



**Preoperative Assessment of Multinodular Goiter- A Relationship between  
Histopathological Diagnosis and Imaging Methods.**

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## Introduction

Fine Needle Aspiration Cytology (FNAC) is a safe, quick, and inexpensive diagnostic method used for evaluating thyroid nodules and determining surgical indications. The Bethesda system is improved to standardize and enhance thyroid cytology reports. There are six categories: nondiagnostic or unsatisfactory, benign, atypia of undetermined significance or follicular lesion of undetermined significance, follicular neoplasm or suspicious for a follicular neoplasm, suspicious for malignancy, and malign.

The ultrasonographic features of thyroid nodules include increasing risk of cancer in thyroid nodules, marked hypoechoic internal composition, calcification (microcalcification or macrocalcification), acoustic shadowiness in the posterior side of the lesion, and the absence of a peripheric halo. Microcalcification is typically calcification of the psammoma body, typical for papillary cancers, while macrocalcification is dystrophic calcification in benign nodules formed due to fibrosis and degeneration.

Acoustic shadowiness in the posterior side of the lesion is formed by the preventing of sound cross posteriorly due to peripheric fibrous tissue. Peripheric thin hypoechoic halo is seen in 60-80% of benign nodules but not in 15% of cancers. Vascularization is demonstrated in 42% of malign nodules and only 14.7 of benign nodules in Frates and friends' study

Regional lymph node metastasis can be demonstrated by palpation or screening methods in 30% of differentiated thyroid cancers, with a higher ratio in centers administering central and ipsilateral lateral lymph node dissection routinely. Ultrasonographic evaluation affects the extension of the operation in 40% of surgical procedures. Lymph node metastasis is most commonly ipsilateral and only 18% is contralateral. Modified radical lateral lymph node dissection provides a longer survival time in patients with lymph node metastasis, so preoperative ultrasonographic evaluation of lymph nodes in thyroid cancers is suggested.

## Materials and Methods

The study focuses on 321 patients with multinodular goiter who underwent surgery at the General Surgery Clinic between January 2021 and December 2022. The patients' reports of fine needle aspiration biopsies were evaluated using Bethesda classification, which includes malign, suspicion of malignancy, follicular neoplasia, undetermined significance of atypia, and benign. Ultrasonography was used to evaluate the size of the thyroid

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gland, the number of nodules, the reason for the nodules, the margin of nodules, the presence of halo, the features of classifications, and the sonographic features of nodules. The materials excised during the operation were also evaluated in pathology laboratories. Pathologic analysis results included carcinomas, nodular hyperplasia, follicular adenoma, follicular neoplasia, Hurthle cell neoplasia, and lymphocytic thyroiditis.

Statistical analysis included the Kolmogorov Smirnov test, KI-Kare test, Student test, Ki-Kare test, and Spearman Correlation analysis. The results were presented as median  $\pm$  standard deviation or in numbers (%), and the proportion of quantitative data to normal distribution was evaluated using the Kolmogorov Smirnov test.

## Findings

This study analyzed the pathologic analysis of 309 patients with multinodular goiter at the Clinic of General Surgery of Medical Faculty of Trakya University between 2012-2013. The mean age of the patients was  $49.5 \pm 12.21$  years, with 69 males and 252 females. The study found that the rate of multinodularity was 61.8, with cystic nodularity being 11.3, solid nodularity being 33.7, hypoechogenicity being 34.6, hyperechogenicity being 21.7, microcalcification being 26.5, macrocalcification being 26.5, vascularization being 21.7, halo formation being 26.5, and margin irregularity being 12.6.

The Bethesda classification was used to evaluate the pathologic analysis of the patients. After operative histopathologic analysis, 44% of patients had malignancy, with papillary carcinoma being the most common. The benignity ratio was 56%, with nodular hyperplasia, follicular adenoma, and lymphocytic thyroiditis being the most common benign lesions.

The non-carcinoma group had a significantly higher determination rate of benign and undetermined significance of atypia or follicular lesions than the carcinoma group. The suspicion of malignancy and malignancy rates were lower in the non-carcinoma group. Ultrasonographic examinations showed that the rate of hypoechogenicity, microcalcification, and margin irregularity was significantly higher in the carcinoma group, while the rate of hyperechogenicity was significantly lower in the carcinoma group. However, there was no significant difference between the carcinoma and non-carcinoma groups for the rates of solid nodules, cystic nodules, multinodularity, macrocalcification, vascularization, and halo formation.

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## Discussion

Thyroid nodules are a common clinical evidence, with palpable nodules in 47% of the population and non-palpable nodules in 60%. In American studies, incidental thyroid nodules can be determined by the rate of 67%, especially in older females. The median age of patients is  $49.5 \pm 12.21$  years, with 22.3 (n:69) of patients being male and 77.7 (n:240) of patients being female. The prevalence of thyroid nodules is known as %4 by the palpation in regions where there is no iodine insufficiency, while in our country, the goiter is seen in school children by the changeable ratios from 5% to 56%. Cold nodules concomitant with thyroid cancers and multinodular goiter are seen more often in iodine insufficient regions.

Fine needle aspiration biopsy (FNAB) is the gold standard for differential diagnosis of thyroid nodules, with the number of patients who have thyroidectomy operation getting lower and the determination rate of thyroid cancers in operated patients getting 2 to 7 times higher. The pathologic analysis of fine needle aspiration biopsy of patients according to the Bethesda classification is evaluated, with 25.9 (n:80) being benign, 10% (n:31) being undetermined significance of atypia or undetermined significance of follicular lesion, 44.7 (n:138), is follicular neoplasia or suspicion of follicular neoplasia, 15.9% (n:49) is suspicion of malignancy, and 3.6 (n:11) being malignant.

Thyroid FNAB is a valuable method in diagnosing thyroid cancer, but it has restrictive points such as insufficient sampling, unavailability of making differential diagnosis between malignancy and benignancy of follicular or Hurthle cell lesions, selection of nodule for FNAB in multinodular goiter, false negative results, and experience of clinician for FNAB by USG. Special factors of thyroid nodules for insufficient sampling include small nodules, macrocalcifications, hypervascularity, and deep or posteriorly localization of nodule in the neck region.

USG decreases insufficient sampling ratio by providing a chance to get FNAB from solid components of mixed solid-cystic lesions. In this study, nondiagnostic cytology ratio due to insufficient sampling is 5.4 and lower than the suggested 5%10 ratio of the literature. There is no significant difference between the USG examinations of patients statistically for existence of solid nodule, multinodularity, hypoechogenicity, hyperechogenicity, macrocalcification, microcalcification, vascularization, existence of halo, and results of FNAB.

One of the most important restrictive points of thyroid FNAB is the unavailability for the definitive diagnosis of malignancy of follicular lesions. The malignancy risk is changeable between the 5%-15% ratio for the nodules defined as undertermined significance of follicular lesions by Bethesda classification. If these patients who have indeterminate malignancy potential by FNAB are operated, cancer is determined in nearly 25-30% of these patients histopathologically. However, benign adenomas are determined in 75-80% of these patients histopathologically, leading to unnecessary operations to be sure about the histopathologic diagnosis.

Post-operative histopathologic analysis shows that 44% (n:136) of patients have malignancy, including papillary carcinoma, minimal invasive follicular carcinoma, and medullary carcinoma. The benignity ratio of patients is 56%, with nodular hyperplasia, follicular adenoma, and lymphocytic thyroiditis. The sensitivity of FNAB gets lower if a nodule without the FNAB nodule has cancer in multinodular goiter patients.

## Conclusion

The TIRADS (Thyroid Imaging Reporting and Data System) is a sonographic system used to classify thyroid nodules for cancer risk. It determines cancer diagnosis in a 80% ratio for isoechoic or hypoechoic non-capsular nodules with peripheral microcalcification and hypervascularization. The system has a sensitivity of 88% and a specificity of 49%. 99% of benign thyroid nodules remain benign during a 10-year follow-up period. However, periodic screenings are recommended for suspicious nodules or those not applied by FNAB. The follow-up interval should be between 6 months and 18 months. Patients with suspicious or malignant FNAB results should be operated, while those with benign results should be periodically monitored by USG and FNAB. The main reasons for widespread use of FNAB are its ease of use, cost-effectiveness, higher sensitivity and specificity ratios, and lower false positive and false negative ratios. FNAB is considered the most valuable and gold standard method for diagnosing thyroid nodules today.



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