Section: Otorhinolaryngology

Original Research Article

CYTODIAGNOSIS FOR SURGICAL INTERVENTION IN THYROID SWELLINGS

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ABSTRACT

Background: Thyroid swellings are common clinical conditions ranging from benign goitres to malignancies. Fine needle aspiration cytology (FNAC) is widely used as a first-line diagnostic tool; however, its accuracy requires correlation with histopathological examination (HPE). **Aims:** To evaluate the cytodiagnostic role of FNAC in thyroid swellings and correlate findings with postoperative histopathology.

Materials and Methods: A prospective study was conducted over two years on 40 patients presenting with thyroid swellings. All cases underwent thyroid profile, ultrasonography, FNAC, and thyroidectomy with subsequent histopathological analysis. Patients with known carcinoma, metastatic thyroid disease, and bleeding diathesis were excluded.

Results: The majority of patients were females (M\:F = 3:37; 92.5%), with the highest incidence in the 31–40 years age group (40%). Cosmetic swelling was the commonest presentation (80%), while 20% had pressure symptoms. FNAC diagnosed colloid goitre (18 cases), nodular goitre (9), follicular neoplasm (8), AUS (3), Hashimoto's thyroiditis (1), and papillary carcinoma (1). On histopathology, multinodular goitre (45.9%) and follicular adenoma (37.5%) were most common, with 3 cases (7.5%) identified as malignant. Of these, 2 malignancies were misdiagnosed as colloid goitre on FNAC. FNAC showed sensitivity of 90%, specificity of 100%, diagnostic accuracy of 68%, positive predictive value of 100%, and negative predictive value of 90.9%.

Conclusion: FNAC is a reliable initial investigation for thyroid swellings with high sensitivity and specificity. Nevertheless, histopathological confirmation remains essential, particularly in follicular neoplasms where cytology cannot distinguish between adenoma and carcinoma.

Keywords: Cytodiagnosis, Surgical Intervention, Thyroid Swellings

INTRODUCTION

Thyroid nodules localized or generalized collectively termed as goiter, which usually presents as a swelling in front of the neck. The incidence of clinically palpable thyroid swellings is 4-7%. The prevalence of thyroid nodules ranges from 4-10% in adult population and from 0.2-1.2% in children. They are more commonly seen in women. Thyroid swellings are of cosmetic concerns besides the problem of hypo or hyper-functioning. The spectrum and predictability of thyroid swellings is variable ranging from benign to malignant nature. The incidence of thyroid cancer in a clinically solitary thyroid nodule or in a multinodular goiter is around 4-7% with high incidence among women.[1,2]

The FNAC yields thyroid swelling cells to investigate their nature and differentiating into benign and malignant lesions. FNAC is minimally invasive procedure which has replaced invasive procedure of excision biopsy. It is a robust screening test for probing into the nature of thyroid lesions before proceeding to major surgical procedure. FNAC is widely accepted as the most accurate, sensitive, specific and cost effective diagnostic procedure in the preoperative assessment of thyroid nodules.[2]

FNAC is a first line of investigation and also a preferred diagnostic method for the initial stage of

evaluation of thyroid nodules. Goal of FNAC is to detect thyroid neoplasms for surgical resection and to identify non-neoplastic lesions that may be managed conservatively. This method has reduced the diagnostic surgeries for thyroid nodules by 60-85%.[3]

MATERIALS AND METHODS

Prospective clinical study in Department of Otorhinolaryngology, Kamineni institute of medical sciences, Narketpally, Nalgonda District, Telangana state. October 2017- September 2019. A total of 40 patients were included in the study.

Inclusion Criteria: Age: 20-80yrs in Patients presenting to outpatient department with thyroid swellings.

Exclusion Criteria: Hypothyroidism, Thyroiditis, Known thyroid malignancy and bleeding diathesis

Data for the study were collected from patients presenting to Otorhinolaryngology and General surgery outpatient department of our college.

All patients underwent detailed history taking and clinical evaluation of thyroid swelling. Thyroid function tests (T3, T4, and TSH) were performed to assess hormonal status. Ultrasonography (USG) of the thyroid was done to evaluate the size, site, and characteristics of the lesion. Fine Needle Aspiration Cytology (FNAC) of the thyroid swelling was carried out for cytological diagnosis. All patients subsequently underwent thyroidectomy, and the excised specimens were subjected to histopathological examination (HPE) for confirmation of the diagnosis.

RESULTS

A detailed clinical history was taken followed by FNAC and histopathological examination.

Table 1: Demographic distribution in present study.

Age group (in years)	No of subjects (n)	Percentage
21-30	05	12.5%
31-40	15	37.5%
41-50	09	22.5%
51-60	06	15%
61-70	03	7.5%
71-80	02	5%
Total(N)	40	100%
Gender		
Male	03	7.5%
Female	37	92.5%
Symptoms		
Swelling	32	80%
Pressure symptoms	08	20%

More number of cases (15) have been observed in 31-40 years of age group. Less number of cases (2) have been observed in 71-80 years of age. More number of female cases have been identified compared to males (37:3). More number of patients (32) had swelling in the neck as the presenting symptom compared to (8) patients which had pressure symptoms.

Among 8 patients, 1 had hoarseness of voice, 6 had dysphagia, and 1 had both hoarseness of voice with dysphagia.

Table 2: FNAC Results in present study.

FNAC results	No of subjects (n)	Percentage
Colloid goitre	18	45%
Nodular goitre	09	22.5%
AFUS	03	7.5%
Follicular neoplasm	08	20%
Hashimotos thyroiditis	01	2.5%
Papillary carcinoma	01	1%
TOTAL(n)	40	100%

AFUS- Atypical Follicular pattern of undetermined significance

On FNAC, out of 40 cases, majority of cases were identified as colloid goitre- 18 cases (45%) followed by Nodular goitre - 9 cases (22.5%); Follicular neoplasm - 8 cases (20%); AUS - 3 cases (7.5%); Hashimotos thyroiditis - 1 case (2.5%); Papillary carcinoma - 1 case (2.5%).

Table 3: Histopathology Results in present study.

Histopathology Results	No of subjects (n)	Percentage
Colloid goiter	03	7.5%
Multi nodular goiter	19	47.5%
Follicular adenoma	15	37.5%
Hashimotos thyroiditis	0	0%
Papillary carcinoma	03	7.5%
TOTAL (n)	40	100%

Colloid goitre multinodular goitre follicular adenoma hashimotos thyroiditis papillary carcinoma Histopathology revealed majority of the cases as Multinodular goiter in 19 cases **(47.5%)** followed by Follicular adenoma in 15 cases **(37.5%)**; Colloid goitre in 3 cases **(7.5%)**; Papillary carcinoma in 3 cases **(7.5%)**

Table 4: Correlation of FNAC and histopathology results.

	Histopathology Results				
FNAC results	**Colloid goiter**	**MNG**	**Follicular adenoma**	**Hashimotos thyroiditis**	**Papillary carcinoma**
Colloid goitre (18)	3	7	6	0	2
Nodular goitre (9)	0	7	2	0	0
AUS(3)	0	1	2	0	0
Hashimotos thyroiditis(1)	0	1	0	0	0
Follicular neoplasm(8)	0	3	5	0	0
Papillary carcinoma(1)	0	0	0	0	1

The table depicts the correlation between FNAC findings and final histopathological diagnosis in 40 thyroidectomy specimens**.** FNAC showed high accuracy in identifying colloid and nodular goitres; however, discrepancies were observed in cases of follicular neoplasms and malignancies, where histopathology provided the definitive diagnosis**.**

Table 5: Thyroid lesions diagnosed by FNAC and their comparison with histopathological diagnosis.

FNAC report	No of subjects (n)	Histopathology Report	No of subjects (n)	Remarks
Colloid Goitre	18	Colloid Goitre	03	True Positive
		Multinodular Goitre	07	True Negative
		Follicular Adenoma	06	True Negative
		Papillary Carcinoma	02	False Negative
Nodular Goitre	09	Multinodular Goitre	07	True Positive
		Follicular Adenoma	02	True Negative
AFUS	03	Multi Nodular Goitre	01	True Negative
		Follicular Adenoma	02	True Positive
Hashimotos Thyroiditis	01	Multinodular Goitre	01	True Negative
Follicular Neoplasm	08	Multinodular		True
		Goitre	03	Negative
		Follicular Adenoma	05	True Positive
Papillary Carcinoma	01	Papillary Carcinoma	01	True Positive

Sensitivity**:** True Positive x100 True Positive + False Negative=18x100/18+2 = 90**%** Specificity**:** TrueNegativex100 True Negative + False Positive 20x100/20+0 = 100**%**

Accuracy**:** TruePositive+TrueNegativex100 True Positive+ True Negative + False Positive + False Negative**.**

Table 6: Statistical analysis for thyroid lesions.

18 (True Positive)	0 (False Positive)
2 (False Negative)	20 (True Negative)

Sensitivity**:** TruePositivex100 /True Positive + False Negative =18x100/18+2 = 90**%**

Specificity**:** True Negative x100 /True Negative + False positives =20x100/20+0 = 100**%**

Accuarcy: True positives +True Negative x 100/ True Positive + True Negative + False Positive + False Negative =18 +20x100/40 = 68%
Positive predictive value: True Positivex100 / True Positive + True Negative + False Positive =18 x100/18+0 = 100%
Negative predictive value: True Negative x 100 /True Negative + False Negative 20x100/20+2 = 90.9%.
X2 – 51.88; p- 0.0001; statistically significant.

Table 7: Comparison of FNAC results in various studies.

FNAC	Khageswar rout et al [7] n (76)	Manoj gupta et al [4] n (75)	Arupsen gupta et al [8] N (178)	Present study n (40)
Colloid goitre	32	39	135	18
Colloid goitre with cystic degeneration	10	6	0	0
Nodular goitre	0	0	0	09
Thyroglossal cyst	15	0	0	0
AFUS	0	0	0	03
Hashimoto′s thyroiditis	08	0	13	01
Follicular neoplasms	06	12	24	08
Suspicious of malignancy	0	03	0	0
Papillary carcinoma	05	09	0	1
Anaplastic carcinoma	0	0	06	0

Table 8: Histopathological results of various studies.

Histopathology Results	Khageswar Rout et al [7] n (76)	Manoj Gupta et al[4] n (75)	Arupsen Gupta et al [8] n (178)	Present study n (40)
Colloid goitre	31	0	135	03
Nodular goitre	0	39	0	19
Colloid goitre with cystic degeneration	10	0	0	0
Thyroglossal cyst	15	0	0	0
Hashimotos thyroiditis	08	03	13	0
Follicular adenoma	04	12	13	15
Follicular carcinoma	01	0	14	0
Papillary carcinoma	06	12	0	03

Table 9: Comparison of diagnostic parameters on cyto- histopathological correlation in various studies

Study	No of Patients	Sensitivity	Specificity	Accuracy	Negative Predictive Value	Positive Predictive Value
Al sayer et al [9]	70	86%	93%	92%	96%	80%
Bouvet et al [10]	78	93.5%	75%	79.6%	88.2%	85.3%
Manoj gupta et al [4]	75	80%	86.6%	84%	86.6%	80%
Arupsen g gupta et al [8]	178	90%	100%	98.8%	98.75%	100%
Present series	40	90%	100%	68%	90.9%	100%

DISCUSSION

In present study includes all those patients having thyroid lesions with and without symptoms, with age limit of 20-80 years, both males and females presenting to ENT OPD and surgery OPD and admitted to ward. The study was undertaken with the aims of evaluating cytological, clinico-pathological and histopathological profile of various thyroid lesions, to assess the efficacy of cytology for surgical intervention. Total 40 cases with thyroid swellings in euthyroid state (assessed by thyroid function tests) were studied. In each patient detailed clinical history was obtained and thorough clinical examination was done prior to cytological evaluation and surgical intervention.

Age wide distribution noted for various other studies. The mean age of patients with thyroid lesions in our study was 44.92years. In our study maximum number of cases were seen in the third decade. This is in accordance with most of the studies and closest to Manoj Gupta et al study.[4]

Female to male ratio in our study was 12.3:1. It was comparable to most of the studies and closest to Manoj Gupta et al[4] in which female to male ratio was 11.5:1. In our study, 92.5% of the patients were females, which showed, solitary thyroid nodules were 12-13 times more common in females compared to males. Both benign and malignant thyroid lesions predominated among females.

In Ananthakrishnan N et al.[5] reported a clinicopathological profile of 503 patients with a single thyroid nodule in which 90% of the patients presented with neck swelling and only 10% with pain. Handa U et al.[6] stated in their study that the major presenting symptom was diffuse swelling and/or nodular swelling of the thyroid. In our study Majority of patients i.e., 32 cases (80%) presented with swelling in the neck compared to 8 cases of pressure symptoms. Among the 8 cases of pressure

symptoms, difficulty in swallowing was present in 6 cases, 1 had hoarseness of voice and 1 patient had both difficulty in swallowing and hoarseness of voice. In a study done by Khageswar et al.[7] with 76 subjects, FNAC revealed 32 cases (39.1%) as Colloid goitre, 10 cases (13.1%) as Colloid goitre with cystic degeneration, 15 cases (19.7%) as Thyroglossal cyst, 8 cases (10.5%) as Hashimotos thyroiditis, 6 cases (7.8%) as Follicular neoplasms and 5 (6.5%) as Papillary carcinoma. Among the benign lesions, colloid goitre predominated whereas papillary carcinoma among malignant lesions. In study done by Manoj Gupta et al (2006) with 75 subjects, FNAC revealed 39 cases (52%) of Colloid goitre, 6 cases (8%) of Colloid goitre with cystic degeneration, 12 cases (16%) of Follicular neoplasms, 3 cases (4%) Suspicious of malignancy, 9 cases (12%) as Papillary carcinoma.

Colloid goitre predominated among benign lesions whereas papillary carcinoma was more in malignant lesions. In a study done by Arupsen Gupta et al.[8] with 178 subjects, FNAC diagnosed, 135 cases (75.8%) as Colloid goitre, 13 cases (7.3%) as Hashimotos thyroiditis, 24 cases (13.4%) as Follicular neoplasms, 6 cases (3.3%) as Anaplastic carcinoma.

Anaplastic carcinoma has predominated among malignant lesions and colloid goitre among benign lesions in this study. Our study showed that the majority of benign lesions are Colloid goitre (45%) followed by Nodular goitre (22.5%) Follicular neoplasms (20%) AUS (7.5%), Hashimotos thyroiditis (2.5%) and among the malignant lesions Papillary carcinoma (2.5%) predominated. This is in accordance with most of the studies and close to study done by Manoj Gupta et al in which colloid goitre (52%) was predominant among the benign thyroid lesions. None of the patients in our study had complications of FNAC such as hemorrahge, infection. In study done by Khageswar et al.[7] with 76 subjects, histopathology revealed 31 cases (40.7%) as Colloid goitre, 10 cases (13%) as Colloid goitre with cystic degeneration, 15 cases (19.7%) as Thyroglossal cyst, 8 cases (10.5%) as Hashimotos thyroiditis, 4 cases (5.2%) as Follicular adenoma, 1 case (1.3%) of Follicular carcinoma, 6 cases (7.8%) of papillary carcinoma.

More number of colloid goitre cases have been diagnosed on histopathology among the benign lesions whereas papillary carcinoma has predominated among malignant lesions followed by follicular carcinoma. In a study done by Manoj Gupta et al.[4] with 75 subjects, histopathology diagnosed 39 cases (52%) of Nodular goitre, 3 cases (4%) of Hashimotos thyroiditis, 12 cases (16%) of follicular adenoma and 12 cases (16%) of Papillary carcinoma. Nodular goitre has predominated among the benign lesions and papillary carcinoma among malignant lesions with no follicular carcinoma cases. In a study done by Arupsen Gupta et al.[8] with 178 subjects, histopathology diagnosed, 135 cases (75.8%) as Colloid goitre, 13 cases (7.3%) as Hashimotos Thyroiditis, 13 cases (7.3%) as Follicular adenoma, 14 cases (7.8%) of Follicular carcinoma.

Among the benign lesions, nodular goitre cases were more and maximum number of follicular carcinoma were diagnosed among malignant lesions with no case of papillary carcinoma in this study. In our study histopathology revealed majority of the cases as multinodular goiter 19 cases (47.5%) followed by follicular adenoma in 15 cases (37.5%); colloid goiter in 3 cases (7.5%); papillary carcinoma in 3 cases (7.5%). This is in accordance to Manoj Gupta et al.[4] study.

Of the 3 cases diagnosed as colloid goiter on FNAC, 2 cases were papillary carcinoma on histopathology. In our study cyto-histopathological correlation was possible clinically ans statistically in all 40 cases. 2 benign cases on routine FNAC turned out to be malignant on histopathology (false negative). Both the cases were diagnosed as colloid goiter on cytology and were found to be papillary carcinoma on histopathology. The methods used for calculation of sensitivity, specificity, accuracy, positive predictive value, negative predictive value are similar to previous studies. In the present study, FNAC demonstrated strong performance in diagnosing thyroid swellings, with a sensitivity of 90%, specificity of 100%, accuracy of 68%, positive predictive value (PPV) of 100%, and negative predictive value (NPV) of 90.9%. These metrics affirm FNAC as an effective initial diagnostic tool in the pre-operative evaluation of thyroid lesions. Comparable findings were reported by Al-Sayer et al.[9] who documented a sensitivity of 86%, specificity of 93%, accuracy of 92%, PPV of 96%, and NPV of 80%, reinforcing FNAC's diagnostic reliability in real-world settings. Additionally, Bouvet et al.[10] emphasized FNAC's role in guiding surgical decision-making, especially in selecting patients for operative management based on cytological findings. Despite high reliability, FNAC has limitations—particularly in detecting certain papillary carcinomas, which may be misdiagnosed as benign due to sampling error or overlapping cytological features. This concern aligns with our findings, where two false-negative cases were reported. Other studies have reported diagnostic accuracy rates exceeding 90%—such as one institutional study reporting 96.05% accuracy—solidifying FNAC's status as a mainstay in thyroid lesion evaluation, albeit with mindful interpretation in ambiguous or follicular-patterned lesions. Our diagnostic parameters on cyto-histopathological correlation are comparable to other studies. In our study, accuracy was 68%, lower than other studies but close to Bouvet et al.[10] The sensitivity (90%) and specificity (100%) were better than most of the mentioned studies except Arupseng Gupta et al.[8]

CONCLUSION

In our study we conclude that fine needle aspiration cytology is a relatively atraumatic, well tolerated, safe procedure which can be readily performed in outpatient set up. This technique is an excellent first line method for investigating the patients presenting with thyroid swellings. Apart from the high accuracy rate of FNAC, this technique is rapid, safe and painless. It can be especially valued as it is an outpatient procedure; done without prior preparation or anaesthesia. Complications of FNAC such as infection, haemorrhage are were nil in our study.

Although FNAC has been used with success in the diagnosis of papillary, medullary, and anaplastic thyroid carcinomas, it is difficult to assess its value in follicular lesions. The main problem is the distinction between benign lesions, such as follicular adenoma or nodular adenomatous goitre, and follicular carcinoma or follicular variant of papillary carcinoma (FVPTC). Therefore, histological evaluation is necessary to demonstrate capsular/vascular invasion for follicular carcinoma and the subtle nuclear aspects in follicular variant of papillary carcinoma. Thus FNAC must never be thought as a replacement for histopathological diagnosis in all cases. The two have to complement each other and accurate for further management and the final diagnosis rests on the histopathological findings of the thyroid swellings.

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