

ORIGINAL ARTICLE

FINE NEEDLE ASPIRATION CYTOLOGY: SENSITIVITY AND SPECIFICITY IN THYROID LESIONS

Mohammed Ayub Musani, Faheem A. Khan, Shoukat Malik, Yousuf Khambaty

Karachi Medical and Dental College, Abbasi Shaheed Hospital, Karachi, Pakistan

Background: Thyroid enlargement is one of the common problems in patients presenting at outpatients department of ENT particularly in females. Thyroid nodules are common, thyroid cancer is uncommon and the most common way for it to present is as a solitary thyroid nodule. This study was conducted to evaluate the sensitivity and specificity of Fine Needle Aspiration Cytology (FNAC) in thyroid diseases.

Method: This prospective analytic study was conducted at ENT Department of Karachi Medical and Dental College/Abbasi Shaheed Hospital during year 2004–8. One hundred and five cases were enrolled who underwent thyroid surgery after complete evaluation by history, clinical examination, Thyroid profile, Thyroid Scintigraphy, Ultrasound neck and FNAC. In cases which were revealed malignant by FNAC, CT scan were done to see the extent of disease and neck node status. Surgery was done in all cases and specimens sent for histopathology. **Results:** Male to female ratio of the patients was 1:8.5. Most common lesion was benign nodule (96). Malignant lesions were 9 in FNAC. In histopathology, the benign nodules were 92, and malignant cases were 13. Sensitivity of FNAC was 61.53% and specificity was 98.9%. **Conclusion:** FNAC in Thyroid has high sensitivity and specificity.

Keywords: FNAC, Thyroid, nodule, malignant, cytology

INTRODUCTION

Thyroid enlargement is one of the common problems in patients presenting at outpatient department of ENT, particularly in females. Thyroid nodules are common, thyroid cancer is uncommon and the most common way for it to present is as a solitary thyroid nodule. Wienke JR¹ has reported the prevalence of thyroid nodules about 4–7% whereas in UK about 8% of population has nodular thyroid disease and significant numbers of them have solitary nodules. The problem in clinical practice is to distinguish 10% of thyroid nodule with cancers reliably from many benign nodules. Moreover, a definitive preoperative tissue diagnosis of malignancy allows appropriate surgery and relevant patient counselling. Fine needle aspiration cytology (FNAC) is the cornerstone of the investigation², and it is the diagnostic procedure for the nodule after primary thyroid disease is ruled out with normal thyroid function test³.

The FNAC was first reported by Martin and Ellis in 1930.^{4,5} Now, FNAC has become a critical step in the evaluation of neck masses.⁶ Previous, formal open surgical biopsy will yield a definitive histopathological diagnosis but may mandate an extensive approach, which may be inappropriate for best management⁷ and will break the barrier and risk of spread in superficial tissues of neck. Then comes the role of FNAC, the ease of which coupled with the rapidity of obtaining a pathological diagnosis allows more intelligent therapeutic approach.⁸ This technique is an excellent first line method for investigating the nature of palpable lesions in the head and neck region.⁹ FNAC is widely accepted as the most cost-effective diagnostic procedure in the assessment of thyroid nodules and also helps to

select patients preoperatively for surgery.¹⁰ FNAC is safe, inexpensive and less invasive diagnostic modality with cost-effective by avoiding the un-necessary operation. FNAC has high sensitivity in picking up malignancy in thyroid.¹¹

Most studies show accuracy rate exceeding 80%.^{12–14} Its limitation includes false negative, false positive, indeterminate or suspicious results.¹⁵ The false negative is defined as the patients in which FNAC shows benign pathology but histopathology reveals malignancy¹⁶, while false positive indicates malignancy in FNAC but histopathology shows benign pathology. False positive result ranges 0–8%.¹⁷

This study was conducted to evaluate the reliability of FNAC in thyroid disease in picking up malignant and benign lesions.

MATERIAL AND METHODS

This study was conducted at ENT Department of Karachi Medical and Dental College and Abbasi Shaheed Hospital during the period of 2004–2008. Patients presenting with thyroid enlargement were preceded through detail history, clinical examination, thyroid profile, thyroid scintigraphy, and ultrasound neck. Hot and toxic nodules and diffuse Goitre with hyperthyroidism were excluded from this study and referred for medical treatment. One hundred and five patients with thyroid nodules were enrolled after fulfilling these criteria and were sent for FNAC. The patients in whom malignancy was suspected, CT scan was performed to see the extent of tumour, its spread in surrounding structure and neck nodes. Surgery of all these patients was done and the specimen sent for histopathology.

RESULTS

In 105 patients, 11 were male and 94 were female with male to female ratio of 1:8.5. In FNAC most common lesion was benign nodule (96, 91.4%), and 9 (8.6%) cases were malignant. According to histopathology results, the benign nodules were 92 (87.6%), and malignant cases were 13 (12.4%). Eight cases were true positive, 5 cases were false negative, 1 case false positive and 91 cases were true negative. Sensitivity of FNAC was 61.53%, and specificity was 98.9%.

Table-1: Gender distribution of the patients

Gender	Number of cases
Male	11 (10.5%)
Female	94 (89.5%)

Table-2: Nature of thyroid nodules in FNAC and histopathology

Thyroid nodules	FNAC	Histopathology
Benign	96 (91.4%)	92 (87.6%)
Malignant	09 (8.6%)	13 (12.4%)

Table-3: Sensitivity and specificity index

Sensitivity	61.53%
Specificity	98.9%

Table-4: Summary of FNAC and Histopathology

FNAC Findings	Histopathology Findings	
	Malignancy Present	Malignancy Absent
Malignancy Positive	8 (7.61%) (True Positive)	1 (0.95%) (False Positive)
Malignancy Negative	5 (4.76%) (False Negative)	91 (86.66%) (True Negative)

DISCUSSION

Prehand information of nature of disease alters the treatment options greatly. In thyroid, benign nodules require partial thyroidectomy or lobectomy, where as malignant disease demand extensive surgery, i.e., total thyroidectomy, neck dissection followed by radio iodine ablation and lifetime dependency on thyroxine supplement. In thyroid disease, this benefit of prehand knowledge of pathology is granted by FNAC which is a well establish technique for pre-operative assessment of thyroid nodules.¹⁸ The FNAC is cost-effective, less traumatic, less invasive, and easily performed procedure.¹⁹ FNAC is a useful tool in the diagnosis in thyroid nodules if a suspicion of cancer exists. It has reduced the need of imaging and surgery and increased the yield of cancer in patients who come for surgery.²⁰

Incidence of thyroid nodule is more common in female as is evident in this study with male to female ratio of 1:8.5. This observation was also made in a study by Hand *et al* in which male female ratio was 1:6.35.²¹ Russel *et al* showed male to female ratio 1:3.² Mahar *et al* found 78% of thyroid nodules in females.¹¹

The most common type of thyroid nodule was benign nodules. Mahar conducted study on 125 cases, and he found that 63 (50.4%) cases were benign

lesion.¹¹ Another study also showed that 83.33% cases were benign lesions.²⁰

Histopathology revealed 92 cases were benign nodules and 13 cases were malignant nodules. Five (4.76%) cases were false negative. Different studies show ranges from 1.5–11.5%.²²⁻²⁴ Ashcraft and Van Herle noted that false negative result varied in reported series from 2–50%.²⁵ False positive result in our study was 1 (0.95%). Other studies show range from 0–8%.^{22,24} Campbell and Pillsbury reported 1.2% false positive results.²⁶

In our study sensitivity was 61.53% and specificity was 98.9%. Humberger concluded sensitivity around 65.53% and specificity 72–100%.¹⁷ The study of Naggada *et al* reported 88.9% sensitivity and 96% specificity of FNAC in thyroid masses.¹⁶ The FNAC is a sensitive and specific method of evaluating thyroid nodules for malignancy.²⁷ Safirullah also reported high accuracy rate of FNAC (94.2% sensitivity and 94% specificity) in cases of diagnosis of malignant thyroid diseases and propose that its routine use can make the management of thyroid swelling cost-effective by avoiding unnecessary surgeries.¹⁹

CONCLUSION

The FNAC is very useful and readily available tool for evaluating thyroid nodules with high sensitivity and specificity in picking up benign lesion and excluding the malignant disease. This is very helpful in patient counselling and defining the extent of surgery.

REFERENCE

1. Wienke JR, Chong WK, Fielding JR, Zou KH, Mittelsteadt CA. Sonographic features of benign thyroid nodules. *J Ultrasound Med* 2003;22:1027–31.
2. Howard RJ. Tumors of the Thyroid and Parathyroid glands. Stell and Maran's, Head and Neck Surgery. Butterworth and Heinemann, 4th edition, 2000:459–85.
3. Grace A Lee, Masharani U. Disorder of the Thyroid Gland. Current Diagnosis and Treatment, Otolaryngology Head and Neck Surgery, Mc Graw Hill, 2nd edition, 2008:548–66.
4. Patel N, Gill J, Shammari AL, Khalil HMB, Chowdhary CR. Fine needle aspiration cytology—Are we getting it right? *Int Congress Series* (1240) 2003;1399–1402.
5. Martin HE, Ellis EB. Biopsy by needle puncture and aspiration. *Ann Surg* 1930;92:169–81.
6. Derrick T Lin, Daniel G Deschler. Neck Masses. Current Diagnosis and Treatment, Otolaryngology Head and Neck Surgery, Mc Graw Hill, 2nd edition, 2008:397–407.
7. Tilak V, Dhaded AV, Jain Ragini. Fine needle aspiration of head and neck masses. *Indian J Pathol Microbiol* 2003;45(1):23–30.
8. Russ EJ, Scanlon FE, Christ AM. Aspiration cytology of head and neck masses. *Am J Surg* 1978;36(1):342–7.
9. Lampe BH, Crammer MH. Advances in the use of fine needle aspiration cytology in the diagnosis of palpable lesions of head and neck. *J Otolaryngol* 1991;120(2):108–16.
10. Bajaj Y, Thompson A. Fine needle aspiration cytology in diagnosis and management of thyroid disease. *J Layrngol Oto* 2006;120:467–9.
11. Mahar SA, Husain A, Islam N. Fine needle aspiration cytology of thyroid nodule: diagnostic accuracy and pitfalls. *J Ayub Med Coll Abbottabad* 2006;18(4):26–9.

12. Gharib H. Diffuse nontoxic and multinodular goiter. *Curr Ther Endocrinol Metab* 1994;5:99–101.
13. Bugis SP, Young JKE, Archibald SD, Chen VS. Diagnostic accuracy of fine needle aspiration cytology verses frozen section in solitary thyroid nodules. *Am J Surg* 1986;152(4):411–6.
14. Boyd LA, Earnardt RC, Dunn JT, Frierson HF, Hanks JB. Preoperative evaluation and predictive value of fine needle aspiration and frozen section of thyroid nodules. *J Am Coll Surg* 1998;187(5):494–502.
15. Baloch MN, Ali S, Ansari MA, Maher M. Contribution of Fine needle aspiration cytology in the diagnosis of malignant Thyroid nodules. *Pak J Surg* 2008;24(1):19–21.
16. Naggada HA, Musa AB, Gali BM, Khalil MIA. Fine needle aspiration cytology of thyroid nodules. A Nigerian tertiary hospital experience. *Internet J Cardiovasc Res* 2006:5.
17. Humburger JI. Diagnosis of thyroid nodules by fine needle aspiration biopsy: use and abuse. *J Clin Endocrinol Metab* 1994;79:335–9.
18. Tabaqchali MA, Hanson JM, Johnson SJ, Wadehra V, Lennard TW, Proud G. Thyroid aspiration cytology in Newcastle: a six year cytology/histology correlation study. *Ann R Coll Surg Engl* 2000;82(3):149–55.
19. Safirullah, Mumtaz N, Khan A. Role of Fine Needle Aspiration Cytology (FNAC) in the diagnosis of thyroid. *J Postgrad Med Inst* 2004;18(2):196–201.
20. Ramsden J, Watkinson JC. Thyroid cancers. *Scott-Brown's Otorhinolaryngology, Head and Neck Surgery*. 7th edition, vol 2, Hodder Arnold, 2008:2663–701.
21. Handa U, Garg S, Mohan H, Nagarkar N. Role of fine needle aspiration cytology in diagnosis and management of thyroid lesions: A study on 434 patients. *J Cytol [serial online]* 2008 [cited 2009];25:13–7.
22. Caruso D, Mazzaferri EL. Fine needle aspiration biopsy in the management of thyroid nodules. *Endocrinologist* 1991;1:194–202.
23. Gharib H, Goellner JR. Fine needle aspiration biopsy of the thyroid: An appraisal. *Ann Intern Med* 1993;118:282–9.
24. Guidelines of the Papnicoloau Society of Cytopathology for the examination of fine needle aspiration specimens from thyroid nodules. *Mod Pathol* 1996;9(6):710–5.
25. Ashcraft MW, Van Herle AJ. Management of thyroid nodules II: scanning techniques, thyroid suppressive therapy and fine needle aspiration. *Head Neck Surg* 1981;3:297–322.
26. Cambell JP, Pillsbury HC 3rd. Management of the Thyroid nodule. *Head Neck* 1989;11(5):414–25.
27. Grant CS, Hay ID, Gough IR, Mc Carthy PM, Goellner JR. Long term follow-up of patients with benign thyroid FNA Cytologic diagnosis. *Surgery* 1998;106:980–6.

Address for Correspondence:

Dr. Mohammed Ayub Musani, B-599, Block-13, Federal B Area, Karachi, Pakistan. **Cell:** +92-333-3394015

Email: ayubmusani@yahoo.com