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Accuracy of Thyroid Imaging Reporting and Data System in Evaluation of Thyroid Neoplasm

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ABSTRACT

Background: Several US Thyroid Imaging Reporting and Data Systems (TIRADS) have been proposed for risk assessment of thyroid nodules. The nodules are usually divided into variant categories based on TIRADS and are then guided to Fine Needle Aspiration (FNA) Biopsy or follow-up, according to the risk of malignancy**.**

Objective: To assess the specificity, sensitivity and accuracy of TIRADS in diagnosis of thyroid neoplasm

Patients and Methods: This study included 60 patients presented to the General Surgery and Endocrine Surgery Unite Outpatient Clinic at Mansoura University Hospitals with thyroid disorders. The study was conducted during the period between 1 November 2018 and the end of March 2020.

All patients were radiologically evaluated using neck ultrasound with TIRADS classification. Fine needle aspiration was performed and the results of both were compared to the postoperative pathology reports.

Results: the current study evaluated the accuracy of TIRADS (TIRADS 3,4a and 4b) compared to (TIRADS 4c and 5) with sensitivity 83.3%, specificity 92.9%, PPV 83.3%, NPV 92.9% and accuracy 90.0%.

Conclusion: TIRADS scoring system is of great value in the diagnosis of simple nodular goiter as it gives a degree of accuracy more than 90% compared to FNAC were the degree of accuracy was 78.3%.

Keywords: TIRADS, Fine needle aspiration, thyroid neoplasm.

INTRODUCTION

In the general population, the prevalence of thyroid nodules is growing around the world, especially in women. The American Thyroid Association and the American Association of Clinical Endocrinologists have issued separate recommendations for thyroid lesion treatment. High-resolution ultrasound is indicated in the assessment of thyroid nodules as the first line modality [(1)].

In the prediction of malignancy and the selection of thyroid nodules that should be assessed by fine-needle aspiration (FNA), ultrasonography (US) is an important diagnostic process. Well-known suspicious US features are the presence of marked hypo-echogenicity, micro-lobulated or irregular margins, micro-calcifications and a taller-than-wide shape. It has been reported that a combination of these features could provide better diagnostic accuracy than a single feature alone [(2)].

Several studies have examined the possibility of malignant nodules using ultrasound-guided biopsy due to suspicious ultrasonographic characteristics in order to prevent overuse of fine needle aspiration cytology (FNAC) in multiple benign thyroid nodules. The American College of Radiology has created the Breast Imaging Reporting and Data System (BI-RADS) for breast cancer to classify various groups according to the risk of malignancy [(3)].

Likewise, for thyroid imaging, there was no regular sonographic reporting method.

Horvath *et al.* [(4)] created a thyroid ultrasonographic system to stratify cancer risk and formed six categories based on sonographic characteristics, called the Thyroid Imaging Reporting and Data System (TI-RADS) [(4)].

Six major sonographic characteristics were concluded by the authors: solid components, marked hypo-echogenicity, micro-lobulated or irregular margins, micro-calcifications, and taller-than-wide shapes that are significantly correlated with carcinoma. These thyroid cancer risk stratifications facilitated TIRADS practice [(5)]. To date, TI-RADS has been implemented in different studies to assess malignant and benign thyroid nodules and to decide if thyroid lesions have good diagnostic output. While, its clinical use was challenged and multicenter evidence was required to further improve its clinical practice practicability. Several studies showed positive results of TI-RADS in the diagnosis of thyroid cancer [(6)].

PATIENTS AND METHODS

This study included 60 patients presented to the General Surgery and Endocrine Surgery Unit Outpatient Clinic at Mansoura University Hospitals with thyroid disorders. The study was conducted during the period between the 1 November 2018 and the end of March 2020.

All patients were radiologically evaluated using neck ultrasound with TIRADS classification by Professor Mahmoud Abd El-Shahid. Fine needle aspiration was performed and the results of both were compared to the postoperative pathology reports.

Ethical approval: Approval of the Ethical Committee, Faculty of Medicine, Mansoura University was

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obtained. All patients signed an informed consent to their participation in this study.

Inclusion Criteria:

1- Age above 18years.

2- Euthyroid patients (normal TSH level).

3- Patients presented with TIRADS 3, 4 and 5 nodules.

Exclusion Criteria:

1. Patients presented with TIRADS1, and 2 nodules.
2. Patients with toxic nodules.
3. Recurrent goiter.

All patients were subjected to the following:

History: Complete history taking from all cases including:

Personal history: Name, age, sex, occupation, residence, marital status, menstrual history in females and special habits.

Complaint and present history

The thyroid lesion is analyzed regarding the presenting symptoms (incidental, visible or palpable mass, pain, dysphagia, or voice changes like: hoarseness and weight loss), site, size and course (gradual or rapidly progressive).

Past history

- History of previous exposure to neck irradiation or surgery.
- History of other comorbidities as diabetes mellitus, hypertension, cardiac, renal and hepatic diseases.

Drug history

- History of receiving anti thyroid drugs or thyroid replacement therapy and the duration of taking it.
- History of drug allergy.

Family history: Family history of similar conditions or familial syndromes like MEN 2A or MEN 2B.

General Examination: General appearance of the patient, body built, conscious level, decubitus and vital signs (pulse, blood pressure and temperature). Examination of the head, chest, abdomen and extremities. Length, weight and BMI (Body Mass Index) of all the patients were also recorded.

C) Local Examination: • Examination of the neck for the thyroid swelling if it was clinically palpable and full assessment of it including; site, size, shape, consistency, contour, mobility, relation to surroundings , skin over , retrosternal extension , pulsation and audible bruit. • Examination of the cervical lymph nodes was done to assess if there is enlargement or tenderness.

Investigations:

I. Full laboratory investigations:

- Free serum T3 & T4: measured to evaluate the treatment and follow up.
- TSH blood Levels: measured to evaluate the treatment and follow up.
- Liver function Tests.
- Complete blood count.
- INR.
- Blood grouping.

II. Radiological studies:

- Thyroid Ultrasound: to prove whether the lesion is cystic or solid and for TIRADS classification.
- X-ray Neck and upper chest: to detect any tracheal shift, calcifications and pulmonary metastatic nodules.
- CT scan: was done for those patient presented with huge MNG or goiter with retrosternal extension.

III. Indirect laryngoscopy: to check the mobility of vocal cords

IV. Cytological study:

- Ultrasound guided FNAC was done to all patients presented in the Outpatient Clinic of Endocrine Surgery Unit with signs of thyroid nodules according to the guidelines of the TIRADS classification.
- In our study, we used high quality ultrasound device to be capable of finding small_thyroid nodules (> 2 mm). Also, posterior nodules and non-palpable, by clinical examination in small MNG.
- We asked Professor Mahmoud Abd Al Shahid to apply the TIRADS classification to our cases using General Electric Logic P5 ultrasound device.
- We used the TIRADS classification adopted by **Horvath *et al.*** in 2009 [(4)] for evaluation of our cases. We adopted the following classification in our study:

TIRADS 1: Normal.
TIRADS 2: Benign (0% cancer risk).
TIRADS 3: Probably benign (<5 %cancer risk).
TIRADS 4: Suspicious (5–95 % cancer risk).

- TIRADS 4A: Low suspicion (5–10 % cancer risk).
- TIRADS 4B: Intermediate suspicion (11–65 % cancer risk).
- TIRADS 4C: High suspicion (66–95 % cancer risk).

TIRADS 5: Suggestive of malignancy (>95 % cancer risk).
TIRADS 6: confirmed malignancy (100%).

- Accordingly, we performed fine needle aspiration biopsies using ultrasound by dr Mahmoud Abd Al Shahid.

Ultrasound-guided FNAC:

With the neck slightly extended, the patient was positioned in a supine position. His or her skin was cleaned up with a sterile material like betadine after the lesion is localized and the area is covered. For the U/S, the probe of U/S is used with a clean cover mounted above it. US gel usually is not required.

At the predetermined site, about 2 mL of 1 percent lidocaine hydrochloride as a local anesthetic is injected into the superficial layers in front of the gland. With an attached 20-mL syringe, a 27-gauge needle is used. The probe is located at the gland, scanning of nodule is conducted before aspiration, accompanied by colored visualization of vasculature of the nodules in order to prevent vascular damage during the operation. During the needle injection, the patient is advised not to swallow or talk. The needle can be positioned perpendicular to the transducer, and the tip of the needle during the procedure should be carefully controlled. The biopsy is done when the needle hits the target.

Visualization of the needle while moving inside the tissues is mandatory during the operation to reach the targeted lesion. The aspiration is recommended to be done at least twice. The slides for wet fixation should be placed immediately in 95% alcohol for staining with the Papanicolaou stain. For Giemsa staining air-dried smears the prepared slides are left unfixed and transported to the laboratory.

Those FNABs are then sent for cytological analysis, some of them are analyzed at Mansoura University Pathology Department and the others are done in private labs. After that, the patients were admitted to our department for either hemi-thyroidectomy or total thyroidectomy according to the NCCN (National Comprehensive Cancer Network) guidelines. Then the post-operative pathology for every patient is compared to both the results of FNAC and the TIRADS classification

Example of patients included in the study:

Patient No. (1)

Figure (1): MNG case 1

Figure (2): Specimen after total thyroidectomy

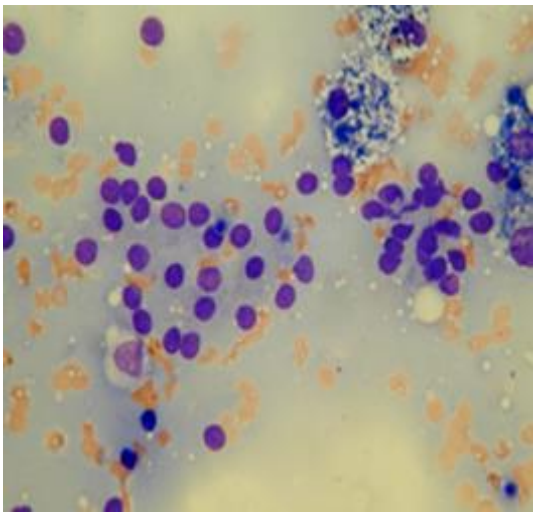


Figure (3): Benign FNAC 1.

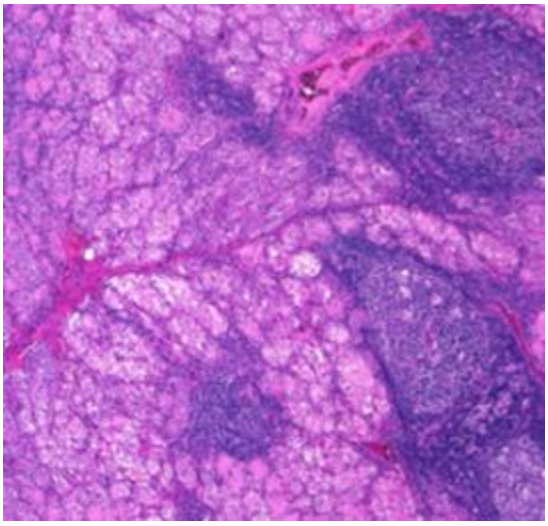
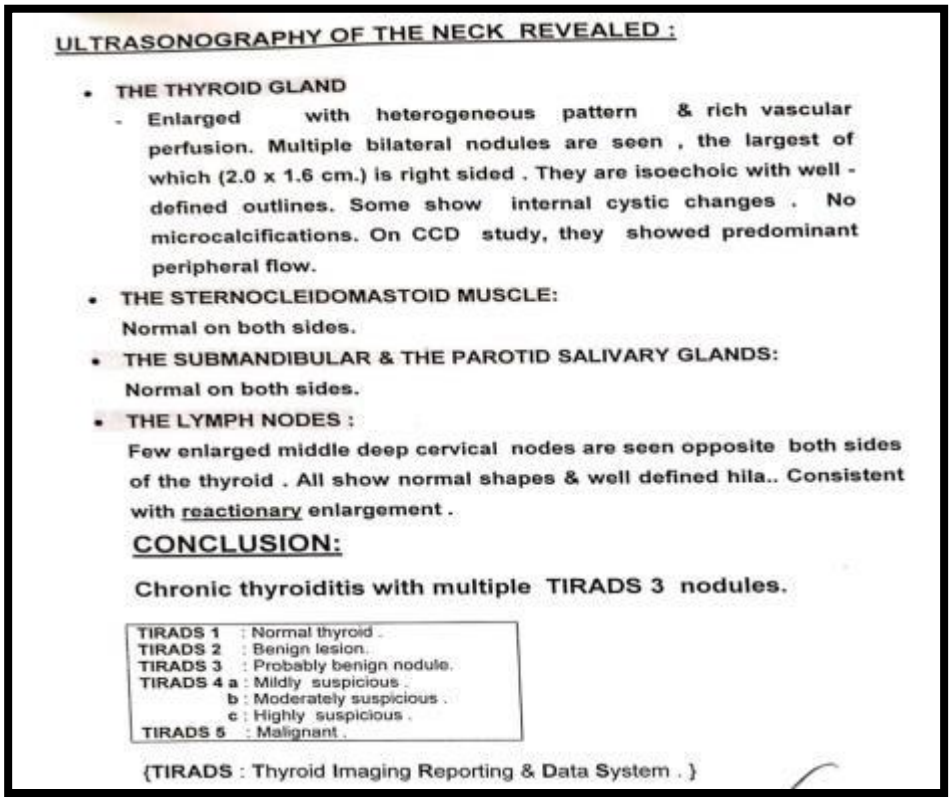


Figure (4): MNG with lymphocytic thyroiditis Postoperative pathology 1

Neck us report with TIRADS classification

Figure (5): TIRADS 3 classification.



ULTRASONOGRAPHY OF THE NECK REVEALED :

- THE THYROID GLAND
  - Enlarged with heterogeneous pattern & rich vascular perfusion. Multiple bilateral nodules are seen , the largest of which (2.0 x 1.6 cm.) is right sided . They are isoechoic with well - defined outlines. Some show internal cystic changes . No microcalcifications. On CCD study, they showed predominant peripheral flow.
- THE STERNOCLEIDOMASTOID MUSCLE:
  Normal on both sides.
- THE SUBMANDIBULAR & THE PAROTID SALIVARY GLANDS:
  Normal on both sides.
- THE LYMPH NODES :
  Few enlarged middle deep cervical nodes are seen opposite both sides of the thyroid . All show normal shapes & well defined hila.. Consistent with reactionary enlargement .

CONCLUSION:

Chronic thyroiditis with multiple TIRADS 3 nodules.

TIRADS 1	: Normal thyroid .
TIRADS 2	: Benign lesion.
TIRADS 3	: Probably benign nodule.
TIRADS 4 a	: Mildly suspicious .
b	: Moderately suspicious .
c	: Highly suspicious .
TIRADS 5	: Malignant .

{TIRADS : Thyroid Imaging Reporting & Data System . }

Patient No. (2)

Figure (6): MNG case 5.

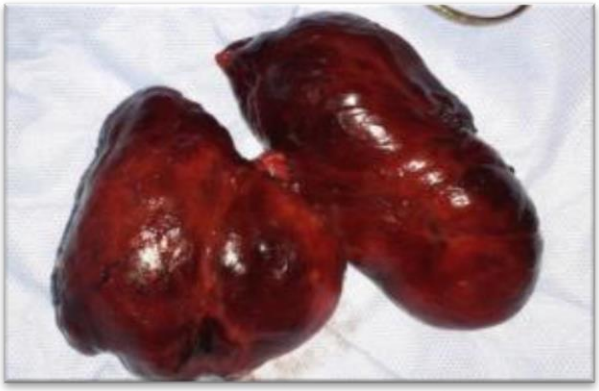


Figure (7): Specimen after total thyroidectomy 5.

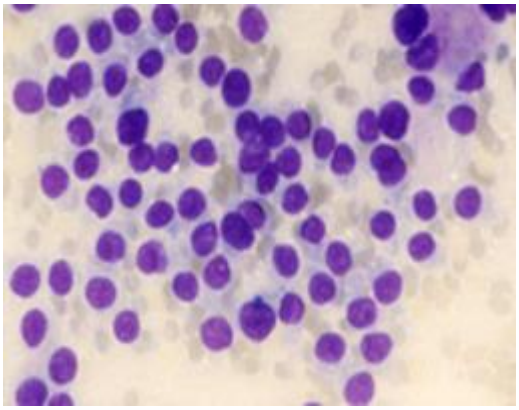


Figure (8): Atypia of undetermined significance FNAC.

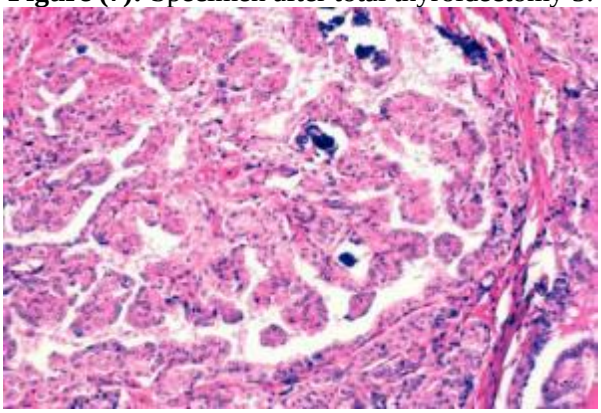
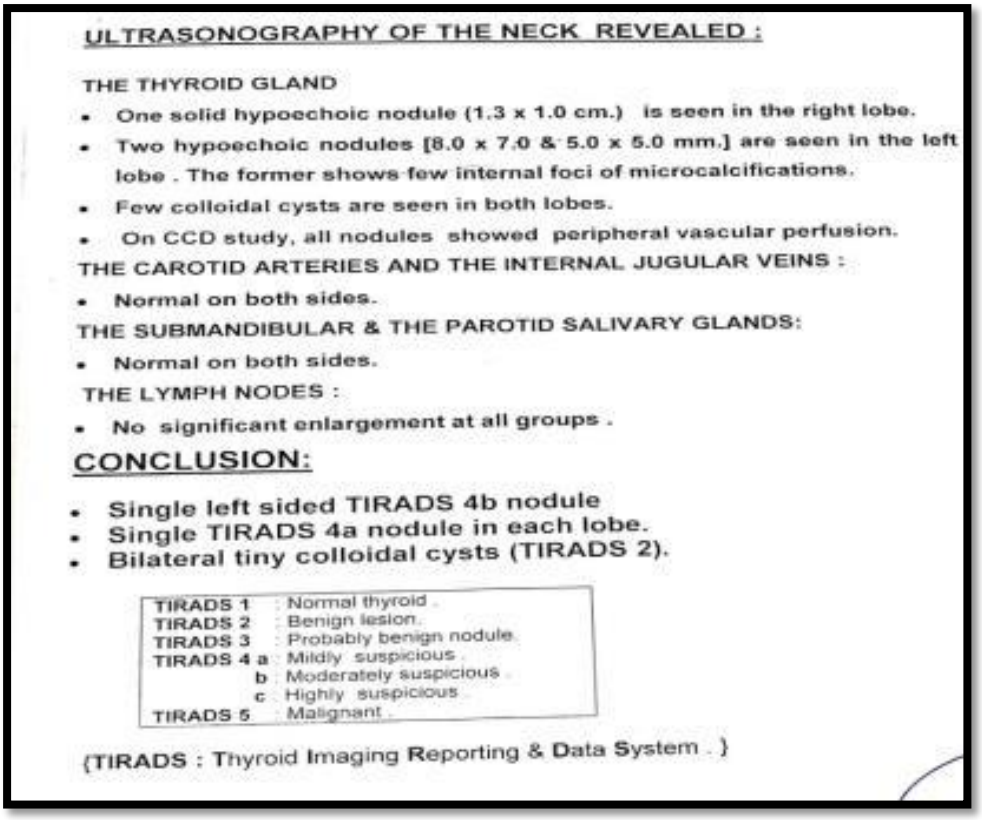


Figure (9): Papillary carcinoma postoperative pathology.

Neck us report with TIRADS classification


ULTRASONOGRAPHY OF THE NECK REVEALED :

THE THYROID GLAND

- One solid hypoechoic nodule (1.3 x 1.0 cm.) is seen in the right lobe.
- Two hypoechoic nodules [8.0 x 7.0 & 5.0 x 5.0 mm.] are seen in the left lobe . The former shows few internal foci of microcalcifications.
- Few colloidal cysts are seen in both lobes.
- On CCD study, all nodules showed peripheral vascular perfusion.

THE CAROTID ARTERIES AND THE INTERNAL JUGULAR VEINS :

- Normal on both sides.

THE SUBMANDIBULAR & THE PAROTID SALIVARY GLANDS:

- Normal on both sides.

THE LYMPH NODES :

- No significant enlargement at all groups .

CONCLUSION:

- Single left sided TIRADS 4b nodule
- Single TIRADS 4a nodule in each lobe.
- Bilateral tiny colloidal cysts (TIRADS 2).

TIRADS 1	: Normal thyroid .
TIRADS 2	: Benign lesion.
TIRADS 3	: Probably benign nodule.
TIRADS 4 a	: Mildly suspicious .
b	: Moderately suspicious .
c	: Highly suspicious .
TIRADS 5	: Malignant .

(TIRADS : Thyroid Imaging Reporting & Data System .)

Figure (10): TIRADS 4a and 4b classification.

Statistical analysis

Data were fed to the computer and analyzed using IBM SPSS Corp. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) for non-parametric data and mean ± standard deviation for parametric data after testing normality using Shapiro–Wilk test. Significance of the obtained results was judged at the (0.05) level.

RESULTS

Our study was conducted on 60 patients. 76.7% (no = 46) of the cases were females and 23.3% (no=14) were males. They were chosen according to the inclusion and exclusion criteria (Table 1).

Table (1): Demographic characteristics.

	Mean±SD	**Min-Max**
Age/years	39.48±11.68 (19.0-72.0)	
Sex	**No=60**	**%**
Male	14	23.3
Female	46	76.7

Table (2), showed that the medical history was variable among our cases and it was found that 75.0% of the cases did not have any medical co-morbidities, 5% were diabetic, 1.7% had HCV infection, 10% had HTN, 1.7% had osteoarthritis, 1.7% had IBS, 1.7% had GERD and 1.7% had dystonia **(**Table 2).

Table (2): Medical history distribution among studied cases

Medical history	**No**=60	**%**
FREE	45	75.0
DM	3	5.0
IBS	2	3.3
HTN	6	10.0
HCV	1	1.7
GERD	1	1.7
Dystonia	1	1.7
Osteoarthritis	1	1.7

Regarding TIRADS classification, it was found that 33.3% of the cases were TIRADS 3, 36.7% were TIRADS 4a, 23.3% were 4b, 3.3% were TIRADS 4c and 3.3% were TIRADS 5 (Figure 11).

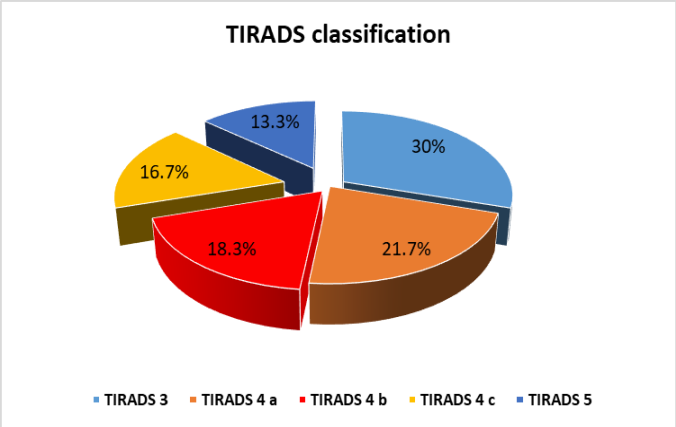


Figure (11): TIRADS classification of the studied cases.

It was found 6.7% were Bethesda I, 38.3% were Bethesda II, 20.0% were Bethesda III, 26.7% were Bethesda IV and 8.3% were Bethesda V (Table 3).

Table (3): FNAC (Bethesda) results among studied cases

FNAC (Bethesda)	No=60	%
Bethesda l	4	6.7
Bethesda II	23	38.3
Bethesda III	12	20.0
Bethesda IV	16	26.7
Bethesda V	5	8.3

It was shown that 30.0% of the cases were papillary carcinoma, 15.0% were lymphocytic thyroiditis (Hashimoto thyroiditis), 8.3% were hyperplasia, 16.7% were follicular adenoma and 30.0% were colloid (Table 4).

Table (4): Pathology results among studied cases

Pathology	No=60	%
Papillary carcinoma	18	30.0
Hyperplastic non nodular	5	8.3
Hashimoto Thyroiditis	9	15.0
Follicular adenoma	10	16.7
Colloid	18	30.0

Cases with MNG represent 53.3% while STN cases represent 46.7%of all cases (Table 5).

Table (5): Number of MNG & STN among studied cases.

Cases	No=60	%
MNG	32	53.3
STN	28	46.7

All patients presented with MNG (no=32) underwent total thyroidectomy. While patients with STN (no=28), nine of them underwent total thyroidectomy and the remaining nineteen cases underwent hemi thyroidectomy. There was statistical significance [P < 0.001 (Table 6)].

Table (6): Type of surgery distribution among studied cases

	Total thyroidectomy No=41	Hemi-thyroidectomy No=19	Test of significance
MNG	32 (78.0)	0 (0.0)	χ^2=31.78
STN	9 (22.0)	19 (100.0)	P < 0.001*

Regarding surgery, 68.3% of the cases underwent total thyroidectomy and 31.7% underwent hemi-thyroidectomy (Table 7).

Table (7): Surgery according to pathology results among studied cases

Surgery	Benign No=42(%)	Malignant No=18(%)	Test of significance
Total thyroidectomy	24 (57.1)	17 (94.4)	χ^2=8.10
Hemi-thyroidectomy	18 (42.9)	1 (5.6)	p=0.004*

The accuracy of TIRADS as regards TIRADS 3,4a and 4b compared to TIRADS 4c and 5 showed sensitivity of 83.3%, specificity of 92.9%, PPV of 83.3%, NPV of 92.9% and accuracy of 90.0% (Table 8).

Table (8): Accuracy of TIRADS classification in differentiating malignant thyroid lesions

	Benign No=42(%)	Malignant No=18(%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
TIRADS 3,4A, 4B	39	3	83.3	92.9	83.3	92.9	90.0
TIRADS 4C &5	3	15					

The accuracy of the Bethesda system or FNAC in differentiating malignant thyroid lesions, it was found to be 78.3% with specificity = 81.0%, sensitivity = 72.2%, PPV = 61.9% and NPV =87.2% (Table 9).

Table (9): Validity of FNAC in detection of pathology

FNAC	Pathology		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
	Benign no=42	Malignant no=18					
Bethesda i , II , III	34	5	72.2	81.0	61.9	87.2	78.3
Bethesda IV, Bethesda V	8	13					

DISCUSSION

The TIRADS provides prediction of malignancy risk by categorizing ultrasound trends or taking into account the count of ultrasound risk scores and doubtful US characteristics. Several guidelines recommend risk arrangement methods based on the classification in recent years of ultrasound modalities for thyroid nodules [(7)].

In the TIRADS sonological lexicon, strong composition, taller than wide, marked hypo-echogenicity, micro-calcifications and irregular margins are sonological characteristics for thyroid lesions to be malignant [(8)]. Therefore, the current study aimed to assess the specificity, sensitivity and accuracy of TIRADS in diagnosis of thyroid malignancy. The study included 60 patients with non-toxic thyroid nodules, subjected to US to detect TIRADs classification and to FNAC at Pathology Department in Mansoura University Hospitals or private laboratories.

The current study evaluated the demographic characteristics of the studied cases, which showed that mean age was 39.48 ± 11.68 years and 23.3% of cases were males while 76.7% were females. Regarding medical and surgical history of the patients, 75.0% of the cases did not have any medical co-morbidities, 5% were diabetic, 1.7% had HCV infection, 10% had HTN, 1.7% had osteoarthritis, 1.7% had IBS, 1.7% had GERD and 1.7% had dystonia.

A study conducted by **Srinivas *et al.*** [(8)] to assess the diagnostic precision of the regular use of the category of TIRADS in distinguishing a benign from a malignant thyroid lesion and to evaluate the function of the TIRADS system in significantly decreasing biopsies. There were 343 women (93.97 percent) and 22 men (6.03 percent) out of 365 patients included in that report. The patients' average age was 33.1 years (from18 to 68 years).

The present study found that TSH level among the studied cases was 1.52 ± 0.98. Regarding TIRADS classification, it was found that 33.3% of the cases were TIRADS 3, 36.7% were 4a, 23.3% were 4b, 3.3% were 4c and 3.3% were 5.

Sahli *et al.* [(9)] conducted a research in 2019 to assess the diagnostic importance of the undetermined significance and a suspicious nodule of the TIRADS. A TIRADS 4 (81, 60.9 percent) was allocated to most nodules, followed by TIRADS 3 (25, 18.8 percent), TIRADS 5 (18, 13.5 percent), and TIRADS 2 (9, 6.8 percent). A TIRADS 1 or "benign" designation was not assigned to any thyroid nodules in that report. Regarding the Bethesda system or FNAC findings among our cases, it was found that 6.7% were Bethesda I, 38.3% were Bethesda II, 20.0% were Bethesda III, 26.7% were Bethesda IV and 8.3% were Bethesda V. Regarding pathological findings, it was shown that 30.0% of the cases were papillary carcinoma, 15.0% were lymphocytic thyroiditis (Hashimoto thyroiditis), 8.3% were hyperplasia, 16.7% were follicular adenoma and 30.0% were colloid. Regarding surgery, 68.3% of the cases underwent total thyroidectomy and 31.7% underwent hemi-thyroidectomy.

Sahli *et al.* [(9)] recorded that follicular adenoma was 28.6% then adenomatoid nodule was 18.8%, noninvasive follicular thyroid neoplasm with papillary-like nuclear features was 14.3%, hyperplasia of nodules was 13.5%, thyroiditis (lymphocytic pattern) was 1.5% and Hürthle cell adenoma was 1.5% (the most prevalent benign pathology). In 30 nodules, 22.6% were malignant pathologically. Classic papillary thyroid cancer was, 9.8% then follicular variant of papillary carcinoma was 6.0%, follicular carcinoma was 6.0%, and Hürthle cell carcinoma was 0.8%. These are the most common pathologies among the malignancies.

There was no substantial difference in the distribution of age and gender between the malignant and benign groups for either AUS cytology or FLUS cytology.

In our study, all patients presented with MNG (no=32) underwent total thyroidectomy. While, patients with STN (no = 28) nine of them underwent total thyroidectomy and the remaining nineteen cases underwent hemi-thyroidectomy. There was statistical significance ($P < 0.001$). Regarding, the association between the final pathology among the included cases and FNAC and surgery, the present study found that there was significant statistical difference between the final pathology (benign or malignant) of the cases and FNAC or Bethesda system (Bethesda IV P=0.007 and Bethesda V P=0.01). Moreover, this study found that there was significant statistical difference between the final pathology (benign or malignant) of the cases and surgery [(hemi-thyroidectomy), $p = 0.004$]. Lately, there had been a substantial rise in the identification of thyroid lesions, with advancements in high-resolution US modalities combined with a prevalent availability, resulting in a corresponding rise in the number of FNAC analyses needed for thyroid neoplasms and consequently a growing number of cases diagnosed as carcinomas of the thyroid [(2).] The relationship between the classification of TIRADS and the pathology was examined by **Baser *et al.*** [(7)]. An important statistical difference between benign and malignant nodules was observed in the TIRADS group ($P = 0.001$). In the malignant rather than benign category, TIRADS 4c and 5 classifications were more predominant.

Also, this study evaluated the accuracy of the Bethesda system or FNAC in differentiating malignant thyroid lesions. It was found to be 78.3% with specificity =81.0%, sensitivity =72.2%, PPV= 61.9% and NPV =87.2%.In this study, it was found that TIRADS 3 represented 30.0% of cases, TIRADS 4a represented 21.7%, TIRADS 4b represented 18.3%,

TIRADS 4c represented 16.7% and TIRADS5 represented13.3%.

Importantly, the current study evaluated the accuracy of TIRADS as regard (TIRADS 3,4a and 4b) compared to (TIRADS 4c and 5) with sensitivity of 83.3%, specificity of 92.9%, PPV of 83.3%, NPV of 92.9% and accuracy of 90.0%. Many literatures assessed the diagnostic importance of thyroid imaging reporting and data system and the FNAC of the thyroid nodule. In contrast to our results, a study was done by **Friedrich-Rust *et al.*** [10] involving 114 patients presented a high NPV (92 -100 percent) for categories 4 and 5 of the TIRADS in the exclusion of carcinoma in thyroid nodule investigative work. In addition, a retrospective analysis of 100 patients trying to compare single doctor-established ultrasonographic TIRADS outcomes to FNAC results. The analysis showed that 83 percent were in concordance rate with 70.6%, 90.4% and 93.8% for sensitivity, specificity and NPV respectively [9]. A prospective analysis of 502 nodules in 210 patients with relating TIRADS to pathology after surgery in 2009 assessing the relationship of TIRADS and final pathology by **Horvath *et al.*** [4]**.** They reported a malignancy risk to be 0 percent, 1.8 percent, 76.1 percent, and 98.9 percent among TIRADS 2, 3, 4 and 5 respectively. The researchers registered a sensitivity, specificity, PPV, and NPV of 99.6 percent, 74.35 percent, 82.1 percent, and 99.4 percent, respectively using TIRADS 4–5 to apply FNAC.

It was found that in multivariate logistic regression analysis in the AUS subcategory, TIRADS was correlated with carcinoma. Class TIRADS 4c was associated with malignancy. No substantial difference was observed between histopathological malignant and benign nodules with particular regard to suspicious US characteristics in the FLUS subclass ($P > 0.05$, all) [7]**.** Also, another study found that the thyroid imaging reporting and data system's sensitivity, precision, positive predictive value, negative predictive value, and accuracy were 71.4 percent, 38.1 percent, 40.2 percent, 69.6 percent, and 50.4 percent, respectively [11].

Consequently, TIRADS classification and U/S scoring, in addition to suspicious U/S features, could be helpful in the prediction of malignancy and planning further management for thyroid nodules.

The discrepancies in findings of the above mentioned studies can be explained by a number of factors including differences in genetic background, the etiology of thyroid lesions, dissimilar populations, selection of patients and limited sample size.

CONCLUSION

TIRADS scoring system is of great value in the diagnosis of simple nodular goiter as it gives a degree of accuracy more than 90% compared to FNAC were the degree of accuracy was 78.3%.

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