

Original Research Article

Correlation of fine needle aspiration cytology and histopathology of neck swellings

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ABSTRACT

Background: Neck swellings are a common clinical finding affecting all age groups. FNAC is a minimally invasive procedure helpful in the diagnosis of various neck swellings. The purpose of this study is to determine the accuracy of FNAC in the diagnosis of neck swellings by comparing it with the histopathology which is taken as the gold standard.

Methods: A prospective study which included 90 patients who attended ENT and surgery departments of Government Medical College, Trivandrum with neck swellings from July 2006-2007. FNAC of the swelling was done and the FNAC results were compared with the histopathology results. The specificity, sensitivity, positive and negative predictive values and accuracy of FNAC were calculated.

Results: Of the 90 patients, thyroid swelling formed the major group followed by lymph node, salivary gland and miscellaneous swellings. Thyroid swellings had a female predominance while the other three groups namely lymph node, salivary gland and miscellaneous groups showed a male preponderance. When the neck swellings namely thyroid, salivary gland, lymph node and miscellaneous group were taken into consideration as a whole, the sensitivity of FNAC for detecting malignancy was 64.3%. The specificity, positive predictive value, negative predictive value and accuracy were 97.4%, 81.8%, 93.7% and 92% respectively.

Conclusions: FNAC can be rated as a safe, simple, reliable, cost effective and rapid diagnostic tool with high specificity and sensitivity for the initial evaluation of neck swellings.

Keywords: FNAC, Histopathology, Specificity, Sensitivity, Accuracy

INTRODUCTION

Diagnosis of neck swellings has always posed a problem for the otorhinolaryngologist due to extensive differential diagnosis. Extraction of a detailed clinical history and detailed physical examination still remains in the forefront of all investigations. Clinical data serves as a safeguard in the interpretation of the fine needle aspirate and should not bias the pathologist. In this study we have tried to bring out the importance of fine needle aspiration cytology in the diagnosis of neck swellings. Fine needle aspiration cytology for evaluation of a neck mass was first used by Kun in 1847, but failed to gain recognition

and importance in those times.¹ Later, in 1930, Martin and Ellis rediscovered this technique in the diagnosis of various organ lesions.² Over a period of years, FNA biopsy has become established as an accurate, safe, and minimally invasive and cost effective technique and one of the preferred first-line diagnostic tools. It is very useful in differentiating neoplastic from non-neoplastic lesions.³ This concept still remains the primary goal. In cases of suspected local recurrence or nodal metastasis of previously diagnosed and treated cancer, FNAC is of great assistance in making an earlier therapeutic decision without the need for further diagnostic surgery. FNAC of head and neck swellings is a generally well accepted technique with high specificity.⁴

The success of FNAC depends on four fundamental requirements. Samples must be representative of the lesion, samples must be adequate in terms of cells and other tissue components, samples must be correctly smeared and processed and it should be accompanied by relevant and correct clinical information.

Aims

1. Evaluation of FNAC and its correlation with clinical and histopathological findings.
2. To determine the accuracy of FNAC and the extent of false positivity and false negativity.
3. To define the role of FNAC in differentiating between benign and malignant lesions.
4. To assess its importance in malignancy typing.
5. To delineate its utility in the early diagnosis of neck swelling.
6. To study the clinical spectrum of neck masses.

METHODS

This is a prospective study conducted in Government Medical College, Thiruvananthapuram over a period of one year from July 2006-2007 and included ninety patients. Patients with neck swelling attending General Surgery and ENT Departments of Medical College, Thiruvananthapuram during this period were included in this study.

Relevant history was extracted from these patients and a detailed physical examination done. Necessary investigations were done and then data were accurately entered in the proforma made. Then patients were subjected to FNAC of their neck swellings.

FNAC were taken in the cytopathology department of Medical College, Thiruvananthapuram by expert pathologists. The procedure was executed devoid of any anaesthesia with all sterile precautions. A 23 gauge disposable needle attached to a 10cc syringe was used for thyroid and 22 gauge needle for other neck swellings. Three aspiration samples were taken from each swelling and smeared onto microscopy slides. These were immediately wet fixed in the fixative (95% ethyl alcohol) and stained with papanicolaou stain. Patients with non-specific infection of the salivary gland or lymphnodes were given an antibiotic course. Sometimes the swelling disappeared with the antibiotic treatment. But if it persisted, surgical excision was done and the specimen sent for histopathological examination.

If FNAC report was tuberculosis, this was correlated with the biopsy report of the node excised. The patient was then given antituberculosis chemotherapy. If the FNAC report of the enlarged cervical lymph node was a secondary metastasis, the primary was searched for and biopsied. If a neck dissection was required, it was carried out along with the primary surgery. The FNAC diagnosis

of the lymph node was then correlated with the histopathology of the nodes surgically removed.

The data collected were entered into a master sheet and statistical tables were computed to compare different groups and to draw valid conclusions based on the observation. A descriptive statistical analysis was thus done. The diagnostic methods, FNAC and histopathology were compared with each other to see their effectiveness as diagnostic tools. Histopathology was taken as the gold standard. The effectiveness of FNAC was assessed by computing sensitivity, specificity, accuracy, positive predictive value and negative predictive value. For all computations, statistical packages were used. Diagrams and charts were drawn wherever necessary to illustrate the important findings.

RESULTS

Of the 90 patients, thyroid swelling formed the major group. This constituted about 46 patients (51%). Next in line, were lymph node swellings, which constituted 19 patients (21%). Salivary gland swelling constituted 15 patients (17%) and the miscellaneous group 10 patients (11%). The mean age of patients was 38.9 years for thyroid swelling, 44.7 years for salivary gland group, 29.3 years for the lymph node group and 21.8 years for the miscellaneous group. Regarding the sex distribution, out of the 46 cases with thyroid swellings, 43 were females (93.51%) and 3 were males (6.5%) showing a female predominance. In the other three groups there is a slight male preponderance constituting 53.3% in the salivary group, 52.6% in the lymph node group and 70% in the miscellaneous group.

Table 1: Sex distribution of the neck swelling.

Sex	Male (%)	Female (%)
Thyroid	3 (6.5)	43 (93.5)
Lymph node	10 (52.6)	9 (47.4)
Salivary	8 (53.3)	7 (46.76)
Miscellaneous	7 (70)	3 (30)

The clinical diagnosis of thyroid swelling were classified into three group, namely solitary nodule thyroid, multinodular goitre and diffuse thyroid enlargement. Of the 46 cases of thyroid swelling, 23 were clinically detected to be multinodular goitre, which constituted 50%, 18 were solitary nodule thyroid (39.1%) and 5 were diffuse enlargement of the thyroid (10.9%). The clinical diagnosis of salivary gland swelling constituted 6 cases of pleomorphic adenoma (40%) 4 cases of chronic sialadenitis (26.7%) 3 cases of Warthin's tumour (20%) and 2 cases of malignancy (13.3%).

Of the 19 cases of lymph node swellings, about 14 cases (73.76%) were clinically detected as non-specific lymphadenitis which formed the majority. 3 cases were clinically labelled as metastatic lymph nodes i.e. 15.8%

and one each as tuberculous lymphadenitis (5.36%) and lymphangioma (5.3%).

In the miscellaneous group, clinically there were 4 cases each of thyroglossal cyst (40%) and dermoid cyst (40%) and one case each of branchial cyst and lipoma.

Table 2: Distribution of neck swelling according to clinical diagnosis.

Type	Clinical diagnosis	No (%)
Thyroid (n=46)	Multinodular goitre	23 (50)
	Solitary nodule thyroid	18 (39.1)
	Diffuse thyroid enlargement	5 (10.9)
Salivary gland (n=15)	Pleomorphic adenoma	6 (40)
	Chronic sialadenitis	4 (26.7)
	Warthin's tumour	3 (20)
	Malignancy	2 (13)
Lymphnode (n=19)	Non-specific lymphadenitis	14 (73.7)
	Metastatic lymph node	3 (15.8)
	Tuberculous lymphadenitis	1 (5.3)
	Lymphangioma	1 (5.3)
Miscellaneous (n=10)	Thyroglossal cyst	4 (40)
	Dermoid cyst	4 (40)
	Branchial cyst	1 (10)
	Lipoma	1 (10)

FNAC of thyroid swellings showed 38 cases as benign swelling 4 as malignant (8.7%) and 4 cases could not be classified as benign on malignant (8.7%). The benign lesions included nodular goitre (69.6%) and thyroiditis (13%). All the 4 malignant cases detected by FNAC were papillary carcinoma (8.7%). The 4 cases which could not be classified included 3 cases of follicular neoplasm and one case of inconsistent result due to inadequacy of aspirate.

In the salivary gland swellings 14 cases (93.3%) were diagnosed as benign and 1 cases (6.7%) as malignant by FNAC. The major benign lesion detected by FNAC was pleomorphic adenoma which constituted 7 cases (46.7%). The other benign lesions were chronic sialadenitis and Warthin's tumour which constituted 26.7% and 20% respectively. Only a single malignant lesion was detected by FNAC which was a case of mucoepidermoid carcinoma.

FNAC detected 16 benign (84.2%) and 3 malignant cases (15.8%) in the lymph node group. The benign cases included reactive change lymph node (63.2%), tuberculous lymphadenitis (15.8%) and lymphangioma (5.3%). The 3 malignant cases were metastatic lymph nodes (15.8%).

All lesions in the miscellaneous group were diagnosed as benign lesion on histopathology. None of them turned out to be malignant. The lesions were 4 cases of thyroglossal

cyst (40%), 4 case of epidermoid cyst (40%), one case each of branchial cyst (10%) and lipoma (10%).

Table 3: Distribution of neck swelling according to FNAC.

Type	FNAC	No (%)
Thyroid (n=46)	Nodular goitre	32 (69.6)
	Thyroiditis	6 (13)
	Papillary carcinoma	4 (8.7)
	Follicular neoplasm	3 (6.5)
	Inconsistent	1 (2.2)
Salivary gland (n=15)	Pleomorphic adenoma	7 (46.7)
	Chronic sialadenitis	4 (26.7)
	Warthin's tumour	3 (20)
	Mucoepidermoid carcinoma	1 (6.7)
Lymphnode (n=19)	Reactive change LN	12 (63.2)
	Tuberculous lymphadenitis	3 (15.8)
	Metastatic LN	3 (15.8)
	Lymphangioma	1 (5.3)
Miscellaneous (n=10)	Thyroglossal cyst	4 (40)
	Epidermal cyst	4 (40)
	Lipoma	1 (10)
	Branchial cyst	1 (10)

FNAC detected 32 cases (69.6%) as nodular goitre. Of this, 26 cases (56.52%) were confirmed by histopathology as nodular goitre, but 6 cases had a different diagnosis at histopathology. 2 cases (14.3%) turned out to be papillary carcinoma and 4 cases were diagnosed as Hashimoto's thyroiditis. Of 6 cases (13%) detected as thyroiditis, 4 cases (8.7%) correlated with histopathology (8.7%). On histopathology, one was diagnosed as benign diffuse colloid goitre and the other as nodular goitre. Of the 3 cases (6.5%) detected as follicular neoplasm by FNAC, one case was confirmed as a follicular adenoma, one as a follicular variant of papillary carcinoma, and the other as a case of lymphocytic thyroiditis by histopathology. Of the 7 cases (15.2%) of papillary carcinoma detected by histopathology, FNAC could pick up only 4 cases (8.7%).

In the lymph node group, 6 cases (31.6%) were confirmed as tuberculous by histopathology. Of this FNAC could detect only 3 cases ie 15.8%. In other 3 cases of tuberculous lymphadenitis, the FNAC report was reactive change lymph node. Of the 12 cases (63.2%) reported as reactive change lymph node by FNAC, 7 cases (36.8%) were confirmed by histopathology. 5 cases had a different diagnosis by histopathology namely tuberculous lymphadenitis in 3 (15.8%) and lymphoma in 2 (10.5%). 3 cases (15.8%) were diagnosed as metastatic LN by both FNAC and histopathology. One case of lymphangioma was reported as lymphangioma in FNAC.

As far as the salivary gland swellings are concerned, 7 cases (46.7%) turned out to be pleomorphic adenoma by

FNAC of which 6 cases (40%) were confirmed as pleomorphic adenoma by histopathology. One case was diagnosed as chronic sialadenitis by histopathology. Of the 4 cases (26.7%) diagnosed as chronic sialadenitis by FNAC, 3 cases (20%) were confirmed by histopathology one case (6.7%) was diagnosed as well differentiated squamous cell carcinoma by histopathology. All the 3 cases (20%) of Warthin's tumour were diagnosed by both FNAC and histopathology. 1 case (6.7%) was diagnosed as mucoepidermoid carcinoma by both FNAC and histopathology. 1 case (6.7%) detected as squamous cell carcinoma by histopathology was not picked up by FNAC.

All 4 cases (40%) of thyroglossal cyst diagnosed by FNAC were confirmed by histopathology. Of the 4 cases (40%) of epidermal cyst, only 3 cases (30%) were diagnosed by FNAC. But in one case the diagnosis was inconsistent. A single case of lipoma (10%) was diagnosed by both FNAC and HPR. One case (10%) reported as cystic lesion by FNAC was diagnosed to be a branchial cyst by histopathology.

The sensitivity and specificity of FNAC for malignancy in thyroid lesions compared to the gold standard were about 57.1% and 100% respectively. The positive predictive value, negative predictive value and accuracy of FNAC in diagnosing malignancy in thyroid lesions were 100%, 92.9% and 93.5% respectively. This shows that fine-needle aspiration cytology is highly specific test in ruling out malignancy in thyroid lesions.

When the thyroid swellings are taken, there were 4 cases which were true positives and 39 cases which were true negatives for malignancy. There were no false positives and 3 cases were false negatives.

Of the total salivary gland swellings, only one case was true positive for malignancy. 13 cases were true negative for malignancy. There were no false positives and one case came out to be a false negative for malignancy. In diagnosing malignancy among salivary gland lesions, FNAC is a specific test.

Table 4: Statistical indices for malignancy in neck swelling.

	Thyroid (%)	Salivary gland (%)	Lymph node (%)	Neck swellings as a whole (%)
Sensitivity	57.16	50	60	64.3
Specificity	100	100	100	97.4
Positive predictive value	100	100	100	81.8
Negative predictive value	92.90	92.90	87.50	93.7
Accuracy	93.50	93.33	89.50	92.2

For pleomorphic adenoma, 6 cases were true positive, 8 cases were true negative and one case was false positive and there were no false negative cases. FNAC is highly sensitive and specific for detecting pleomorphic adenoma in salivary gland. In our study, FNAC was found to be 100% sensitive and about 88.9% specific for detecting pleomorphic adenoma. The positive predictive value, negative predictive value and accuracy of FNAC for pleomorphic adenoma were 85.7%, 100% and 93.3%.

In our study out of the 15 salivary gland swellings, pleomorphic adenoma constituted the major group (40%) which was confirmed by histopathology.

Only 3 cases of metastatic lymph nodes were there in our study and all the three were positive by both fine-needle aspiration cytology and histopathology.

The miscellaneous lesions included thyroglossal cyst, branchial cyst, epidermal cyst and lipoma. In diagnosing cystic lesions among the miscellaneous lesions, FNAC is highly specific and sensitive. FNAC is very specific in detecting malignancy in neck swellings.

When the neck swellings namely thyroid, salivary gland, lymph node and miscellaneous group is taken into consideration as a whole, the sensitivity of FNAC for

detecting malignancy is 64.3%. The specificity, positive predictive value, negative predictive value and accuracy were 97.4%, 81.8%, 93.7% and 92.2%.

Table 5: Statistical indices for the detection of pleomorphic adenoma and miscellaneous cystic lesions.

	Pleomorphic adenoma (%)	Miscellaneous cystic lesions (%)
Sensitivity	100	88.8
Specificity	88.90	100
Positive predictive value	85.71	100
Negative predictive value	100	50
Accuracy	93.33	90

DISCUSSION

In our study of the cytohistopathological correlation of neck swelling of patients who attended ENT and Surgery Department of Medical College, Thiruvananthapuram during the period July 2006-June 2007, we came across various types of neck swellings. The sample size during this short period was ninety. Both the FNAC and smear

analysis were done in the cytopathology department by expert cytopathologist.

Aspirates from the thyroid constituted 51% of the total cytological material examined. Hence thyroid was the most frequent site where fine-needle aspiration cytology was performed as far as neck swellings were concerned. Next in line was the lymph node swelling which came up to 21% followed by salivary gland swellings about 17%. The remaining miscellaneous group of 11% included neck swellings like thyroglossal cyst, dermoid cyst, branchial cyst and lipoma. Of the thyroid aspirates 93.5% were from female patients. This confirmed the female preponderance of thyroid swellings. The other three groups namely salivary gland, lymph node and miscellaneous showed a male preponderance of 53.3%, 52.6% and 70% respectively.

We categorized the swellings into four groups -thyroid group, salivary gland group, lymph node group and miscellaneous group. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy for malignant lesions were computed for each of these groups. The same statistical analysis was carried out for malignant neck swellings as a whole.

Regarding the thyroid swellings, when a cytohistological correlation was done, it was seen that out of the 32 cases (69.6%) diagnosed as nodular goitre by FNAC, only 26 cases (56.5%) turned out to be histologically positive. Of the other 6 cases, 2 cases (4.3%) turned out to be papillary carcinoma and 4 cases (8.7%) were diagnosed as Hashimotos thyroiditis by histopathology. Of the 10 cases of (21.7%) thyroiditis confirmed by histopathology FNAC could pick up only 4 cases (8.7%). The other 6 cases were wrongly diagnosed by FNAC. One cases as follicular neoplasm by, 4 cases as nodular goitre and one as inconsistent. 6.5% cases were diagnosed as follicular neoplasm by FNAC while histologically one turned out to be follicular adenoma, the second as follicular variant of papillary carcinoma and the third one as lymphocytic thyroiditis. It has been mentioned by many authors about the difficulties to distinguish between the follicular variant of papillary carcinoma and follicular neoplasm by FNAC.⁵⁻¹⁴ This variant of papillary carcinoma has been shown to make up a large proportion of malignancies cytologically reported as follicular neoplasms.^{15,16} Papillary carcinoma could be detected by FNAC only in 4 out of the total 7 cases detected by histopathology. Two of the cases of papillary carcinoma were reported as nodular goitre and one as follicular neoplasm. Papillary carcinoma with degenerative changes and several follicular variants of papillary carcinoma may have macrofollicular areas and yield moderate amounts of colloid on FNAC leading to the misdiagnosis as goitre.

When the diagnostic effectiveness of FNAC in detecting thyroid malignancy was compared with histopathology, there were 4 true positive cases and 30 true negative cases. There were no false positives. But we came across

3 false negative cases. In diagnosing malignancy in thyroid swellings, the sensitivity of FNAC in our study is 57.1% and the specificity is 100%. The positive predictive value turned out to be 100%. The negative predictive value was 92.9% and the accuracy of FNAC in diagnosing malignancy in thyroid swellings was 93.5%.

FNAC could not differentiate between a true follicular adenoma and a follicular malignancy. The cytological reports are hence invariably given as follicular neoplasm. It is only by histology that the vascular and capsular invasion patterns of follicular carcinoma could be made out. About 70-90% follicular neoplasms are detected by cytology and the proportion of carcinoma in lesions detected as follicular neoplasm ranges from 14% to 44%.¹⁷⁻²⁰ But in our study no case of follicular carcinoma was reported.

A comparison of the results obtained in our study was done with other studies. Howlett et al in 2004 conducted a study on 647 patient with neck swelling of whom 276 patient underwent subsequent surgery.²¹ In their study, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC to differentiate benign from malignant disease of thyroid swellings were 62%, 86%, 42%, 93% and 82%.

In comparison, our study revealed a sensitivity of 57.1% and a specificity of 100%. But the positive and negative predictive values in our study were high, positive predictive value of 100% and negative predictive value about 92.9%. The accuracy in our study was about 93.5% for thyroid.

Another study by Cheung et al on thyroid swelling showed a sensitivity, specificity, positive and negative predictive value for fine-needle aspiration cytology of 54%, 100%, 100% and 75% respectively.²²

The incidence of malignancy in solitary nodule thyroid is 10-15%. The sensitivity, specificity, positive predictive value, negative predictive value and, accuracy of FNAC for the detection of malignancy in solitary nodule thyroid in our study was 80%, 92.03%, 80%, 92.3% and 88.9% which showed that FNAC was highly specific as well as sensitive. Our study was comparable with the study conducted by Bajaj et al in which 160 patients with thyroid swelling were included.²³ In their study, the sensitivity, specificity and accuracy of FNAC were 93.18%, 73.14% and 78.94% respectively for predicting malignancy in solitary thyroid nodule.

As far as the lymph node swellings are concerned, 3 cases were true positives and 14 cases true negatives. There were no false positives. There were 2 false negative cases which were diagnosed as reactive change lymph node by FNAC. Both of them were lymphoma on histopathology. Failure to obtain a representative sample was certainly responsible for most of the misdiagnosis.

In our study when metastatic lymph nodes were considered separately, there were no false positives or false negatives. The true positive cases were 3 in number and the true negative cases were 16. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC in our study for metastatic lymph nodes were 100%. In our study sample, there were only 3 metastatic lymph nodes and all the 3 were diagnosed as metastatic lymph node by FNAC and correlated with histopathology.

A study of FNAC on 42 patients with head and neck lymph nodes by Javaid et al showed a sensitivity, specificity, accuracy, positive predictive value and negative predictive value of 95.83%, 94.44%, 95.23%, 95.85% and 94.44% respectively.²⁴

In our study, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 60%, 100%, 100%, 87.5% and 89.5%. But the sensitivity in our study was only 60%. This could be due to the low sample size in our study.

As for the salivary gland swellings were concerned, there was one case each in the true positive and false negative group. There were no false positive cases. The true negative cases were 13 in number. The false negative cases were a rare case of well differentiated squamous cell carcinoma of the parotid gland misdiagnosed as chronic sialadinitis by fine-needle aspiration cytology. This could probably have been a sampling error.

In a study by Howlett et al of the FNAC of 647 patients with neck swellings which constituted salivary gland swellings, the sensitivity, specificity, positive predictive value, negative predictive value accuracy of FNAC in differentiating between benign and malignant salivary gland tumours were 64%, 100%, 100%, 83% and 87%.²¹ The results attained in our study were comparable with this study.

The most common salivary gland which was found to be affected by tumour in our study sample was the parotid gland and the most common benign tumour was pleomorphic adenoma which correlates with the study by Fernandes and Pandit (1993-1998) on 123 patients with salivary swellings.²⁵ In their study the accuracy, sensitivity and specificity of FNAC for diagnosing pleomorphic adenoma was 87.5%, 90.3% and 80% respectively. In our study, FNAC was found to be 100% sensitive and about 88.9% specific for detecting pleomorphic adenoma. The positive predictive value, negative predictive value and accuracy of FNAC for pleomorphic adenoma were 85.7%, 100% and 93.3%.

A retrospective study by Poole et al of the fine-needle aspiration biopsy of 104 cases of salivary gland tumours showed that fine-needle aspiration cytology to be 88.2% sensitive, 98.1% specific and 93.3% accurate for diagnosing

pleomorphic adenoma.²⁶ Our study results for pleomorphic adenoma were comparable with this study.

In the miscellaneous group for the diagnosis of cystic lesions like thyroglossal cyst, branchial cyst and epidermal cyst, the sensitivity, specificity, positive predictive value and negative predictive value and accuracy were 88.9%, 100%, 100%, 50% and 90%.

When the neck swellings namely thyroid, salivary gland, lymph node and miscellaneous group is taken into consideration as a whole, the sensitivity of FNAC for detecting malignancy is 64.3%. The specificity, positive predictive value, negative predictive value and accuracy were 97.4%, 81.8%, 93.7% and 92.2%.

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