

Fine Needle Aspiration Cytology: A Reliable Tool for Diagnosis & Management of Various Thyroid Lesions.

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ABSTRACT

Background: Thyroid gland is unique from other endocrine organs. Because of its superficial location it is easily approachable for direct physical examination, cytological evaluation & histopathological study. The main objective of FNAC of thyroid is to categorize patients who need surgery for neoplastic disorder from those having functional or inflammatory abnormality requiring a clinical follow up & medical treatment. **Aims & Objectives:** To study cytomorphological features of thyroid enlargement & palpable lesions of thyroid. To study the distribution of lesion according to age & sex. To correlate cytomorphological features of thyroid lesions with histopathological features wherever possible. **Methods:** The present study was conducted in department of pathology of Teerthankar Mahaveer Medical College & Research Centre, Moradabad. The study period included retrospective cases from April 2016 to January 2008 with total no. of cases 750. All relevant clinical profile of these cases was taken from case records. All thyroid lesions conventionally diagnosed by FNA were classified according to TBSRTC. **Results:** In the present study, a total of 750 cases of thyroid swellings were categorized under TBSRTC. Of which maximum cases were seen of benign etiology i.e. colloid goiter more commonly affecting middle age group i.e. 31-40 yrs with female preponderance. Then the sensitivity & specificity of FNAC were determined. In benign sensitivity & specificity was reported to be 96% & 100% respectively. In malignant lesions both were found to be 100%. **Conclusion:** FNAC biopsy is regarded as a minimally invasive, cost-effective technique with diagnostic accuracy in the range of 90-99%. The task of convincing clinicians of the value of the technique has been extremely successful since their expectations of a high level of accuracy have been met. The conclusion drawn from this study implicates FNAC as a useful primary investigative modality for evaluation of palpable thyroid lesions. It also helps in distinguishing lesions based on the clinical management required.

Keywords: Thyroid lesions, Fine Needle Aspiration Cytology, The Bethesda System Reporting Thyroid Cytology.

INTRODUCTION

Thyroid gland is unique from other endocrine organs. Because of its superficial location it is easily approachable for direct physical examination, cytological evaluation & histopathological study. In surgical practice, thyroid lesions are seen in 4-7% of population more commonly affecting females than males. Excision of all thyroid lesions is practically impossible & associated with greater risk.^[1,2]

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Therefore Thyroid FNAC has proven as the most accurate & cost effective initial method for directing

the clinical management of patients with thyroid swellings.^[3-5]

From the past 3 decades, confidence in FNAC as a reliable procedure has grown considerably & has emerged as a most direct, accurate diagnostic tool in the management of thyroid disease, gaining world wide popularity.^[3,6]

The main objective of FNAC of thyroid is to categorize patients who need surgery for neoplastic disorder from those having functional or inflammatory abnormality requiring a clinical follow up & medical treatment.^[7]

Different imaging techniques are used for preoperative diagnosis of thyroid swellings like radionuclide scanning, high resolution ultrasonography etc. However FNAC is accurate & cost effective OPD procedure in comparison to imaging techniques, sometimes its need ultrasound guidance especially in cystic lesions.

But the success of FNAC is based on following factors:

1. Expertize aspiration
2. Skilful cytological interpretation
3. Rational analysis based on cytological & clinical information regarding individual patient.

This study is undertaken to identify the cytomorphological spectrum of various thyroid lesions & correlating histopathologically wherever possible.

Aims & Objectives:

Aims & objectives of study are:

1. To study cytomorphological features of thyroid enlargement & palpable lesions of thyroid.
2. To study the distribution of lesion according to age & sex.

To correlate cytomorphological features of thyroid lesions with histopathological features wherever possible.

MATERIALS AND METHODS

The present study was conducted in department of pathology of Teerthanker Mahaveer Medical College & Research Centre, Moradabad.

Methods of Collection of Data:

The study period included retrospective cases from April 2016 to January 2008. All relevant clinical profile of these cases was taken from case records.

Sample size: 750

Inclusion criteria:

- All palpable lesions of thyroid gland.
- Clinically Non palpable lesion through USG guided FNAC

Exclusion criteria:

- Swelling arising from skin & surrounding structures of thyroid gland.

Methodology:

Equipments: 10-20 ml disposable syringe, 2.5 cm long & 23-25 gauze disposable needles, cotton swabs, Coplin jars for fixatives & clean glass slides respectively.

Chemicals & reagents: include

Spirit: for local disinfection.

Fixatives: 95% ethanol.

Reagents for May Grunwald Giemsa, Haematoxylin & Eosin, Papanicolaou & Congo red stain.

Assure patient, explain the procedure & after taking the written consent in patients language, make the patient lying flat with pillow under shoulder & neck, head should fall back with neck extended – separate the neck muscles- lateral lobes become more prominent. Clinical examination like consistency, mobility, tenderness & measurements done. Instruct the patient not to speak /deglutinate during the procedure.

Under all aseptic precautions needle is introduced attached with 10 ml disposable syringe, with minimal negative pressure material is aspirated. Material is expelled immediately on the slides. At least two to three passes were done. If on aspiration there was fluid it was tried to aspirate completely & then respiration done from residual solid area, if not possible USG guidance was undertaken.

Processing of Specimen:

Air dried – May grunwald Giemsa stain.

Wet smear without air drying – alcohol fixed - H&E & PAP stain.

Procedure was advised to repeat after at least 21 days in cases where aspiration was a cellular, haemorrhagic.

RESULTS

Thyroid lesions constitute total 750 cases which have been studied during a period of 7.5 years (April 2016 to January 2008).

Majority of cases taken in the present study are seen in middle age group (31- 40 yrs) with total no. of cases being 200 which was followed by 174 cases seen in (41-50 yrs) age group, affecting mainly the female patients (603 cases) with male to female ratio of 1:4.

Table 1: Age & Sex Distribution.

Age (years)	Male	Female	Total
10-20	15	73	88
21-30	30	143	173
31-40	27	173	200
41-50	41	133	174
51-60	17	65	82
61-70	15	13	28
71-80	1	2	3
	147	603	750

The Bethesda System Reporting Thyroid Cytology (TBSRTC) categorization was done in all the cytologically diagnosed cases. The result of which are as follows:

Above table shows maximum no. of cases under benign category 672 cases (89.6%) which are further sub classified as in [Table 3].

From the above table we can see that majority of cases were of colloid goitre [Figure 1]. Out of 605 cases of colloid goiter, 100 cases were subjected to histopathological examination out of which 95 cases were reported colloid goiter, 4 cases were of

follicular adenoma & 1 case was thyroglossal cyst which gives diagnostic accuracy of 95%.

Table 2: Classification of Thyroid Lesions Diagnosed By FNAC Using TBSRTC System.

Lesion	No. of cases	Percentage
Non-diagnostic/unsatisfactory-I	11	1.5%
Benign – II	672	89.6%
Atypia of undetermined significance – III	3	0.4%
Follicular neoplasm/ suspicious of follicular neoplasm – IV	25	3.33%
Suspicious of malignancy – V	4	0.5%
Malignant – VI	35	4.6%

Table 3: Further Division of Benign Lesions of Bethesda Category.

Benign lesions	No. of cases	Percentage
1) Colloid goiter	605	90.0%
2) Hashimotos thyroiditis	56	8.3%
3) Subacute thyroiditis	8	1.18%
4) De Quervains thyroiditis	2	0.3%
5) Thyroglossal cyst	1	0.15%
Total	672	100%

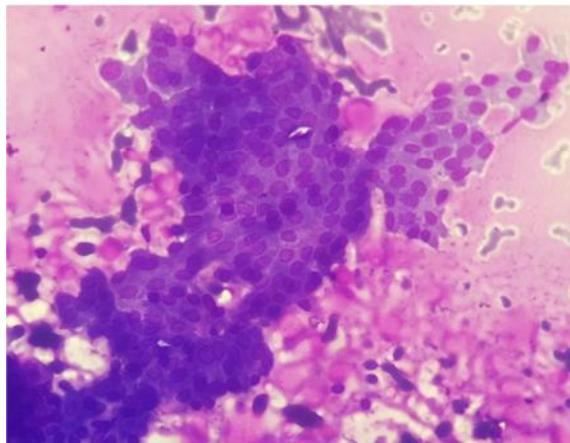


Figure 1: FNAC smear showing follicular cells arranged in monolayered sheets with colloid in background.

Second common was hashimotos thyroiditis (56 cases) which was cytologically diagnosed on basis of follicular cells with hurthle cell changes in sheets & clusters along with few adhered lymphocytes along with scattered polymorphous population of lymphoid cells on haemorrhagic background. Colloid is scanty [Figure 2]. Histopathology was not done in any case.

This was followed by thyroiditis both Subacute (8 cases) & De Quervains (2 cases). None was subjected to histopathology.

1 case was reported to be thyroglossal cyst in which histopathology was also done & it was reported same on histology giving it 100% accuracy.

So the above data gives the sensitivity & specificity of 96% & 100% respectively.

25 cases (3.5%) were reported to be follicular neoplasm. Of which, 15 were subjected to histopathological examination, of which 11 were follicular adenoma, 2 of follicular carcinoma & 2 of colloid goitre, giving it diagnostic accuracy of 73.3%.

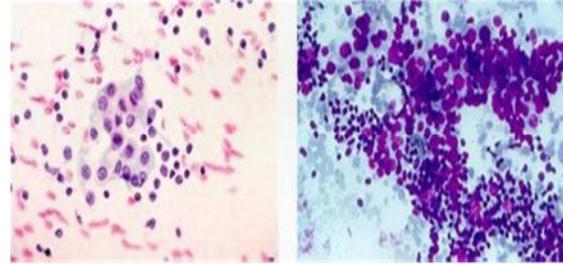


Figure 2: Hashimoto thyroiditis. A, Group of Hurthle cells with large cytoplasm and prominent nuclei, surrounded by a teratogenous population of lymphocytes (Papanicolaou, x60). B, Hypercellular aspirate with lymphocytes & hurthle cells. (may grunwald giemsa stain).

In the VI category of TBSRTC 35 cases were reported which were further categorized in [Table 4].

Table 4: Further Classification of Malignant Lesions.

Malignant lesions on FNAC	No. of cases	Percentage
1) Papillary carcinoma	25	71.4%
2) Medullary carcinoma	3	8.5%
3) Anaplastic carcinoma	4	11.4%
4) Metastatic carcinoma	3	8.5%
Total	35	100%

Among the 35 malignant lesions maximum no. of cases were found to be of papillary carcinoma 25 cases (71.4%). 15 were subjected to histopathology & reported to be positive with accuracy of 100% [Figure 3].

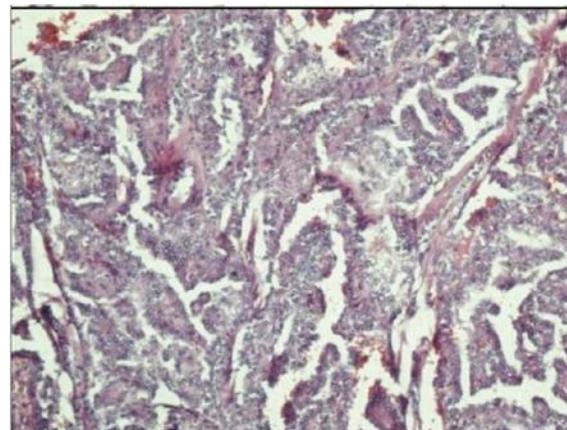


Figure 3: Photomicrograph of papillary carcinoma thyroid: Histopathology section showing papillary architecture of tumor cells. (H and E, x 100).

Next common among malignant lesion reported was anaplastic carcinoma (4 cases), none was subjected to histopathology, followed by medullary [Figure 4] & metastatic carcinoma both having 3 cases.

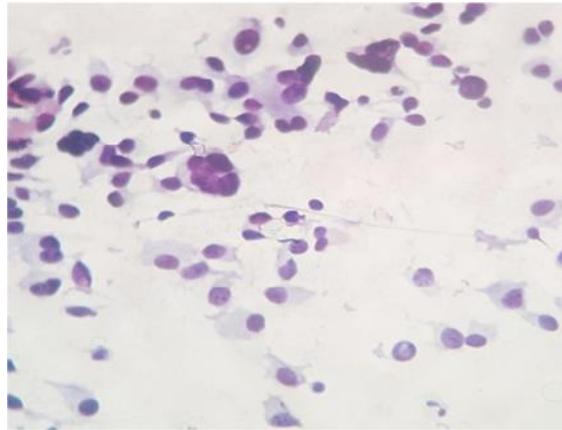


Figure 4: Photomicrograph of medullary carcinoma thyroid: FNAC smear showing aggregates and dispersed cells, variable cell pattern - plasmacytoid, small and spindle cells along with giant cells. (H and E, x 200).

Histopathology was done in 1 case of medullary & reported same giving 100% accuracy.

No histopathology was done in cases of metastatic carcinoma.

The sensitivity & specificity in malignant lesion was 100 % each.

DISCUSSION

Thyroid nodules cause apprehension because their behaviour is unpredictable.^[8] Whether thyroid enlargement is diffuse or in the form of nodule; it has to be investigated to rule out the possibility of a neoplasm.^[9] FNA has proven to be an effective management tool in patients with thyroid nodules. Its main purpose is to provide a rational approach for management and determine the correct surgical procedure when surgery is required. Various studies on thyroid diseases have estimated that about 42 million people in India suffer from thyroid disorders.^[10]

Table 5: Histopathology Correlation of Cytomorphological Diagnosis.

Cytomorphological Diagnostic	Cases subjected for histopathology	Report on histopath	Accuracy
1) Colloid goiter	100	95- Colloid goiter 4- follicular adenoma 1-Thyroglossal cyst	95%
2) Hashimotos thyroiditis	-	-	-
3) Follicular neoplasm	15	11- Follicular Adenoma 2- Follicular Carcinoma 2 – colloid goiter	73.3%
4) Subacute thyroiditis	-	-	-
5) De quervains thyroiditis	-	-	-
6) Thyroglossal cyst	1	1	100%
Malignant lesions			
1) Papillary carcinoma	15	15	100%
2) Medullary carcinoma	1	1	100%
3) Anaplastic carcinoma	-	-	-
4) Metastatic carcinoma	-	-	-

In the present study, maximum numbers of cases were seen in the age group 31-40 years - 200 cases (26.6%). Similar observations were seen by Rangaswamy et al.^[16] and Gupta et al.^[14] which concluded that maximum number of thyroid lesions are seen in age group of 31-40 yrs of age group. However, Yassa et al.^[12] observed maximum number of cases between age group 41 and 50 years. In our study this age group was second most common.

In the present study, maximum thyroid swellings were seen in female patients with M:F ratio being 1:4, which correlates with the observations made by Silverman et al.^[13] - 1:10, Gupta et al.^[14] - 1:11, Handa et al. 1:6.3^[17] and Yassa et al.^[12] - 1:7.

In the present study, maximum number of cases belonged to the benign category 672 cases (89.6%), 35 cases (13%) belonged to malignant. Which is

concordant with the study done by Handa et al,^[17] which reported out of total 434 pts, 381 cases (87.7%) were reported to be benign & 31 cases (7.14%) were reported to be malignant. Another study done by Swamy et al,^[15] also reported that same incidence i.e..out of 120 cases of thyroid lesion 100 cases (83.66%) were benign & 20 cases (16.66%) were reported to be malignant, whereas in the study done by Singh et al.^[11] a maximum number of cases belonged to malignant, i.e., 70 cases (57.3%) which was discordant with our study, the reason behind this may be the study was conducted on solitary nodules only.

In the present study, maximum number of cases was seen in the goiter group i.e., 608 cases (90.0%). Similar observations were seen in the study concluded by Silverman et al.^[13] 175 cases (56.5%),

Gupta et al.^[14] 45 cases (60%), Swamy et al.^[15] 60 cases (50%). However, according to Rangaswamy et al.^[16] maximum number of cases belonged to follicular neoplasm 21 cases (44.68%). This is due to the fact that this study was conducted cytologically diagnosed neoplastic lesions only.

In the present study carcinoma group comprised 35 cases (4.6%), which were similar to the observations done by Handa et al.^[17] & Swamy et al.^[15] which reported malignant group comprised of 31 cases (7.14%)^[23] and 20 cases (16.66%) respectively.

In our study in carcinoma group maximum no. of cases were reported to be papillary carcinoma 25 cases (71.4%) which was discordant with the other studies conducted by Handa et al.^[17] and Rangaswamy et al.^[16] in which they reported maximum cases were of follicular neoplasm. This could be due to the fact that study conducted by Rangaswamy et al. included cases of solitary thyroid nodules only.

We have 4 cases (11.4%) of anaplastic carcinoma & histopathology was done in 1 case & reported the same giving the 100% diagnostic accuracy.

In other study done by Handa et al.^[17] & Rangaswamy et al.^[16] only 1 case (5.8%) & 2 case (3.5%) respectively was reported to be of anaplastic which on histopathology was also reported to be same so this was discordant with our study. This variation in the present study may be due to inclusion of older age group which could be more prone to anaplastic carcinoma.

In this study 3 cases (8.5%) were reported of medullary carcinoma which were concordant with the study done by Handa et al.^[17] & Rangaswamy et al.^[16] whom reported 3 cases & 2 cases respectively.

We reported 3 cases of metastatic carcinoma which was again higher as compared to study done by Handa et al.^[17] & Rangaswamy et al.^[16] both of them reported only 1 case of metastatic which was again discordant with our study & this could be due to inclusion of higher age group in present study.

So with this study showed sensitivity & specificity in case of benign lesions to be 96% & 100% respectively.

Sensitivity & specificity in cases of malignant lesions comes out to be 100%. These findings were concordant with studies conducted by Handa et al. & Silvermann et al. which showed sensitivity of 97% & 93% respectively & specificity of 100% & 95.1% respectively.

CONCLUSION

FNAC is regarded as a minimally invasive, cost-effective technique with diagnostic accuracy in the range of 90-99%. The task of convincing clinicians of the value of the technique has been extremely successful since their expectations of a high level of accuracy have been met. The conclusion drawn from this study implicates FNAC as a useful primary

investigative modality for evaluation of palpable thyroid nodules. It also helps in distinguishing lesions based on the treatment required. TBSRTC aids in accurate cytological diagnosis. An effective implementation of this system would allow consistency in reporting of diagnostic terminologies between the cytopathologists and clinicians. Apart from this; it would also result in formulating a consistent management approach toward various thyroid related lesions.

REFERENCES

1. Abu-Nema T, Ayash K, Tibblin S: The role of aspiration biopsy cytology in the diagnosis of cold solitary nodules, *Br J Surg.* 1987;74:203.
2. Tunbridge WM: The spectrum of thyroid disease in a community. The Wicham Survey. *Clin Endocrinol.* 1997;17: 481-493.
3. Clark DP, Faquin WC. *Thyroid Cytopathology.* 2nd ed. New York: Springer; 2010.
4. Manoj G, Savita G, Vedbhushan G. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. *J Thyroid Res.* 2010;10:1-5.
5. Shirish C, Neha S, Harsh K, Pagaro P, Charusheela G, Mohit R. Clinicopathological correlation of thyroid nodules.. *Int J Pharm Biomed sci.* 2012; 3(3):97-102.
6. Gita J, Orell SR. *Thyroid.* In: Orell SR, Sterrett GF, editors. *Fine Needle Aspiration Cytology.* 5th ed. Philadelphia: Churchill Livingstone; 2012.118-55.
7. Sanchez MA, Stahl RE. *The Thyroid, Parathyroid, & Neck Masses other than lymph nodes.* In: Koss LG, Malamed MR, editors. *Koss Diagnostic cytology & its histopathological bases.* 5th ed. Philadelphia. Lipincott Williams & Wilkins; 2006.1149-86.
8. Bibbo M. *Comprehensive Cytopathology.* 2nd ed. Philadelphia, PA: W.B. Saunders Company; 1997. p. 673.
9. Jo VY, Stelow EB, Dustin SM, Hanley KZ. Malignancy risk for fine-needle aspiration of thyroid lesions according to the Bethesda System for Reporting Thyroid Cytopathology. *Am J Clin Pathol.* 2010;134:450-6
10. Bommanahalli BP, Bhat RV, Rupanarayan R. A cell pattern approach to interpretation of fine needle aspiration cytology of thyroid lesions: A cyto-histomorphological study. *J Cytol.* 2010;27:127-32.
11. Singh DK, Kumar R, Paricharak SD, Nigam N, Nigam SK. Role of fine needle aspiration cytology in solitary thyroid nodules. *J Evol Med Dent Sci.* 2013;36:6903-14.
12. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA, et al. Long-term assessment of a multi-disciplinary approach to thyroid nodule diagnostic evaluation. *Cancer.* 2007; 111:508-16.
13. Silverman JF, West RL, Larkin EW, Park HK, Finley JL, Swanson MS, et al. The role of fine-needle aspiration biopsy in the rapid diagnosis and management of thyroid neoplasm. *Cancer.* 1986; 57:1164-70.
14. 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; 2010:379051.
15. Swamy GG, Madhuravani S, Swamy GM. Fine needle aspiration cytology – A reliable diagnostic tool in the diagnosis of thyroid gland enlargements. *Nepal Med Coll J.* 2011;13:289-92.
16. Rangaswamy M, Narendra K, Patel S, Gururajprasad C, Manjunath G. Insight to neoplastic thyroid lesions by fine needle aspiration cytology. *J Cytol.* 2013;30:23-6.

17. Handa U, Garg S, Mohan H, Nagarkar N. Role of fine needle aspiration cytology in diagnosis and management of thyroid lesions: A study of 434 patients. *J Cytol.* 2008;25:13-7

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