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Research Article

Prevalence and Sonographic Features of Incidental Thyroid Nodules in Maxillofacial Radiology: An EU-TIRADS-Based Risk Assessment

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Abstract

Aim: Incidental thyroid nodules (ITNs) are frequently discovered during imaging for non-thyroid-related reasons, with ultrasonography (US) serving as a key tool for their detection and risk assessment. This study aims to determine the prevalence and sonographic characteristics of ITNs in patients undergoing head and neck ultrasonography for non-thyroidal indications at a maxillofacial radiology clinic, using the European Thyroid Imaging Reporting and Data System (EU-TIRADS) for risk stratification.

Material and Methods: Patients referred for head and neck ultrasonography for indications unrelated to thyroid pathology were included in this study. Patients with known thyroid disease, palpable thyroid masses, prior thyroid surgery, or head and neck radiotherapy were excluded. Thyroid nodule characteristics, including size, composition, echogenicity, margin, shape, and vascularity, were evaluated. Risk stratification was performed using the EU-TIRADS system, and nodules with suspicious features were referred for further evaluation, including fine-needle aspiration cytology.

Results: A total of 170 patients aged between 17 and 72 years (mean age: 29.35 years) were evaluated. Incidental thyroid nodules were identified in 49 patients (28.8%). Nodules were present in 24.29% of males (n=70) and 32% of females (n=100). Among the patients with nodules, 3 patients (6.12%) were diagnosed with papillary thyroid carcinoma (PTC), and 13 patients (7.7%) were referred for endocrinology consultation due to thyroiditis, hypoplasia, or hyperplasia.

Conclusion: The findings underscore the importance of opportunistic thyroid evaluation in patients undergoing head and neck ultrasonography for non-thyroidal reasons. With a 28.8% prevalence of incidental thyroid nodules, early detection through such opportunistic screening may facilitate timely management of suspicious lesions.

Keywords: thyroid nodule, ultrasonography, fine-needle aspiration biopsy, head and neck imaging

INTRODUCTION

Incidental thyroid nodules (ITNs) are asymptomatic thyroid nodules discovered during imaging that are performed for reasons unrelated to thyroid pathology (1). The prevalence of ITNs in ultrasound (US) examinations can reach 67%, with age and female sex identified as risk factors (2). Although ITNs often remain benign, the malignancy risk is approximately 12% for nodules evaluated by US-guided fine-needle aspiration cytology (FNAC), particularly in populations already undergoing invasive diagnostic procedures or surgical interventions (1).

Thyroid US is cost-effective, noninvasive, and widely accessible, making it vital for both initial detection and risk stratification of thyroid nodules. Various guidelines, including those from the European Thyroid Association (ETA), incorporate US-based risk stratification systems such as the Thyroid Imaging Reporting and Data System (TIRADS) to characterize ITNs and guide clinical decision-making (3). TIRADS classifications are used to identify nodules that warrant further evaluation via FNAC or follow-up US, thereby facilitating early diagnosis and appropriate therapeutic interventions and reducing the rates of localized and distant metastases in thyroid cancer patients (4). The prevalence of ITNs differs among various populations,

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ranging from 21% in Finland (5) to 33% in Italy (6) and 34% in Korea (7). However, limited data exist regarding the prevalence of ITNs detected during routine maxillofacial radiology. This study aimed to determine the prevalence and US characteristics of ITNs in patients who underwent head and neck US for nonthyroid indications at a maxillofacial radiology clinic. The sonographic features were categorized according to the EU-TIRADS, and both grayscale and color Doppler US were employed to assess risk profiles and guide further management.

MATERIAL AND METHODS

This study evaluated volunteers referred to the Bahçeşehir University School of Dental Medicine, Oral and Maxillofacial Radiology Clinic for head and neck ultrasonography between January 1 and December 31, 2024. The study protocol was approved by the Bahçeşehir University Ethics Committee (Ethics approval number 2023-22/08). The study adhered to the tenets of the 1964 Helsinki Declaration and its later amendments.

Written consent was obtained from all participants who agreed to undergo thyroid ultrasonography in addition to their primary imaging. This research was designed as a cross-sectional observational study. The inclusion criterion was undergoing an ultrasound examination of the neck area. The exclusion criteria included known thyroid disease, a palpable thyroid mass, prior thyroid surgery, or a history of head and neck radiotherapy.

Demographic data (sex and age) were recorded for each participant. One oral and maxillofacial radiologist with 5 years of imaging experience independently performed the initial US assessments. A single ultrasound device (Acuson Redwood, Siemens Medical Solutions, Mountain View, CA, USA) with an 18L6 linear probe (4.6–17.8 MHz) was used for all examinations. The stored images were subsequently re-evaluated by a radiologist with 15 years of thyroid ultrasound experience. Any discrepancies between the two radiologists were resolved by consensus.

For each thyroid nodule, the following US features were assessed: size (largest axis in millimeters), composition (cystic, spongiform, mixed predominantly cystic, mixed predominantly solid, or solid), echogenicity (anechoic, markedly hypoechoic, mildly hypoechoic, isoechoic, hyperechoic), echotexture (homogeneous or heterogeneous), margin (smooth, ill-defined, irregular-spiculated, or irregular-microlobulated), shape (oval, round, taller than wide, taller than long), presence of echogenic foci (none, hyperechoic spots, microcalcifications, macrocalcifications), and vascularity (Type I: no detectable intranodular or perinodular vascularity; Type II: perinodular and/or minimal intranodular vascular flow; Type III: prominent intranodular vascularity accompanied by mild perinodular flow). Nodules are classified according to their solid component when they exhibit a mixed composition (3). Risk classification was performed via the EU-TIRADS scoring system (Table 1). EU-TIRADS categorization was applied strictly according to the European Thyroid Association guidelines. When multiple nodules were present, the nodule with the highest TIRADS category was evaluated as the primary lesion, regardless of its size. Marked hypoechogenicity (solid components), microcalcifications, microlobulated margins and a taller-than-wide shape were regarded as suspicious ultrasonographic features. Endocrinology referrals were made according to EU-TIRADS risk categories and sonographic findings. Nodules with suspicious features consistent with EU-TIRADS 5 were referred for further evaluation, as well as EU-TIRADS 4 nodules measuring ≥15 mm. Patients with findings suggestive of thyroiditis, thyroid hypoplasia or hyperplasia, or diffuse parenchymal abnormalities were also referred to endocrinology. Nodules that did not meet the criteria for FNAC were advised to undergo endocrinology-based clinical and ultrasonographic follow-up in accordance with guideline recommendations (Fig. 1).

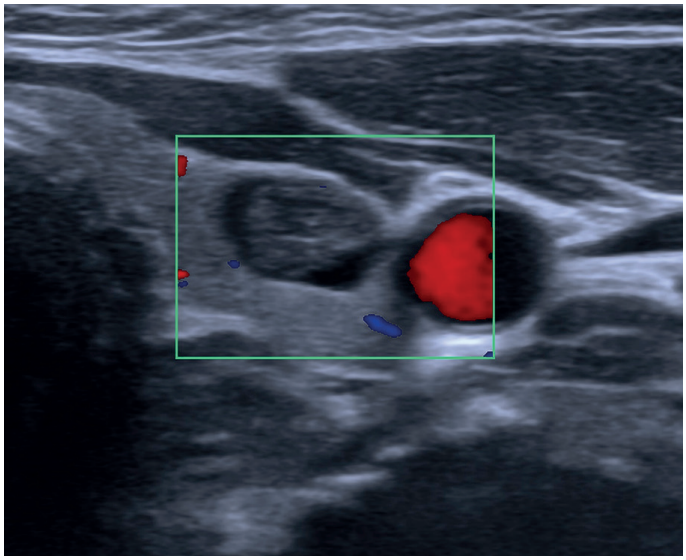

Figure 1. Ultrasound image of a 26-year-old man demonstrating a solid, markedly hypoechoic thyroid nodule with well-defined margins and no detectable vascularity. The lesion also contains microcalcifications. These combined features correspond to EU-TIRADS 5 classification. Ultrasound-guided FNAC confirmed papillary thyroid carcinoma.

Statistical analysis

The data were analyzed via SPSS version 25 (SPSS, Chicago, IL, USA). Continuous data are expressed as the means ± standard deviations, whereas categorical variables are presented as frequencies or percentages. Continuous variables were evaluated via Student's t test, and categorical variables were compared via the chi-square test or Fisher's exact test, as appropriate. Correlations between certain variables were assessed via Spearman correlation. A two-tailed p value of less than 0.05 was considered statistically significant.

A sample size and precision assessment was also performed to evaluate the adequacy of the study population for estimating the prevalence of incidental thyroid nodules. The analysis was conducted using G*Power 3.1 software. This study aimed to estimate the prevalence of incidental thyroid nodules in patients undergoing head and neck ultrasonography for non-thyroidal indications. With a total of 170 participants, the 95% confidence interval around the observed prevalence of 28.8% provides a reasonable degree of precision for a prevalence estimate. This level of precision is considered methodologically acceptable for an exploratory single-center prevalence study.

RESULTS

A total of 170 patients, representing a broad age range (mean age: 29.35 years; range: 17–72 years), were included in the study. Among the cohort, 111 individuals presented no discernible pathological findings, whereas 49 patients (28.8%) presented with at least one incidental thyroid nodule (Table 2). In male patients (n=70), nodules were found in 24.29%, whereas they were found in 32% of female patients (n=100). Among the patients found to have thyroid nodules, 3 (6.12%) were diagnosed with papillary thyroid carcinoma (PTC). Notably, 13 patients (7.7%) necessitated endocrinology consultation due to specific findings—9 with thyroiditis (5.29%), 3 with thyroid hypoplasia (1.8%), and 1 with thyroid hyperplasia (0.6%). The data revealed a greater prevalence of nodules in females; however, this difference was not statistically significant (p=0.24). The mean age of patients with nodules (33.12 ± 12.71 years) was greater than that of patients without nodules (27.82 ± 10.82 years), although the difference was not statistically significant (p = 0.326). The average diameter of the thyroid nodules was 5.19 mm, with the largest nodule measuring 12 mm. There was no significant difference between the sexes in terms of the mean diameter of the nodules (p = 0.745). Ultrasonographic evaluation demonstrated that more than half of the nodules were cystic in composition (55.1%), followed by mixed predominantly cystic (12.2%), mixed predominantly solid (14.3%), and solid lesions (18.4%). Regarding echogenicity, 55.1% of nodules were anechoic, 22.4% mildly hypoechoic, 14.3% isoechoic, and 8.2% markedly hypoechoic. Most nodules exhibited homogeneous echotexture (79.6%), whereas 20.4% demonstrated heterogeneous patterns. Shape analysis revealed predominantly oval morphology (91.8%), with only one round nodule (2%) and three nodules (6.1%) showing a taller-than-wide orientation. Marginal characteristics included smooth borders in 81.6% of nodules, ill-defined margins in 16.3%, and irregular microlobulated margins in 2%. Hyperechoic foci were detected in a subset of nodules, comprising hyperechoic spots (12.2%), microcalcifications (12.2%), and macrocalcifications (2%). Vascularity patterns were predominantly Type I (85.7%), followed by Type II (10.2%) and Type III (4.1%). Extrathyroidal extension was identified in 4.1% of nodules (Table 2). Additionally, high-risk features such as irregular margins or microlobulations (1 patient), microcalcifications (6 patients), taller-than-wide signs (3 patients), extrathyroidal growth (2 patients), and high intranodular vascularization (type III, 3 patients) were observed in select cases (Table 3).

There was no significant difference in the EU-TIRADS score between sexes (p = 0.44). However, a significant positive correlation was observed between EU-TIRADS scores and age (r = 0.252, p = 0.001).

Table 1. EU-TIRADS categories

Category	Feature
EU-TIRADS 1: normal	No nodules
EU-TIRADS 2: benign	Pure cyst Entirely spongiform
EU-TIRADS 3: low risk	Ovoid, smooth isoechoic/hyperechoic No features of high suspicion
EU-TIRADS 4: intermediate risk	Ovoid, smooth, mildly hypoechoic No features of high suspicion
EU-TIRADS 5: high risk	At least 1 of the following features of high suspicion: – Irregular shape – Irregular margins – Microcalcifications – Marked hypoechogenicity (and solid)

EU-TIRADS: European Thyroid Imaging Reporting and Data System

Table 2. Patient characteristics and risk stratifications based on the EU-TIRADS classification

Variable	
Age, years	29.35± 11.61
Female, n (%)	100 (58.8)
Nodule, n (%)	49 (28.8)
EU-TIRADS 1: Normal, n (%)	121 (71.2)
EU-TIRADS 2: Benign, n (%)	27 (15.9)
EU-TIRADS 3: Low risk, n (%)	5 (2.9)
EU-TIRADS 4: Intermediate risk, n (%)	5 (2.9)
EU-TIRADS 5: High risk, n (%)	12 (7.1)

EU-TIRADS: European Thyroid Imaging Reporting and Data System

Table 3. Ultrasound characteristics of thyroid nodules

	Frequencies n (%)
Composition	
Cystic	27 (55.1)
Mixed predominantly cystic	6 (12.2)
Mixed predominantly solid	7 (14.3)
Solid	9 (18.4)
Echogenicity	
Anechoic	27 (55.1)
Mildly hypoechoic	11 (22.4)
Isoechoic	7 (14.3)
Markedly hypoechoic	4 (8.2)
Echotexture	
Homogeneous	39 (79.6)
Heterogeneous	10 (20.4)
Shape	
Oval shape	45 (91.8)
Round	1 (2)
Taller than wide	3 (6.1)
Margin	
Smooth margin	40 (81.6)
Ill-defined margin	8 (16.3)
Irregular margin-Microlobulated	1 (2)
Irregular margin-Spiculated	-
Vascularity	
Type I	42 (85.7)
Type II	5 (10.2)
Type III	2 (4.1)
Hyperechoic foci	
Hyperechoic Spots	6 (12.2)
Microcalcifications	6 (12.2)
Macrocalcifications	1 (2)
Extrathyroidal Extension	
Present	2 (4.1)

DISCUSSION

This study investigated the added value of thyroid imaging in patients undergoing US evaluations for nonthyroid maxillofacial indications. The prevalence and characteristics of ITNs discovered at a maxillofacial radiology clinic were evaluated, and referral for FNAC or surveillance of patient risk stratifications was performed with the EU-TIRADS criteria. Our findings indicated an ITN incidence of 28.8% in cohort patients with a mean age of 29.35 years. Among these, 3 (6.12%) patients were diagnosed with PTC. Additionally, patients whose thyroid findings were consistent with thyroiditis (n=9), thyroid hypoplasia (n=3), or thyroid hyperplasia (n=1) were referred for endocrinology consultation.

Thyroid nodules are a common clinical concern and are frequently identified incidentally across diverse populations. Epidemiological studies report that the prevalence of palpable thyroid nodules is approximately 4–7%, particularly in iodine-sufficient regions (8, 9). However, autopsy data suggest that the actual prevalence of thyroid nodules may be substantially higher, ranging from 10% to 60% (10). Moreover, the use of high-resolution US has revealed an even greater prevalence of ITNs, reaching 68% in some populations (10, 11).

In the present study, the prevalence of ITNs was 28.8%. This rate is lower than that reported in some studies (6, 7, 11), but it aligns with findings from the study of Moifo et al., which reported a prevalence of 28.3% and another study conducted in a Turkish population, which reported that 23.17% of all check-up patients had thyroid nodules (12). These variations may be attributed to regional population differences among the studies. For example, a study conducted in an iodine-deficient population in Germany reported an ITN prevalence of 68%, with 53% of patients exhibiting thyroid nodules without gland enlargement and 15% displaying both gland enlargement and thyroid nodules (11). The relatively lower prevalence in the current study may also be influenced by the younger mean age of the cohort. In the present study, the mean age was lower than the ages reported in other series (6, 11, 12). Guth et al. reported a higher prevalence of ITNs, with a median age of 56±11.9 years. Furthermore, the prevalence of thyroid nodules significantly increased with age (11). In our study, while patients with nodules were older on average than those without, the difference was not statistically significant. However, the EU-TIRADS score was significantly positively correlated with age.

Thyroid nodules reportedly exhibit a female predominance. Male sex has been identified in the literature as a risk factor for thyroid cancer (13). Bukasa-Kakamba et al. noted that thyroid nodules were predominantly observed in females; however, males were more frequently affected by thyroid cancer (30.9% vs. 20.1%) (13). While the data indicated a greater prevalence of nodules in females (32%) than in males (24.29%), this difference was not statistically significant. Additionally, risk stratifications were similar between the sexes. This finding is consistent with results from the study of Guth et al. (11).

Malignant neoplasms are found in 2–15% of thyroid nodules, with the majority being diagnosed with papillary thyroid carcinoma and follicular carcinoma (over 90%) (10, 14). The malignancy rate has been shown to be similar for both palpable and nonpalpable thyroid nodules, although incidental nodules tend to exhibit better progression-free survival and prognosis (15).

In a retrospective analysis by McCorry et al., which reviewed patients referred for US evaluation after incidentally detected ITNs on computed tomography (CT), positron emission tomography (PET), magnetic resonance imaging (MRI), and US, 3.5% of the ITNs were found to be malignant (16). Eidt et al. reported a cancer incidence of 5.9%, with ACR-TIRADS and EU-TIRADS potentially allowing FNAC to be avoided in 26.7% and 17.8% of cases, respectively (17). Similarly, in our study, 6.12% of all incidental thyroid nodules were found to be malig-

nant, falling within the range of previous reports. The variability in findings across studies can be influenced by factors such as the population studied, the initial imaging method used, and the number of patients selected for further evaluation (18).

Thyroid nodules are commonly encountered but are often asymptomatic and are frequently detected as incidental findings by imaging modalities such as CT, PET, carotid Doppler studies, and neck US and MRI (10). Guidelines strongly recommend thyroid US with cervical lymph node evaluation for all patients with known or suspected thyroid nodules (19). US is widely regarded as the preferred imaging modality for evaluating thyroid nodules because of its noninvasive nature, accessibility, and high sensitivity in detecting carcinomas, with sensitivity ranging from 87% to 95% (10, 15).

The implementation of various risk stratification systems, such as the EU-TIRADS, offers standardized terminology for describing the appearance of thyroid nodules and aids in selecting cases for FNAC (8, 19). This approach aims to improve thyroid cancer diagnosis while safely identifying low-risk nodules for which FNAC can be avoided. The EU-TIRADS incorporates four high-risk features: marked hypoechogenicity (and solid composition), being taller than wide, microcalcifications, and irregular margins (3, 20, 21). However, strict adherence to guidelines may increase the risk of missing thyroid cancer diagnoses in borderline cases while attempting to minimize “unnecessary” FNAC procedures (20). A meta-analysis comparing four ultrasound-based risk stratification systems—namely, the American College of Radiology (ACR)-TIRADS, the American Thyroid Association (ATA), the Korean Thyroid Association/Korean Society of Thyroid Radiology (KTA/KSThR; K-TIRADS), and the EU-TIRADS—found comparable diagnostic capabilities among these systems (22). Studies comparing the EU-TIRADS with the ACR-TIRADS (20) and K-TIRADS (23) have shown that both systems are suitable for assessing thyroid nodules and, through risk stratification, can help avoid unnecessary FNAC. In our study, we chose the EU-TIRADS for its ease of use compared with score-based guidelines such as the ACR-TIRADS (20).

Our findings highlight the potential role of maxillofacial radiology in the detection of ITNs, especially as US is increasingly utilized for oral and maxillofacial diagnostic procedures (24). Incorporating thyroid screening into these routine evaluations could provide an additional layer of healthcare screening, reducing the risk of delayed or missed thyroid pathologies. Furthermore, ITNs present a similar degree of malignancy risk to clinically apparent nodules, yet their incidental detection often leads to a more favorable prognosis, including better progression-free survival and overall survival (15).

Several limitations should be acknowledged. First, the study was conducted in a single university maxillofacial radiology clinic, which may limit the generalizability of our findings. Second, although both a maxillofacial radiologist and a general radiologist interpreted the images, variability in operator skill and image interpretation may introduce bias. Finally, the cross-sectional design of the study limits our ability to determine the natural progression of nodules over time or to assess their eventual risk of developing malignancy.

Further research, including cost–benefit analyses, is necessary to refine and validate the role of opportunistic thyroid screening in nonthyroid imaging settings. The potential benefits and outcomes of implementing thyroid ultrasound scans in maxillofacial radiology clinics require further investigation.

CONCLUSION

This study reported a 28.8% prevalence of incidental thyroid nodules that would likely have gone unnoticed otherwise. It emphasizes the importance of evaluating the thyroid region, which may lead to the early identification of suspicious lesions, prompt endocrinology referrals, and potentially improved clinical outcomes. By incorporating standardized evaluation methods such as the EU-TIRADS, clinicians can determine which nodules warrant closer follow-up or biopsy. Taken together, these findings highlight that opportunistic thyroid assessments in maxillofacial radiology clinics may enhance early detection, improve patient management, and reduce the risk of missing clinically significant thyroid abnormalities.

DECLARATIONS

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Author contributions

E.Ç. put forward the research concept and contributed to the formal analysis and investigation together with V.A.A., E.Ç. and N.G. provided the data resources. Data curation was carried out by E.Ç., V.A.A., and NG. The original draft of the manuscript was written by E.Ç., while N.G. and G.Ü. contributed to its review and editing. G.Ü. also contributed to the visualization and provided supervision throughout the study. All authors have read and approved the final manuscript.

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Clinical trial number

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Data availability

The datasets used and/or analysed during the study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study protocol was approved by the Bahçeşehir University Ethics committee (Ethics approval number 2023-22/08). The study adhered to the tenets of the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all subjects involved in the study.

Consent for publication

Not applicable.

Competing interests

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

1. Hoang JK, Langer JE, Middleton WD, et al. Managing incidental thyroid nodules detected on imaging: white paper of the ACR Incidental Thyroid Findings Committee. J Am Coll Radiol. 2015;12(2):143-50.
2. Nguyen XV, Job J, Fiorillo LE, Sipos J. Thyroid incidentalomas: practice considerations for radiologists in the age of incidental findings. Radiol Clin North Am. 2020;58(6):1019-31.
3. Russ G, Bonnema SJ, Erdogan MF, et al. European Thyroid Association guidelines for ultrasound malignancy risk stratification of thyroid nodules in adults: the EU-TIRADS. Eur Thyroid J. 2017;6(5):225-37.
4. Yu J. Trends in the incidence of thyroid cancer among US persons from 2000 to 2019. Eur J Cancer Prev. 2024;33(1):5-10.
5. Brander AE, Viikinkoski VP, Nickels JI, Kivisaari LM. Importance of thyroid abnormalities detected at US screening: a 5-year follow-up. Radiology. 2000;215(3):801-6.
6. Bartolotta T, Midiri M, Runza G, et al. Incidentally discovered thyroid nodules: incidence, and greyscale and colour Doppler pattern in an adult population screened by real-time compound spatial sonography. Radiol Med. 2006;111(7):989-98.
7. Moon JH, Hyun MK, Lee JY, et al. Prevalence of thyroid nodules and their associated clinical parameters: a large-scale, multicenter-based health checkup study. Korean J Intern Med. 2018;33(4):753.
8. Dahlberg J, Carlqvist J, Larsson E, et al. Effects of Implementation of European Thyroid Imaging Reporting and Data System Risk Stratification in a Thyroid Cancer Program in Western Sweden: A Retrospective Cohort Study. Endocr Pract. 2024;30:830e6.
9. Uludag M, Unlu MT, Kostek M, et al. Management of thyroid nodules. Med Bull Sisli Etfal Hosp. 2023;57(3):287.
10. Wilhelm SM. Evaluation of thyroid incidentaloma. Surg Clin North Am. 2014;94 3:485-97.
11. Guth S, Theune U, Aberle J, et al. Very high prevalence of thyroid nodules detected by high frequency (13 MHz) ultrasound examination. Eur J Clin Investig. 2009;39(8):699-706.
12. Arğun D, Basim P. Rates of incidental thyroid nodule and thyroid cancer detection in routine check-up examinations: a single-center study. Bagcilar Med Bull. 2021;6(3).
13. Bukasa-Kakamba J, Bayauli P, Sabbah N, et al. Ultrasound performance using the EU-TIRADS score in the diagnosis of thyroid cancer in Congolese hospitals. Sci Rep. 2022;12(1):18442. Epub 2022/11/04. doi: 10.1038/s41598-022-22954-y. PubMed PMID: 36323772; PubMed Central PMCID: PMCPMC9630411.
14. Haugen BR, Alexander EK, Bible KC, et al. 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer. Thyroid. 2016;26(1):1-133.
15. Chooi JE, Ravindiran A, Balasubramanian SP. The influence of incidental detection of thyroid nodule on thyroid cancer risk and prognosis—A systematic review. Clin Endocrinol (Oxf). 2022;96(2):246-54.
16. McCrory D, Li C, Devlin B. Five-year review of incidental thyroid nodule management in the ENT outpatient department. Ann Thyroid. 2023;8.
17. Eidt LB, Nunes de Oliveira C, Lagos YBB, et al. A prospective comparison of ACR-TIRADS and EU-TIRADS in thyroid nodule assessment for FNA-US. Clin Endocrinol (Oxf). 2023;98(3):415-25. Epub 2022/07/22. doi: 10.1111/cen.14799. PubMed PMID: 35864563.
18. Fisher SB, Perrier ND. The incidental thyroid nodule. CA Cancer J Clin. 2018;68(2):97-105.
19. Xia M, Song F, Zhao Y, et al. Ultrasonography-based radiomics and computer-aided diagnosis in thyroid nodule management: performance comparison and clinical strategy optimization. Front Endocrinol (Lausanne). 2023;14:1140816. Epub 2023/05/30. doi: 10.3389/fendo.2023.1140816. PubMed PMID: 37251675; PubMed Central PMCID: PMCPMC10213653.
20. Borges AP, Antunes C, Caseiro-Alves F, Donato P. Analysis of 665 thyroid nodules using both EU-TIRADS and ACR TI-RADS classification systems. Thyroid Res. 2023;16(1):12. Epub 2023/05/08. doi: 10.1186/s13044-023-00155-7. PubMed PMID: 37150822; PubMed Central PMCID: PMCPMC10165776.
21. Abraham PJ, Lindeman BM. Management of incidental thyroid nodules. Surg Clin North Am. 2024;104(4):711-23.
22. Kim PH, Suh CH, Baek JH, et al. Diagnostic performance of four ultrasound risk stratification systems: a systematic review and meta-analysis. Thyroid. 2020;30(8):1159-68.
23. Marukatat N, Parklug P, Chanasriyotin C. Comparison of the diagnostic accuracy of K-TIRADS and EU-TIRADS guidelines for detection of thyroid malignancy on ultrasound. Radiography (Lond). 2023;29(5):862-6. Epub 2023/07/07. doi: 10.1016/j.radi.2023.06.011. PubMed PMID: 37413957.
24. Orhan K. Introduction to Ultrasonography in Dentomaxillofacial Imaging. In: Orhan K, ed, Ultrasonography in dentomaxillofacial diagnostics. Cham: Springer. 2021.p.1-4. https://doi.org/10.1007/978-3-030-62179-7_1