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Pathology

Diagnostic Accuracy of Fine Needle Aspiration Cytology in the Diagnosis of Head and Neck Lesions in Comparison to Histopathology

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Abstract: The head and neck region encompasses a wide range of lesions especially of thyroid, lymph nodes and salivary glands with a variety of differential diagnosis ranging from inflammatory to neoplastic. They account for almost one half of all body sites aspirated. To make an accurate and effective surgical intervention, it is essential to make a pre-operative assessment of the nature of these lesions. The primary objective of the study was to assess the spectrum of head and neck masses and to determine the accuracy of FNAC in detection of various lesions in a tertiary care centre of India. The present study included 100 cases of head and neck swellings that had undergone preoperative FNAC and subsequently histopathological examination were included in the study. In our study, efficacy of FNAC in the diagnosis of various thyroidal and non-thyroidal lesions of the head and neck were obtained. Overall sensitivity, specificity and diagnostic accuracy rate of 89.27%, 99.25% and 88.66% were achieved. FNAC is recommended as a safe and reliable technique in diagnosis of thyroid and non-thyroidal head and neck lesions. It is a quick, convenient procedure and should be considered as a first line investigation in evaluation of the lesions of head and neck.
Keywords: FNAC, Histopathology, HNF.

INTRODUCTION

Fine needle aspiration cytology (FNAC) with its minimally invasive procedure has been helpful in the diagnosis of various swellings [1]. FNA for cytologic evaluation of a neck mass was first reported by Kun in 1847. However, the procedure did not gain wide acceptance in medicine at that time. In the 1930s, Memorial Sloan Kettering rediscovered the utility of needle biopsy of head and neck masses.

The use of large-bore needles at that time led to frequent complications, one of which was occasional seeding of the tumor along the biopsy tract [2]. The frequent morbidity associated with this procedure prevented widespread acceptance of this technique in other centers of America. A resurgence of FNA occurred in the 1950s, led by physicians in Sweden. FNA was commonly used for cytologic examination of metastatic lesions in the neck with excellent results. Since then, FNA of solitary neck masses has become a well-accepted, safe, and cost-effective procedure in the diagnosis of neck masses.

FNAC is of relevance as it is safe, inexpensive procedure with a quick result and an excellent patient compliance [3]. The head and neck region encompasses a wide range of lesions especially of thyroid, lymph nodes and salivary glands with a variety of differential diagnosis ranging from inflammatory to neoplastic. They account for almost one half of all body sites aspirated. To make an accurate and effective surgical intervention, it is essential to make a pre-operative assessment of the nature of these lesions [4].

The primary objective of the study was to assess the spectrum of head and neck masses and to determine the accuracy of FNAC in detection of various lesions in a tertiary care centre of India.

MATERIALS & METHODS

Study design

This is an Observational and Retrospective study.

Study setup

This study is conducted at Department of Pathology of a tertiary care centre.

Study duration

The duration of study was three years; January-2015 to December-2017.

Sampling

Purposive sampling technique is used for selection of desired samples according to inclusion criterion.

Sample size

100 subjects were recruited for the study after fulfilling inclusion criteria.

Inclusion criteria

The present study included 100 cases of head and neck swellings that had undergone preoperative FNAC and subsequently histopathological examination were included in the study.

Exclusion criteria

Uncoperative patients or patients who refused to give consent were excluded from the study.

Methods

Demographic characters like age, sex, height, weight of all subjects were noted. FNAC was carried out using 20ml disposable syringe with 23-25 gauze needle attached. Smears were prepared and routinely stained with Papanicalaou (PAP) / Haemotoxylin and Eosin (Hand E) and May Grunewald Gimesa (MGG) stains. Special stains like Ziehl Neelson (ZN) stain and Periodic Acid Schiff (PAS) stains were used wherever required. The surgical specimen were fixed in 10% neutral formalin and subjected to gross examination, processing, paraffin embedding, and section cutting, staining by H&E and mounting by DPX. The cytomorphological features of various diseases were studied. FNAC and HPE of the same lesion were correlated.

Ethical consideration

Prior to conduct of the present study, the protocol of the study was submitted to ethical and scientific committee of hospital. After getting due approval from these two committees, the present study was initiated. Also prior to conduct of study related procedure/investigation, a voluntary written informed consent was taken from the patient /legally acceptable representative.

Statistical technique

The demographic data of 100 subjects was analysed by statistical software, SPSS version 17.0. Continuous variables were compared with same parameters measured using two tailed paired t test with a p value of <0.05 being considered as significant.

Financial input and funding: The patient underwent procedures as per protocol laid down by our institution for management of such patients. Hence there was no financial burden on patient or institution. This project was not funded by any of pharmaceutical/diagnostic industry.

RESULTS

Age of the patients ranged from 8-80 years with a median age of 44 years. Maximum numbers of lesions were observed in the age group 20-30 years including the malignant lesions. Overall there was a female predominance with a M:F ratio of 1:1.3. The maximum difference was in the thyroid lesions with a M:F ratio of 1:2 followed by salivary glands 1:1.4. However, in Lymph nodes there was a male dominance with a ratio of 1.5:1.

A total of 218 FNACs of various thyroid and non thyroid lesions of head and neck were obtained in a period of 3 years between January-2015 to December-2017. In 100 patients, HPE was performed which comprised 45 (45%) cases of lymph nodes (anterior cervical, posterior cervical submental, submandibular and supraclavicular) 35 (35%) cases of thyroid, 16 (16%) cases of salivary gland (8 parotid, 4 submandibular and 4 minor salivary glands) and miscellaneous included 4 (4%) case of soft tissue swellings over the occipital region. The FNAC and HPE comparison were made among them (Table 1).

Table-1: Cyto-Histological Correlation of Lymph Nodes

FNAC Reports (n)	Histopathological Report (n)	Accuracy Rate
Reactive (n=18)	Reactive (n=15) Non Hodgkins Lymphoma (n=3)	77.8% (4 False negative for malignancy)
Tuberculosis(n=17)	Tuberculosis(n=17)	100%
Metastatic Adenocarcinoma (n=4)	Metastatic Adenocarcinoma(n=4)	100%
Hodgkin Lymphoma(n=3)	Hodgkin Lymphoma(n=3)	100%
Non Hodgkin Lymphoma(n=3)	NonHodgkin Lymphoma(n=2) Reactive (n=1)	66% (1 False positive for malignancy)

Among lymph nodes, the final diagnosis were reactive lymphadenitis (18), Tuberculosis (17), metastatic adenocarcinoma (4), Hodgkin Lymphoma (3) and Non Hodgkins Lymphoma (3) with a sensitivity,

specificity and accuracy rate of 83.7%, 97% and 88% respectively (Table 5).

Table-2: Cyto-Histological Correlation of Thyroid

FNAC Reports (n)	Histopathological Report (n)	Accuracy Rate
Colloid Goitre (n=10)	Colloid Goitre (n=10)	100%
Benign Cystic Lesions(n=4)	Colloid Goitre with cystic changes (n=2) Papillary carcinoma (n=2)	50% (1False negative for malignancy)
Papillary carcinoma (n=3)	Papillary carcinoma (n=3)	100%
Follicular Neoplasm (n=11)	Follicular Adenoma (n=8) Follicular carcinoma (n=3)	100%
Hashimoto Thyroiditis(n=6)	Hashimoto Thyroiditis (n=6)	100%
Lymphocytic Thyroiditis(n=1)	Lymphocytic Thyroiditis(n=1)	100%

Following FNAC and HPE the final diagnosis of thyroid swellings were nodular colloid goitre (10), colloid goitre with cystic changes (2), hashimoto thyroiditis (6), papillary carcinoma (5) and follicular Neoplasm (11) with overall sensitivity, specificity and acccuracy rate of 95.4%, 100% and 92.65% respectively. (Table 2,5)

Table-3: Cyto-Histological Correlation of Salivary Glands

FNAC Reports (n)	Histopathological Report (n)	Accuracy Rate
Chronic sialadenitis (n=6)	Chronic sialadenitis (n=6)	100%
Pleomorphic adenoma(n=5)	Pleomorphic adenoma(n=5)	100%
Benign cystic lesion(n=3)	Warthin's Tumor (n=2) Chronic sialadenitis (n=1)	0%
Mucoepidermoid carcinoma(n=2)	Mucoepidermoid carcinoma(n=2)	100%

Similarly, chronic sialdenitis (7) were the commonest lesion in salivary glands followed by pleomorphic adenoma (5), warthin's tumor (2) and mucoepidermoid carcinoma (2). For the diagnosis of salivary gland lesions the FNAC and HPE was concordant with a sensitivity, specificity and accuracy rate of 78%, 100% and 74% (Table 3).

Table-4: Cyto-Histological Correlation of Soft Tissue Swelling

FNAC Report (n)	Histopathological Report (n)	Accuracy Rate
Lipoma (n=4)	Lipoma (n=4)	100%

Table-5: Sensitivity, Specificity and Diagnostic Accuracy of FNAC in Diagnosis of Head and Neck Lesions in the Study

Organ of Origin	FNAC/HPE	Sensitively	Specificity	Accuracy Rate
Thyroid	35/35	95.4%	100%	92.65%
Lymph Nodes	45/45	83.7%	97%	88%
Salivary Glands	16/16	78%	100%	74%
Miscellaneous	4/4	100%	100%	100%
Total	100/100	89.27%	99.25%	88.66%

DISCUSSION

Evaluation of a patient with a neck mass should always begin with a thorough history, followed by a complete head and neck examination. The entire mucosal surface of the upper aerodigestive tract requires special attention. If the physical examination does not explain the neck mass, a FNA of the neck mass may be performed. Head and neck masses are the common clinical conditions encountered. It is important to assess the conditions properly for the right management protocol as the differential diagnosis of head and neck swellings cover a broad spectrum of diseases.

In our study, efficacy of FNAC in the diagnosis of various thyroidal and non-thyroidal lesions of the head and neck were obtained. Overall sensitivity, specificity and diagnostic accuracy rate of 89.27%, 99.25% and 88.66% were achieved. This is comparable to the various other studies reported. (Table 6) [5-8].

Table-6: Comparison of the Present Study with Other Studies

	Present Study	Tilak *et al*. [5]	Chauhan *et al*. [6]	Tadon *et al*. [7]	Mobley *et al*. [8]
Sensitivity	89.27%	90.9%	93.1%	89.6%	96.6%
Specificity	99.25%	93.2%	100%	96.5%	97.7%
Accuracy rate	88.66%	92.7%	98.4%	93%	94.4%

Fine-needle aspiration (FNA) has several advantages over excisional biopsy. In today's economic environment, cost savings is an important consideration in medicine. FNA is also more convenient for patients and their families. The procedure requires only an office visit with minimal loss of time from work. On the other hand, excisional biopsy often requires time off from work, preoperative blood tests, and often, radiographic and cardiac testing. Furthermore, surgery exposes patients to the risks of anaesthesia, postoperative infection, and the possibility of tumor seeding. A percentage of patients may require overnight admission to the hospital and extra time away from work.

Open biopsy may interfere with further treatment. Incorrectly placed biopsy incisions may make subsequent neck dissection or excision difficult. These complications included compromise of later tumor resection, the necessity for excision of extra skin and adjacent soft tissue, and local recurrence in the neck wound after surgery.

Fine-needle aspiration for head and neck masses has several limitations also. Failure to establish an accurate diagnosis may be because of sampling error. In these circumstances, repeat aspiration is suggested, and excisional biopsy may be considered. Personnel responsible for handling, processing (experienced cytotechnologist), and reading (cytopathologist) FNA samples must be well trained. Interobserver variability must be minimized. The accuracy of FNA varies with report and according to the tissues sampled.

The diagnostic accuracy following aspiration of a cystic mass may be especially suspect because of the potential to aspirate acellular material. Good evidence currently suggests that the best results are achieved when FNA is accomplished using ultrasonographic or CT guidance to improve sampling accuracy. Either modality allows more precise localization of lesions and may facilitate more accurate positioning of the needle to aspirate the capsule in lesions with central necrosis. Accuracy is further enhanced by including a cytologist at the chairside to stain and preview the slides before the procedure is terminated. This also offers the potential to obtain extra material for flow cytometry when a lymphoma is suspected.

If any questions exist regarding interpretation of the aspirate, decisions on further therapy (eg, surgery, radiation, chemotherapy) should be deferred until the mass is accurately diagnosed. Finally, using FNA under the appropriate conditions is important. FNA complements clinical diagnosis and should not be considered a substitute for a thorough history and physical examination.

CONCLUSIONS

FNAC is recommended as a safe and reliable technique in diagnosis of thyroid and non-thyroidal head and neck lesions. It is a quick, convenient procedure and should be considered as a first line investigation in evaluation of the lesions of head and neck.

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