

Original Article

Comparative study of FNAC and histopathology in the diagnosis of thyroid swelling

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Abstract:

The objective of this study was to determine the efficacy of fine needle aspiration cytology in diagnosis and management of thyroid swelling. The study evaluated the predictive value of Pre operative fine needle aspiration cytology (FNAC) in surgical decision making, by comparing this (FNAC) with the post operative histopathological diagnosis.

Ninety patients who underwent thyroidectomy between Jan-2007 to Dec-2008 were analysed in the department of Otolaryngology and Head-Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka. All the patients underwent pre operative FNAC were included in this study.

FNAC was accurate in 85 (94.44%) patients. Failure were mainly noted in cases of follicular neoplasm (lesion). Our result indicates that FNAC is helpful in the diagnosis and surgical planning of thyroid swelling. However, histopathological analysis is still remaining essential to distinguish follicular adenoma from follicular carcinoma.

Key words: FNAC, Histopathology, Thyroid swelling

Introduction

Thyroid gland and its enlargement are known since the time of Hippocrates. Among the endocrine organs, diseases of the thyroid gland is the most common. A good number of diseases affect the thyroid gland and

almost all of them presents with nodular thyroid swelling. Nodular goiter remains a problem of enormous magnitude all over the world, although exact data on incidence and prevalence are unavailable. In our country the national prevalence rate is 10-15%, which indicates, the whole country is endemic. The endemicity varies from one place to another. The highest prevalence rate in Bangladesh is in the district of Rangpur and Jamalpur, the range varies from 21-30%. Nodular thyroid disease is more prevalent than diffuse goitre. In a report from the thyroid clinic, BSMMU, Dhaka 32.67% of all thyroid patients had solitary nodules (Alauddin M, 2003).

A solitary nodule has a higher risk of being malignant, than the multiple multinodular goitre (Hilal M, Al-Sayer et al., 1985). The

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challenge to the clinician is to select patients, whose gland harbor thyroid cancer from the large group of patients, with thyroid nodules (Hanni Cary L, et al., 1984). Laboratory investigations other than FNAC have limited role to find out the nature of thyroid swelling. Isotope scan can demonstrate the functioning capacity of the nodule but cannot predict the histopathological character (Satter MA, 2003). Ultrasonographic scanning is capable of differentiating solid from cystic lesion but cannot distinguish malignant from benign one (Pendse A.K, 1983).

The conventional criteria are in-efficient in focusing the need for surgery and do not increase or decrease the suspicion of malignancy. Histological examination of the removed thyroid swelling is the most accurate way to determine the pathology. It requires preparation and long procedure like anaesthesia, hospitalization and sometime even over treatment (Thomas V, 2000). Fine needle aspiration cytology (FNAC) is simple, less expensive, readily available and reliable, effective and almost accurate diagnostic technique. It is suitable because of its compliance, minimal morbidity and ease to performance. It is also saving of time and result can be given within an hour or two. Apart from aseptic precaution no special preparation is required (Sadhukhan B, et al., 1992).

FNAC can provide accurate cytodiagnosis of most of the malignancies. The main stem of diagnosis of nodular thyroid swelling is by clinical means, fine needle aspiration cytology and histopathological (histopathology) examination. But they differ in many occasions and therefore this comparison is done with a view to make the correlation between FNAC and histopathology (Thomas A, et al., 1980). Previous studies shows that the sensitivity of thyroid FNAC ranges from 80 to 98 percent and its specificity from 58 to 100% (Bajaj Y, 2006). Both false positive and

false negative results obtained from FNAC (Starvic GD et al., 1980).

Methods:

A Cross sectional study was done in the Department of Otolaryngology- Head & Neck Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka from January 2007 to December 2008. Ninety patients, both male and female of different age group are included.

Inclusion criteria- Those patient presenting with thyroid swelling. Only euthyroid patients and admitted patients were selected. All the patients underwent thyroid surgery and histopathology.

Exclusion criteria- Patient presenting with hypo/hyperthyroid state. In our study 90 admitted patients of thyroid swelling were evaluated in the Department of Otolaryngology-Head & Neck Surgery in Bangabandhu Sheikh Mujib Medical University by taking detailed history, clinical examination, thyroid hormone estimation including TSH, FT₃, FT₄, ultrasonogram, thyroid scan, FNAC and histopathology of resected thyroid specimen were done. Preoperatively all the 90 cases were diagnosed by FNAC and by clinical means but final diagnosis was confirmed by histopathology. Both FNAC and histopathology were done in pathology department, BSMMU and some private diagnostic centre in Dhaka. All operations were done under G/A.

To shape up the study we will follow the following formula which are widely acceptable.

Sensitivity: The portion of the patients having malignant thyroid disease and positive cytological diagnosis on FNAC.

$$\text{Sensitivity (\%)} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}} \times 100$$

True positive: Those with positive results on histopathology and on FNAC, who actually have the disease.

False negative: Those with negative result on FNAC but positive on histopathology, who actually have the disease.

Specificity: The portion of the patients with non malignant thyroid disease and positive cytological diagnosis calculated by

$$\text{Specificity (\%)} = \frac{\text{True Negative}}{\text{True Negative} + \text{False Positive}} \times 100$$

True negative: Those with non malignant thyroid disease on FNAC, who do not actually have the malignant disease on histopathology.

False positive: Those with positive for malignant thyroid disease on FNAC, who do not actually have the malignant disease on histopathology.

Accuracy: The proportion of the correct results true positive and true negative in relation to all cases studied, calculated by

$$\frac{\text{True Positive} + \text{True Negative}}{\text{True Positive} + \text{False Positive} + \text{True Negative} + \text{False Negative}} \times 100$$

Positive Predictive Value (PPV): The probability of having malignant thyroid disease following a positive FNAC finding. It is calculated by

$$\text{PPV (\%)} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Positive}} \times 100$$

Negative Predictive Value (NPV): The probability of not having malignant thyroid disease following negative FNAC findings. It is calculated by

$$\text{NPV (\%)} = \frac{\text{True Negative}}{\text{True Negative} + \text{False Negative}} \times 100$$

Observation and Results

Out of 90 patients with thyroid swelling, most of the patients were between 21 to 40 years age group (60%). Mean age 37.70,

(SD±10.05) years. Lower limit of age was 18 years and the highest age was 60 years. Mean age of male 42.15, (SD ±10.60) years and in female mean age 33.25 (SD ± 9.50) years. In female, thyroid swelling was common in 3rd and 4th decades and in case of male it was in 4th, 5th and 6th decades. Twenty six (28.88%) male and sixty four (71.12%) female. Representing Male: Female ratio 1:2.46. All the patients presented with thyroid swelling ninety (100%), some patients also presented with other symptoms like cervical lymphadenopathy in five (5.55%) cases, dyspnoea two (2.22%) due to pressure effect by huge thyroid swelling, two (2.22%), hoarseness of voice due to involvement of recurrent laryngeal nerve. The shortest duration of thyroid swelling in this series was 1 year and longest duration was 16 years. Maximum patients of this series were presented between 1 to 2 years which was thirty four (37.78%). Fourteen (73.69%) out of nineteen thyroid malignancies presented within 1-2 years, four (21.05%) presented within 2-4 years and one (5.26%) presented within 6-8 years. Short duration of thyroid swelling associated with malignancy but long duration does not exclude malignancy. Right lobe is more affected in this series but the reason cannot be explained. Most of the thyroid swelling were firm seventy (77.77%), others were hard fourteen (15.55%), cystic three (3.34%) and firm to hard three (3.34%). Malignant lesions were most common in hard (15.55%) thyroid swelling. Fourty eight (53.33%) cases were clinically solitary thyroid nodule, twenty nine (32.22%) were clinically multinodular goiter and thirteen (14.45%) were clinically malignant.

Table-Ia
FNAC diagnosis of thyroid swelling (n = 90).

| Diagnosis | | No of patients | Percentage (%) |
|----------------|-------------------|----------------|----------------|
| Non neoplastic | | 71 | 78.88 |
| Neoplastic | Follicular lesion | 3 | 3.34 |
| | Carcinoma | 16 | 17.78 |
| Total | | 90 | 100 |

In this series of 90 thyroid swelling on FNAC shows seventy one (78.88%) non neoplastic and nineteen (21.12%) neoplastic.

Table-Ib
FNAC diagnosis of non neoplastic thyroid swelling (n=71).

| Diagnosis | | No of patients | Percentage (%) |
|----------------|---------------------|----------------|----------------|
| Non neoplastic | Nodular goitre | 47 | 52.22 |
| | Multinodular goitre | 20 | 22.22 |
| | Thyroiditis | 03 | 3.33 |
| | Adenomatus goitre | 01 | 1.11 |
| Total | | 71 | 78.88 |

Among non neoplastic thyroid swelling, nodular goitre was common forty seven (52.23%), followed by multinodular goitre which was twenty (22.22%).

Table-Ic
FNAC diagnosis of neoplastic thyroid swelling (n = 19).

| Diagnosis | | No of patients | Percentage (%) |
|------------|---|----------------|----------------|
| Neoplastic | Follicular lesion | 03 | 3.33 |
| | Papillary carcinoma | 14 | 15.56 |
| | Follicular variant of papillary carcinoma | 01 | 1.11 |
| | Highly suspicious for malignancy | 01 | 1.11 |
| Total | | 19 | 21.11 |

In neoplastic thyroid swelling papillary carcinoma was most common fourteen (15.56%) followed by follicular lesion which was three (3.33%). Highly suspicious for malignant one on FNAC was papillary carcinoma on histopathology.

90 cases underwent some form of thyroid surgery. right hemithyroidectomy was done

in twenty six (28.88%), left hemithyroidectomy was done seventeen (18.88%), sub total thyroidectomy twenty four (26.67%), total thyroidectomy twelve (13.34%), completion thyroidectomy six (6.67%) and total thyroidectomy with modified neck dissection five (5.56%).

Table-IIa*Histopathological (histopathology) diagnosis of thyroid swelling (n=90).*

| Diagnosis | | No of patients | Percentage (%) |
|----------------|--------------------|----------------|----------------|
| Non neoplastic | | 68 | 75.56 |
| Neoplastic | Follicular adenoma | 3 | 3.33 |
| | Carcinoma | 19 | 21.11 |
| Total | | 90 | 100 |

Ninety cases of thyroid swelling after histopathology sixty eight (75.56%) were non neoplastic and twenty two (24.44%) were Neoplastic.

Table-IIb*Histopathological diagnosis of non neoplastic thyroid swelling (n=68).*

| Diagnosis | | No of patient | Percentage (%) |
|----------------|---------------------|---------------|----------------|
| Non neoplastic | Multinodular goiter | 44 | 48.89 |
| | Nodular goiter | 22 | 24.45 |
| | Thyroiditis | 02 | 2.22 |
| Total | | 68 | 75.56 |

Among 68 cases of non neoplastic thyroid swelling multinodular goiter was forty four (48.89%) followed by nodular goiter twenty two (24.45%).

Table-IIc*Histopathological diagnosis of neoplastic thyroid swelling (n=22).*

| Diagnosis | | | No of patient | Percentage (%) |
|------------|--------|---|---------------------|----------------|
| Neoplastic | Benign | Follicular adenoma | 03 | 3.33 |
| | | Malignant | Papillary carcinoma | 14 |
| | | Follicular variant of papillary carcinoma | 04 | 4.44 |
| | | Follicular carcinoma | 01 | 1.11 |
| Total | | | 22 | 24.44 |

In 22 cases of neoplastic thyroid swelling papillary carcinoma was most common fourteen (15.56%) followed by follicular variant

of papillary carcinoma which was four (4.44%) and then follicular adenoma which was three (3.33%).

Table-III

Variation of diagnosis of malignancy between FNAC and histopathology in thyroid swelling.

| Diagnosis | FNAC | Histopathology |
|---|----------------|----------------|
| Papillary carcinoma | 13 | 14 |
| Follicular variant of papillary carcinoma | 01 | 04 |
| Follicular carcinoma | Not conclusive | 01 |
| Total | 14 | 19 |

Table-III shows, the disparity of diagnosis of malignancy in thyroid swelling by FNAC and histopathology. Histopathology diagnosis is the final diagnosis. FNAC diagnosis were correct for 14 cases out of 19 malignancies. The difference between histopathology diagnosis and FNAC is statistically significant ($z=7.5$, $p<0.001$).

One case was false positively diagnosed by FNAC as papillary carcinoma which was actually nodular goitre on histopathology, similarly three follicular variant of papillary carcinoma was false negatively diagnosed by FNAC as nodular goitre which was actually malignant on histopathology.

Out of nineteen malignant cases papillary carcinoma was the most common fourteen (73.69%). Among nineteen malignant cases of thyroid swelling male were eight (42.11%) and female were eleven (57.99%) and male female ratio was 1:1.37.

Out of nineteen malignant cases, maximum cases of papillary carcinomas in the 4th decade.

Table-IV

The accuracy of diagnostic test of FNAC in thyroid swelling (n=90)

| Tests | Malignant | Benign |
|---------------|-------------------------|-------------------------|
| Positive test | a) True positive 14 | b) False positive 02 |
| Negative test | c) False negative 05 | c) True negative 71 |

Positive means positive for malignancy, negative means negative for malignancy. In our series ninety cases underwent preoperative FNAC and postoperative histopathology. By comparing the results of FNAC and histopathology we found fourteen cases were (a) true positive, two cases (b) false positive, five cases (c) false negative and seventy one cases (d) true negative.

Discussion:

Carcinoma of the thyroid is the most common malignancy of endocrine system comprises 0.6% and 1.6% of all cases of malignant neoplasm in men and women respectively (Aravindan, 2006). Among them the differentiated tumours (papillary and follicular) are surgically treatable and have a good prognosis. The incidence of this malignancy has increasing over the last decade. The incidence of malignancy within clinically solitary thyroid nodule is approximately 10-20% (Watkinson, 2000).

In this series 90 patients with thyroid swelling were evaluated clinically by taking detail history, examination, FNAC and postoperative histopathology. In our series, mean age of male patient was 42.15 (SD \pm 10.60) years and in female 33.25 (SD \pm 9.50) years and in combined male and female mean age 37.70, (SD \pm 10.05) years. Starvic GD, et al., 1980, in a study showed that mean age was 32.35 (SD \pm 5.6) years. With statistical analysis there was significant difference between the mean age of two studies ($z=4.69$, $p < 0.05$) due to small number of patients and wide variation of age in our series. Highest number of patients were found in third and fourth decade which did not differ with our study.

The youngest patients of our series was a girl of 18 years, a case of papillary carcinoma, the oldest patient of our series was a man of 60 years, a case of follicular variant of papillary carcinoma. Thus youngest and oldest patient

of our series have been suffering from malignant disease. Out of 90 cases twenty six (28.88%) were male and sixty four (71.12%) were female and male : female ratio was 1:2.46. Similar sex distribution (1:2.85) supported by (Sattar MA, 2003).

In our series detailed history was taken and clinical evaluation was done for every cases. All the 90 patients presented to us with a complain of swelling at thyroid region. Most of the patients were asymptomatic at the time of presentation. Other presenting features were metastatic cervical lymphadenopathy five (5.55%) out of 90 cases, two (2.22%) presented with dyspnoea (due to pressure by huge thyroid swelling) and two (2.22%) presented with change of voice (due to right vocal cord palsy).

Regarding the duration of thyroid swelling, maximum thirty four (37.78%) out of 90 presented to us in our series with the duration of 1-2 years. Shortest duration of thyroid swelling was 1 year and longest duration was 16 years. Most of the malignancies 14 out of 19 were found in thyroid swelling of 1-2 years duration, 4 were found in 2-4 years duration and 1 was found in 6-8 years of duration. Short duration of thyroid swelling usually associated with malignancy. Long duration of thyroid swelling does not exclude malignancy (Sattar MA 2003). On clinical evaluations of site of involvement of thyroid swelling in our series it was found more on the right lobe which was thirty seven (41.11%), followed by twenty five (27.77%) involved the left lobe and twenty one (23.34%) involved both lobe. It was our observation that right lobe was more involved, but why more? Cannot be explained.

Most of the thyroid swelling on clinical palpation were firm seventy (77.77%) out of 90, hard were fourteen (15.55%), firm to hard three (3.34%) and three (3.34%) were cystic. Thirteen (14.45%) out of 14 clinically hard nodule were malignant and one (1.11%) was

diagnosed as Riedel's thyroiditis by histopathology. Our study was compared with the study of "Sattar MA 2003" on the point of duration of swelling, consistency and site of involvement. Regarding the site of involvement our study was compared with the study of Sattar M.A 2003 and there was no significant difference observed between the two studies ($Z = 1.34, P >.05$). Majority of the thyroid swelling were firm in the above two study and there was no significant difference observed between the two ($Z = 1.28, P >.05$). On the point of duration of swelling majority of the swelling of our study was 1-2 years duration, which was also compared with the study of (Sattar MA 2003) and there was no significant difference observed ($Z = 1.56, P >.05$) on statistical analysis.

In our study preoperative FNAC was done for 90 cases. Out of 90 FNAC of thyroid swelling, FNAC diagnosis of thyroid swelling, seventy one (78.88%) were nonneoplastic, nineteen (21.11%) were neoplastic. Out of 19, fourteen (15.56%) were papillary carcinoma, three (3.33%) were follicular lesion and one (1.11%) was highly suspicious for malignancy (which was found papillary carcinoma on histopathology) and one (1.11%) was follicular variant of papillary carcinoma. histopathology was done for every resected specimen of thyroid. histopathology diagnosis regarded as final diagnosis. On histopathology out of 90, nineteen (21.11%) were found malignant, seventy one (78.88%) were found non malignant (means non-neoplastic plus benign neoplastic) of which sixty eight (75.56%) were non neoplastic and three (3.33%) were follicular adenoma. Out of 19 thyroid malignancy 11 were female and 8 were male and male: female ratio of thyroid malignancy in our series was 1:1.37. On comparing the result of FNAC and histopathology we found fourteen (15.56%) out of 90 were true positive for malignancy (both FNAC and

histopathology results were positive for malignancy), two were false positive (which was positive for malignancy on FNAC but was non neoplastic on histopathology), five were false negative (which was non neoplastic on FNAC but were malignant on paraffin section) and seventy one were true negative (where the results of FNAC and histopathology both were negative for malignancy), three (3.34%) follicular lesion on FNAC of which one was follicular adenoma on histopathology and other two were nodular goitre. The chances of malignancy in thyroid swelling of our study nineteen (21.11%). Firat M, 2002 showed in a study chances of malignancy in thyroid nodule was 6%. Statistically there was significant difference between the two studies ($z=7.65$, $P<0.001$). May be due to our study were more on cold, solid thyroid swelling.

The sensitivity of FNAC in our study 73.68%, specificity 97.26% and the accuracy of our test 94.44%. The sensitivity and specificity of our study compared with the study of (Bajaj Y, 2006) and there was no significant difference observed ($z =1.65$, $p > 0.05$) between these two studies. The accuracy of our test compared with the study of (Hee Nee Pang 2007) and there was no significant difference found ($z =1.41$, $p > 0.05$) on statistical analysis. In our study false negative FNAC five (5.55%), false positive FNAC two (2.22%). Our false negative and false positive results were compared with study of (Thomas V, McCaffry 2000). Regarding the false positive results there was no significant difference observed between these two studies ($z= 1.71$, $p >0.05$). But significant difference observed between false negative results of these two studies ($z = 2.58$, $p < 0.05$). Both false positive and false negative results obtained from our study.

Conclusion:

In our series, out of 90 patients with thyroid swelling, false negative FNAC were five

(5.55%) cases and false positive FNAC were two (2.22%) cases, on comparing the results of FNAC with histopathology. Only FNAC is not conclusive, rather it can help the surgeon to select the patients for subsequent management of thyroid swelling. Negative FNAC does not exclude malignancy. False positive FNAC can misguide the surgeon for over treatment. So, both false positive and false negative results may be an outcome of FNAC.

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