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Original article

Accuracy Of Fine Needle Aspiration Cytology (FNAC) In The Diagnosis Of Thyroid Swellings

Dr. Md. Alamgir Hossain Sikder[1], Dr. AZM Mahfuzur Rahman[2], Dr. Md. Abul Khair[3]

[1]Associate Professor, Department of Surgery, Dhaka National Medical college (DNMCH), [2]Register, Department of Surgery DMCH, [3]Register Surgeon Mymensingh Medical College.

Abstract:

Objective: To evaluate the accuracy of fine needle aspiration cytology (FNAC) in comparison to paraffin section in thyroid swelling.

Study design: Cross sectional study.

Place and duration of study: Department of Surgery, Bangabandhu Sheikh Mujib Medical University from July 2009 to June 2011.

Patient and method: One hundred patients with enlarged thyroid gland of both sexes were selected from admitted patient of Surgery department. All patients had preoperative FNAC, performed by pathologist at the Histopathology department and postoperative specimen were also examined and histopathological diagnosis were made. All FNAC diagnosis were correlated with the histopathological diagnosis.

Results: Out of 100 patients 23 were male and 77 were female, male-female ratio 1: 3.3. In FNAC 76 patients were diagnosed as benign lesion of which 8 were later diagnosed as malignant on histopathological examination (68 were true negative 8 were false negative). 22 cases were diagnosed as malignant, both on FNAC and histopathological examination. Only 2 cases were diagnosed as follicular neoplasm on FNAC but on histopathological examination diagnosed as follicular carcinoma (22 cases were true positive) in this study. Overall sensitivity of FNAC were 68.75%, specificity 100.00% and accuracy 90%; PPV=100% & NPV=87.18%

Conclusion: FNAC is a reliable, safe and accurate method as a preoperative evaluation in thyroid gland swelling before surgery. FNAC has more accuracy and specificity in detecting thyroid gland malignancy and therefore it is a reliable diagnostic test for evaluating thyroid swellings.

Key words: Thyroid gland, FNAC Histopathology

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Introduction :

Thyroid disorders are one of the common problems encountered in clinical practice with majority of benign in nature (Burguera B and Gharib H, 2000). They are endemic in mountainous region of the world, where the soil, water & food supply contain little iodine (Elahi et al., 2005).

Bangladesh is an endemic area for iodine deficiency goiter. In many cases non-neoplastic goiter present as a solitary thyroid nodule (STN). Most of the STN are benign, few are malignant. The endemicity varies from one place to another. The highest prevalence in Bangladesh is in the district of Jamalpur, Rangpur; the range varies from 21-30%(Islam et al. 2010). Nodular thyroid disease is more prevalent than diffuse goiter. In a report from thyroid clinic, BSMMU, Dhaka, 32.67% of all thyroid patients had solitary nodules (Islam et al. 2010).

Long standing goiter (more than 5 years) is regarded as a risk factor for the development of thyroid cancer (Champa Suohel et al. 2009). Thyroid cancer is a relatively rare malignancy, representing only 1.5% of all the cancers, but it is the commonest endocrine cancer accounting for 92% of all endocrine malignancies (Islam , 2010). Papillary carcinoma is the most common thyroid cancer followed by follicular, medullary, anaplastic and lymphoma. So evaluation of thyroid

swelling should be undertaken by careful history taking, physical examination and investigation like FT_3, FT_4 and TSH level with FNAC and further evaluation by postoperative histopathological examination.

Fine needle aspiration cytology (FNAC) is a well established outpatient procedure used in the primary diagnosis of palpable, thyroid swelling. FNAC gained acceptance in the UK and USA in 1970 (Niazi et al., 2007). Currently this technique is practices worldwide and it is the investigation of choice in thyroid swelling. The limitation includes follicular carcinoma, false negative results, false positive results and a proportion of FNAC result fall into the indeterminate or suspicious group. The sensitivity of thyroid FNAC ranges from 80 to 98% and its specificity from 58 to 100% (Thomson , 2006).

Methods:

A cross sectional study was done in the Department of Surgery,Bangabandhu Sheikh Mujib Medical University,Dhaka from July 2009 to June 2011. Hundred patients,both male and female of different age group are included.

Inclusion criteria: Patients of both sexes presented with thyroid swelling. Only euthyroid patients were selected. Only admitted patients were selected. Patients who underwent thyroid surgery followed by histopathological examination (paraffin section)

Exclusion Criteria: Patient presenting with hypo/hyperthyroid state. Patient who did not undergo surgical intervention. Patients who refused to be included in the study.

Results:

100 patients with thyroid swelling were selected from the department of Surgery, BSMMU during the period of July 2009 to June 2011. All cases were evaluated clinically, a ultrasound scan and FNAC. Routine paraffin section histopathology were done in all cases. The patients of both sexes and different ages were included. Out of 100 patients most were between 21 to 40 years age group. Mean age 35.60, (SD 11.93) years.

Table-I: Age and sex distribution of patients n=100

Age (years)	Male No.	Female No.	Total No.
11-20	2	7	9
21-30	3	26	29
31-40	6	22	28
41-50	7	13	20
51-60	5	9	14
Total	**23**	**77**	**100**

Mean age of male 39.85 (SD 12.37) years and mean age of female 34.33 (SD 11.58) years . In female thyroid swelling was common in 3rd and 4th decades where in male it was in 4th, 5th & 6th decades. (Male to female ratio is 1:3.3).

Table-II: FNAC of thyroid swelling (n=100)

Diagnosis		No. of patients	Percentage (%)
Non neoplastic		76	76
Neoplastic	Follicular neoplasm	2	2
	Carcinoma	22	22
Total		100	100

Table-II shows 100 thyroid swellings. FNAC shows 76 (76%) non neoplastic, 24 (24%) neoplastic.

Table-III: FNAC diagnosis of non neoplastic thyroid swelling (n=76)

Diagnosis		No. of patients	Percentage (%)
Non-neoplastic	Multinodular	74	97.36
	Thyroiditis	2	2.63
Total		76	

Table III shows that among non neoplastic thyroid swellings multinodular goitres were common 74 (74%), follwed by, thyroiditis 2 (2.63%).

Table-IV: FNAC diagnosis of malignancy in thyroid swelling (n=22)

Diagnosis		No. of patients	Percentage (%)
Neoplastic	Follicular carcinoma	0	0
	Papillary carcinoma	20	90.90
	Medullary carcinoma	2	9.10
Total		**22**	**100.00**

Among neoplastic thyroid swelling papillary carcinoma was most common 20 (90.90%), followed by medullary carcinoma, 2 (9.10%).

Table-V: Histopathological (paraffin section) diagnosis of thyroid swelling n=100

Diagnosis		No. of patients	Percentage (%)
Non neoplastic		68	68
Neoplastic	Follicular adenoma	2	2
	Carcinoma	30	30
Total		100	100

Out of 100 cases of thyroid swellings after paraffin section 68 (68%) were non neoplastic and 32 (32%) were neoplastic.

Table-VI: Histopathological diagnosis of non-neoplastic thyroid swelling n=68

Diagnosis		No. of patients	Percentage (%)
Non-neoplastic	Multinodular	62	91.16
	Thyroiditis	6	8.82
Total		68	100

Table VI shows that among 68 cases of non neoplastic thyroid swellings multinodular were 62 (91.16%) and thyroditis were 6 (8.82%).

Table-VII: Histopathological diagnosis of neoplastic thyroid swelling (n=32)

Diagnosis			No. of patients	Percentage (%)
Neoplastic	Benign	Follicular adenoma	2	6.25
	Malignant	Papillary carcinoma	26	81.25
		Follicular carcinoma	2	6.25
		Medullary carcinoma	2	6.25
Total			**32**	**100**

In 32 cases of neoplastic thyroid swelling papillary carcinoma was most common 26 (81.25), followed by follicular carcinoma 2 (6.25%) and medullary carcinoma 2 (6.25%).

Table-VIII: Variation of diagnosis of malignancy between FNAC and paraffin section in thyroid swelling (n=22)

Diagnosis	FNAC %	Paraffin section %
Papillary carcinoma	20 (20)	26 (26)
Follicular carcinoma	0 (0)	2 (2)
Medullary carcinoma	2 (2)	2 (2)
Total	**22 (22)**	**30 (30)**

Table- VIII shows the disparity of diagnosis of malignancy in thyroid swelling by FNAC and paraffin section. Paraffin section diagnosis is the final diagnosis. FNAC diagnosis were correct for 22 cases out of 30 cases of malignancy. The difference between paraffin section diagnosis and FNAC is statistically significant (z=3.04, P< 0.001).

Table-IX: The accuracy of diagnostic test of FNAC in thyroid Carcinoma (n=100)

FNAC	Gold standard test (Histopathology)		Total
	Disease positive(Malignant)	Disease negative(Benign)	
Malignant	22	0	22
Benign	10	68	78
Total	32	68	100

$x^2 = 54$ p <.001

Sensitivity (SEN) $= \frac{TP}{TP+FN} \times 100 = \frac{22}{22+10} \times 100 = 68.75\%$

Specificity (SPE) $= \frac{TN}{FP+TN} \times 100 = \frac{68}{0+68} \times 100 = 100\%$

Accuracy $= \frac{TP+TN}{Total\ Population} \times 100 = \frac{22+68}{22+0+10+68} \times 100 = 90\%$

Positive predictive value (PPV) $= \frac{TP}{TP+FP} \times 100 = \frac{22}{22+0} \times 100 = 100\%$

Negative predictive value (NPV) $= \frac{TN}{FN+TN} \times 100 = \frac{68}{68+10} \times 100 = 87.18\%$

Discussion:

Fine needle aspiration cytology (FNAC) is the initial investigation in the diagnosis of thyroid swelling. The technique is safe, simple and quick, with low complication rate. Several other test such as high resolution ultrasonography and FNAC have been used for evaluation of thyroid swelling before proceeding to thyroid surgery. Studies have demonstrated that among all the diagnostic modalities, FNAC is the most accurate, cost effective test for rapid diagnosis of thyroid swelling (Ali Rizvi et al., 2005; Gutman PD 1998).

In this discussion accuracy of FNAC in the diagnosis of thyroid swelling compared with concluded results with some of the available international studies. Results of this study are almost similar to that of the international studies.

In this series 100 patients with thyroid swellings were evaluated by taking detail history, physical examination, FNAC and histopathology.

Age distribution in this series, mean age of male patient was 39.85 (SD 12.37) years and in female mean age is 34.33 (SD 11.58) and both male, female mean age is 35.60 (SD 11.93). (Safirullah, Mumtaz N, Khan A. 2000) in a study showed that mean age is32 (SD 13.5) years, with statistical analysis there is no significant difference between the mean age of two studies. (Z= 2.00, P< 0.05). Highest number of patients were found in 3rd and 4th decades which did not differ with this study.

Sex distribution of thyroid swelling in this series, out of 100 cases male 23 (23%) and female 77 (77%), male female ratio 1:3.3. Similar sex distribution are (1:2.57) observed in other studies (Mahar 2007).

In this study preoperative FNAC was done for 100 cases. Out of 100 cases of thyroid swelling 76 (76%) were non neoplastic, 24 (24%) were neoplastic, of which 20 (90.903%) were papillary carcinoma and 2 (9.10%), medullary carcinoma. 2 cases reported as follicular lesion in FNAC, so, follicular carcinoma cannot be diagnosed by FNAC. Histopathological diagnosis is the final diagnosis in case of follicular carcinoma.

On histopathology out of 100 (hundred), 32 (32%) were found malignant 68 (68%) were found non malignant.

Out of 24 malignancy, 15 were female 9 were male. Male, female ratio of thyroid malignancy is 1:1.65. On comparing the results of FNAC and histopathology, 22 (22%) out of 100 were true positive for malignancy (both FNAC and histopathology results was positive for malignancy).

Eight were false negative (which was non neoplastic on FNAC but were malignant on paraffin section). Sixty eight were true negative (which FNAC and histopathology were negative for malignancy. The chances of malignancy in thyroid swelling, in this study is thirty (30%). Firat M 2002 showed in his study that chances of malignancy in thyroid nodule was 6%, statistically there was significant difference between two studies. ($Z= 4.80$, $P <0.001$), may be due to this study were more on cold solid thyroid swellings.

The sensitivity of FNAC in this study was 68.75%, specificity was 100.00% and accuracy of study was 90%. The sensitivity, specificity and accuracy compared with the study of Bhatti SU et al. (2009), their sensitivity 72.2%, specificity 97.8%, accuracy 94.2%. There was no significant difference observed ($Z=1.38$, $P > 0.05$).

The accuracy also compared with the study of Mundasad B et al. (2006), they studied on 144 patients and their accuracy was 79.1%. Also compared with the study of Safirullah et al. (2000). They studied on 300 cases, out of 300 cases 285 were operated and specimens were sent for histopathology and their accuracy was 94.2%. Again compared with the study of Gupta M, Gupta S and Gupta VB (2010). They studied about 75 cases and their accuracy was 84%.

Comparing the above studies there was no significant difference observed.

In this studies, false negative 10(ten) false positive 0(0%), false negative and false positive results were compared with the study of Thomas V, McCaffrey 2000. Regarding the false positive result, there was no significant difference observed between these two studies ($Z= 1.34$, $P> 0.05$). But significant difference observed between false negative results of these two studies ($Z= 2$, $P < 0.05$). Only false negative results obtained from this study.

Conclusion:

In this study we found FNAC is highly significant ($P< 0.001$) with specificity is 100%, accuracy is 90%, PPV is 100% in diagnosis of thyroid carcinoma.

So we can conclude FNAC is more valid test for diagnosis of thyroid carcinoma.

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