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Histopathologic Correlation of Thyroidectomy Specimen with Preoperative FNAC Findings

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ABSTRACT

Background: Thyroid swelling is a common outpatient presentation, mostly benign but occasionally malignant. Accurate distinction is essential for proper management. FNAC is a widely used, cost-effective initial tool, though limited. Histopathology remains the diagnostic gold standard. This study aimed to correlate FNAC findings with histopathology in thyroid swellings.

Methods: This observational prospective study was conducted at Sudha Medical College and Soni ENT and General Hospital after ethical committee approval. All patients with thyroid swelling who consented to participate were included in the study, irrespective of age and gender. USG-guided FNAC was planned in these patients and reporting was done using the 2023 Bethesda system for reporting thyroid cytopathology and findings were correlated with histopathological examination (HPE) of the thyroidectomy specimen post-surgery.

Result: A Total of 38 patients were studied, with a female-to-male ratio of 4.43:1. Out of all patients, only 3 patients were hypothyroid, while the rest of them were euthyroid. The most common finding on FNAC was Bethesda category II(Benign)-colloid goitre observed in 90% of patients. On analysis, this study showed that FNAC has a sensitivity of 50%, a specificity of 100%, a positive predictive value of 100% and a Negative predictive value of 94%. Combining both nonneoplastic and neoplastic lesions, the diagnostic accuracy of FNAC is close to 90% in our study.

Conclusion: A good clinical examination, Ultrasound of the thyroid and USG-guided FNAC will help in correctly diagnosing thyroid nodules in the majority of patients. FNAC provides a reliable pre-operative diagnosis, so that management of the patient can be planned in a better way.

Key-words: Fine Needle Aspiration Cytology (FNAC), Histopathology, Thyroid Swelling

INTRODUCTION

The thyroid is a butterfly-shaped endocrine gland located at the anterior aspect of the neck. It is a unique gland among endocrine organs and the first to develop in fetal life. One of the most prevalent endocrine illnesses is thyroid dysfunction.

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Thyroid swelling is a very common OPD presentation. With a female-to-male ratio of 1.2:4.3**,** thyroid illness is more prevalent in women [1]. At least one thyroid nodule, whether discovered by chance or visibly palpated, is present in up to 60% of adults [2]. People mostly fear cancerous swelling and often seek medical advice even if there are no compression symptoms. Thyroid cancer is a relatively uncommon cancer, yet it accounts for over 90% of all endocrine cancer occurrences, making it the most prevalent type [3]. Other reasons for approaching a doctor include cosmetic reasons or compressive symptoms in the form of dysphagia, voice change, difficulty in breathing, etc.

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For precise management of thyroid swelling, the most important challenge is to correctly differentiate between benign and malignant thyroid lesions. For this purpose, along with clinical features, FNAC and USG are frequently employed; however, as is well known, each technique has limitations, and the solution to this issue is still difficult [4]. USG findings that may suggest the presence of malignancy include increased vascularity, presence of calcifications, solid composition, and/or cervical lymph node metastasis. FNAC remains the most important investigation as it is minimally invasive, cost-effective, easily available, and results are quickly obtainable. It can help in categorising the lesion so that further decisions can be made regarding the treatment plan for management. The preferred technique for evaluating thyroid nodules is fine-needle aspiration. At present, ultrasound-guided FNAC is the preferred approach since it yields accurate aspirates and valuable information on the location, size, and structure (solid or cystic) [5]. This study is undertaken to correlate the FNAC and histopathological findings in thyroid nodules.

MATERIALS AND METHODS

This was an observational Prospective study, conducted at Sudha Medical College and Soni ENT and General Hospital after ethical committee approval. The definition of Thyroid nodule is taken According to the American Thyroid Association (ATA), a thyroid nodule is a distinct lesion inside the thyroid gland. A total of 38 patients who had thyroid nodules were enrolled in the study.

Inclusion criteria

All patients who had a thyroid nodule, irrespective of age and gender, who consented to FNAC and were subsequently subjected to histopathological examination

Exclusion criteria

- All the patients who did not give consent.
- Any patient in whom either of the one (FNAC/Histopathological examination) was not available.

Procedure- Fine-needle aspiration cytology (FNAC) was performed under USG guidance, under all aseptic measures, with a 23-gauge needle. Slides were made, and smears were fixed with 95% alcohol solution and stained with Giemsa stain. Reporting was done using the "2023 Bethesda system for reporting thyroid cytopathology".

The thyroidectomy post-operative specimens were sent for histological analysis. Samples of thyroid tissue were preserved in 10% formalin. On gross examination, the majority of specimens show colloid-filled cystic spaces with solid normal-looking areas, whereas in 5 patients, well-defined solid nodules were appreciated. In 1 case papillary area was appreciated on gross examination. Representative tissues were submitted and further processed in a tissue processor, then embedded in paraffin. Blocks and slides were made and stained with H & E stain.

Statistical Analysis- Test performance parameters were calculated as follows.

Sensitivity = (True Positives)/ (True Positives +False Negatives)

Specificity= (True Negatives)/ (True Negatives +False Positives)

Positive Predictive Value (PPV)= (True Positives)/ (True Positives+False Positives)

Negative Predictive Value (NPV)= (True Negatives)/ (True Negatives +False Negatives)

Ethical approval- The study protocol was approved by the Institutional Ethics Committee before commencement. All patients provided written informed consent.

RESULTS

A total of 38 patients were studied. Out of which 31 (82%) patients were female, while 7(18%) were male. Female to male ratio of 4.43:1. 17 patients (44.73%) were between 31-50 years of age (Table 1). The youngest patient was 15 years old, while the eldest was 69 years old.

Table 1: Showing the Age distribution of patients

Age (in yrs)	Female	Male
11-20	1	1
21-30	7	0
31-40	9	1
41-50	8	3
51-60	4	0
>60	2	2
Total	31	7

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All patients were euthyroid, except 3 patients who were Hypothyroid. All of these hypothyroid patients were female. (Table 2) None of the patients in the present study were hyperthyroid.

Table 2: Thyroid status of patients

Thyroid status	Female	Male
Euthyroid	28	7
Hypothyroid	3	0
Hyperthyroid	0	0
Total	31	7

In the present study, among 31 female patients, 29 had benign nodules and 2 had malignant lesions. Among all 7 male patients, 5 had benign nodules and 2 had malignant lesions (Table 3).

Table 3: Sex wise distribution of benign & malignant pathologies

Gender	Benign	Malignant	Total
Female	29 (77%)	2 (5%)	31(82%)
Male	5 (13%)	2(5%)	7(18%)

Out of 38 patients, the majority, i.e., 34 patients (90%), on FNAC were reported as Thyroid Bethesda Category II (Benign lesion)- colloid goitre with or without cystic degeneration and/or Hashimoto thyroiditis. Two patients (5%) were reported as Thyroid Bethesda category IV (Follicular neoplasm)- follicular adenoma, whereas the remaining 2 patients (5%) were reported as Thyroid Bethesda category V- suspicious for malignancy on FNAC.

Whereas, on Histopathological examination, 2 patients (5%) had follicular adenoma (Fig. 1-4), 3 patients (8%) had follicular carcinoma, 1 patient (3%) had papillary carcinoma (Fig. 5,6) while remaining 32 patients (84%) had colloid goiter (Fig. 7,8) with 2 of them having overlapping features of Hashimoto thyroiditis (Fig. 9,10). Tables 4 describe in detail the FNAC & histopathological correlation of the lesions.

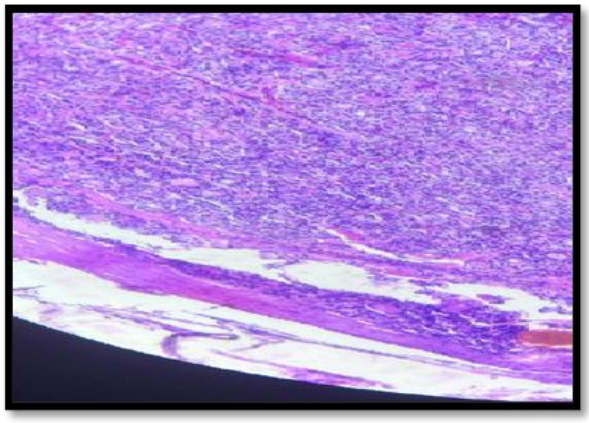

Fig. 1: Low power (10x) view of follicular adenoma

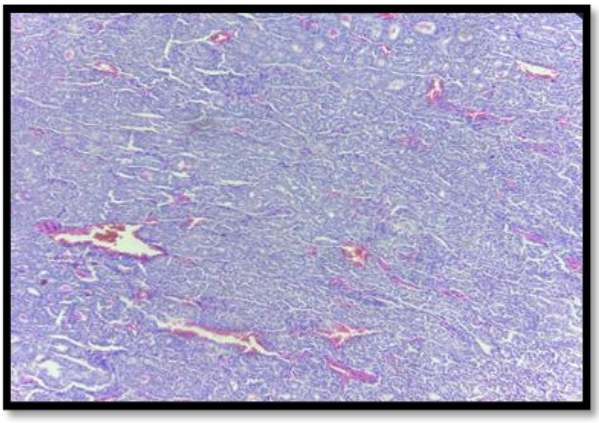

Fig. 2: Low power (10x) view of follicular adenoma

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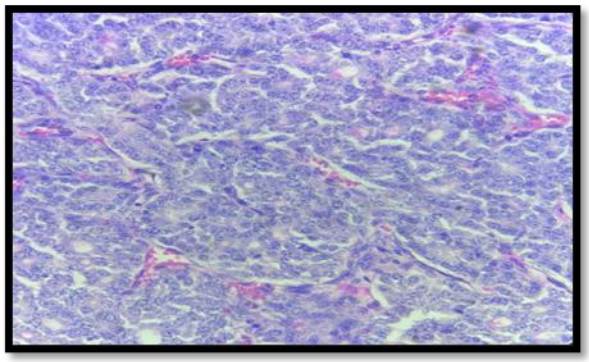

Fig. 3: Follicular adenoma high power (40x) view

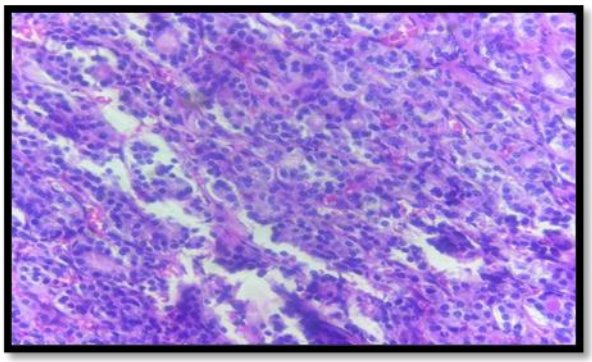

Fig. 4: Follicular adenoma high power (40x) view

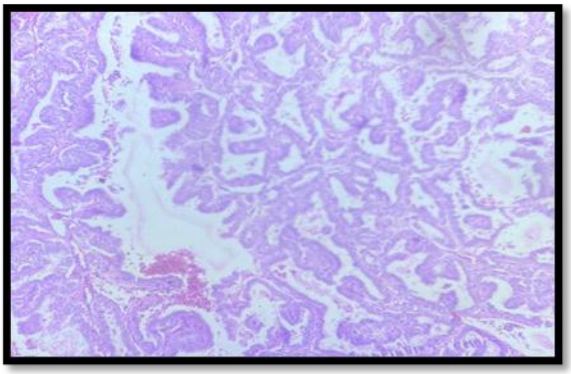

Fig. 5: Papillary carcinoma low power (10x) view

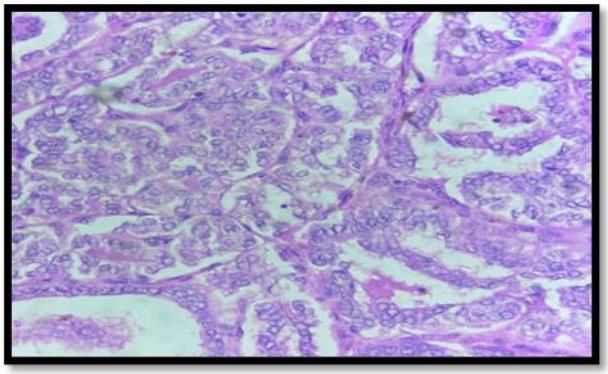

Fig. 6: Papillary carcinoma high power (40x) view

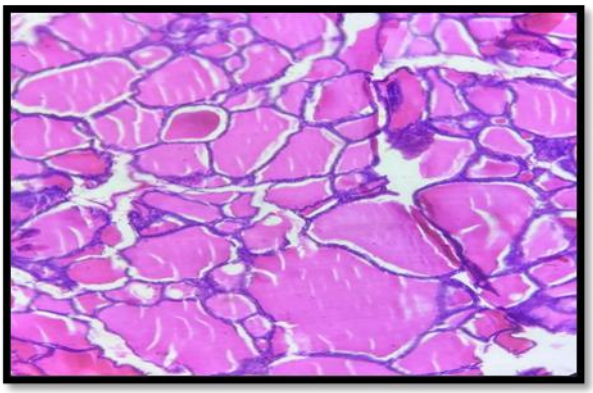

Fig. 7: Colloid goiter low power (10x) view

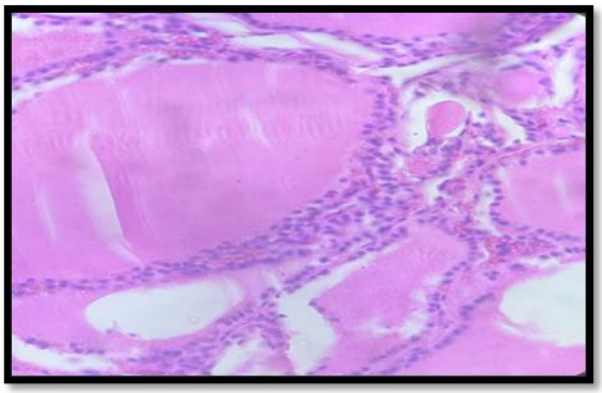

Fig. 8: Colloid goiter high power (40x) view

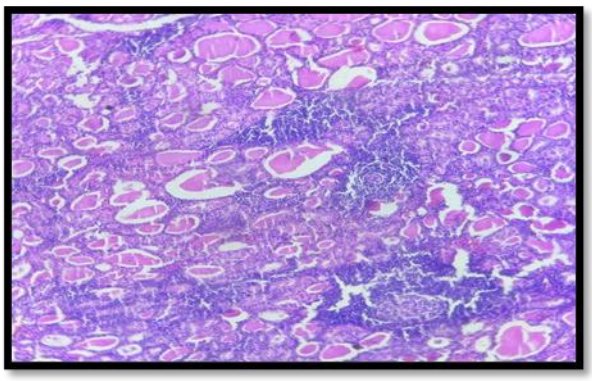

Fig. 9: Colloid goiter with overlapping features of hashimoto thyroiditis low power (10x) view

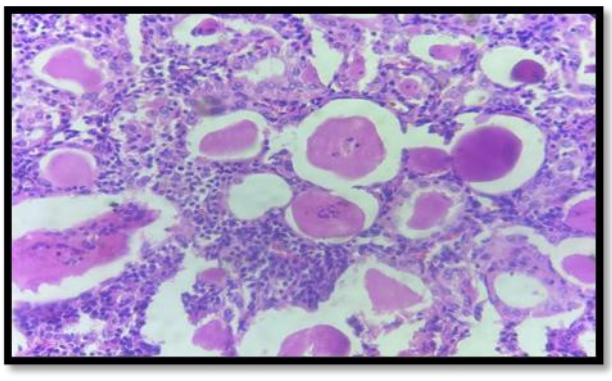

Fig. 10: Colloid goiter with overlapping features of hashimoto thyroiditis high power (40x) view

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Table 4: Correlation of Benign, Suspicious Neoplastic, and Non-Neoplastic Lesions Diagnosed by FNAC with Final Histopathological Findings

FNAC	Number of Patients	Histopathology	Number of Patients	Remarks
Colloid Goiter	34	Colloid goiter	31	True Negative
		Follicular adenoma	1	False Negative
		Follicular Carcinoma	1	False Negative
		Papillary carcinoma	1	False Negative
Follicular Adenoma	2	Follicular adenoma	1	True Positive
		Colloid goiter	1	False Positive
Suspected Neoplastic lesion	2	Follicular carcinoma	2	True Positive

In this study, the sensitivity and specificity of FNAC were 50% and 100% respectively. The positive predictive value (PPV) was 100% whereas the negative predictive value (NPV) was 94% (Table 5).

Table 5: Summary of FNAC and Histopathology Correlation with Diagnostic Indices

	HPE (Malignant)	HPE (Benign)
FNAC (Malignant)	2 (True Positive)	0 (False Positive)
FNAC (Benign)	2 (False Negative)	34 (True Negative)

Sensitivity: 50%, Specificity: 100%, PPV: 100%, NPV: 94%

DISCUSSION

In the present study, a total of 38 patients were studied, out of which 31 (82%) were females and 7 (18%) were males. This was consistent with the study conducted by Ismail Mohamud Abdullahi *et al.,* where 84% of the patients were female [6].

In our study, the female-to-male ratio was 4.4:1. Additionally, 44% of the patients were in the 30–50 years age group, which aligns with the findings of Manoj Gupta *et al.,* who reported that 76% of their patients belonged to the same age group [7].

In the current study, 3 patients were hypothyroid (all females), and the rest were euthyroid. None of the patients were hyperthyroid, which contrasts with the study reported by Usha *et al.* where 9% of the patients were hyperthyroid while 59% were euthyroid [8].

In our study, 77% of females and 13% of males had benign swelling, which was consistent with the study conducted by Mohammed Arif *et al.* [9]. Whereas 5% of females and 5% of males had malignant lesions, it was around 27% and 38% respectively, in the study conducted by Mohammed Arif *et al.* [9]. This difference could be due to the small sample size of our study.

Out of non-neoplastic lesions detected on FNAC, 34 patients out of 38 were reported as Thyroid Bethesda category II, showing features of colloid goiter and Hashimoto thyroiditis on FNAC, which was accurate in 31 (91%) of these patients on HPE. Out of these 34 patients, 2 patients had malignant lesions on HPE (follicular carcinoma and papillary carcinoma), while 1 patient had follicular adenoma.

2 patients who were reported as Thyroid Bethesda category V had suspicious malignant lesions on FNAC and had confirmatory follicular carcinoma on HPE. Combining both non-neoplastic and neoplastic lesions, the diagnostic accuracy of FNAC is close to 90% in our study. This is slightly less than that reported by Rout *et al.* in which the diagnostic accuracy of FNAC was 96.05% [10].

The current study had 100% specificity and 50% sensitivity. According to Parameshwar *et al.*'s study, FNAC had 98% specificity and 87.5% sensitivity [11]. However, FNAC of thyroid lesions demonstrated a sensitivity of 69.2% and specificity of 97.0% in the study by Muppidi *et al.* Their study's total diagnostic accuracy was 89.3%, which was comparable to ours [1].

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As a result, FNAC was found to be a valuable diagnostic tool for thyroid lesions, particularly for differentiating between neoplastic and non-neoplastic diseases. Although the outcomes vary for each series, most large series report an overall accuracy rate of over 90% and a frequency of false-positive and false-negative diagnoses of 5% to 10%. In the differential diagnosis of thyroid nodules, FNAC is generally accepted as the gold standard initial diagnostic technique [12].

LIMITATIONS

A Major Limitation of our study is that it is from a very small geographical area and has a small sample size.

CONCLUSIONS

The present study concludes that Fine Needle Aspiration Cytology (FNAC), particularly when performed under ultrasound guidance, is an effective method for distinguishing benign from malignant thyroid nodules. It is a safe, simple, readily available, reliable, and cost-effective diagnostic tool that offers early cytological evaluation, reduces patient anxiety, and helps avoid unnecessary surgical interventions.

CONTRIBUTION OF AUTHORS

Research concept- Neetu Ramkumar Soni, Hemraj Bhardwaj
Research design- Neetu Ramkumar Soni, Hemraj Bhardwaj, Abdul Wahid
Supervision- Abdul Wahid, Anushree Khandelwal
Materials- Hemraj Bhardwaj, Abdul Wahid
Data collection- Hemraj Bhardwaj, Abdul Wahid
Data analysis and interpretation- Anushree Khandelwal, R.K. Soni
Literature search- Hemraj Bhardwaj, Abdul Wahid
Writing article- Abdul Wahid, Anushree Khandelwal, R.K. Soni
Critical review- Abdul Wahid, Anushree Khandelwal
Article editing- Anushree Khandelwal
Final approval- Anushree Khandelwal, R.K. Soni

REFERENCES

[1] Muppidi K, Kedarisetti V, Mahankali KK. Correlation of fine needle aspiration cytology with histopathological findings in the diagnosis of thyroid swellings–a one-year study in a tertiary care hospital, Hyderabad. J Evid Based Med Healthc., 2021; 8(18): 1246-51. doi: 10.18410/jebmh/2021/239.

[2] Zamora EA, Khare S, Cassaro S. Thyroid Nodule. 2023 Sep 4. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available at: https://pubmed.ncbi.nlm.nih.gov/30571043/.

[3] Kumara Rama SB, Raju R, Radhakrishnan S. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of thyroid swellings. Bengal J Otolaryngol Head Neck Surg., 2016; 24(2): 54–59.

[4] Kirdak VR, Chintale SG, Jatale SP, Shaikh KA. Our experience of clinico-pathological study of thyroid swelling. Int J Otorhinolaryngol Head Neck Surg., 2018; 4(5): 56–61.

[5] Sellami M, Tababi S, Mamy J, Zainine R, Charfi A, et al. Interest of fine-needle aspiration cytology in thyroid nodule. Eur Ann Otorhinolaryngol Head Neck Dis., 2011; 128: 59–64.

[6] Abdullahi IM, Yasin NA, Dirken ES, Mohamoud AM, Guler I, et al. Comparative study of fine needle aspiration cytology and histopathology in thyroid nodules at a tertiary care hospital: First report from Somalia. Asian J Surg., 2023; 46(10): 4202-07. doi: 10.1016/j.asjsur.2022.11.097.

[7] Gupta M, Gupta S, Gupta VB. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. J Thyroid Res., 2010; 18; 2010: 379051. doi: 10.4061/2010/379051.

[8] Usha M, Jasuja A, Rashmi K, Reginald S, Rakshitha HB, et al. Thyroid Lesions: FNAC and Histopathology Correlation in Our Experience. Ann Int Med Den Res., 2016; 2(2): 153-57.

[9] Arif M, Sunil H. Benefits and limitations of FNAC in thyroid diseases: our institutional experience. Int J Res Med Sci., 2013; 1(4): 35–40. doi: 10.5455/2320-6012.ijrms20131124.

[10] Rout K, Ray CS, Behera SK, Biswal R. A Comparative Study of FNAC and Histopathology of Thyroid Swellings. Indian J Otolaryngol Head Neck Surg., 2011; 63(4): 370-72. doi: 10.1007/s12070-011-0280-0.

[11] Parameshwar NR, Govinda SDS. A study of correlation of pre-operative fine needle aspiration cytology and ultrasonography with post-operative histopathology in thyroid swellings. Int Surg J., 2020; 7(5): 1456–60. doi: 10.18203/2349-2902.isj20201851.

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doi: 10.21276/SSR-IIJLS.2025.11.4.16

[12]Attia R, Kotb F, Rabie OM. Role of fine-needle aspiration cytology in the diagnosis of thyroid diseases. Egypt J Surg., 2019; 38(3): 439–50. doi: 10.4103/ejs.ejs_32_19.

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