ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Study Of Role Of Ultrasound In The Early Detection And Management Of Thyroid Nodules.

Jitendra Uttam Deshmukh[1]*, Devendra Kulkarni[2], Prajakta Nandkumar Patil[3], and Rohit Raundal[4].

[1]Assistant Professor, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.
[2, 3]Associate Professor, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.
[4]Senior Resident, Dept Of Radiology, SMBT Institute Of Medical Sciences And Research Centre, Dhamangaon, Maharashtra, India.

ABSTRACT

Thyroid nodules are common, and while most are benign, early detection of malignant nodules is crucial for effective management. Ultrasound (US) is a vital tool for the evaluation of thyroid nodules due to its non-invasive nature and detailed imaging capabilities. This prospective observational study included 30 patients with thyroid nodules who underwent detailed ultrasound evaluation and, if indicated, ultrasound-guided fine-needle aspiration biopsy (FNAB). Patients were followed up at 6-month and 12-month intervals to monitor changes in nodule characteristics. Data were analyzed to determine the role of ultrasound in guiding management decisions. The majority of nodules were solid (60%) and hypoechoic (50%), with 33.3% exhibiting irregular margins. FNAB results showed that 66.7% of nodules were benign, 13.3% were of undetermined significance, and 10% were malignant. Follow-up evaluations revealed that 66.7% of nodules remained stable, while 20% increased in size. Four patients required surgical referral based on follow-up findings. Ultrasound is a crucial tool for the early detection and management of thyroid nodules, offering detailed characterization, guiding FNAB, and facilitating ongoing surveillance, thus optimizing patient care.

Keywords: Thyroid nodules, Ultrasound, Fine-needle aspiration biopsy (FNAB)

https://doi.org/10.33887/rjpbcs/2024.15.5.32

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Thyroid nodules are common clinical findings, with prevalence increasing with age, particularly among women [1]. While most thyroid nodules are benign, a small percentage can be malignant, necessitating accurate and early detection to guide appropriate management. Ultrasound (US) has emerged as a cornerstone in the evaluation of thyroid nodules due to its non-invasive nature, accessibility, and ability to provide detailed imaging of the thyroid gland [2, 3].

Ultrasound enables the characterization of nodules based on their size, composition, echogenicity, margins, and the presence of calcifications, which are critical features for distinguishing benign from malignant nodules. Advanced techniques, such as Doppler ultrasound, further enhance the assessment by evaluating the vascularity of nodules, adding another layer of diagnostic precision. Moreover, ultrasound-guided fine-needle aspiration biopsy (FNAB) has significantly improved the accuracy of cytological diagnosis, reducing the need for unnecessary surgeries [4-6].

The role of ultrasound extends beyond diagnosis; it is integral to the management and follow-up of thyroid nodules. By monitoring changes in nodule size and characteristics over time, clinicians can make informed decisions regarding intervention. This study aims to explore the efficacy of ultrasound in the early detection and management of thyroid nodules, emphasizing its diagnostic value, procedural guidance, and role in ongoing patient care [7].

METHODOLOGY

This study was conducted over a period of one year, involving a sample size of 30 patients who presented with thyroid nodules at the Department of Radiology. Patients were selected based on clinical examination findings suggestive of thyroid nodules, confirmed through palpation and preliminary investigations. Inclusion criteria encompassed adults aged 18 and above with newly detected thyroid nodules, while those with previously diagnosed thyroid cancer or who had undergone prior thyroid surgery were excluded.

Ultrasound examinations were performed using high-resolution ultrasound machines equipped with linear transducers operating at frequencies between 7.5 and 13 MHz. Each patient underwent a detailed ultrasound evaluation, which included assessing the size, shape, composition, echogenicity, and vascularity of the thyroid nodules.

Doppler ultrasound was utilized to examine the vascular patterns within the nodules. These features were systematically documented to aid in distinguishing between benign and suspicious nodules.

For nodules deemed suspicious based on ultrasound characteristics, ultrasound-guided fine-needle aspiration biopsy (FNAB) was performed. The procedure involved using a 25-gauge needle to obtain cellular samples from the nodules under real-time ultrasound guidance.

The collected samples were then sent for cytological examination. The cytology results were categorized according to the Bethesda system for reporting thyroid cytopathology, allowing for consistent diagnostic criteria.

Patients were followed up at regular intervals to monitor any changes in the characteristics of their thyroid nodules. Follow-up ultrasounds were conducted at 6-month and 12-month intervals. During these follow-up visits, the nodules were re-evaluated for any changes in size, composition, and other ultrasound features.

Based on the findings, further management decisions, including repeat FNAB or surgical referral, were made as necessary.

Data collected from the initial and follow-up evaluations were analyzed to determine the efficacy of ultrasound in the early detection and management of thyroid nodules.

ISSN: 0975-8585

RESULTS

Table 1: Age Distribution of Patients

Age (years)	Frequency (n=30)
18-29	5
30-39	7
40-49	10
50-59	5
≥60	3

Table 2: Gender Distribution of Patients

Gender	Frequency (n=30)
Male	10
Female	20

Table 3: Clinical Presentation of Patients

Clinical Presentation	Frequency (n=30)
Asymptomatic	18
Symptomatic	12

Table 4: Cytological Findings from FNAB

Cytology Category	Frequency (%)
Benign	20
Atypia of Undetermined Significance (AUS)	4
Follicular Neoplasm	3
Suspicious for Malignancy	2
Malignant	1

Table 5: Follow-Up Outcomes at 12 Months

Outcome	Frequency (%)
Stable Nodule Size	20
Increased Nodule Size	6
Decreased Nodule Size	2
New Suspicious Features	2
Surgical Referral	4
Repeat FNAB	3

DISCUSSION

The demographic data indicated a higher prevalence of thyroid nodules among women, with 66.7% of the study population being female. This finding aligns with existing literature, which consistently reports a higher incidence of thyroid nodules in women. The age distribution revealed that most nodules were detected in the 40-49 age group, followed by the 30-39 age group. This suggests that middle-aged individuals are more likely to present with thyroid nodules, possibly due to cumulative exposure to risk factors over time. Interestingly, 60% of the patients were asymptomatic, highlighting the importance of routine screening and ultrasound evaluation in detecting thyroid nodules that might otherwise go unnoticed [8].

Ultrasound Characteristics of Thyroid Nodules

Ultrasound examination is pivotal in the initial evaluation of thyroid nodules. The majority of nodules were solid (60%), with hypoechoic nodules being the most common echogenicity pattern observed (50%). Hypoechoic nodules often warrant closer scrutiny as they are more likely to be

associated with malignancy compared to isoechoic or hyperechoic nodules. Irregular margins and the presence of calcifications were noted in 33.3% and 40% of the nodules, respectively, both of which are ultrasound features that increase the suspicion of malignancy. These findings underscore the utility of detailed ultrasound assessment in differentiating benign from potentially malignant nodules, guiding the need for further diagnostic procedures such as fine-needle aspiration biopsy (FNAB) [9, 10].

Cytological Findings from FNAB

FNAB remains the gold standard for the cytological evaluation of thyroid nodules, especially those with suspicious ultrasound features. In our study, 66.7% of the nodules were benign, which is consistent with the general observation that the majority of thyroid nodules are non-cancerous. However, 13.3% of the nodules were categorized as atypia of undetermined significance (AUS) or follicular neoplasm, necessitating close follow-up and, in some cases, repeat biopsies. Notably, 10% of the nodules were suspicious for malignancy or confirmed as malignant, indicating the critical role of FNAB in identifying nodules that require surgical intervention. The relatively low percentage of malignant nodules in this study reflects the importance of FNAB in the diagnostic algorithm, helping to avoid unnecessary surgeries for benign conditions [11].

Follow-up ultrasound evaluations at 6-month and 12-month intervals provided valuable data on the stability or progression of thyroid nodules. Most nodules (66.7%) remained stable in size over the one-year follow-up period, supporting a conservative approach for managing benign nodules with regular monitoring. However, 20% of the nodules increased in size, and 6.7% developed new suspicious features, prompting further diagnostic evaluation or surgical referral. This highlights the dynamic nature of thyroid nodules and the need for ongoing surveillance, even for nodules initially deemed benign. The decision to perform repeat FNAB or refer for surgery was guided by changes observed during follow-up. Four patients were referred for surgery based on significant growth or suspicious ultrasound features, and three patients underwent repeat FNAB. These management decisions were informed by the initial and follow-up ultrasound findings, demonstrating the integral role of ultrasound in the longitudinal care of patients with thyroid nodules.

The findings of this study emphasize the value of ultrasound as a non-invasive, readily accessible, and highly informative tool in the early detection and management of thyroid nodules. Ultrasound not only aids in the initial characterization of nodules but also plays a crucial role in guiding FNAB and monitoring nodule progression over time. Given the predominance of benign nodules, a conservative approach with regular ultrasound follow-up is often appropriate, reducing the need for invasive procedures. However, for nodules with suspicious features or significant growth, timely intervention is essential to ensure optimal patient outcomes.

CONCLUSION

In conclusion, ultrasound is indispensable in the early detection and management of thyroid nodules. It offers detailed characterization of nodules, guides FNAB, and facilitates ongoing surveillance, thereby optimizing patient care and reducing unnecessary interventions. The results of this study reinforce the importance of routine ultrasound evaluation in clinical practice and highlight its pivotal role in the effective management of thyroid nodules.

Fig 1: USG

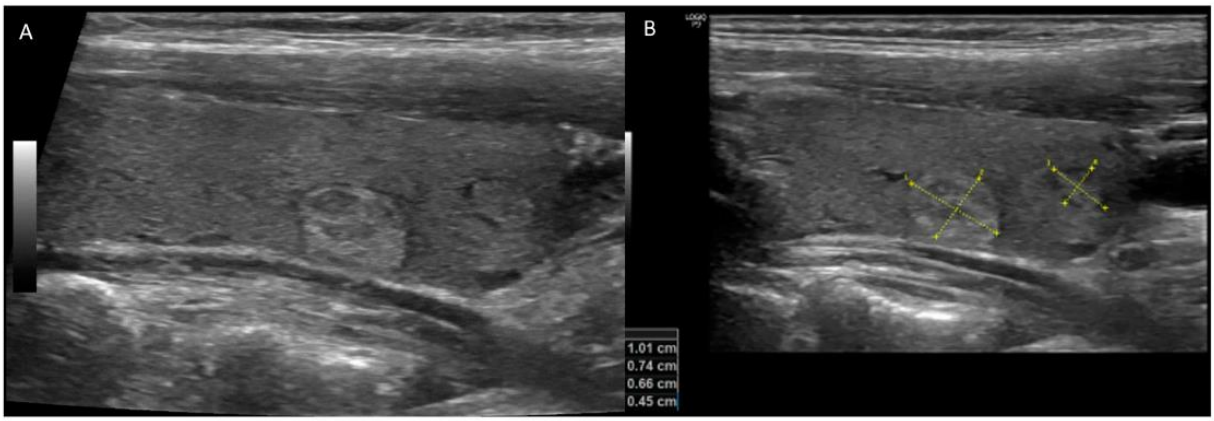

Fig 2: USG

REFERENCES

[1] Danese D, Sciacchitano S, Farsetti A, Andreoli M, Pontecorvi A. Diagnostic accuracy of conventional vs. sonography-guided fine-needle aspiration biopsy of thyroid nodules. Thyroid 1998; 8:15–19

[2] Rosen IB, Azadian A, Walfish PG, Salem S, Lansdown E, Bedard YC. Ultrasound-guided fine-needle aspiration biopsy in the management of thyroid disease. Am J Surg 1993; 166:346–349

[3] Kim DW, Lee EJ, Kim SH, et al. Ultrasound-guided fine-needle aspiration biopsy of thyroid nodules: comparison in efficacy according to nodule size. Thyroid 2009; 19:27–31

[4] Lee YH, Kim BH, Suh SI, et al. Comparison of cytological results obtained by repeated US-guided fine-needle aspiration biopsies of thyroid nodules: focus on the rate of malignancy and diagnostic concordance. Diagn Cytol 2009; 37:492–497

[5] McHenry CR, Walfish PO, Rosen M. Non-diagnostic fine needle aspiration biopsy: a dilemma in management of nodular thyroid disease. Am Surg 1993; 59:415–419

[6] MacDonald L, Yazdi HM. Nondiagnostic fine needle aspiration biopsy of the thyroid gland: a diagnostic dilemma. Acta Cytol 1996; 40:423–428

[7] Chow LS, Gharib H, Goellner JR, van Heerden JA. Nondiagnostic thyroid fine-needle aspiration cytology: management dilemmas. Thyroid 2001; 11:1147–1151

[8] Alexander EK, Heering JP, Benson CB, et al. Assessment of nondiagnostic ultrasound-guided fine needle aspirations of thyroid nodules. J Clin Endocrinol Metab 2002; 87:4924–4927

[9] Baloch Z, LiVolsi VA, Jain P, et al. Role of repeat fine-needle aspiration biopsy (FNAB) in the management of thyroid nodules. Diagn Cytopathol 2003; 29:203–206

[10] Richards ML, Bohnenblust E, Sirinek K, Bingener J. Nondiagnostic thyroid fine-needle aspiration biopsies are no longer a dilemma. Am Surg 2008; 196:398–402

[11] American Thyroid Association (ATA) Guidelines Taskforce on Thyroid Nodules and Differentiated Thyroid Cancer, Cooper DS, Doherty GM, Haugen BR, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009; 19:1167–1214