e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(3); 1735-1741

Original Research Article

Thyroid Lesion Diagnosis via Fine Needle Aspiration Cytology: A Tertiary Hospital Experience in India

Chandra Mohan Kumar[1], Sandip Kumar[2], Sudhanshu Shekhar[3], Dilip Kumar[4]

[1]Tutor, Department of Pathology, Patna Medical College & Hospital, Patna, Bihar, India
[2]Tutor, Department of Pathology, Patna Medical College & Hospital, Patna, Bihar, India
[3]Tutor, Department of Pathology, Patna Medical College & Hospital, Patna, Bihar, India
[4]HOD, Department of Pathology, Patna Medical College & Hospital, Patna, Bihar, India

Received: 26-01-2026 / Revised: 25-02-2026 / Accepted: 27-03-2026
Corresponding Author: Sudhanshu Shekhar
Conflict of interest: Nil

Abstract:

Background: Thyroid nodules are common endocrine disorders, and distinguishing benign from malignant lesions is essential for appropriate management. Fine needle aspiration cytology (FNAC) is a simple, minimally invasive, and cost-effective diagnostic technique widely used for the evaluation of thyroid swellings.

Objective: To study the cytomorphological spectrum of thyroid lesions diagnosed by FNAC in patients attending a tertiary care hospital.

Materials and Methods: This hospital-based descriptive study was conducted over 9 months from April 2025 to December 2025 in the Department of Pathology, Patna Medical College and Hospital, Patna. A total of 110 patients presenting with thyroid swellings underwent FNAC using a 23–25 gauge needle. Smears were stained with May-Grünwald-Giemsa and Papanicolaou stains and examined cytologically. Lesions were classified into benign, inflammatory, and neoplastic categories based on standard cytological criteria.

Results: The majority of patients were female (81.8%), with a female-to-male ratio of 4.5:1. The most affected age group was 31–40 years. Benign lesions constituted 63.6% of cases, followed by inflammatory lesions (16.4%) and neoplastic lesions (20%). Colloid goiter (50%) was the most common diagnosis, while papillary carcinoma was the most frequent malignant tumor.

Conclusion: FNAC is an effective first-line diagnostic tool for evaluating thyroid lesions. It helps differentiate benign from malignant conditions and supports appropriate clinical management while reducing unnecessary surgical interventions.

Keywords: Thyroid lesions, FNAC, Thyroid nodules, Cytology, Papillary carcinoma.

DOI: 10.25258/ijcpr.18.3.283

Introduction

Thyroid disorders constitute a significant proportion of endocrine diseases worldwide and present a major clinical challenge due to their high prevalence and diverse etiologies [1,2]. Thyroid nodules are commonly encountered in routine clinical practice, with prevalence rates ranging from 4–7% on palpation and up to 67% on ultrasonography [3].

Although the majority of thyroid nodules are benign, the primary clinical concern lies in excluding malignancy, which occurs in approximately 5–15% of cases [4]. Accurate and timely diagnosis is therefore essential to guide appropriate management and avoid unnecessary surgical procedures [5].

Fine needle aspiration cytology (FNAC) has become the cornerstone of preoperative evaluation of thyroid nodules due to its simplicity, cost-effectiveness, and high diagnostic accuracy [6,7]. It is particularly valuable in developing countries like India, where access to advanced diagnostic modalities may be limited [8].

FNAC allows for differentiation between benign and malignant lesions and provides valuable information regarding inflammatory and functional thyroid disorders [9]. The adoption of standardized reporting systems, such as The Bethesda System for Reporting Thyroid Cytopathology, has further improved diagnostic consistency and clinical decision-making [10,11].

In India, iodine deficiency, environmental factors, and genetic predisposition contribute to the varied spectrum of thyroid lesions [12]. Hospital-based studies from different regions of the country have reported considerable variation in the cytological patterns of thyroid swellings [13–15].

Despite the widespread use of FNAC, regional data from tertiary care centers remain important for understanding local disease patterns and improving diagnostic accuracy [16]. The present study was undertaken to analyze the cytomorphological profile of thyroid lesions diagnosed by FNAC at a tertiary care hospital in eastern India.

Materials and Methods

Study Design: The present investigation was conducted as a hospital-based descriptive observational study aimed at evaluating the cytomorphological spectrum of thyroid lesions using fine needle aspiration cytology (FNAC). The study focused on assessing the distribution of benign, inflammatory, and neoplastic thyroid lesions in patients presenting with thyroid swellings at a tertiary care teaching hospital.

Study Duration: The study was carried out over a period of 9 months from April 2025 to December 2025 during which all eligible patients presenting with thyroid enlargement and referred for cytological evaluation were included.

Study Setting: The study was conducted in the Department of Pathology, Patna Medical College and Hospital (PMCH), Patna, Bihar, India, a large tertiary care teaching hospital that receives patients from urban as well as rural regions of eastern India.

All cytological procedures and smear evaluations were performed in the cytopathology laboratory of the Department of Pathology by experienced pathologists.

Study Population: The study population consisted of patients presenting with clinically detectable thyroid swellings who were referred to the pathology department for FNAC.

A total of 110 patients fulfilling the inclusion criteria were enrolled in the study.

The age of the patients ranged from 15 to 70 years, representing a wide demographic spectrum. Both male and female patients were included in order to evaluate gender-related differences in the occurrence of thyroid lesions.

Sample Size: During the study period, 110 consecutive patients presenting with thyroid nodules or diffuse thyroid enlargement underwent FNAC and were included in the analysis.

The sample size was determined based on the number of patients attending the hospital during the study period and fulfilling the predefined inclusion criteria.

Inclusion Criteria: The following patients were included in the study:

- Patients of any age and gender presenting with clinically palpable thyroid swelling
- Patients referred for FNAC evaluation of thyroid nodules or diffuse thyroid enlargement
- Patients who provided informed consent for the FNAC procedure and participation in the study

Exclusion Criteria: Patients were excluded from the study under the following conditions:

- Inadequate or unsatisfactory cytological smears obtained after aspiration
- Patients who declined to provide informed consent
- Patients with incomplete clinical information

Clinical Evaluation: Before the cytological procedure, all patients underwent a detailed clinical assessment. Information was obtained regarding:

- Age and gender
- Duration of thyroid swelling
- Clinical symptoms such as pain, dysphagia, or rapid enlargement
- History of thyroid disease or prior treatment

Relevant clinical findings were recorded and correlated with cytological observations wherever necessary.

FNAC Procedure: Fine needle aspiration cytology was performed under strict aseptic precautions.

The procedure involved the following steps:

1. The patient was positioned comfortably with the neck slightly extended to expose the thyroid swelling.
2. The skin over the swelling was cleaned using antiseptic solution.
3. A 23–25 gauge disposable needle attached to a 10-mL syringe was used for aspiration.
4. The needle was inserted into the thyroid nodule, and negative pressure was applied while performing multiple to-and-fro movements to obtain cellular material.
5. In cases where the initial sample was insufficient, additional passes were performed to ensure adequate material.

The aspirated material was immediately expressed onto clean glass slides.

Preparation and Staining of Smears

The obtained material was used to prepare multiple cytological smears.

The smears were processed as follows:

- Air-dried smears were stained using May-Grünwald-Giemsa (MGG) stain
- Alcohol-fixed smears were stained using Papanicolaou stain

These staining methods allowed optimal visualization of:

- Cellular morphology

- Nuclear characteristics
- Cytoplasmic details
- Background components such as colloid, lymphocytes, or necrotic material

Cytological Evaluation: All stained smears were examined under light microscopy by experienced cytopathologists.

The cytological evaluation focused on several diagnostic parameters, including:

- Cellularity of the smear
- Arrangement of follicular epithelial cells
- Presence of microfollicular, macrofollicular, or papillary patterns
- Nuclear features such as grooves, inclusions, or pleomorphism
- Background elements including colloid, inflammatory cells, and debris

Based on these cytomorphological features, the lesions were classified into different diagnostic categories.

Where applicable, the lesions were interpreted in accordance with the Bethesda System for Reporting Thyroid Cytopathology, which standardizes thyroid FNAC reporting and improves diagnostic consistency.

Cytological Classification: The thyroid lesions identified in the study were categorized into the following diagnostic groups:

1. **Benign lesions**
   - Colloid goiter
   - Nodular goiter
2. **Inflammatory lesions**
   - Hashimoto thyroiditis
   - Lymphocytic thyroiditis
3. **Neoplastic lesions**
   - Follicular neoplasm
   - Hurthle cell neoplasm
4. **Malignant lesions**
   - Papillary carcinoma
   - Medullary carcinoma
   - Anaplastic carcinoma

This classification enabled assessment of the overall cytological spectrum of thyroid lesions observed in the study population.

Data Collection: All clinical and cytological findings were systematically recorded in a structured data collection sheet. The following parameters were documented:

- Age of the patient
- Gender distribution
- Cytological diagnosis
- Category of thyroid lesion (benign, inflammatory, neoplastic, malignant)

These variables were later used for statistical analysis and interpretation of results.

Statistical Analysis: The collected data were entered into a spreadsheet and analyzed using descriptive statistical methods.

Ethical Considerations: The study was conducted in accordance with standard ethical principles for biomedical research.

- Informed consent was obtained from all patients prior to performing the FNAC procedure.
- Patient confidentiality was strictly maintained.
- No invasive procedures other than routine FNAC were performed for research purposes.

Results

A total of 110 patients presenting with thyroid swellings underwent fine needle aspiration cytology (FNAC) during the study period. The cytological findings demonstrated a wide spectrum of thyroid lesions ranging from benign non-neoplastic conditions to malignant neoplasms.

Demographic Profile: The age of patients ranged from 15 to 70 years, with the majority of cases occurring in the third and fourth decades of life. The 31–40 year age group constituted the highest proportion of cases. Female patients were significantly more affected than males, demonstrating a marked female predominance.

The distribution of cases according to age and gender is presented in Table 1.

Table 1: Age and Gender Distribution of Patients with Thyroid Lesions (n = 110)

Age Group (years)	Male	Female	Total	Percentage (%)
11–20	2	8	10	9.1
21–30	4	18	22	20.0
31–40	5	24	29	26.4
41–50	4	18	22	20.0
51–60	3	14	17	15.5
>60	2	8	10	9.1
Total	**20**	**90**	**110**	**100**

Females accounted for 81.8% of cases, whereas males constituted 18.2%, resulting in a female-to-male ratio of approximately 4.5:1.

The graphical representation of age distribution of thyroid lesions is illustrated in Figure 1.

Cytological Spectrum of Thyroid Lesions: FNAC evaluation revealed that benign lesions constituted the majority of thyroid swellings, followed by inflammatory conditions and neoplastic lesions.

The distribution of thyroid lesions according to cytological diagnosis is summarized in Table 2.

Table 2: Cytological Diagnosis of Thyroid Lesions by FNAC (n = 110)

Cytological Diagnosis	Number of Cases	Percentage (%)
Colloid Goiter	55	50.0
Nodular Goiter	15	13.6
Hashimoto Thyroiditis	12	10.9
Lymphocytic Thyroiditis	6	5.5
Follicular Neoplasm	8	7.3
Hurthle Cell Neoplasm	2	1.8
Papillary Carcinoma	8	7.3
Medullary Carcinoma	1	0.9
Anaplastic Carcinoma	1	0.9
Total	**110**	**100**

Among all lesions, colloid goiter was the most frequently encountered diagnosis, accounting for 50% of cases, followed by nodular goiter (13.6%) and Hashimoto thyroiditis (10.9%).

The overall distribution of benign, inflammatory, and neoplastic lesions is illustrated in Figure 2.

Distribution of Benign and Malignant Lesions: For analytical purposes, the lesions were further categorized into benign, inflammatory, and malignant groups.

Table 3: Categorization of Thyroid Lesions

Category	Number of Cases	Percentage (%)
Benign lesions	70	63.6
Inflammatory lesions	18	16.4
Neoplastic lesions	22	20.0
Total	**110**	**100**

Benign lesions constituted the largest category (63.6%), whereas neoplastic lesions accounted for 20% of the cases.

Malignant Thyroid Lesions: Among the malignant cases identified on FNAC, papillary carcinoma was the most common malignant tumor, followed by medullary carcinoma and anaplastic carcinoma.

Table 4: Distribution of Malignant Thyroid Lesions

Type of Malignancy	Number of Cases	Percentage (%)
Papillary carcinoma	8	80
Medullary carcinoma	1	10
Anaplastic carcinoma	1	10
Total	**10**	**100**

Papillary carcinoma accounted for the majority of malignant lesions, representing 80% of all malignant cases.

The proportion of different malignant thyroid tumors is illustrated in Figure 3.

Cytomorphological Findings: Cytological evaluation demonstrated characteristic features depending on the lesion type:

- Colloid goiter showed abundant colloid material with scattered follicular epithelial cells arranged in sheets and clusters.
- Hashimoto thyroiditis demonstrated lymphocytic infiltration, Hurthle cell changes, and follicular epithelial destruction.
- Follicular neoplasms showed increased cellularity with microfollicular arrangements and scant colloid.
- Papillary carcinoma revealed papillary clusters, nuclear grooves, and intranuclear inclusions.

Representative cytological images of common thyroid lesions identified on FNAC are shown in Figure 4.

Figures

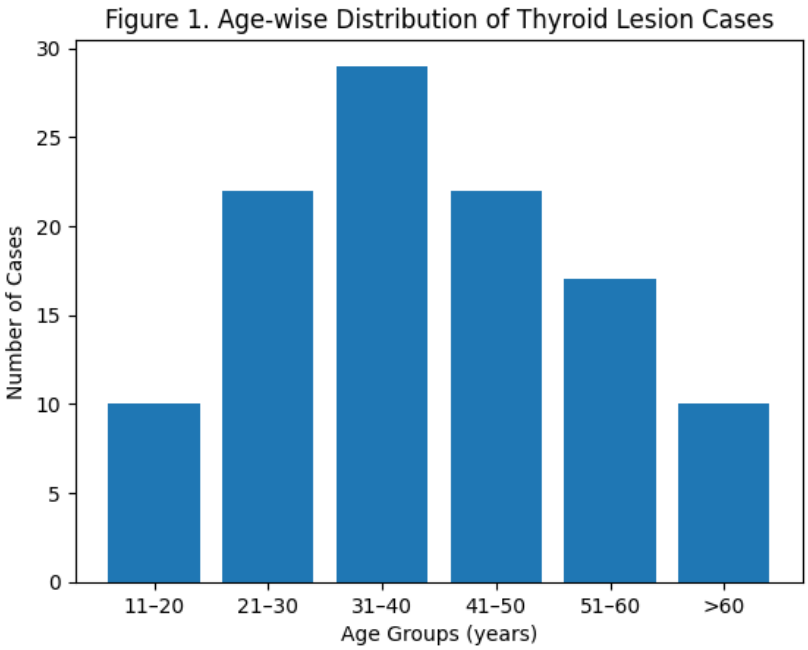

Figure 1: Age-wise distribution of thyroid lesion cases

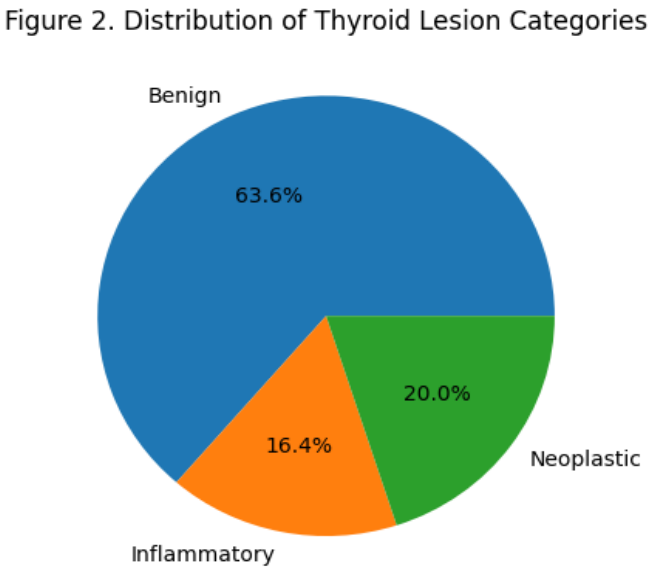

Figure 2: Overall distribution of thyroid lesions diagnosed by FNAC

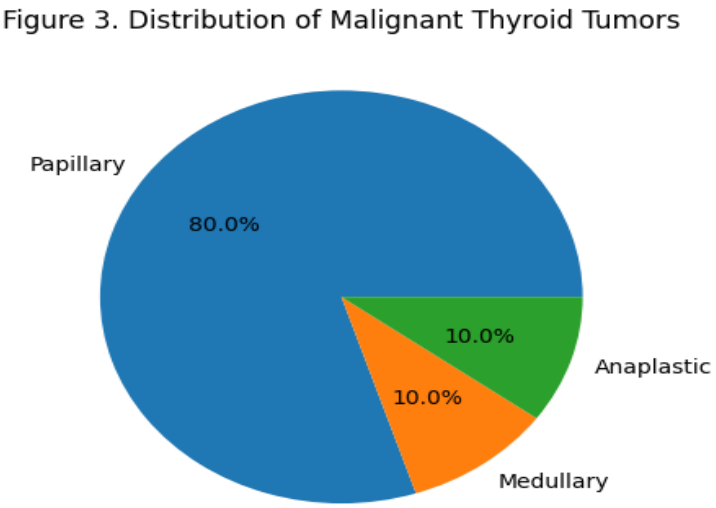

Figure 3: Distribution of malignant thyroid tumors

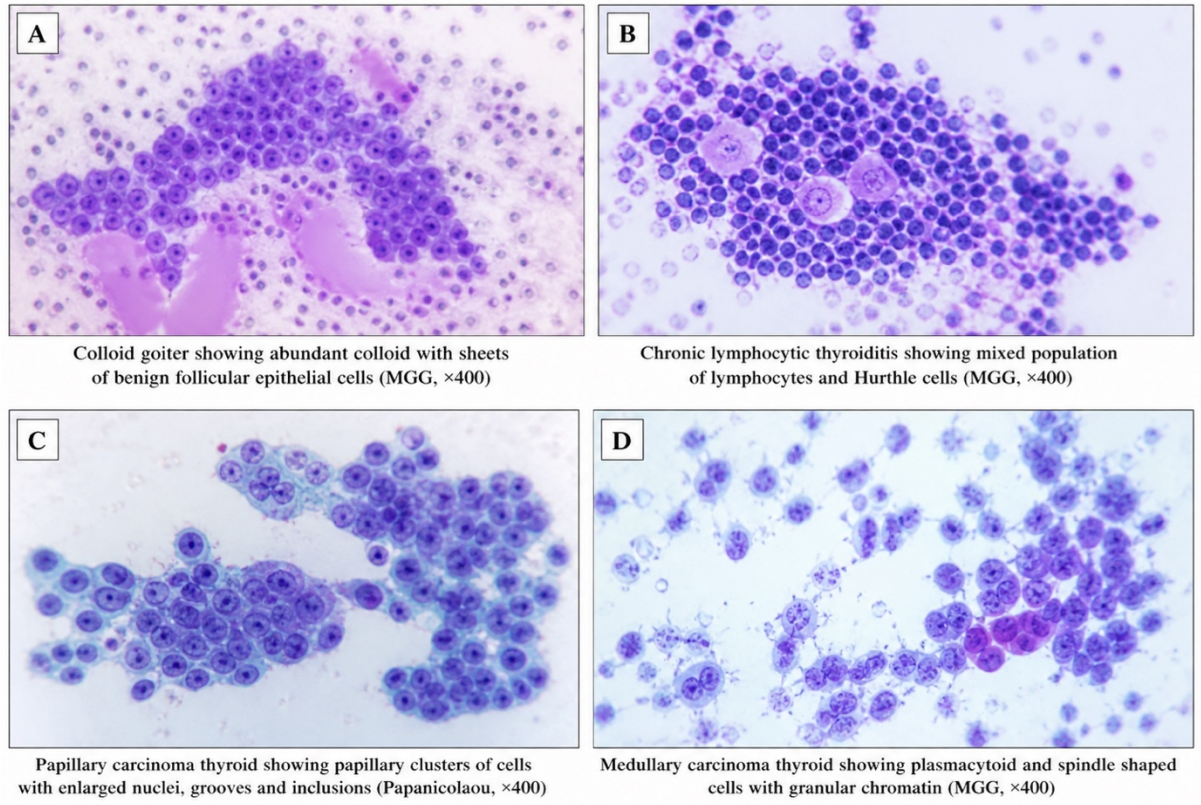

Figure 4: Representative FNAC smear of thyroid lesion showing characteristic cytomorphological features (MGG/Papanicolaou stain, ×400 magnification)

Discussion

Thyroid lesions are among the most frequently investigated endocrine disorders, and FNAC plays a pivotal role in their evaluation. In the present study, benign thyroid lesions constituted the majority of cases, a finding consistent with several Indian and international studies [17].

Colloid goiter emerged as the most common diagnosis, reflecting the high prevalence of benign hyperplastic thyroid disorders in iodine-deficient and borderline-sufficient regions [18]. Inflammatory lesions, including thyroiditis, were also observed and are known to show characteristic cytological features on FNAC [19].

Neoplastic lesions comprised a smaller proportion of cases, with malignant lesions being relatively infrequent. Similar trends have been reported by other tertiary care center-based studies [20]. FNAC

has been shown to have high sensitivity and specificity in detecting thyroid malignancies, thereby reducing unnecessary surgeries [21,22].

The use of standardized reporting systems has improved interobserver reproducibility and facilitated better clinician-pathologist communication. Studies have emphasized that FNAC, when combined with clinical and radiological findings, significantly enhances diagnostic accuracy [23].

Despite its limitations, FNAC remains an indispensable diagnostic tool, particularly in resource-limited settings such as public tertiary hospitals in India [24,25].

Limitations

Histopathological correlation was not available for all cases. Ultrasound-guided FNAC was not performed in all patients, which may have affected sampling adequacy.

Conclusion

FNAC is a simple, safe, and effective diagnostic modality for the evaluation of thyroid lesions. Its routine application in tertiary care hospitals can facilitate early diagnosis, reduce unnecessary surgical interventions, and improve patient outcomes.

References

1. Vanderpump MPJ. The epidemiology of thyroid disease. Br Med Bull. 2011; 99:39– 51.
2. Hegedüs L. Clinical practice: the thyroid nodule. N Engl J Med. 2004; 351:1764– 1771.
3. Guth S, Theune U, Aberle J, Galach A, Bamberger CM. Very high prevalence of thyroid nodules. Thyroid. 2009; 19:125–130.
4. Dean DS, Gharib H. Epidemiology of thyroid nodules. Best Pract Res Clin Endocrinol Metab. 2008; 22:901–911.
5. Gharib H, Papini E, Paschke R. Thyroid nodules: a review. Lancet. 2008; 373:947– 956.
6. Burch HB. Evaluation and management of thyroid nodules. Endocrinol Metab Clin North Am. 1995; 24:663–710.
7. Orell SR, Sterrett GF. Fine needle aspiration cytology. 5th ed. Edinburgh: Churchill Livingstone; 2012.
8. Mondal SK, Sinha S, Basak B, Roy DN, Sinha SK. FNAC of thyroid lesions. J Cytol. 2011; 28:106–110.
9. Das DK. Thyroid cytology: current issues. Diagn Cytopathol. 2003; 28:1–2.
10. Cibas ES, Ali SZ. The Bethesda system for reporting thyroid cytopathology. Am J Clin Pathol. 2009; 132:658–665.
11. Ali SZ, Cibas ES. The Bethesda system for reporting thyroid cytopathology. 2nd ed. New York: Springer; 2017.
12. Unnikrishnan AG, Menon UV. Thyroid disorders in India. Indian J Endocrinol Metab. 2011;15(Suppl 2):S78–S81.
13. Gupta M, Gupta S, Gupta VB. FNAC of thyroid swellings. CytoJournal. 2010; 7:8.
14. Bamanikar S, Soraisham P, Jadhav S, Kumar H. FNAC in thyroid lesions. Indian J Otolaryngol Head Neck Surg. 2014; 66:152–157.
15. Bagga PK, Mahajan NC. FNAC of thyroid swellings. Indian J Pathol Microbiol. 2010; 53:101–104.
16. Sangalli G, Serio G, Zampatti C. FNAC of thyroid nodules. Cytopathology. 2006; 17:255–263.
17. Tabaqchali MA, Hanson JM, Johnson SJ. FNAC of thyroid nodules. Cytopathology. 2000; 11:394–399.
18. Zimmermann MB. Iodine deficiency disorders. Endocr Rev. 2009; 30:376–408.
19. Kini SR. Thyroid cytopathology. New York: Igaku-Shoin; 2008.
20. Yassa L, Cibas ES, Benson CB. Long-term assessment of thyroid FNAC. Thyroid. 2007; 17:1061–1066.
21. Baloch ZW, Sack MJ, Yu GH. FNAC accuracy. Diagn Cytopathol. 1998; 19:241–246.
22. Handa U, Garg S, Mohan H. FNAC in thyroid lesions. Indian J Pathol Microbiol. 2008; 51:65–69.
23. Frates MC, Benson CB, Charboneau JW. Ultrasound evaluation of thyroid nodules. Radiology. 2005; 237:794–800.
24. Wong CK, Wheeler MH. Thyroid nodules: rational management. World J Surg. 2000; 24:934–941.
25. Gharib H, Goellner JR. FNAC and thyroid nodules. Endocr Pract. 1995; 1:410–417.