Thyroid Ultrasound Reports: Deficiencies and Recommendations

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Significance of the Study

- Thyroid ultrasound plays a major role in the clinical management of adult patients with thyroid nodules. Its role is greatly dependent on the operator's experience and comprehensive reporting. In this study, we aimed at an objective evaluation of the content and completeness of thyroid radiology reports. Incomplete ultrasound reports ultimately affect malignant risk stratification and subsequent therapeutic decisions.

Keywords

Ultrasound report · Thyroid ultrasound · Thyroid nodule · Risk assessment

Abstract

Objective: Thyroid ultrasound plays a major role in the clinical management of patients with thyroid nodules. Comprehensive reporting enables malignant risk stratification and biopsy decisions. In this study, we aimed at a systematic evaluation of the content and completeness of thyroid radiology reports. **Methods:** A retrospective study was undertaken. A total of 200 thyroid ultrasound reports of examinations performed over a 1-year period were reviewed. After excluding 18 reports, the remaining 182 were evaluated for the inclusion of the following nodule characteristics: size, 3-axis dimensions, location, presence or absence of five signs suspicious of malignancy, namely microcalcification, hypoechogenicity, irregular margin, height-to-width ratio, and

intranodular vascularity. **Results:** While all reported nodules could be stratified easily as being more or less than 1 cm in size, only 23.6% of these nodules were reported in 3 dimensions, and 33.5% of the nodules were specifically localized. For any described nodule, the frequency of reporting on echogenicity was 50%, on vascularity 19.2%, on margin 10.4%, on calcifications 9.3%, and no report contained a description of the height-to-width ratio. The cumulative frequency of reporting on one characteristic per nodule was 84%, of two characteristics 27%, three characteristics 4.4%, and no report included ≥ 4 characteristics per nodule. **Conclusion:** Despite easily accessible templates, reporting of thyroid nodule sonogram continues to be incomplete and inconsistent. This in turn constitutes a waste of a significant tool that could otherwise help in making timely informed medical decisions and in providing a significant platform for patients' future follow-up.

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Introduction

Thyroid nodules are commonly detected by high-resolution ultrasound with a prevalence of 19–67% [1]. While most of these nodules are benign, thyroid cancer is found in 5–15% of cases [2]. Therefore, their clinical significance relies on the ability to discriminate between benign and malignant lesions. As the likelihood of malignancy is greatly influenced by sonographic features, ultrasound has proven to be a significant tool in the initial evaluation, malignant risk stratification, and long-term management of thyroid nodules, thus its use has been endorsed by the American Thyroid Association (ATA), American Association of Clinical Endocrinologists (AACE), and European Thyroid Association [1–4]. The key role it plays in making clinical decisions is highly dependent on informative, easily interpreted reports provided by experienced, knowledgeable physicians.

Over history, the domain of ultrasound has moved gradually from being completely controlled by radiologists to being shared with clinicians, a move that could be related in part to inefficient communication of abnormalities detected by ultrasound to treating physicians [5]. Efforts to decrease the ambiguity of thyroid ultrasound reports and enhance their diagnostic value have persisted for years. Tools to standardize reporting have been developed such as the Thyroid Imaging Reporting and Data System (TIRADS) by Horvath et al. [6], and then modified by others over the last decade [1, 3, 5–14]. Additionally, the ATA and AACE guidelines provide specific features that should, at a minimum, be documented in reports [1, 3]. All these guidelines, differences notwithstanding, agree on the principle that all thyroid ultrasound reports should explicitly describe features that inform decision-making. To date, and despite these efforts, the general adoption of any comprehensive reporting tool seems to be a challenge, and reporting in many instances continues to follow subjective personal preferences.

There is limited research that critically appraises the content of the ultrasound reports provided by radiologists. Few studies have documented the suboptimal quality at some centers, in addition to a widespread dissatisfaction by endocrinologists and surgeons with these reports [15–20]. The negative impact of incomplete reporting on timely cytological diagnosis and surgical intervention has been documented [19, 20]. Nevertheless, Griffin et al. [21] proved recently, in a three-phase study, that simple implementation of the ACR TI-RADS structured reporting template improved the quality significantly. Therefore, more studies are required to continu-

ously and objectively evaluate the value of these reports at different facilities. This in turn will eventually, in collaboration with the relentless efforts made by different organizations to standardize and simplify the reporting, induce the change.

At our center, thyroid ultrasound has been performed primarily by radiologists for years; anecdotal experience seemed to be frustrating at multiple occasions due to the lack of significant information in the supplemented reports. In this study, we retrospectively reviewed 182 reports done over a 1-year period, aiming at an objective evaluation of their content and completeness.

Methods

We conducted a retrospective evaluation of 200 thyroid ultrasound reports of studies performed by radiologists at a tertiary referral medical center in Kuwait between March 2014 and April 2015. After excluding reports that showed no discrete lesions and those that reported purely cystic nodules, a total of 182 reports of thyroid nodules were finally reviewed. The study was conducted in accordance with our institution's research ethics guidelines.

Using some of the guidelines of ATA and AACE on assessment of thyroid nodules, each report was assessed for the inclusion of the following criteria: size of nodule(s), 3-axis dimensions, meticulous localization, presence or absence of five signs suspicious of malignancy, namely microcalcification, hypoechogenicity, irregular margin, height-to-width ratio, and intranodular vascularity [1, 3].

The size of the nodule was stratified to be above or below 1 cm based on the largest diameter. Location was evaluated as being nonspecific (simply the lobe) or more descriptive (as lower pole, upper pole, or central). Other features were considered recorded if they were specifically reported as being present or absent.

Statistical Analysis

All statistical analyses were conducted using SPSS software. Analyses included χ^2 and Fisher's exact test to study the association between the variables. The results were considered statistically significant at $p < 0.05$. Number, frequencies, and percentages were also calculated.

Results

A total of 58.8% of the 182 reports reviewed were of multinodular glands (>1 nodule), and 41.2% were of glands with unifocal lesions. As for multiple nodular goiters, 76.6% of the reports referred only to the largest nodule, 1.9% reported suspicious looking nodules, 12.1% reported on all nodules, and 9.3% reported on none. A total of 65.4% of the nodules reported were ≥ 1 cm in size. A nonspecific description of the location (only specifying the lobe) was the case in 66.5% of all nodules. Only 23.6%

of nodules were reported in 3 dimensions; this was not significantly influenced by nodule size being more or less than 1 cm ($p = 0.073$); however, it was significantly more likely to be reported for single rather than multiple nodular goiters ($p < 0.001$).

For any described nodule, the frequency of reporting on echogenicity was 50%, on vascularity 19.2%, on margin 10.4%, on calcifications 9.3%, and no report contained description of the height-to-width ratio. For those reported, the cumulative frequency of reporting on one characteristic per nodule was 84%, two characteristics 27%, three characteristics 4.4%, and no report included ≥ 4 characteristics per nodule. Furthermore, 34.6% of the reports mentioned none of the five characteristics.

Echogenicity and vascularity were more likely to be reported ($p < 0.001$) for single rather than multiple nodular goiters. However, that difference was not significant for calcifications and margin reporting, respectively ($p = 0.299$ and $p = 0.285$).

While nodular size made no significant difference in reporting on margin ($p = 0.215$), echogenicity ($p = 0.275$), or calcification ($p = 0.951$), vascularity was significantly more reported on nodules ≥ 1 cm ($p < 0.001$).

Out of all nodules with reported echogenicity, 42.9% were hypoechoic ($p < 0.001$), out of those with reported calcifications, 47.1% were positive for microcalcification ($p < 0.001$), and 82.9% of those with reported vascularity had increased intranodular vascularity ($p < 0.001$). Finally, 5.3% of reported margins were irregular ($p = 0.104$).

Discussion

In this study aiming to evaluate the content of ultrasound reports for thyroid nodules, we found that reports lacked standardization and consistency. In most cases, the description was suboptimal to guide a subsequent clinical decision on management or even a proper baseline for future follow-up. Our study is in agreement with others showing that few thyroid ultrasound reports contained the necessary information, and greatly supports previous studies expressing dissatisfaction of physicians with reports provided by radiologists [15–20].

Ultrasound is a primary tool in the evaluation, risk stratification, and follow-up of thyroid nodules. However, its value in impacting diagnosis and thus therapeutic decisions is highly affected by the operator and style of reporting. For example, malignant risk stratification using ATA guidelines would be significantly impeded by suboptimal documentation. This is evidenced by a tre-

mendous rise in the estimated risk of malignancy for a solid hypoechoic nodule from 10–20% to >70–90% if at least one additional feature, such as microcalcification, taller-than-wide shape, or irregular margin, was reported as absent or present, respectively [1]. Therefore, commenting on echogenicity in addition to other suspicious malignant features should be complementary and not mutually exclusive. Furthermore, since different studies favored different criteria as better predictors of malignancy, the more features reported the better is the distinction between benign and malignant lesions [1–3, 13, 14, 17, 19, 20]. In our study, the low rate of reporting on each of the suspicious malignant features and even lower cumulative reporting on multiple criteria is quite worrisome.

As for patients with multiple thyroid nodules, the ATA recommends that each nodule ≥ 1 cm should be evaluated in the same fashion as a solitary nodule ≥ 1 cm, since each of these nodules carries an independent risk of malignancy [1]. Additionally, the ACR TI-RADS Committee discourages the usage of the term “dominant nodule,” as it underestimates the primary role of architecture in determining further management [14]. Hence, the choice of reporting solely on the largest nodule, which seems to be largely adopted at our center, would by default ignore other possibly suspicious nodules that could require immediate attention and/or close follow-up on serial ultrasounds.

Follow-up of thyroid nodules using serial sonograms is done to determine nodular growth and/or change in pattern. This in turn is meant to guide future FNA decision-making based on either a 20% increase in at least two of the three nodular dimensions and/or development of suspicious US characteristics [1, 14, 22, 23]. Therefore, an initial precisely descriptive platform report that includes three axis dimensions and specific localization of any nodule targeted for follow-up is extremely essential for serial comparison, and its value cannot be overstated [14]. In turn, the paucity of this essential information in our reports further highlights their suboptimal nature.

The solution is within reach and is evidenced by the recent study by Griffin et al. [21]. They compared the completeness and consistency of thyroid ultrasound reports before and after the implementation of the ACR TI-RADS and concluded that the use of a structured reporting template improved the quality of these reports significantly [21].

Limitations of our study include the small sample size and the retrospective nature of the study. Furthermore, it lacked data on the clinical outcome that could have been affected by the quality of thyroid ultrasound reports. Larger prospective studies are warranted.

Conclusion

The pivotal role that thyroid ultrasound plays in the management of patients with thyroid nodules necessitates applying standardized reporting system templates such as the ACR TI-RADS. The role of a thorough, informative, and easily interpreted report which is not based on subjective preference is indispensable for the utilization of ultrasound in the management of patients.

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Disclosure Statement

The authors have no conflicts of interest to disclose.

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