

Fine-needle aspiration biopsy of thyroid nodules

Determining when it is necessary

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In recent decades, the incidence of thyroid cancer has risen alarmingly, becoming a common issue of diagnosis and management for primary care physicians. Papillary thyroid cancers comprise most of detected cases at 85%.^{1,2} This increasing rate of diagnosis is largely attributed to advances in imaging permitting early detection of subclinical tumours, as high-resolution ultrasound detects nodules in 19% to 68% of randomly selected individuals.¹ Yet despite the high rates of discovery, the mortality rate of these endocrine tumours has remained stable with an excellent prognosis, as 99% of patients with nodules smaller than 20 mm are alive at 20 years.² Hence, it is imperative to strike a balance between appropriate rates of detection and intervention to minimize morbidity and mortality, without subjecting the patient to unnecessary workup and anxiety. In order to properly stratify potential risk of malignancy, ultrasound imaging findings should be corroborated with pertinent findings on clinical history and physical examination to determine which nodules should undergo fine-needle aspiration (FNA) biopsy. We present a concise summary of the key findings that should be considered when determining which thyroid nodules require subsequent investigation.

When further investigation is required

Thyroid ultrasound and FNA biopsy based on the clinical picture are the mainstay of investigation in suspected thyroid nodules (**Table 1**). Increased likelihood of thyroid malignancy from clinical history and physical examination findings should prompt an ultrasound to determine FNA biopsy eligibility based on nodule size and sonographic features. Findings from the clinical history that increase the likelihood of malignancy include rapid growth of a neck mass, head and neck irradiation, total body irradiation for bone marrow transplantation, familial thyroid carcinoma, or thyroid cancer syndromes (eg, multiple endocrine neoplasia type 2, familial adenomatous polyposis, Cowden disease).¹ Relevant physical examination findings suggestive of malignancy include dysphonia, dysphagia, dyspnea, regional lymphadenopathy, and fixation of the nodule to surrounding tissue.¹ Measurement of serum thyroid-stimulating hormone (TSH) should be included in the initial workup of a nodule greater than 1 cm in any dimension, as recent American Thyroid Association guidelines report a positive association between serum TSH levels and increased risk of nodule malignancy and more advanced staging of thyroid cancer.¹ Moreover, previous studies

Table 1. Categorization of nodules based on the degree of suspicious features and the likelihood of malignancy


| NODULE FEATURES | THRESHOLD SIZE FOR FNA | LIKELIHOOD OF MALIGNANCY |
|---|------------------------|--------------------------|
| High suspicion Solid hypoechoic nodule or solid hypoechoic component of partially cystic nodule with ≥ 1 of the following features: <ul style="list-style-type: none"> • Irregular margins (infiltrative, microlobulated) • Microcalcification • Taller-than-wide shape • Rim calcification with small extrusive soft tissue component • Evidence of extrathyroidal extension | ≥ 1.0 cm | > 70%-90% |
| Intermediate suspicion Hypoechoic solid nodule with smooth margin without the following: <ul style="list-style-type: none"> • Microcalcifications • Extrathyroidal extension • Taller-than-wide shape | ≥ 1.0 cm | 10%-20% |
| Low suspicion Isoechoic or hyperechoic solid nodule, or partially cystic nodule with eccentric solid area without any ultrasonographic features | ≥ 1.5 cm | 5%-10% |
| Very low suspicion Spongiform or partially cystic without any ultrasonographic features | ≥ 2.0 cm | < 3% |
| Purely cystic nodules | No biopsy required | < 1% |

FNA—fine-needle aspiration.

estimate a 16% chance of malignancy with TSH levels below 0.06 mIU/L; a 25% chance with levels between 0.4 and 1.39 mIU/L; and a 52% chance when levels are greater than 5.00 mIU/L.³

With respect to ultrasound, specific findings on imaging can help consolidate a decision in determining which nodules mandate FNA biopsy. Microcalcifications, hypoechogenicity, irregular margins, taller-than-wide shape, invasion of normal structures, and lymphadenopathy are all independent features highly suggestive of malignancies.¹ When considering suspicious features, one should also consider Hashimoto thyroiditis in the working diagnosis, as it might masquerade as a malignant lesion. Signs of recent upper respiratory tract infections, cervical pain, elevated inflammatory markers, fever, swelling, and symptoms of hypothyroidism all allude to this benign inflammatory condition.⁴ Conversely, imaging reports of a predominantly cystic nodule, cholesterol deposits forming punctate, echogenic foci with ring-down or comet-tail artifacts, solid debris with septations causing a spongiform appearance, and slow growth are associated with benign thyroid nodules.¹ A highly cystic composition might be particularly reassuring, as reports have cited that 88% of thyroid cancers are uniformly solid or have minimal cystic changes of less than 5%, with marked cystic changes of more than 50% occurring in only 2.5% of cancers, all of which had numerous other suspicious sonographic findings.⁵ **Table 1** presents a summary of these recommendations including categorization of nodules based on the degree of suspicious features and likelihood of malignancy. If cytology results of an FNA biopsy are nondiagnostic, the biopsy should be repeated with ultrasound guidance and on-site cytologic evaluation.

Conclusion

With the rising incidence but unchanged mortality rates of thyroid cancer, conservative management with greater emphasis on monitoring is the working consensus in managing thyroid nodules. This requires corroboration of clinical and imaging findings to determine the necessity of FNA biopsy. Ultimately, as most cases are benign and malignancies often follow an indolent course, judicious use of cytologic investigation and conservative management become essential for optimal clinical practice. 

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Competing interests

None declared

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