies on microscopy
ill-defined margins
chaotic intranodular vascularity on colour flow imaging
adjacent characteristic lymph nodes: cystic necrosis in, microcalcification in , located in the pre-/paratracheal regions and along the cervical chains.

**Ultrasound features of anaplastic carcinoma include:**
hypoechoic tumour diffusely involving the entire lobe or gland
ill-defined margin

areas of necrosis in nodal or distant metastases in 80% of patients; the involved lymph nodes show evidence of necrosis .
multiple small intranodular vessels on colour flow imaging
extracapsular spread and vascular invasion in a third of patients

**Ultrasound features of medullary carcinoma include**
solid hypoechoic nodule
echogenic foci in tumours due to amyloid deposition and associated calcification ; similar deposits are also seen in associated nodal metastases
chaotic intranodular vessels within the tumour on colour flow imaging.

**Ultrasound features of follicular lesions include**
hyperechoic/isoechoic in echotexture ; hypoechoic lesions have a higher risk of beingmalignant
predominantly solid and homogeneous
well-defined, haloed .
benign lesions have a type II vascularity, whereas malignant lesions have a type III vascularity

**Ultrasound features of lymphoma of thyroid gland include**:
focal thyroid involvement may be seen as a well-defined nodule with pseudocystic appearance or heterogeneous appearance
diffuse involvement may result in heterogeneous echopattern or simple enlargement of the gland with normal echopattern
associated round, hypoechoic, reticulated lymphomatous nodes in the neck
background of previous Hashimoto's thyroiditis in the form of echogenic fibrous strands within the thyroid gland is often seen

**Ultrasound features of thyroid metastases include**
homogeneous, hypoechoic mass
well-defined margins
predominantly in the lower pole
heterogeneous echopattern when the gland is diffusely involved
multiple, hypoechoic solid, thyroid nodules
chaotic intranodular vascularity.

**DISCUSSION:** About 20% of solitary Thyroid nodules are malignant (20). The incidence of various malignancies are:

| | |
|---|---|
| Papillary carcinoma | 60-80% |
| Follicular carcinoma | 15-18% |
| Anaplastic carcinoma | 3-10% |
| Medullary carcinoma | 4-5% |
| Lymphoma | 5 % |

Hypo echogenicity and an ill-defined margin are known sonographic findings associated with thyroid cancer (21-22). Irregular margins, which result from microinvasion of the surrounding tissues, may also indicate thyroid malignancy (23).Both thick peripheral hypoechoic rim patterns

and the absence of a rim surrounding a thyroid nodule, which represents pericapsular inflammatory infiltration, have been reported to be indicators of malignancy (24).

**Papillary carcinoma**: The commonest thyroid malignancy is papillary carcinoma. It has a peak incidence in the 3rd and 4th decades and is more common in females. The prognosis is the best with this tumor (>90% after 20 years) (25). The peak incidence is in the 5th decade( 26). Common sonographic features of papillary carcinoma included hypoechoic texture (86%), microcalcifications (42%) or no calcifications (47%), well-defined margins (47%), and intrinsic hypervascularity (69%).Papillary carcinoma imaging features can vary from a well defined slow growing adenoma like form to irregular, heterogeneous mass with necrosis. Thus, it may be important to characterize the ultrasonographic features of PTC patients with Graves' disease. (27). Psammoma body microcalcifications are specific to papillary thyroid cancer (10-11). Sonographic criteria for a thyroid malignancy have been established for a papillary thyroid carcinoma (PTC) in most studies .

**Medullary carcinoma:** Medullary thyroid carcinoma (MTC) accounts for 3.5-10% of all thyroid malignancies and lesions are derived from the parafollicular C-cells that produce calcitonin (28). Imaging features are solid nodule, calcification may be seen, local and lymph node extension may also be seen. Medullary thyroid carcinoma (MTC) belongs to the neuroendocrine tumor group (29–31).

**Follicular carcinoma:** The peak incidence is in the 5th decade.[78] Imaging features can vary from a well defined slow growing adenoma like form to irregular, heterogeneous mass with necrosis and calcifications. Lymph nodes metastasis and occult forms and cystic changes are rare. Thyroid echogenicity reflects the gland's follicular structure. (27))

**Anaplastic carcinoma:** Anaplastic carcinoma common in the 6th decade, is the most aggressive from with large size and extensive necrosis and hemorrhage (32). Extra thyroid spread is common. These can arise from papillary to follicular carcinomas.

**Lymphoma:** Thyroid lymphomas may be primary or part of systemic lymphoma. 80% arise in Hashimoto Thyroiditis. (33).

**CONCLUSION:** Ultrasound is the most sensitive method for diagnosing thyroid lesions, and is valuable for identifying many malignant and potentially malignant thyroid lesions. Ultrasound features that are helpful in differentiating includes microcalcifications, irregular or microlobulated margins, marked hypoechogenecity, a lesion that is taller than wide, and intranodular vascularity within a solid thyroid nodule.

Radiologists must be familiar with the various signs on ultrasound that help to distinguish benign from malignant thyroid nodules and the typical appearance of common thyroid cancer. In addition, ultrasound provides a safe tool for disease surveillance in patients with thyroid cancer after treatment.

Despite clear identification, no single Ultrasound criterion is reliable in differentiating different malignant thyroid lesions, but many combined US features may aid in predicting the malignant nature of a given nodule. However, the predictive value of these combinations increases at the expense of their sensitivity.

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