

FINE NEEDLE ASPIRATION CYTOLOGY OF THYROID SWELLINGS WITH HISTOPATHOLOGICAL CORELLATION

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Abstract

Background : To assess the diagnostic accuracy of aspiration cytology as a pre-operative screening procedure and this study was done to reach a consensus and to find out the best diagnostic tool for assessment of thyroid swellings pre-operatively.

Materials and methods : A cross sectional study was carried out in the Department of Otolaryngology & Head Neck Surgery of Chittagong Medical College Hospital (CMCH) between March 2014 to March 2015. Total 50 patients were included in the study, where pre-operative Fine Needle Aspiration Cytology (FNAC) and post operative histopathology were done to find out the correlation. Data were analyzed and presented as both qualitative and quantitative data as applicable using SPSS version 20. The quantitative data were analyzed by mean, standard deviation. The qualitative data were analyzed by Mc NEMAR test (Mc NEMAR χ^2 test).

Results : 50 cases were included in the study. FNAC revealed 40 non- neoplastic lesion, 5 papillary carcinoma, 4 follicular neoplasm and 1 was suspicious for malignancy. Histopathology revealed 38 non neoplastic and 2 neoplastic lesion among 40 non neoplastic cases. 5 cases which were diagnosed as papillary carcinoma thyroid on FNAC were also proved to be same on histopathology. Out of 4 follicular neoplasm 1 was non neoplastic and other 3 were neoplastic. The suspicious for malignancy lesion was proved as cystic papillary carcinoma on histopathology. The sensitivity of FNAC was 81.82%, specificity was

97.44%, positive predictive value was 90%, negative predictive value was 95% and accuracy was 94%.

Conclusion : FNAC of Thyroid is more specific than sensitive with high accuracy rate. Therefore FNAC should be adopted as an initial investigation of thyroid disease.

Key words

FNAC; Histopathology; Thyroid swelling.

Introduction

Patient with a diffuse goitre and a family history of goitre may have a congenital dyshormonogenesis leading to a partial failure of iodide organification this commonly associated with deafness in pendred's syndrome despite the organification defect, these patients are commonly euthyroid¹.

Nodular thyroid disease describes the presence of a single nodule or multiple nodules within the thyroid gland. These nodules are palpable or impalpable, functioning or nonfunctioning. Functioning solitary nodules are those that synthesize thyroid hormone autonomously and thus may lead thyroid hormone excess and symptoms of thyrotoxicosis².

Nodular thyroid disease is more prevalent than diffuse goitre. A solitary nodule or a dominant nodule in a multi nodular gland has a higher risk of being malignant than the multiple palpable nodules of a multi nodular goitre³.

Ultrasonographic scanning in thyroid swelling is capable of differentiating solid from cystic lesion but cannot distinguish malignant from benign one. The presence of micro-calcification has the highest positive predictive value of malignancy of 41.8-94.2%. The sensitivity of this sign is low because micro-calcification is only in 26.1-59.1% of cancers⁴. A predominantly solid (<25% cystic change) nodule containing micro-calcification has a 31.6% likelihood of being cancer whereas a predominantly cystic nodule (>75 % cystic change) with no calcification has 1% likelihood of being cancer⁵. Isotope scan can demonstrate the functioning capacity of the nodule but cannot predict

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the histopathological character. Histological examination of excised thyroid swelling is the most accurate to determine the pathology. It requires preparation & long procedures like anaesthesia, hospitalization & post operative management.

On the contrary FNAC is simple, less expensive, readily available, yet reliable, effective and accurate diagnostic technique⁶. FNAC in expert hands is very reliable, with studies showing overall diagnostic accuracy between 85% & 100%, with specificity for the diagnosis of neoplasia of 72-100% & sensitivity of 65-98%. In a series of over 800 subjects, accuracy of FNAC was over 95% with a false positive rate for malignancy of 2.3% & a false negative rate of 1.1%⁷. Reviewing different studies it is seen that there is difference in many occasions and henceforth this study is done with a view to make the correlation among FNAC & histopathological findings of thyroid swellings in the arena of CMCH.

The risk and benefits were explained to the patients and their attendants. It was assured that all information and records will be kept secret. The procedure would be helpful for both patients and doctors in making rational approach of case management. Written informed consent from the patient is obtained. Finally ethical directives from ethical review board of CMCH for this study was obtained.

Materials and methods

This cross sectional study was carried out in the Department of Otolaryngology & Head Neck Surgery, Chittagong Medical College Hospital during the period of March 2014 to March 2015. Samples were collected after taking written informed consent from patients admitted in the Chittagong Medical College Hospital. Followings are the inclusion & selection criteria of the study.

Inclusion criteria

- i) All the patient with thyroid swelling and clinical & sonological indication for FNAC and subsequent thyroid surgery
- ii) patient of all age group, sex & demographic distribution
- iii) Patient with normal thyroid function test.

Exclusion criteria

- i) Patient with abnormal thyroid function test

- ii) History of previous surgery in the thyroid and para-thyroid region
- iii) History of radiation in the head neck region in the past
- iv) Diffuse goitre with indication for FNAC.

Fifty patient of goitre were collected from Department of Otolaryngology & Head-Neck Surgery of CMCH during the period of March 2014 to March 2015. All cases were evaluated clinically. Thyroid Function test & other relevant investigations together with FNAC & histopathological examination of corresponding tissues were done in all cases.

Results

Fine needle aspiration cytology was done in all cases. FNAC diagnosis is stated below.

Table 1 : FNAC diagnosis of study population.

Diagnosis	No. of patient	Percentage (%)
Nodular goitre	32	64%
Colloid goitre	8	16%
Papillary carcinoma	5	10%
Follicular neoplasm	4	8%
Suspicious for malignancy	1	2%

On the basis of FNAC findings FNAC outcome is stated below.

Table II : FNAC outcome of study population.

Outcome	No. of pt	Percentage (%)
Negative for malignancy (Disease negative)	40	80%
Positive for malignancy (Disease positive)	5	10%
Suspicious lesion (Disease positive)	5	10%

Table III : Histopathological diagnosis of study population.

FNAC	Histopathology						
	N.G	C.G	F.H	F.A	Thyroiditis	P.C	F.C
Nodular goitre (32)	20	1	8	1	2		
Colloid goitre (8)	5	2				1	
Papillary Ca. (5)						5	
Follicular Neoplasm (4)			1	2			1
Suspicious for Malignancy (1)						1	
Total	25	3	9	3	2	7	1

N.G-Nodular Goitre C.G-Colloid Goitre F.H- Follicular Hyperplasia
 F.A-Follicular Adenoma P.C-Papillary Carcinoma
 F.C-Follicular Carcinoma

Final histopathology report depicted that among the 40 disease negative cases 38 appeared non-neoplastic (True negative) and 2 cases appear neoplastic (False negative). Among 5 malignant cases all were proved malignant on histopathology. So here true positive value was 5 & false positive value was 0. Among 5 suspicious lesion 4 were neoplastic lesions and 1 was non-neoplastic. So true positive value was 4 and false positive value was 1. Final histopathological outcome is depicted below.

Table IV : Histopathological outcome of study population.

Test	Result	Number	Total
Positive	True positive (a)	9	10
	False positive (b)	1	
	False negative (c)	2	
Negative	True negative (d)	38	40

Table V : Performance of the study.

Traits	Value
Sensitivity	81.82% (a/a +c)
Specificity	97.44% (d/b +d)
Positive predictive value	90% (a/a +b)
Negative predictive value	95% (d/c +d)
Accuracy	94% (a +d / n)

a – True positive, b – False positive, c – False negative, d – True negative, n – Total population.

The hypothesis of the research was “Is FNAC an effective tool for diagnosis of thyroid swellings.” So for hypothesis testing null hypothesis (H_0) is “FNAC is an effective tool for diagnosis of thyroid swelling.” Alternative hypothesis (H_A) is “FNAC is not an effective tool for diagnosis of thyroid swelling.”

Mc Nemar test statistics (χ^2 – paired)

$$\begin{aligned}
 &= (b - c)^2 / (b + c) \\
 &= (1 - 2)^2 / (1 + 2) \\
 &= 1 / 3 \\
 &= 0.33
 \end{aligned}$$

df (Degree of freedom)

$$= (\text{row} - 1) \times (\text{column} - 1)$$

$$= (2 - 1) \times (2 - 1)$$

$$= 1$$

In χ^2 – table at 5% level of significance against df = 1, the table χ^2 - value (Critical value) = 3.84.

Test statistics (0.33) is less than critical value (3.84); so $p > 0.05$, So H_0 is retained and H_A is rejected. So there is no significant difference between FNAC and post operative histopathological examination.

So it is proved that FNAC is an effective tool for diagnosis of thyroid swelling.

Discussion

In our study the Fine Needle Aspiration cytology revealed 40 non-neoplastic cases (32 cases were diagnosed as nodular goitre and 8 cases were diagnosed as colloid goitre) 5 cases found positive for malignancy (Papillary carcinoma) and 5 cases were suspicious lesions (4 follicular neoplasm and 1 was suspicious for malignancy). For research purpose we did consider 40 cases as “Disease negative” and 10 cases as disease positive (5 malignant and 5 suspicious lesions). In this series we found nodules were more in right lobe than left. There is yet no reported predilection for any specific site and no reason has been put forward for such a predilection. Similar findings were noted by many authors^{8,9}. Finally it was seen that 8 case was diagnosed histopathologically as carcinoma thyroid. Out of which 7 was papillary carcinoma thyroid and 1 was follicular carcinoma thyroid. Out of 7 papillary carcinoma thyroid 2 was multinodular and 5 was solitary nodular in presentation. Where the follicular thyroid carcinoma was multinodular in presentation. In different study it was seen that in areas of adequate dietary iodine, papillary thyroid carcinoma presents as a solitary thyroid nodule. So the fact was consistent with our findings¹⁰. Again most common presentation of follicular carcinoma is solitary nodular, we found our single patient of follicular carcinoma as multinodular goitre¹¹. This finding was inconsistent with other studies. In a nutshell on the basis of histopathology out of 40 “Disease negative” cases 38 were “True negative” and 2 cases were “False Negative”. Out of 10 “Disease positive” cases 9 were “True Positive” and 1 was “False Positive”.

In our study analysis of the data revealed a sensitivity 81.82% and specificity 97.44%, which were translated into diagnostic accuracy of 94%. A Positive Predictive Value (PPV) 90% and a Negative Predictive Value (NPV) 95%. Our results were comparable with published data where FNAC of thyroid is reported to have sensitivity ranges from 65 – 98%, specificity of 72 – 100%, a positive predictive value 34 – 100% and a negative predictive value 83 – 100%. The determinant factor for such a wide range of difference is due to difference in number of cases, difference in planning of diagnostic categories, inclusion and exclusion criteria. Some investigators included follicular lesions in disease positive groups while some excluded it during overall calculation¹².

The overall accuracy of cytological diagnosis in our study was 94%. In published data it has been seen accuracy rate approaches 95% in the differentiation of benign from malignant nodule in thyroid gland¹³.

False negative FNAC results sampling error, coexistence of benign & malignant lesions or cytomorphological overlap between benign and low grade malignant tumor. This is of great concern because it indicates the potential to miss malignant lesions¹⁴. In our study False Negative Rate (FNR) was 18.18%. FNR ranges from 1% - 16% in different series¹⁵.

In our series False Positive Rate (FPR) was 2.56%, which agrees with other series that ranges from 0% - 8%¹⁶. 1 case of follicular neoplasm was found as follicular hyperplasia on histopathology. Aspiration was probably done on the hyper-cellular areas which may lead to over diagnosis.

The most common malignant lesion in our study was papillary thyroid carcinoma (87.5%) and the rest was follicular carcinoma (12.5%). Islam & colleagues found 72.72% papillary carcinoma, 18.18% follicular carcinoma & 9.1% cases of medullary carcinoma¹³. Out of 8 malignant cases 2 were male & 6 were female. So incidence of malignancy was higher in male (25%) than female (14.29%). This is also supported by other similar studies¹⁷.

Limitation

The present study was conducted in a very short period of time. Small sample size was also a limitation. The study population was selected from

single selected hospital in Chottogram. So that the result of the study may not reflect the exact picture of the country.

Conclusion

As this study had been carried out over a limited period of time with a limited number of patients, it could not have been large enough to be reasonable precision. All the facts and figures mentioned here may considerably vary from those of large series covering wide range of time, but still then as the cases of this study were collected from tertiary level hospitals in our country, this study has some credentials in reflecting facts regarding FNAC & histopathological correlation of thyroid nodules.

Recommendations

Cytological errors of some cases can be avoided by paying attention to the possible pitfalls. The suspicious results can be resolved by histopathology. A benign FNAC should be viewed with caution as false negative results do occur. Overall diagnostic accuracy can be improved if FNAC is coupled with Ultrasonography.

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Contribution of authors

SD - Conception, Design, acquisition of data, manuscript writing & final approval.

PKD - Acquisition of data, data analysis, critical revision & final approval.

SMAS - Data analysis, manuscript writing & final approval.

MSH - Interpretation of data, critical revision & final approval.

Disclosure

All the authors declared no competing interest.

References

1. Susan Clarke. The Thyroid Gland : Function tests and Imaging. In Gleeson M et al (eds) , Scoott Brown's Otorhinolayngology, Head and Neck Surgery, 7th edition, London : Hodder Arnold. 2008; 1 : 327-337.
2. Lorrane M Albon and Jayne A Franklyn. The Thyroid : non malignant disease. In Gleeson M et al (eds) Scoott- Brown's Otorhinolayngology, Head and Neck Surgery, 7th edition, London : Hodder Arnold. 2008; 1 : 338-366.
3. Sabiston David C. Text book of Surgery. 15th edition,Carolina: Academic Press.1997;1:599-645.
4. Mahmood S, Hossain GA, Rahman MU, Khan N and Islam SMM. Awareness of General population regarding goitre. Mym Med Journal. 1995;4(2):86-91.
5. Frates MC, Benson CB, Charboneau JW et al. Society of Radiologist In Ultrasound Management of thyroid nodules detected at US : Society of Radiologist in Ultrasound consensus conference statement. Radiology. 2005; 237: 794-800.
6. Alam MN, Haq SA, Ansari MAJ et al. Spectrum of thyroid disorders In IPGM&R; Dhaka, Bangladesh. Journal of Medicine. 1995; 6(2) : 53-58.
7. Kumar H, Daykin J, Holder R, Watkinson JC, Sheppard MC, Franklyn JA Gender. Clinical findings, and serum thyrotropin measurements in the prediction of thyroid neoplasia in 1005 patients presenting with thyroid enlargement and investigated by fine needle aspiration cytology. Thyroid. 1999; 9:1105-1109.
8. Messaris G, Kyriakov K, Vasilopoulos P, Tountas C. The single thyroid nodule and carcinoma. Br J Surg. 1974;61:943.
9. Gupta M, Gupta S, Gupta V. Correlation of fine needle aspiration cytology with histology in the diagnosis of solitary thyroid nodule. J Thyroid Res. 2010;37:951.
10. Moorthy R, Warfield AT. Thyroid and parathyroid gland pathology. In Watkinson JC, Gilbert RW (eds) Stell and Maran's textbool of head and neck surgery and oncology, 5th edition, London: Hodder Arnold. 2012;1:321-366.
11. Islam S et al. Comparative study of FNAC and histopathology in the diagnosis of thyroid swelling. Bangladesh Otorhinolaryngology. 2010; 16(1):35-43.
12. Jogai S et al. FNAC of thyroid : A cytologic study with evaluation of discordant cases. Acta Cytol. 2005;49:483-488.
13. Mundasad B, Mcalister I,Carson J, Piper P. Accuracy of fine needle aspiration cytology in diagnosis of thyroid swellings. Internet J Endocrinol 2006. Available from : <http://www.Ispub.com>.
14. Kantasueb SA, Sukpan KO, Mahanupab PO. The study of thyroid lesions and the correlation between histological and cytological findings. Chiang Mai Med J. 2010;49(3):105-110.
15. Nggda HA, Musa AB, Gali BM, Khali MI. FNAC of Thyroid nodule(s): A Nigerian tertiary hospital experience. Internet J Pathol 2006. Available from www.Ispub.com/ostia/index.Php/ijpa.
16. Bartolazzi A, gasbarri A, Papotti M. Application of an immunodiagnostic method for improving preoperative diagnosis of nodular thyroid lesions. Lancet. 2001;357:658-665.
17. VEnkatachalapathy TS, Sreeramulu PN, Prathima S, Kumar KA. A prospective study of clinical, sonological & pathological evaluation of thyroid nodule. J Biosci Tech. 2012;3(1):474-478.