FNA Diagnostic Value in Patients with Neck Masses in Two Teaching Hospitals in Iran

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Abstract- The FNA (fine needle aspiration) procedure is simple, inexpensive, available and a safe method for the diagnosis of a neck mass. FNA has numerous advantages over open surgical biopsies as an initial diagnostic tool; therefore we decided to compare the accuracy of this method with open biopsy. This Retrospective as well as Descriptive study comparing preoperative FNA results with existing data in the Pathology Department in Bu-Ali and Amir Alam Hospitals. Our study included 100 patients with neck masses of which 22 were thyroid masses, 31 were salivary gland masses, and 47 were other masses. Age ranged from 3 years to 80 years with the mean age of 42.6 years. There were 59 men and 41 women. The Sensitivity was 72%, Specificity 87%, PPV 85%, NPV 75% and diagnostic Accuracy 79%. In this study we had also26% false negative and 15% false positive. FNA is a valuable diagnostic tool in the management of neck masses; also it has been used for staging and planning of treatment for the wide and metastatic malignancy. This technique reduces the need for more invasive and costly procedures. According to the high sensitivity and high accuracy in this study, FNA can be used as the first step of diagnoses test in neck masses.

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Introduction

The FNA (fine needle aspiration) procedure is simple, inexpensive, available and a safe diagnostic method of finding a neck mass. Also, FNA offers a well tolerated method of obtaining a neck biopsy. When the patient is first seen in the clinic, FNA can be performed; the results are promptly read and appropriate management may then be instituted (1). FNA has numerous advantages over open surgical biopsies as an initial diagnostic tool. First and foremost, FNA is a quick and simple procedure that can be performed in a clinic setting without waiting for operating room time. The costs are much lower than obtaining an operating room time and having the patient anesthesized for the biopsy. Open biopsy has potential complications of infection , bleeding, risks related to anesthesia, scarring and cranial nerve injury. Although there are certain reports indicating the complications of FNA such as ecchymosis, hematoma, a draining sinus tract, tumour tracking and pneumothorax; these complications are deemed rare (2). FNA has various limitations mentioned as follow: 1) A lesion may not necessarily be homogenous and FNA samples may only reflect a small portion of the mass. Thus, needle biopsy may miss the true lesion in a bloody necrotic or fibrotic mass. 2) The most important of thyroid cytology lies in distinguishing between the differential diagnostics of cellular follicular lesions. It is especially difficult to differentiate benign from malignant follicular neoplasm by cytologic evaluation (2,3). FNA requires a close relationship between the clinician and cytopathologist. Often the cytopathologist performs the procedure to enable an immediate examination of the quality of the sample and also to make a preliminary diagnosis. The clinician should always give a detailed history and assist the cytopathologist if possible in palpating the lesion before the FNA procedure (2).

Histologic diagnosis remains the gold standard in distinguishing the etiology of neck masses and ruling out malignant disease. We therefore performed a study to determine this value among Iranian patients with neck masses.

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Materials and Methods

A retrospective review was performed from cytopathology records of all FNAs of head and neck performed in patients referred to Bu-Ali and Amir Alam hospitals (two referral teaching Hospital in Tehran, Iran). The study protocol was approved by institutional review board of Tehran university of medical sciences.

One hundred existing data records of head and neck FNA from 1997 to 2007 in Bu-Ali and Amir Alam hospitals were evaluated. A questionnaire included personal data (sex, age), moreover the location of mass, its type and the result of FNA and surgical biopsy within classification.

The FNA results were divided as follows: Group1: inadequate or non-diagnostic, Group2: Benign tissue, Group3: malignant tissue. The surgical biopsy results were divided as follows: Group1: non-neoplastic, Group2: benign neoplasm, Group3: malignant neoplasm. The values of sensitivity (SN), specificity (SP), Positive Predictive Value (PPV), Negative Predictive Value (NPV) and diagnostic accuracy were calculated for FNA using formulae below:

Sensitivity= TP/TP+FN

Specificity = TN/TN+FP

PPV= TP/TP+FP

NPV= TN/TN+FN

Accuracy= TP+TN/TP+TN+FN+FP

TP: True Positive; TN: True Negative; FP: False Positive; FN: False Negative

All collected data from the questionnaire was analyzed using SPSS version 11.5 (SPSS Inc., Chiago, USA).

Results

We found that among 100 neck masses, 22 were thyroid, 31 were salivary gland masses, and 47 were other types of masses. Age ranged from 3 to 80 years with the mean age of 42.6 years. Among the patient population, there were 59 men and 41 women.

The results of surgical biopsies were as follow: Group1:non-neoplastic (n=33), Group2: benign neoplasm (n=19), Group3: malignant neoplasm (n=48).

Twenty-four FNAs were diagnosed as "non-diagnostic, inadequate". Forty-three FNAs were categorized as benign, while thirty-three FNAs were categorized as malignant or highly suspicious for malignancy. The histological results of the above groups were shown in table 1, 2, 3, respectively.

Table 1. Histopathological diagnoses of 'non-diagnostic' FNA

Diagnosis	No.
Benign	
Inflammatory process	6
Paraganglioma	2
Fistula	1
Schwannoma	1
Nodular goiter	5
Total	15
Malignant	
SCC	2
Medullary thyroid carcinoma	1
Undifferentiated carcinoma	1
Mucoepidermiod carcinoma	1
Metastatic carcinoma	1
Lymphoma	1
Hodgkin	2
Total	9

Table 4 shows the cytological diagnoses in relation to the final histological examination: 43% benign, 8% suspected, 25% malignant and 24 % inadequate.

The complete sensitivity of FNA was 72%, specificity was 87%, the PPV for malignancy was 85%, the NPV for malignancy was 75% and diagnostic accuracy was 79%. There were 11 false negative, with a false-negative proportion of 26%, and 5 false positive, with the false-positive proportion of 15%.

Table 2. Histopathological diagnoses of 'non-specific benign tissue' FNA

Diagnosis	No.
Benign	
Inflammatory process	7
Nudolar goiter	10
Mixed tumor	12
Schwannoma	1
Fibrolipomatous hamartoma	1
Follicular adenoma	1
Total	32
Malignant	
SCC	2
Papillary carcinoma	2
Metastatic carcinoma	2
Acinic cell carcinoma	1
Lymphoma	3
Hodgkin	1
Total	11

Table 3. Histopathological diagnoses of 'malignant tissue' FNA

Diagnosis	No.
Benign*	
Inflammatory process	2
Nodular goiter	1
Mixed tumor	2
Total	5
Malignant	
Papillary carcinoma	2
Medullary carcinoma	1
Mucoepidermoid carcinoma	2
Adenoid cystic carcinoma	4
Acinic cell carcinoma	1
SCC	7
Adenocarcinoma	1
Undifferentiated carcinoma	2
Hodgkin	1
Lymphoma	7
Total	28

* Showed benign (false positive) data was belonged to thyroid lesion.

Discussion

FNA is a valuable diagnostic tool in the management of neck masses; it has also been used for staging disease and planning treatment for various metastatic malignancies. The technique reduces the need for more invasive and costly procedures (2).

Fine needle aspiration biopsy has been generally accepted as a rapid, accurate and inexpensive means of evaluating neck masses and is currently in widespread use, especially for diagnosing malignancy (4).

FNA may also allow for better planning for surgical resections and avoid disturbing surgical planes preoperatively.

Often a preliminary diagnosis can be made by the cytopathologist at the time of FNA, thus reassuring the patients early and decreasing anxiety (2).

According to our study, we found 24 non-diagnostic and inadequate cases which compared with a similar study by G. Sangalli *et al*. in 5469 cases (2-31% non-diagnostic) where patients were in the same range as our study (5). The majority of inadequate aspirates in our cases were due to a non-representative sample material. Of all 43 FNAs that showed "non-specific benign tissue", 11 came from malignant tumours and 32 of those again came from benign tissue in pathology reports. Likewise in the study of Christopher G. Que Hee *et al.* (1995-1999), 28 cases out of 169 were benign FNAs of which 11 came from malignant tissue whereas 17 samples came from benign tissue. These results show that our false-negative (26%) is less than the Christopher G. Que (39%) study (6). The proportion of false-negative diagnoses depends on the success in the rate of detection of malignant lesion and on the management of the technique of aspiration.

Table 4. Histological correlation of 100 FNAs

Pathology	FNA			
	Benign	Highly suspicious for malignancy	Malignant	Inadequate or non-diagnostic
Benign	32	2	3	15
Malignant	11	6	22	9
Total	43	8	25	24

Table 5. Reported values of sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) obtained from previous series

Series	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Present Study; 2007	72	87	85	75
Cap, *et al*; 1999	86	74	34	97
Ellison *et al*; 1999	97	98	98	-
Baloch, *et al*; 1998	92	84	73.3	98.7
Hamming, *et al*; 1998	67	99	96	88
Leonand, *et al*; 1997	88	78	46	97

In the study by G. Sangalli *et al*. a series of 5469 lesions have been followed for more than 20 years. There were 66 false-negative findings where the main cause of diagnostic error (24 cases) was failure to recognize the follicular variant of papillary carcinoma. Also, this study reported a false positive proportion of 0.2%; which is significantly lower than the value we found in our study. This difference can be related to our study's sample size. The rates of sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) differ considerably among various series (Table 5) (7-10).

It is accepted that the accuracy of FNA depends on the specimen sample and on the person analysing the slide. The experience of the pathologist is also important for the accuracy of any FNA.

In the present study FNA demonstrated good sensitivity and specificity for diagnosing the neck masses malignancy compared to the similar studies.

Based on our results and those from the other studies on FNA, we recommend FNA as a diagnostic method for neck masses because of the method's simplicity, cheapness and safety.

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