Original Article

New Indian Journal of Surgery
Volume 7 Number 2, May - August 2016
DOI: https://dx.doi.org/10.21088/nijs.0976.4747.7216.5

Correlation of Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Thyroid Swellings

SarathBabu Kumara Babu*, RathanRaju, Shankar Radhakrishnan*****

*Assistant Professor, **Senior Resident, Dept of ENT, Annapoorana Medical College & Hospital, Salem -636308, Tamil Nadu.
**Associate Professor, Dept of Community Medicine VMKVMCH, Salem.

Abstract

Background

Fine needle aspiration cytology (FNAC) is now being accepted as the most cost-effective, minimal invasive technique with very low incidence of complications in the diagnosis of most of the thyroid lesions with an added advantage of segregating the patients of solitary thyroid nodule (STN) into operative and non-operative groups. *Aim:* To determine the accuracy of FNAC in terms of sensitivity, specificity, positive predictive value and negative predictive value in comparison with histopathology in the diagnosis of a thyroid swelling. *Methodology:* A prospective longitudinal study was undertaken over a period of 1 year from Jan 2015 to Dec 2015 at the out-patient department of Annapoorana medical college and Hospital. Patients with visible thyroid swelling with a solitary nodule, in euthyroid state and with no other serious medical disorders were included in our study. . FNAC was performed with 23 gauge needle, smears were fixed with ether-95% alcohol solution, and staining was performed using papanicolau's staining. The thyroid specimen which was excised during the thyroidectomy procedure was processed in automated tissue processing units and sent for histopathological examination. *Results:* The validity of FNAC in terms of sensitivity and specificity was assessed by comparing it with the histopathological examination. The sensitivity of FNAC in detecting all the benign and malignant type of thyroid lesions was found to be in the range of 80–100%, whereas the specificity and the positive predictive value was almost 100% and the negative predictive value was between 98-100%, for all the lesions detected by FNAC. So this shows the accuracy of detection of lesions through FNAC is almost 94%. *Conclusion:* The use of FNAC has reduced the number of patients with solitary thyroid nodules undergoing unnecessary surgery and has led to proper planning of surgery in malignant cases.

Keywords: FNAC; HPE; Thyroid Swelling; Validity.

Corresponding Author: Shankar Radhakrishnan, Associate Professor, Dept of Community Medicine Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals (VMKVMCH), NH 47, Sankari Main Road, Seeragapadi, Salem, Tamil Nadu 636308.
E-mail: shnkr_radhakrishnan@yahoo.com

Introduction

Thyroid gland swelling is a common manifestation in most parts of the world, particularly countries like India which is endemic for iodine deficiency disorders. Studies had shown that the prevalence of goitre in India is as high as 40% [1].The development of goitre is a concern for both the patient and the clinician, as many of the thyroid swelling may turn to malignant. Though many of the goitre swellings are benign but still the reports had shown that the prevalence of malignancy among the solitary nodule goitre was about 10% [2].

As such thyroid cancer is relatively a rare malignancy but it is the commonest endocrine cancer accounting for more than 90% of all the endocrine cancers. Among the various types of cancers in thyroid gland, papillary carcinoma is the most common which is followed by follicular, medullary, anaplastic and lymphoma.

Fine needle aspiration cytology (FNAC) is now being accepted as the most cost-effective, minimal invasive technique with very low incidence of complications in the diagnosis of most of the thyroid lesions with an added advantage of segregating the

patients of solitary thyroid nodule (STN) into operative and non-operative groups [3,5].

A thyroid nodule which is usually considered for FNAC should be of firm, palpable and solitary. FNAC can also be performed on nodules with suspicious ultrasonographic features; dominant or atypical nodules in multinodulargoiter; complex or recurrent cystic nodules; or any nodule associated with palpable or ultrasonographically abnormal cervical lymph nodes [6].

FNAC is considered to be the "gold standard" in the selection of patients for surgery.[7]It is usually performed without local anaesthesia and any previous preparations on the patients. Studies have quoted that medical professionals with longstanding experience, the diagnostic (adequate) biopsies obtained from solid nodules had ranged between 90–97% [8,9]. During the procedure, ultrasound guidance instead of palpation had enhanced the value of the FNAC diagnostic accuracy [10,11].

However, the success of FNACdepends on several factors such as aspirator experience, skilful cytological interpretation and a rational analysis based upon a synthesis of cytological and clinical information in the context of an individual patient.

Still the histopathological examination of the thyroid gland was considered superior to FNAC in diagnosing the thyroid pathologies due to certain pitfalls in FNAC such as scanty sample, vascularity of thyroid swelling, variation in sampling technique and skill of the performing expert and as well as the experience of pathologist interpreting the aspirate [12].

However studies had been done in comparison of the diagnostic efficacy between FNAC and histopathology in western countries, in India as such very few studies had been done in this aspect and so the current study was undertaken in view of comparing and correlating the FNAC findings with that of histopathology readings among the patients with palpable thyroid swelling.

Aim

To determine the accuracy of FNAC in terms of sensitivity, specificity, positive predictive value and negative predictive value in comparison with histopathology in diagnosing a thyroid swelling.

Methodology

A prospective longitudinal study was undertaken over a period of 1 year from Jan 2015 to Dec 2015 at the out-patient department of Annapoorana medical college and Hospital. Patients with visible thyroid swelling with a solitary nodule, in euthyroid state and with no other serious medical disorders were included in our study. With those meeting the above criteria totally 200 patients were our study subjects. The study was carried out after getting the clearance from our institutional ethical committee and the informed consent was obtained from all the patients who were included in our study.

All the patients were evaluated by thorough clinical examination including the status of the vocal cords followed by routine serological investigations like haemogram, renal function tests, liver function tests and thyroid function test. The imaging test like chest X-ray, X-ray of soft tissue of neck lateral view and USG of neck were also carried out. FNAC was performed with 23gauge needle, smears were fixed with ether-95% alcohol solution, and staining was performed using papanicolau's staining.

Following the FNAC all the patients were subjected to surgery after getting the fitness from anaesthetist. The thyroid specimen which was excised during the thyroidectomy procedure was processed in automated tissue processing units and sent for histopathological examination. The report of FNAC was then compared with HPE and the validity of FNAC was assessed in terms of sensitivity, specificity and the predictive values.

Results

The age and sex wise distribution was shown in table 1. It is seen from the table that the majority of the study subjects were females and the male: female ratio is 1:9, among those females most of them were in the age group between 30 – 45 years. Out of 200 only 20 were males in our study population.

The diagnosis of the various thyroid gland swelling made on the basis of the FNAC report had shown that among 200 patients, 146 of them had benign lesions and 42 of them had malignant lesions. Among the benign diseases colloid solitary goitre was the most common followed by thyroiditis whereas among the malignant lesions it was the papillary carcinoma which was more common followed by follicular carcinoma. 12 of the FNAC report showed that the sample is inadequate (Table 2).

The post surgical sample of the thyroid gland which was sent for histopathological examination had revealed the report which was almost similar to that of FNAC. The only difference was the 12 samples

which were not diagnosed by FNAC due to the inadequacy of the sample were reported by HPE. In the 12 samples 8 was found to be of benign lesions and the remaining 4 was found to be of malignant lesion (Table 3).

The validity of FNAC in terms of sensitivity and specificity was assessed by comparing it with the histopathological examination. The sensitivity of FNAC in detecting all the benign and malignant type of thyroid lesions was found to be in the range of 80 – 100%, whereas the specificity and the positive predictive value was almost 100% and the negative predictive value was between 98-100%, for all the lesions detected by FNAC. So this shows the accuracy of detection of lesions through FNAC is almost 94% (Table 4).

Table 1: Age and sex wise distribution of the study population

Age group	Gender		Total
	Male	Female	
25 – 30	0	3 (1.6%)	3 (1.5%)
31 – 35	3 (15%)	58 (32.2%)	61 (30.5%)
36 – 40	6 (30%)	32 (17.7%)	38 (19%)
41 – 45	8 (40%)	46 (25.5%)	54 (27%)
46 – 50	2 (10%)	36 (20%)	38 (19%)
>50	1 (5%)	5 (2.7%)	6 (3%)
Total	20 (100%)	180 (100%)	200 (100%)
Mean (SD)	38.6 (4.23)	40.5 (5.42)	

Table 2: FNAC diagnosis of thyroid swelling among the study subjects

FNAC diagnosis		Frequency	Percentage
Benign (n=146)	Solitary/colloid goitre	109	74.6%
	Thyroiditis	23	15.7%
	Adenomatous goitre	8	5.4%
	Follicular adenoma	6	4.1%
Malignant (n=42)	Pappilary carcinoma	19	44.6%
	Follicular carcinoma	13	29.7%
	Anaplastic carcinoma	6	14.8%
	Medullary carcinoma	4	10.6%
Inadequate cytology (n=200)		12	6%

Table 3: HPE diagnosis of thyroid swelling among the study subjects

HPE diagnosis		Frequency	Percentage
Benign (n=154)	Solitary/colloid goitre	111	72%
	Thyroiditis	25	16.2%
	Adenomatous goitre	10	6.4%
	Follicular adenoma	8	5.1%
Malignant (n=46)	Pappilary carcinoma	21	45.6%
	Follicular carcinoma	13	28.2%
	Anaplastic carcinoma	7	15.2%
	Medullary carcinoma	5	10.8%

Table 4: Validity of FNAC in comparison with HPE

Diagnosis	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Solitary/colloid goitre	98%	100%	100%	97.8%
Thyroiditis	92%	100%	100%	98.8%
Adenomatous goitre	80%	100%	100%	98.9%
Follicular adenoma	75%	100%	100%	98.9%
Papillary carcinoma	90.4%	100%	100%	98.8%
Follicular carcinoma	100%	100%	100%	100%
Anaplastic carcinoma	85.7%	100%	100%	99.4%
Medullary carcinoma	80%	100%	100%	99.4%

Discussions

Any form of thyroid enlargement usually leads to a battery of investigations, mainly to rule out the possibility of a neoplasm. The routinely done investigations for an enlarged thyroid are ultrasound (US) examination, thyroid function tests, thyroid scan, and antibody levels and subsequently FNAC was done to segregate the patients requiring surgery and

those who can be managed conservatively [13-15].

The mean of the study population in the present study was 38 years among the males and 40 among the females. The similar type of results was also observed by the study done by Gardner HA etal [16] and Miller JM etal [17]. In our study, female population were almost 9 times than that of the males. Thyroid swelling is more prevalent among the females and many of the studies had proven it and our study was also in par with it and majority of the females were in the age group between 30 – 45 years.

The solitary colloid goitre is the most common benign condition and the papillary carcinoma was the most common malignant lesion identified by FNAC in our study and the results was almost similar to the study done by Handa etal [18]. In our study the FNAC showing inadequacy in getting the sample was only 6% and a similar type of study done by Mahar etal [19] had shown that 9% of the FNAC sample was found to be inadequate and so our study was almost in par with it.

In the present study the HPE report, which was considered to be the gold standard had identified all the 12 samples which were reported as insufficient sample by FNAC. Among the 12 samples 8 were found to be benign and 4 were malignant, the remaining 188 samples which were reported by HPE were almost similar to that of FNAC. Similar to our results the studies done by Gupta M etal [20], Mundasal B etal [21] had shown the samples which were reported as insufficient in FNAC had been diagnosed in HPE. This had proven HPE to be considered as the gold standard test.

In our study the accuracy of FNAC in detection of the thyroid swelling was found to be 94%. It is well compared with the study done by Safirullahetal [22], in which the accuracy was reported as 94.2%, and another study done by Mundasad B etal [21] and Gupta M etal [22] the accuracy was 80% and 85% respectively.

Several international studies have documented the sensitivity of FNAC in thyroid nodules to range from 52-98% [23,24]. Similarly, the international normal range is for specificity is 72 to 100% and for PPV is 50 to 90% [25,26], whereas in our study the sensitivity of FNAC in detecting all the benign and malignant type of thyroid lesions was found to be in the range of 80–100%, whereas the specificity and the positive predictive value was almost 100% for all the lesions detected by FNAC. There was not even a single false positive case reported in our study.

Conclusions

Fine needle aspiration cytology is highly sensitive and specific in the detection of thyroid lesions. Fine needle aspiration cytology is highly accuratein the evaluation of solitary thyroid nodule. Therefore, FNAC should be adapted as an initial investigation of thyroid diseases in all tertiary care hospitals. FNAC provides much more useful information and can readily be used along with other clinical information to decide on the best form of treatment in patients with solitary thyroid nodule. So the use of FNAC has reduced the number of patients with solitary thyroid nodules undergoing unnecessary surgery and has led to proper planning of surgery in malignant cases.

References

1. Agarwal S. Diagnostic accuracy and role of fine needle aspiration cytology in management of thyroid nodules. J SurgOncol .1995; 58: 168-72.
2. Rojeski MT, Gharib H. Nodular thyroid disease. Evaluation and management. New Eng J Med. 1985; 313: 428-36.
3. Asotra S, Sharma J. Role of AgNORs in thyroid lesions on FNAC smears. J Cytol. 2008; 25: 18–22.
4. Layfield LJ, Cibas ES, Gharib H, Mandel SJ. Thyroid aspiration cytology: Current status. CA Cancer J Clin. 2009; 59: 99–110.
5. Guhamallick M, Sengupta S, Bhattacharya NK, Basu N, Roy S, Ghosh AK, et al. Cytodiagnosis of thyroid lesions-usefulness and pitfalls: A study of 288 cases. J Cytol. 2008; 25: 6–9.
6. Ogilvie JB, Piatigorsky EJ, Clark OH. Current status of fine needle aspiration for thyroid nodules. Adv Surg. 2006; 40: 223–38.
7. Polyzos SA, Kita M, Avramidis A. Thyroid nodules - stepwise diagnosis and management. Hormones (Athens). 2007; 6: 101–19.
8. Wong CK, Wheeler MH. Thyroid nodules: Rational management. World J Surg. 2000; 24: 934–41.
9. Landis SH, Murray T, Bolden S, Wingo PA. Cancer statistics, 1998. CA Cancer J Clin. 1998; 48: 6–29.
10. Bennedbaek FN, Hegedus L. Management of the solitary thyroid nodule: Results of a North American survey. J ClinEndocrinolMetab. 2000; 85: 2493–8.
11. Chow LS, Gharib H, Goellner JR, van Heerden JA. Nondiagnostic thyroid fine-needle aspiration cytology: Management dilemmas. Thyroid. 2001; 11: 1147–51.
12. Sunita. K.Shere, Anjali S. Kulkarni, Pragati P Phulgirkar, ShaziaAnjum, Sunita P. Patil, RajanBindu. Correlation of fine needle aspiration cytology with

histopathology in diagnosis of thyroid lesions. Journal of evolution of medical and dental sciences. 2013; 2(26): 4826-4831.

13. Campbell JP, Pillsbury HC. Management of thyroid nodule. Head Neck. 1989; 11: 414-25.
14. Reeve D,Debridge L, Slaon D, Crummer P. The impact of fine needle biopsy on surgery for single thyroid nodule. Med J. 1986 August; 145: 308-11.
15. Caruso P, Muzzaferri EL. Fine needle aspiration biopsy in the management of thyroid nodules. Endocrinology. 1991; 1: 194-202.
16. Gardner HA, Ducatman BS, Wang HH. Predictive value of fine-needle aspiration of the thyroid in the classification of follicular lesions. Cancer. 1993; 71: 2598-603.
17. Miller JM, Kini SR, Hamburger JI. The diagnosis of malignant follicular neoplasms of the thyroid by needle biopsy. Cancer. 1985; 55: 2812-7.
18. Uma Handa, SukantGarg, Harsh Mohan, NitinNagarkar. Role of fifi ne needle aspiration cytology in diagnosis and management of thyroid lesions: A study on 434 patients. Journal of Cytology. 2008 January; 25(1): 13-17.
19. Mahar SA, Husain A, Islam N.Fine needle aspiration cytology of thyroid nodule: diagnostic accuracy and pitfalls.JAyub Med Coll Abbottabad. 2006 Oct-Dec; 18(4): 26-9.
20. Manoj Gupta,* Savita Gupta, and VedBhushan Gupta Correlation of Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule. J Thyroid Res. 2010; 2010: 379051. Published online 2010 Apr 18. doi: 10.4061/2010/379051.
21. Mundasad B, MCallisier I, Carson J and Pyper P. Accuracy of fine needle aspiration cytology in the diagnosis of thyroid swelling. The International Journal of endocrinology. 2006; 2(2): 20-25.
22. Safirullah, Mumtaz N, Khan A. Role of Fine Needle Aspiration Cytology (FNAC) in the diagnosis of thyroid swellings. Department of General Surgery, Hayatabad Medical Complex, Peshwar. 2000; 18(2): 196-201.
23. Sarunya K, Kornkanok S, Pongak M. The study of thyroid lesions and the correlation between histomorphological and cytological findings at MaharajNakorn Chiang Mai Hospital between 2003-2007. Chiang Mai Med J. 2010; 49: 105-110.
24. Guhamallick M, Sengupta S, Bhattacharya NK, Basu N, Roy S, Ghosh AK, *et al*. Cytodiagnosis of thyroid lesions-usefulness and pitfalls: A study of 288 cases. J Cytol. 2008; 25: 6-9.
25. Yeh MW, Demircan O, Ituarte P, Clark OH. False-negative fine-needle aspiration cytology results delay treatment and adversely affect outcome in patients with thyroid carcinoma. Thyroid. 2004;14: 207-15.
26. Richa S, Mathur DR. Diagnostic accuracy of fine needle aspiration cytology (FNAC) of the thyroid gland lesions. Int J Health Sci Res. 2012; 2: 1-7.