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ORIGINAL ARTICLE

Comparative Study Between Fine-needle Aspiration Cytology, TIRAD, and Postoperative Histopathology in Assessment of Thyroid Nodule

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Abstract

Background: **One of the surgeries in general surgery that is most regularly carried out is a thyroidectomy. The risks of complications following thyroid surgery have significantly decreased, partly due to the development of new technologies such as harmonic scalpel and ligasure that aim to further reduce morbidity. The goal is to compare the Bethesda fine-needle aspiration cytology (FNAC) method and sonographic criteria as tools for evaluating indeterminate thyroid nodules, with the results being compared with the final histology.**

Methods: **Ninety individuals with thyroid nodules participated in this prospective trial at El-Hussein Hospital and Sayed Galal University Hospital.**

Results: **The patients' ages ranged between 25 and 60 years. Among the 90 patients, 75 (83.33 %) of them were female, whereas 15 (16.67 %) had masculine characteristics such as a ratio of 5 : 1, a thyroid stimulating hormone (TSH) mean SD (2.82 1.34), and FNAC sensitivity. Accuracy and specificity 93 %, 98 %, and 96.6 %. About 72.4 %, 90 %, and 88.2 % for term ultrasound scan (USS) sensitivity, specificity, and accuracy. The average operating duration was 82.17 min, and most patients stayed in our hospital for one to two days following surgery. Most people did not have any issues.**

Conclusion: **In our research, it was discovered that FNAC and ultrasonography (USG) have a rising specificity. Ultrasound and FNAC are two such diagnostic methods, however, using both together is optimal and will help avoid unnecessary surgery for many people. There is currently no test that can reliably determine whether or not a nodular goiter is cancerous.**

Keywords: Fine-needle aspiration cytology, Thyroid nodule, TIRAD

1. Introduction

One of the procedures in general surgery that is most regularly carried out is a thyroidectomy. The preferred course of treatment for many thyroid conditions is total thyroidectomy. A significant rate of morbidity and mortality was associated with the first documented cases of thyroid surgery, which occurred in the 12th century, and the procedure was not regularly carried out until the 1800s.[1] The rate of both temporary hypocalcemia and recurrent laryngeal nerve injury complications is reported to be 5–15 % as surgical technique and technology have evolved, whereas the rate of permanent paralysis of the recurrent laryngeal nerve and hypocalcemia complications is reported to be 1% or less. In large part thanks to the development of new technologies that further reduce morbidity, statistics on complications after thyroidectomy have significantly decreased. The Harmonic scalpel and the Ligasure are two such instruments that have been devised to enable a surgeon to achieve improved hemostasis and a safe dissection while executing an operation, and both are widely used in thyroid surgery.[2]

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Thyroid surgery entails meticulous devascularization of the thyroid gland, which has one of the organs' richest blood supply, with multiple blood arteries and plexuses accessing its parenchyma. Hemostasis in thyroid surgery is often achieved through ligation and/or severing of blood vessels; these methods are reliable but time-consuming.[3] Ultrasonography (US) is commonly utilized in thyroid gland evaluation. Nodules are one of the many conditions that can be depicted and classified by the United States. Nodules can be either benign or malignant. According to some research, less than 10 % of thyroid nodules are cancerous, whereas nodules are found in up to 50–67 % of the population.[4] Thyroid fine-needle aspiration cytology (FNAC) and, by extension, the diagnosis of thyroid cancer, have both increased as a result of the enhanced detection of thyroid nodules using US. Comparable problems inspired the creation of the Breast Imaging Reporting and Data System (BI-RADS) classifications.[5] The diagnostic examination of thyroid nodules by FNA is the most precise and economical option. Data from the most up-to-date studies show that US-guided FNA for the diagnosis of thyroid cancer has an overall accuracy of 69–97 %, with a sensitivity of 76–98 %, a specificity of 71–100 %, a false-negative rate of 0–5%, a false-positive rate of 0–5.7 %, and a false-positive rate of 0–5%.[5] Thyroid Imaging Reporting and Data System was created in 2009 by Horvath et al.[6] who drew inspiration from the BI-RADS of the American College of Radiology (TIRADS, thyroid imaging reporting and data systems).[7]

2. Methods

In this prospective study, 90 patients with thyroid nodules had a complete history and clinical examination at Sayed Galal University Hospital and El-Hussein Hospital. The time of the study after 1 year started from January 2022. Thyroid stimulating hormone (TSH), free T3, and free T4 levels were measured in the laboratory. Ultrasound examination was performed on all patients to assess size, calcification, vascularity, echogenicity, solid or cystic nodule, expansion outside the caprole, and IN affection.

All patients additionally underwent FNAC. Histopathological findings verified the diagnosis after all surgical procedures were completed.

The results of the FNAC and term ultrasound scan (USS) tests were compared and the histopathological diagnosis was obtained after thyroidectomy.

After thoroughly outlining the intervention and how any associated morbidity would be managed, all cases included in the study provided informed permission.

2.1. Inclusion criteria

Any person over the age of 18 of either sex. This condition is called nodular goiter, a unique nodule in the thyroid.

2.2. Exclusion criteria

Coexisting morbidity, toxic goiter, advanced malignancy, and recurrent goiter.

All patients underwent the following:

Complete history taking and clinical examination, laboratory investigation, thyroid function tests, TSH, free T3 and free T4, radiological evaluation, and FNAC.

3. Results

Table 1.

Patients' ages varied widely, from 25 to 60 (Table 2).

There were a total of 90 patients, with 5 women for every man (Fig. 1, Tables 3–7).

Finding cancer in nodular goiter with USG had a sensitivity of 72.43 % and a specificity of 90.12 %, whereas doing so via FNAC had a sensitivity of 93% s and a specificity of 98 %.

4. Discussion

Radiologically speaking, a thyroid nodule is a discrete lesion in the thyroid gland.[8] Thyroid nodules have a high prevalence and are frequently seen in the general population, with estimates ranging from 2 to 6 % when discovered through palpation to 19–35 % when found with ultrasound and 8–65 % when found through physical examination alone (autopsy data).[6] These may be found accidently during a radiologic procedure such as US, computed tomography (CT), or magnetic resonance imaging (MRI) of the neck, or they may be seen clinically on self-palpation by the patient. An increasing number of thyroid nodules are being discovered through fortuitous imaging studies in recent years.[9]

Patients who are diagnosed with a thyroid nodule, whether through clinical or incidental means, should undergo a thorough history and physical

Table 1. Age ranges included in this analysis.

-	Minimum	Maximum	Mean	SD
Age	25	60	40.87	10.59

Table 2. Distinguishing gender.

Sex	*N* (%)
Female	75 (83.33)
Male	15 (16.67)
Total	90 (100.00)

examination. The first step in the diagnostic process is a serum TSH level (TSH).[8]

Histopathology is the gold standard for diagnosing thyroid abnormalities. However, appropriate diagnosis during preliminary probes is critical for developing effective management strategies. Biochemical, cytological, imaging, and histopathological examinations can all help make a diagnosis.[10]

Thyroid examination by USG is the most helpful imaging method available. Thyroid USG is performed for a variety of reasons, such as the examination of a palpable nodule or suspected enlargement of the thyroid, and the workup of accidently detected nodules. Contrasting black and white and full color in patients with a thyroid nodule, Doppler USG is used to assess sonographic features

Table 3. Clinical presentation, neck swelling, and pressure symptoms.

Clinical presentation	*N* (%)
Neck swelling	84 (93.33)
Pressure symptoms	6 (6.67)
Total	90 (100.00)

Table 4. Hormonal assay (all patients are euthyroid).

	Minimum	Maximum	Mean	SD
TSH	0.4	5	2.82	1.34

such as size, shape, echogenicity (hypoechoic or hyperechoic), composition (cystic, solid, or mixed), and the presence of coarse or fine calcifications, a halo and borders, and internal blood flow.[11]

Table 5. Comparison between USS and fine-needle aspiration cytology according to sensitivity, specificity, and accuracy.

	ROC curve				
	Sens.	Spec.	PPV	NPV	Accuracy
FNAC	93	98	95.5	92.7	96.6
USS	72.4	90	83	82	88.2

USS, term ultrasound scan.

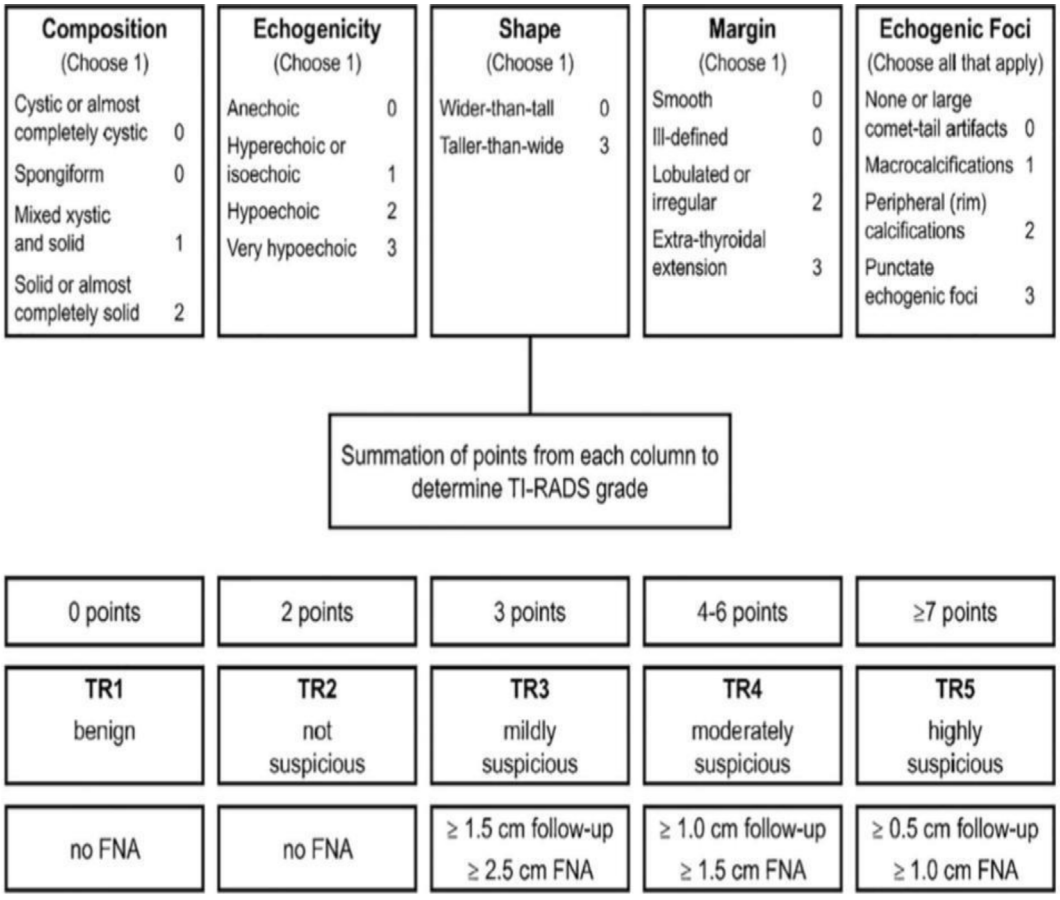

Fig. 1. ACR TI-RADS (American College of Radiology). The ACR TI-RADS is based on the evaluation of five key features of a nodule composition, echogenicity, shape, margin, and echogenic foci — that are scored individually, the feature scores being summed to arrive at the final classification of the risk level.

Table 6. Operative time and hospital stay.

	Minimum	Maximum	Mean	SD
Operative time	55	140	82.17	24.00
Hospital stays	1	2	1.20	0.41

Mean operative time was 82.17 min and most of the patients stayed in our hospital ranging from 1 to 2 days postoperative.

Table 7. Complications after thyroidectomy: most of the patients had no complications.

Complications	*N* (%)
No	72 (80.00)
Hematoma at the site of the wound	3 (3.33)
Intraoperative bleeding	3 (3.33)
Postoperative bleeding	3 (3.33)
Hypocalcemia	6 (6.67)
Hoarsness of voice	3 (3.33)
Total	90 (100.00)

If the nodule was solid or a mixed solid–cystic variety, and if it was also hypoechoic and non-huloet on USG, then the USG report is suggestive of malignancy.[12]

When it comes to details concerning thyroid nodules, FNAC is your best bet. About half as many thyroidectomies are performed when FNAC is used. By age,[13] the surgical yield of cancer generally doubles, while the overall healthcare costs for these people drop by 25 %.[14]

The purpose of the current diagnostic workup is to identify patients with a high probability of having a malignant nodule present before surgery.[15]

USG and FNAC are frequently utilized in the diagnostic workup, but both have their limitations and a definitive solution remains elusive.[7]

Our research was conducted prospectively in 2022 at Sayed Galal Hospital.

Researchers in this study analyzed the demographics, clinical characteristics, and thyroid function of 90 patients with multiple or single thyroid nodules. Thyroid ultrasound, fine-needle aspiration, and removal. Our study's larger sample size is likely attributable to the longer treatment duration compared with those of the studies by Gunaratne et al. ([16], 42 patients) and Elmaraghy et al. ([17], 20 patients).

Our patients' ages span from 25 to 60, with a mean age of 40.8 years (plus or minus 10.5). Mean ages in studies by Gunaratne et al.[16] and Shashikala V et al.[18] were 42 and 39 years, respectively, therefore, these results are in line with what was found there.

Our female patients make up 83.3 % of our total (75 cases), whereas our male patients only make up 16.6 % (15 cases). Many writers' researches corroborate this, for example, Menegassi et al.,[19] Gunaratne et al.,[20] and Shashikala V et al.[18,21]

Yet, this may also be aided by the fact that fems tend to be more health-conscious and put more emphasis on their appearance.

The main clinical presentation of our patients is swelling at the lower part of the neck, but some patients complain of pressure symptoms such as dyspnea, hoarseness of voice, or dysphagia similar to the study by Bičakčić et al.[21] and Shashikala V et al.[18]

The Royal College of Pathologists of Australasia (RCPA-Australasia) has allowed a wide range for the sensitivity and specificity of FNAC with respect to thyroid neoplasms (Beneragama et al.[22]), which is inconsistent with the global statistics relating to the validity of FNAC as a tool for diagnosing thyroid pathology.

Our results show that FNAC is a reliable method for diagnosing neoplasms, with respectable levels of sensitivity, specificity, and accuracy. When compared with regional research, however, ours is more sensitive. The majority of these operations may have been carried out because of FNAC findings indicating follicular proliferations, which raises concerns of malignancy.

This leads to a biased population and an increase in the proportion of true positives.

In this investigation, the sensitivity and specificity of FNAC were 90 % and 98 %, respectively, while Gunaratne and colleagues reported 94 % and 7.2 %, respectively, and Elmaraghy et al. reported 18 33 % and 100 %, respectively.

In our study, the accuracy of FNAC was 96.6 %, although in other studies, the accuracy ranged from 79 % to 98 %, depending on the experience of the person performing the FNAC and the experience of the cytologist evaluating the cytology findings. Gunaratne and colleagues.[16]

Because of the small sample size and the possibility of a false positive, FNAC has some limitations. In our series, 6.67 % of the specimens were deemed insufficient, while 3.3 were deemed suspicious. On final examination, three of the 12 suspected cases were determined to be malignant. Because of the high frequency of malignancy-suspicious lesions in these situations, surgical excision of these nodules should be strongly considered.

Based on our research, we determined that USG had a sensitivity of 724 % and a specificity of 90.1 % for distinguishing benign from malignant nodules. USG has been shown to have a sensitivity of 64.7 % and specificity of 69.2 % in indicating a malignant lesion (Gunaratne et al.[16]). The sensitivity and specificity of USG, according to a study conducted by Yunus and Ahmed, both aged 25 years, were determined to be 93.8 and 66.0 %, respectively.

The reasons for lower sensitivity of USG than FNAC may be due to variability in sonography: interpretations as more than one participated in the study, but as regards the simplicity and safety of the procedure, it is acceptable as a survey test.

In the current study, mean operative time is 82.1 min ranging from 55 to 140 min according to experience of a surgeon and intraoperative complications such as bleeding, it is correlated to a study by Patoir et al.,[23] in which the mean operative time was 86.1 min.

Hypocalcemia is the main postoperative complication similar to the study by Shashikala V et al.[18]

4.1. Conclusion

The specificity of USG and FNAC was found to be quite high in our research. Using various diagnostic modalities (ultrasound and FNAC) rather than depending on a single modality can provide ideal results and help a large percentage of patients to avoid unnecessary surgery, even though no single study has proven a 100 % accuracy in diagnosing malignancy in nodular goiter.

Authorship

All authors have a substantial contribution to the article.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Conflicts of interest

The authors declared that there were no conflicts of interest.

References

1. Finel JB, Mucci S, Branger F, et al. Thyroidectomy in patients with a high BMI: a safe surgery? *Eur J Endocrinol*. 2014;171: 99–105.
2. Zarebczan B, Mohanty D, Chen H. A comparison of the LigaSure and harmonic scalpel in thyroid surgery: a single institution review. *Ann Surg Oncol*. 2011;18:214–218.
3. Sharma J, Milas M, Weber CJ, Carlson GW. Neck: lateral neck. Anat basis tumor surg. *Published online*. 2010:55–128.
4. Xian M. *Neutro-Connectedness Theory, Algorithms and Applications*. Logan, Utah: book 1-90 UTAH STATE UNIVERSITY; 2017. https://doi.org/10.26076/f6eb-3ff4.
5. Williams D. Thyroid growth and cancer. *Eur Thyroid J*. 2015;4: 164–173.
6. Dean DS, Gharib H. Epidemiology of thyroid nodules. *Best Pract Res Clin Endocrinol Metabol*. 2008;22:901–911.
7. El-Kaissi S, Wall JR. *Thyroid Ultrasonography and Fine Needle Aspiration Biopsy: A Practical Guide and Picture Atlas*. Abu Dhabi, United Arab Emirates: Bentham Science Publishers; 2018.
8. Mittal M, Ganakumar V, Shukla R, Kumar GM. Thyroid nodule: approach and management. In: *Goiter-Causes and Treatment*. IntechOpen; 2020.
9. АА Тян, ШУ Рашидова. Diagnosis of thyroid nodules. *Re-health J*. 2020;4:4–14.
10. Ogilvie JB, Piatigorsky EJ, Clark OH. Current status of fine needle aspiration for thyroid nodules. *Adv Surg*. 2006;40: 223–238.
11. Schlumberger MJ, Filetti S, Hay ID. Nontoxic diffuse and nodular goiter and thyroid neoplasia. *Williams Textb Endocrinol. Published online*. 2011:440–475.
12. Malagimani SC, Patil NS. Clinical, radiological and pathological correlation of thyroid nodule. *J Evol Med Dent Sci*. 2017; 6:2137–2142.
13. Yoldas T, Makay O, Icoz G, et al. Should subtotal thyroidectomy be abandoned in multinodular goiter patients from endemic regions requiring surgery? *Int Surg*. 2015;100:9–14.
14. Mazzaferri EL. Management of a solitary thyroid nodule. *N Engl J Med*. 1993;328:553–559.
15. Sengupta A, Pal R, Kar S, Zaman FA, Basu M, Pal S. Clinicopathological correlates of incidentally revealed thyroid swelling in Bihar, India. *J Pharm BioAllied Sci*. 2012;4:51.
16. Gunaratne SA, Wijesinghe H, Wijesinghe CJ, Dissanayake SKE, Godakandage MHP. Comparison of Fine Needle Aspiration Cytology (FNAC) and thyroid ultrasonography in the diagnosis of thyroid nodules. *J Diagnostic Pathol*. 2016;10:2.
17. Elmaraghy AEM, Farahat MS, Elsayed MM, Rushdi AM. The diagnostic accuracy of ultrasound guided fine needle aspiration biopsy for Dominant nodules in multinodular goiter. *Egypt J Hosp Med*. 2018;73:6252–6258.
18. Shashikala V, Muralidhar A, Kuchinoor A, Suntan A. A clinical study of solitary nodule thyroid. *Int Surg J*. 2019;6: 754–758.
19. Menegassi J, Bordin V, Oliveira SS. Diagnostic accuracy between fine needle aspiration biopsy (FNA) and pathological examination of the thyroid. *J Bras Patol Med Lab*. 2013;49: 288–293.
20. Gunaratne SA, Wijesinghe HK, Wijesinghe CJ, Disanayake SK, Godakandage MH. Comparison on fine needle aspiration cytology (FNAC) and thyroid ultrasonography in management of thyroid nodules. *Int Clin Pathol J*. 2017;5:124.
21. Bičakčić E, Mušanović S, Pušina S, Salibašić M, Bičakčić-Filipović E. A gigantic nodular goiter with retrosternal propagation: case report. *Med J*. 2021;27(3/4),77.
22. Beneragama DH, Jayasuriya W, Samarawickrama RIU, et al. Validity of fine needle aspiration cytology in the diagnosis of thyroid diseases. *J Diagnostic Pathol*. 2011;5:1.
23. Patoir A, Payet C, Peix JL, et al. Determinants of operative time in thyroid surgery: a prospective multicenter study of 3454 thyroidectomies. *PLoS One*. 2017;12:e0181424.