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Comparison of Fine Needle Aspiration Cytology and Histopathology in diagnosing malignant thyroid swellings: Experience from a Tertiary Care Centre of Tripura, India

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ABSTRACT

Background

Thyroid nodular disease, including thyroid cancer, is increasingly prevalent worldwide, with significant incidence in India. This study compares FNAC and histopathological examination (HPE) findings in diagnosing malignant thyroid lesions in a tertiary care center in Tripura, India.

Methods

This retrospective study analyzed data from patients who underwent both FNAC and HPE between September 2019 and August 2020 at Agartala Government Medical College and GBP Hospital. Out of 98 records, 30 cases with malignant HPE results were included. Data were abstracted using Epi Info software and analyzed with IBM SPSS software. Qualitative variables were summarized using percentages, while quantitative variables were summarized using mean (SD).

Results

The majority of the cases were female (86.67%), Bengali (76.67%), and aged 21-40 years (73.33%). FNAC accurately detected malignant thyroid lesions in 73.3% of cases. Discrepancies between FNAC and HPE were found in eight cases, primarily involving papillary carcinoma of the thyroid (PCT), which FNAC misdiagnosed as other conditions. PCT was the most common HPE diagnosis, representing 76.66% of cases, predominantly in females. Most patients (86.67%) underwent total thyroidectomy, with a few requiring additional surgical interventions.

Conclusion

FNAC is a minimally invasive, cost-effective procedure with high accuracy in diagnosing malignant thyroid swellings. However, the definitive diagnosis relies on HPE, which remains the gold standard due to FNAC's limitations. The study emphasizes the need for precise diagnostic techniques and vigilant monitoring, especially among females with thyroid malignancies. Further research with larger sample sizes is recommended to enhance the generalizability of these findings.

Keywords: FNAC, histopathology, thyroid neoplasms

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INTRODUCTION

Thyroid nodular disease, including thyroid cancer, is becoming increasingly prevalent worldwide.[1,2] In India, thyroid nodules are quite common, with 12.2% of the community exhibiting palpable nodules.[3] Diagnosing thyroid nodules is crucial for identifying thyroid cancers, which can be found in a subset of these cases. The incidence of thyroid cancer in India has also risen, as evidenced by age-standardized rates (ASR). According to the National Cancer Registry Program, the lifetime risk of developing thyroid cancer is 1 in 752 for Indian males and 1 in 285 for Indian females.[4] In Tripura, the age-adjusted incidence rates (AAR) for thyroid cancer are 0.6 per 100,000 males and 1 per 100,000 females.[5] Removing all thyroid lesions is impractical and carries significant risks. Therefore, Fine Needle Aspiration Cytology (FNAC) is frequently used as the initial diagnostic test for evaluating thyroid nodules and diffuse thyroid lesions. FNAC is reliable, safe, cost-effective, minimally invasive, and has high sensitivity and specificity.[6,7] Despite its advantages, cytological studies have limitations; the accuracy of FNAC relies heavily on the experience of the aspirator and the pathologist's interpretation. Its accuracy is particularly lower in cases of suspicious cytology and follicular neoplasms. Histopathological examination of the thyroid gland is often considered superior to FNAC for diagnosing thyroid pathologies due to certain limitations of FNAC, such as inadequate samples, thyroid swelling vascularity, variability in sampling techniques, and the skill of the performing expert and pathologist interpreting the aspirate.[8,9] Although several studies have compared the diagnostic efficacy of FNAC and histopathology in India, research specifically focusing on northeast India, and particularly Tripura, is limited. Therefore, this study aims to compare FNAC findings with histopathological readings in patients with malignant thyroid lesions.

Material & methodology

Study design, setting & duration

This retrospective record-based study was done between October and December 2020 after getting clearance from the Institutional Ethics Committee, Agartala Government Medical College and GBP Hospital (AGMC & GBPH), Agartala, Tripura, India. Data were collected from the medical record department of AGMC & GBPH from September 2019 and August 2020. This tertiary care centre, being the largest medical teaching hospital caters to the population from both urban and rural areas of Tripura.

Inclusion Criteria and exclusion criteria

We included only the case records of patients who had undergone both FNAC and histopathological examination (HPE) during the study period. Records that showed only one of the investigations (either FNAC or HPE) and those with HPE reports indicating benign lesions were excluded from the study.

Sample size and sampling

A total of 98 records were found during the study duration where both FNAC and HPE were done. However, in 68 cases HPE reports showed benign lesions. Therefore, we finalized the data of 30 patients as the final sample size.

Study variables and data analysis

Data were abstracted in a data abstraction sheet designed with the help of Epi Info software (version 7.2.4.0, CDC, Atlanta) for Windows. We abstracted data on results of FNAC and HPE, age, gender, ethnicity, and treatment details from the records of subjects for further analysis. We used IBM Statistical Package for Social Sciences (SPSS) software (IBM Corp., released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.) for data analysis. Qualitative variables were summarized using percentages, and quantitative variables were summarized using mean (SD).

Results

The majority of the cases were female (86.67%), belonged to Bengali ethnicity (76.67%), and were between 21-40 years old (73.33%) (Table 1).

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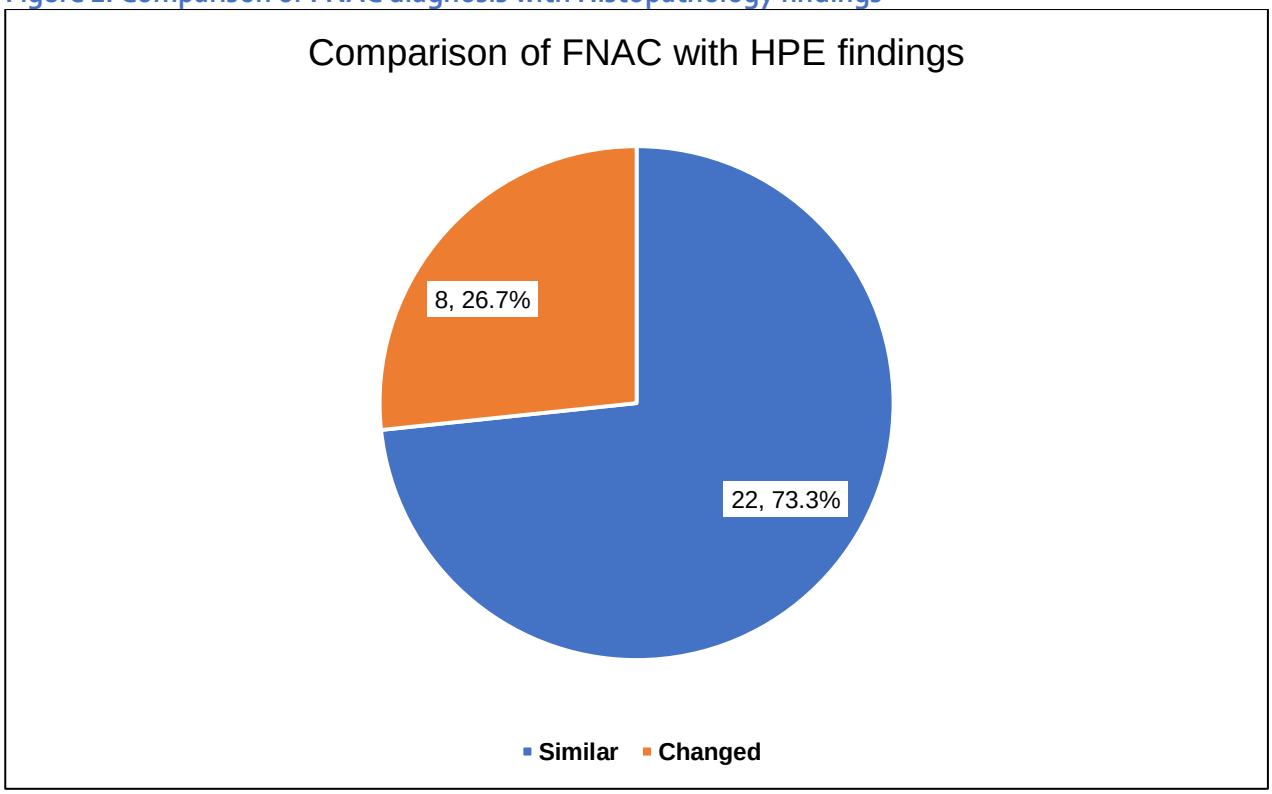
Table 1: Basic characteristics of the sample (N=30)

Variables	Frequency	Percentage
Gender		
Male	4	13.33%
Female	26	86.67%
Ethnicity		
Bengali	23	76.67%
Tribal	7	23.33%
Age-group		
21-40	22	73.33%
41-60	7	23.33%
>60	1	3.33%

In 22 cases, the histopathological examination (HPE) diagnosis was concordant with the findings of fine-needle aspiration cytology (FNAC). However, in eight cases, there was a discrepancy between the HPE and FNAC diagnoses (Figure 1).

Figure 1: Comparison of FNAC diagnosis with Histopathology findings



The accuracy of the FNAC in detecting malignant thyroid lesion was 73.3%. Table 2 provides a detailed overview of all 30 cases, including their FNAC and HPE diagnoses and the corresponding treatments.

Table 2: Detail overview of all cases

Sl No.	Sex/ Age	FNAC Findings	HPE Findings	Treatment done
1	F/23	PCT (FOLLICULAR V)	PCT (FOLLICULAR V)	TT
2	F/28	PCT	PCT	TT
3	F/27	PCT	PCT	TT
4	F/45	MCT	PCT	TT
5	F/30	PCT	PCT	TT
6	M/38	MCT	MCT	TT
7	F/23	STN, COLLOID G (U/L)	PCT (FOLLI V)	HT -> TT
8	F/43	HURTHLE CL N W/ MNG	FOLLI. CA	TT
9	F/38	FOLLI. ADENOMA	PCT (FOLLI V)	HT -> TT
10	F/52	HURTHLE CL N	FOLLI. CA	TT
11	F/36	PCT	PCT	TT
12	F/34	PCT	PCT	TT
13	F/40	PCT	PCT	TT
14	F/27	STN, COLLOID G (U/L)	PCT	HT -> TT
15	M/37	MCT (PAPIL V)	PCT	TT
16	F/21	PCT	PCT	TT
17	F/55	FOLLI. ADNOMA	FOLLI. CA	TT
18	F/29	PCT	PCT	TT
19	F/42	PCT	PCT	TT
20	F/33	PCT	PCT	TT
21	M/47	STN, FOLLI. ADNOMA	FOLLI. CA	HT -> TT
22	F/29	PCT	PCT	TT
23	F/48	PCT (FOLLIC V)	PCT (FOLLIC V)	TT
24	F/27	PCT	PCT	TT
25	F/38	HURTHLE CL CA	HURTHLE CL CA	TT
26	F/62	MCT	MCT	TT
27	M/35	PCT	PCT	TT
28	F/22	COLLOID G (B/L)	PCT	TT ->RADIOIOD
29	F/24	PCT	PCT	TT
30	F/26	PCT	PCT	TT

M: Male; F: Female; PCT: Papillary Carcinoma Thyroid; MCT: Medullary Carcinoma Thyroid; STN: Soft Tissue Nodule; COLLOID G: Colloid Goiter; HURTHLE CL Ca W/ MNG: Hurthle Cell Carcinoma with Multinodular Goiter; FOLLI. CA: Follicular Carcinoma; FOLLI. ADNOMA: Follicular Adenoma; HURTHLE CL CA: Hurthle Cell Carcinoma; TT: Total Thyroidectomy; HT: Hemithyroidectomy; Radioiod: Radioactive iodine; U/L: Unilateral, B/L: Bilateral

Discussion

Thyroid enlargement typically prompts a comprehensive series of investigations to exclude neoplastic conditions. The standard diagnostic approach includes ultrasound (US) examination, thyroid function tests, thyroid scans, and antibody level assessments. Fine-needle aspiration cytology (FNAC) is then performed to differentiate patients needing surgical intervention from those who can be managed conservatively. Considering this, this retrospective record-based study was done to compare the FNAC findings with the histopathological findings in diagnosing malignant thyroid lesions from the largest tertiary care centre in Tripura.In our study, the majority of the cases were females (86.67%), which is similar to the study findings of Chakraborty et al. and Gautam et al.[10,11] Specifically, Chakraborty et al. reported that 88% of cases in their study from North-East India were females.[10] This high prevalence among females is reflective of similar demographic patterns observed in thyroid disorders. Most participants in our study were within the 20-40 years age group, with the highest incidence occurring in the third decade of life. This trend is similar to those reported in studies by Babu et al., Chakraborty et al., Rout et al., and Sengupta et al.[8,10,12,13] In our cohort, the accuracy of fine-needle aspiration cytology (FNAC) in detecting thyroid swellings was found to be 73.3%. This is considerably lower compared to the accuracy reported in other studies, such as Ullah et al. (94.2%), Gupta et al. (92%), and Bhartiya et al. (97.1%).[14–16] This discrepancy may be attributed to variations in study populations, techniques, or criteria used for FNAC diagnosis. Further investigation is warranted to understand the underlying factors contributing to these differences in diagnostic accuracy. In cases where discrepancies between FNAC and HPE were observed, the majority of diagnosis in HPE identified papillary carcinoma of the thyroid (PCT). Conversely, FNAC had diagnosed these cases as medullary carcinoma (MCT), solitary thyroid nodule (STN), colloid goiter, follicular adenoma, or Hurthle cell carcinoma. PCT was the predominant finding in HPE, accounting for 23 out of 30 patients, which aligns with several studies where PCT is the most common malignant thyroid lesion. Specifically, PCT represented 76.66% of cases, closely correlating with the findings of Rout et al. (71.4%).[12] Notably, the majority of PCT cases involved female patients, with 21 out of 30 cases (70%). This gender distribution is consistent with the higher prevalence of thyroid malignancies in females, as reported in the literature.[17,18] The significant incidence of PCT and its predominant occurrence in female patients underscores the necessity for precise diagnostic techniques and vigilant monitoring in this demographic. Among the cases studied, 26 patients underwent total thyroidectomy. The remaining four patients, who initially underwent hemithyroidectomy, were subsequently scheduled for total thyroidectomy following histopathological confirmation of papillary carcinoma and follicular carcinoma. One case, involving a 22-year-old female diagnosed with papillary carcinoma, necessitated radioactive iodine thyroid scanning as part of her management plan.

Limitations

Our study has several limitations, including its retrospective design and relatively small sample size. Consequently, the findings may not be fully representative of the general population in the region.

Conclusion

FNAC is a simple, quick, economical, and minimally invasive procedure that can be easily performed in an outpatient setting or at the bedside. It provides a high degree of accuracy in diagnosing malignant thyroid swellings. However, the definitive diagnosis relies on the histopathological examination (HPE) of excised thyroid tissue, which remains the gold standard in thyroid cytology reporting. The accuracy of FNAC findings depends on the nature of the disease, the experience of the cytopathologist, and an understanding of the inherent limitations of the diagnostic method.

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