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Fine Needle Aspiration Cytology (FNAC) as a Diagnostic Procedure in Palpable Lesions of Head and Neck Region

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Abstract
Objective: *This study is done to analyse the cytomorphological features of different head and neck lesions, classify them and to evaluate diagnostic accuracy and limitation of FNA of head and neck lesions with cyto-histological correlation.*
Material and Methods: *The material consists of 250 cases of palpable lesions of head and neck region. Fine needle aspiration smears were taken and stained with Giemsa, PAP and H&E stains. FNAC results were analysed according to anatomical location and all the lesions were classified into inflammatory and neoplastic pathology. The FNA diagnosis was correlated with available subsequent histopathological diagnosis.*
Results: *Among 250 cases, most of the lesions were from lymph nodes (40.8%) and thyroid (36%). Out of 250 FNAs of head and neck lesions, histopathological evaluation was done in 64 cases (25.6%). The sensitivity of FNAC in this study was found 88% and specificity was 94.8%. The overall diagnostic accuracy found to be 92.1% with positive and negative predictive values of 91.6%, 92.5% respectively.*
Conclusion: *Our study found that FNAC is a simple, quick, inexpensive, and minimally invasive technique to diagnose different types of head and neck swellings. It could differentiate the infective process from neoplastic one and avoids unnecessary surgeries.*

Introduction
Palpable masses of head and neck region are quite common, affecting all age groups. The lumps are worrisome for both, clinicians and patients as the diagnostic spectrum ranges from innocuous inflammation to life threatening malignancies.
FNAC is one of the most valuable tests available in the initial assessment of a patient with palpable mass in Head and Neck region or where a recurrence is suspected after previous treatment[1].

FNAC being simple, reliable, quick, least traumatic and fairly economical, has become a popular outpatient procedure in diagnosing the exact nature of various Head and Neck lesions. FNAC of palpable lesions of Head and Neck region is found to have an accuracy of 80.7-100%[2,3,4,5,6]. However, a close co-operation between the clinician and cytopathologist is essential pre-requisite to arrive at an exact diagnosis.[7]

Nowadays, FNAC has moved to the forefront of the diagnostic tests for the evaluation of palpable masses in Head and Neck region. It has contributed a great deal to transform cytology from a primary screening tool to powerful diagnostic technique thereby reducing the number of cases requiring excision biopsy[8].

Material and Methods

The present study aims at pointing out the diagnostic utility of Fine Needle Aspiration Cytology in palpable lesions of head and neck region. This prospective study was undertaken from March 2013–February 2014 in the department of pathology, J.L.N. Hospital and Research centre Bhilai (Chhattisgarh).

The material consists of 250 cases of palpable lesions of head and neck region- including lesions of lymph nodes, thyroid, salivary gland, and few miscellaneous lesions. The FNA diagnosis was correlated with available subsequent histopathological diagnosis. The patients were selected without any consideration of age, sex. Following cases were excluded from the study:

- Cases presenting with uncorrectable coagulopathies.
- Where there is lack of safe biopsy route.
- Uncooperative patient

A careful thorough history and clinical examination was done in each case. Routine and specific biochemical investigations were carried out as per individual requirements. FNAC was done without any aids of C.T. or ultrasonic guidance.

Procedure- With proper aseptic precaution, the area was cleaned with cotton swab soaked in antiseptic solution. Then the swelling was Immobilized and fixed with one hand and felt for site of aspiration. With the other hand 22-25 gauge needle attached to disposable syringe (10ml) was inserted, in such a way that the needle gets positioned within the swelling. Next, with the application of negative pressure the needle was moved back and forth in different directions within the swelling. After that negative pressure

was released while keeping the needle inside the target tissue. Needle was then withdrawn. Smears were prepared ;few kept air dried for MGG stain, Ziehl- Neelsen stain and others were fixed in 95% alcohol for PAP and H&E stains. Special staining was done whenever required.

Statistical Method

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of Fine needle aspiration cytology were calculated by correlating the results of cytology with histopathology (Gold Standard) on samples which have gone through both tests, by using Galen and Gambino method with following formulas.

1. Sensitivity = TP /TP+FN x100
2. Specificity = TN/TN+FP x 100
3. Positive predictive value = TP/TP + FP x 100
4. Negative predictive value= TN/ TN+FN x100
5. Accuracy = TP +TN/TP+TN+FP+FN x100

Where,

TP (True Positive)= defined as malignant cytological diagnosis from a lesion found to be malignant on histopathology.

TN (True Negative)= defined as benign cytological results from a lesion proved to be benign on histopathology.

FP (False Positive) = defined as a malignant FNA diagnosis which turned out to be benign on histopathology.

FN (False Negative)= defined as benign cytological results from a lesion which turned out to be malignant on histopathology.

p- Value of cytohistopathological association was calculated by using chi-square test.

Observation and Result

The present study was conducted at Pathology Department of Jawaharlal Nehru Hospital and research centre Bhilai. Total 250 cases of palpable lesion of head and neck region were studied. These patients were assessed clinically and FNAC was performed. The accuracy of FNAC was verified by histological examination in 64 cases.

Majority of cases of Fine Needle Aspiration Biopsy performed in the age group of 40-50 yrs.,

followed by 50-60 yrs and least number of cases were seen in age group of > 70 yrs. Out of 250 cases females (60.8) % were outnumbered the males (39.2) % with M:F – 1:1.5 . Most of the lesions were from lymph nodes (40.8%) and thyroid (36%). Those from salivary gland, soft tissue and miscellaneous lesions comprised of 5.2%, 4.8% and 13.2% respectively.
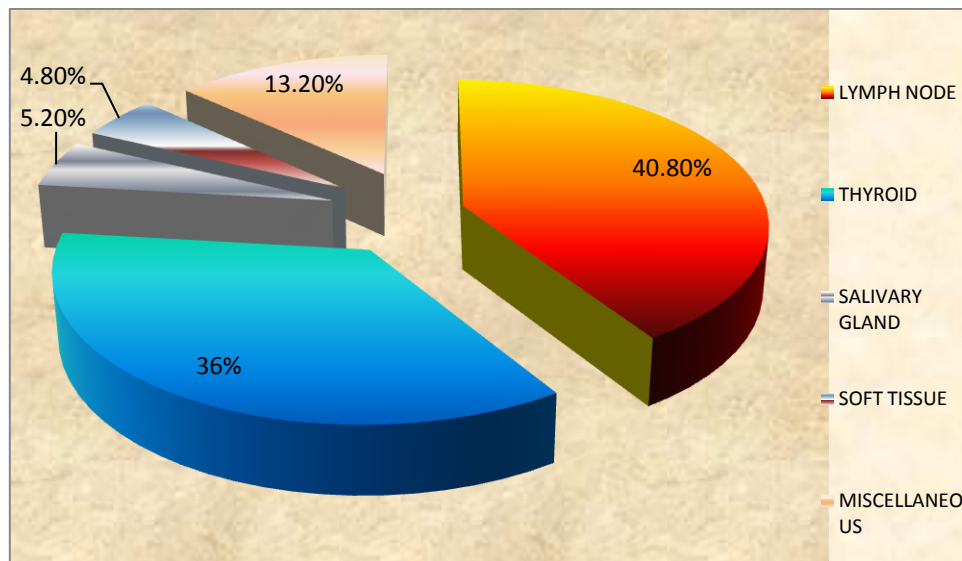
Figure 01: Pie chart showing site wise distribution of cases

Out of 250 FNAs of head and neck lesions, histopathological evaluation was done in 64 cases (25.6%). In lymph nodes, out of 102 cases histological data was available in only 10 cases. In thyroid, salivary gland, soft tissue and miscellaneous cases histological data were available in 29, 07, 04 and 14 cases respectively.

Table -01 Spectrum of FNA of lymph node lesions

S no.	FNAC diagnosis	No of cases (102)	No of cases with surgical biopsy (10)	Concordance (09)	Discordance (1)	Histopathological Diagnosis
1.	Acute Suppurative Lymphadenitis	02	-	-	-	-
2.	Granulomatous Lymphadenitis	26	02	02	-	Granulomatous lymphadenitis-02
3.	Fungal Lymphadenitis	01	-	-	-	-
4.	Reactive lymphadenitis	47	-	-	-	-
5.	Lymphoma	08	04	04	-	NHL-04
6.	Metastasis	17	03	03	-	Metastatic carcinoma-03
7.	Inconclusive	01	01	-	1	Chronic lymphadenitis
	Total	102	10	09	01	

Table 02- Spectrum of FNA of thyroid lesions

Sr no.	FNAC Diagnosis	No. of cases (90)	No. of cases with surgical biopsy (29)	Concordance (25)	Discordance (04)	Histopathological Diagnosis
1.	Cystic lesion(non diagnostic)	01	-	-	-	-
2.	Colloid goitre/Nodular Goitre	48	20	17	03	Colloid Goitre-17 Papillary Carcinoma-03
3.	Lymphocytic Thyroiditis	22	-	-	-	-
4.	Follicular lesion of undetermined significance	01	-	-	-	-
5.	Follicular Neoplasm	05	02	02	-	Follicular Carcinoma-01 Follicular Adenoma-01
6.	Suspicious for malignancy	02	01	-	01	Nodular goitre with papillary hyperplasia-01
7.	Malignant	11	06	06	-	Papillary Carcinoma-06
	TOTAL	**90**	**29**	**25**	**04**	

Table 03- Spectrum of FNA of salivary gland lesions

S no	FNAC Diagnosis	No of cases (13)	No of cases with surgical biopsy (07)	Concordance (07)	Discordance (-)	Histopathological Diagnosis
1.	Pleomorphic Adenoma	06	04	04	-	Plemorphic Adenoma-04
2.	Warthin's Tumour	01	-	-	-	-
3.	Mucoepidermoid Carcinoma	02	02	02	-	Mucoepidermoid Carcinoma-02
4.	Sialadenitis	03	-	-	-	-
5.	Adenocarcinoma NOS	01	01	01	-	Adenocarcinoma NOS-01
	Total	**13**	**07**	**07**	**-**	

Table 04- Spectrum of FNA of soft tissue lesions

Sr no	FNAC Diagnosis	No of cases (12)	No of cases with surgical biopsy (04)	Concordance (04)	Discordance (-)	Histopathological Diagnosis
1.	Lipoma	07	01	01	-	Lipoma-01
2.	Hemangioma	02	-	-	-	-
3.	Benign Spindle Cell Lesion	01	01	01	-	Neurilemmoma-01
4.	Fibromyxoid Tumour	01	01	01	-	Fibromyxoid tumour-01
5.	Spindle Cell Sarcoma	01	01	01	-	Fibrosarcoma-01
	Total	12	04	04	-	

Table 05- Spectrum of FNA of miscellaneous lesions

S no	FNAC Diagnosis	No of case (33)	No of cases with surgical biopsy (14)	Concordance (14)	Discordance (-)	Histopathological Diagnosis
1.	Inflammatoy lesion	02	02	02	-	Non Specific Inflamma-tory lesion-01 Granulomatous inflammatory lesion-01
2.	Abscess	01	-	-	--	-
3.	Epidermal Inclusion cyst	17	05	05	-	Epidermal Inclusion cyst-05
4.	Branchial Cleft Cyst	02	01	01	-	Branchial Cleft Cyst-01
5.	Adenexal Tumour	05	02	02	-	Pilomatrixoma-01 Trichilemmal Carcinoma-01
6.	Metastasis	03	02	02	-	Metastatic Carcinoma-02
7.	SCC	02	01	01	-	SCC-01
8.	Odontogenic Tumour	01	01	01	-	Ameloblastoma-01
	Total	**33**	**14**	**14**	**-**	

Table 06-Sensitivity, Specificity and Accuracy of Head and Neck lesions

Organ/Site	TP	TN	FP	FN	Specificity	Sensitivity	Accuracy
1.Lymph Node	07	02	01	-	66.7%	100%	90%
2.Thyroid	07	18	01	03	94.7%	70%	86.2%
3.Salivary Gland	03	04	-	-	100%	100%	100%
4.Soft Tissue	01	03	-	-	100%	100%	100%
5.Miscellaneous	04	10	-	-	100%	100%	100%
TOTAL	22	37	02	03	94.8%	88%	92.1%

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC were calculated using Galen and Gambino method. The sensitivity of FNAC in this study was found 88% and specificity was 94.8%. The overall diagnostic accuracy found to be 92.1% with positive and negative predictive values of 91.6%, 92.5% respectively.

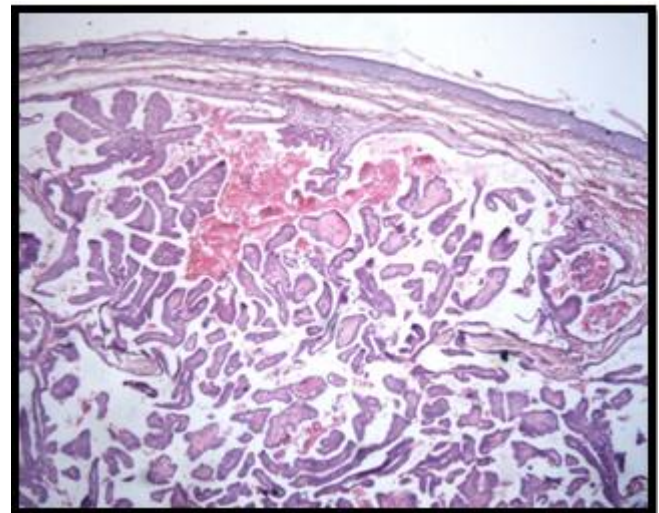**Table 07** Analysis of cyto- histological co-relation of head and neck lesions (n= 64)

		HISTOLOGY		TOTAL	COMMENT
		BENIGN	MALIGNANT		
CYTOLOGY	BENIGN	37 (TN)	3 (FN)	40	3 (FN)
	MALIGNANT	2 (FP)	22 (TP)	24	2 (FP)
TOTAL		39	25	64	

Of these 64 cases, 40 were diagnosed as benign and 24 as malignant on cytology, whereas 39 cases were diagnosed as benign and 25 as malignant on histopathology. There were 3 false negative and 2 false positive cases. It showed strong association between cytological and histological diagnosis (p value <0.005).
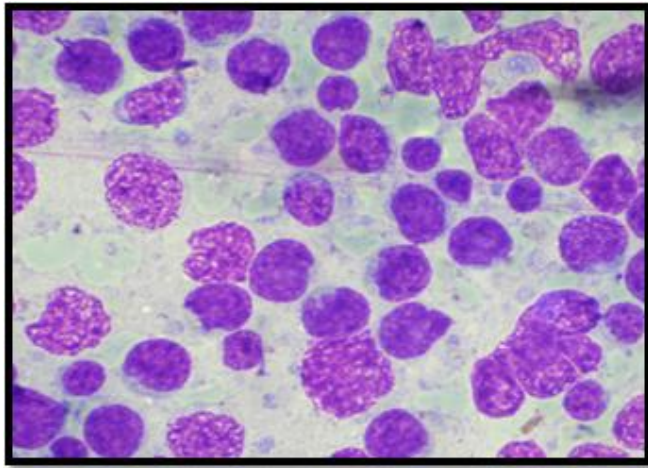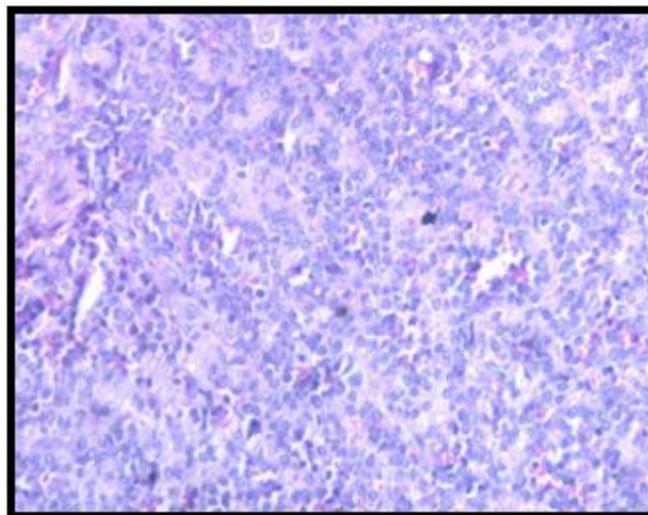
Photograph 1

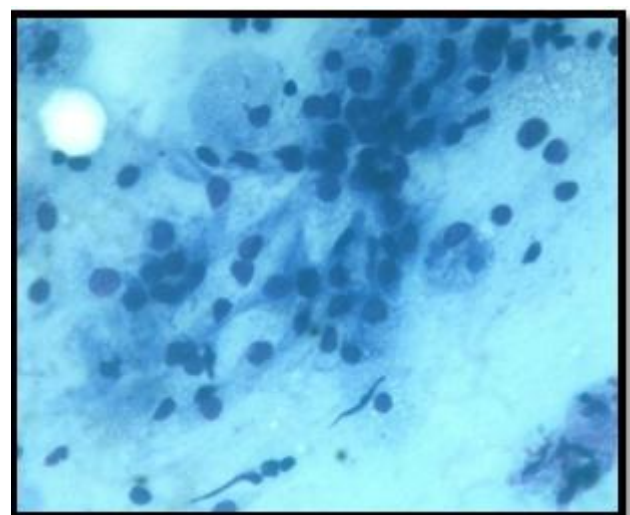**NHL**- Large atypical lymphoid cells showing fine chromatin and prominent nucleoli (MGG ,10x40x)

Photograph 2
NHL TISSUE SECTION (H & E , 10x 10x)

Photograph 3
Papillary Carcinoma Thyroid- tip of papillae with nuclear overlapping and clearing. (H&E , 10X10)
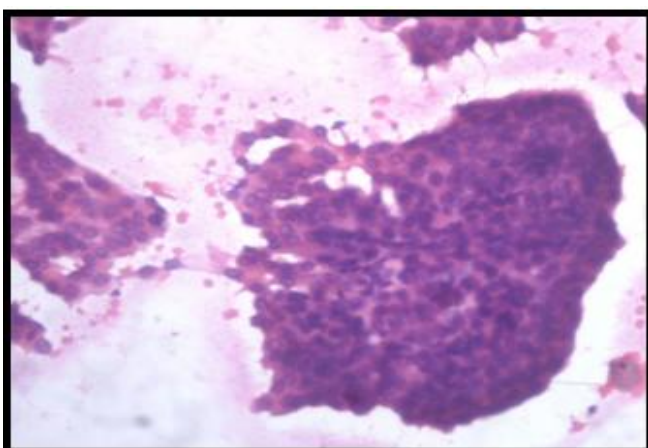

Photograph 4

Papillary Carcinoma Thyroid Tissue Section (H & E, 10x10)

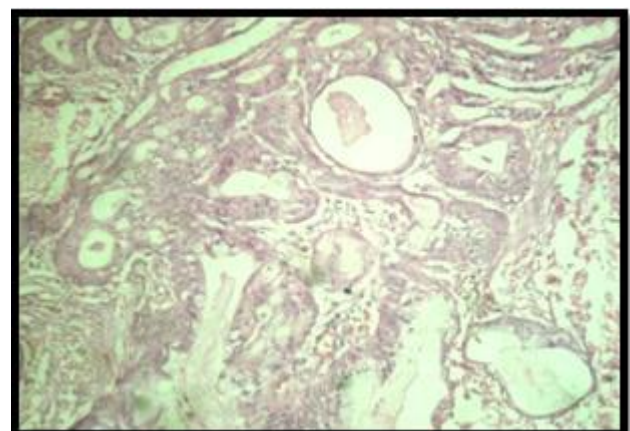
Photograph 5

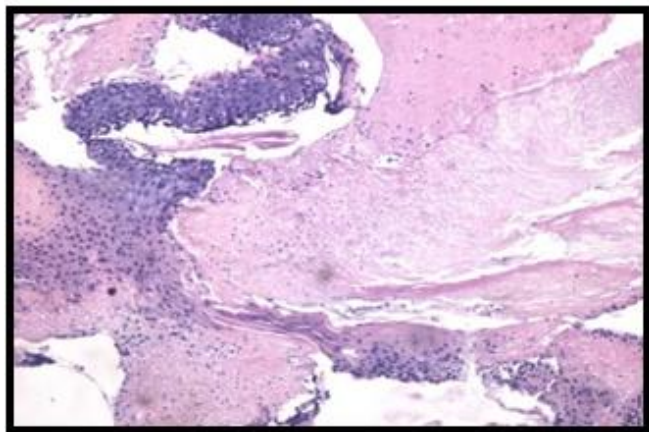**Mucoepidermoid Carcinoma**- Intermediate cells and large vacuolated mucus producing cells (FNA -MGG,10X40)

Photograph 6

Mucoepidermoid Carcinoma Tissue Section (H&E,10X10)

Photograph 7
Pilomatrixoma Tissue Section (H&E, 10X10).

Discussion

In this prospective study, all 250 cases of palpable lesions of head and neck region were analyzed with respect to their histories, clinical presentations and fine needle aspiration cytology findings. Radiological findings contributed significantly in certain cases categorised under soft tissue and miscellaneous groups.

Out of 250 FNACs histopathological correlations were available in 64 (25.6%) cases. Tilak et al[1] studied 155 cases of head and neck lesions and found histological correlation in 55 cases (35.4%). Mustafa et al [9] found histological correlation in 65 cases (18.5%), out of total 250 cases studied. The youngest patient in the study was 3 years old whereas oldest patient was 88 years old. Most common age group of presentation was 41- 50 of age. Amatya BB et al [10] in their similar study, found age of presentation ranged from 9-82 years with mean age of 40 years. In their study the commonest age group of presentation was 31-40 years. Gunvanti B et al[11] conducted similar study found the age of presentation ranged from 1-70 years with commonest age group was 21-30 years. Among the 250 patients, 98 (39.2%) were males and 152 (60.8%) were females, with male: female ratio of 1:1.5. Amatya BB et.al.[10] conducted similar study on 1229 cases and Richa Sharma et.al.[12] on 125 cases of head and neck masses and found M: F ratio of 1:1.4 and 1:1.5 respectively, which is similar to this study. In our study lymph node (40.8%) and thyroid (36%) was the most common aspirated sites, followed by lesions categorised under miscellaneous group (13.2%), salivary gland (5.2%) and soft tissue (4.8%) origin. The comparison of organ wise distribution of lesions of our study with other studies is tabulated below:

Table – 08 Comparison of organ wise distribution of lesions

Authors	Lymph node	Thyroid	Salivary Gland	Others (soft tissue & miscellaneous)
Amatya B B et.al.[10]	48.5%	40.4%	10.3%	0.7%
Umesh Jindal et.al.[13]	50.8%	22.8%.	8.5%	17.7%
Richa Sharma et.al.[12]	60.8%	24%	11.2%	4%
Present study	40.8%	36%	5.2%	18%

In this study, out of total 102 lymph nodes aspirated, reactive lymphadenitis (46.1%) was found to be the commonest diagnosis followed by granulomatous lymphadenitis (25.6%). Histopatholical examination was available in 2 cases of granulomatous lymphadenitis; one reported as tubercular in cytology was confirmed to be so on histopathological examination. Another diagnosed as non specific granulomatous inflammation, turned out to be the same on histopathology. Thus, results showed 100 % correlation of histopathology with cytology. Diagnostic accuracies of FNACs in tubercular lymphadenitis in different studies range between 90-100%[12, 14, 15]. In our study, we have found 17 cases (16.7%) of Metastatic lymph node on cytology, while Richa Sharma et al[12] (2012) and Jasani et al[16] (2013) found incidence of metastatic lymph nodes to be 13.1% and 11% respectively. Histopathological examination was available in 3 cases which showed concordance with cytology. 8 cases (7.9%) were diagnosed as lymphoma which

comprised of 4 cases (50%) of Hodgkin's and 4 cases (50%) of Non Hodgkin's lymphoma. Histopathological examination and IHC were available in all 4 cases of NHL which shows concordance with cytological findings. Histological correlation for Hodgkin lymphoma was not available.

One case which was cytologically diagnosed as inconclusive for malignancy turned out to be chronic lymphadenitis on histopathological examination (False positive). Amatya BB et al[10] and Richa Sharma et al[12] also found similar 1 false positive case each, which was diagnosed as suspicious for lymphoma on cytology and turned out to be granulomatous lymphadenitis and chronic non specific lymphadenitis respectively on histopathology.

Interpretation of representative aspirates can be problem in lymphoma as compared to other malignancies. In our case, we found a few atypical cells which raised suspicion and therefore was reported as inconclusive for malignancy. As per orell et al[17] occasionally NHL of large cell type may have relatively few neoplastic cells scattered in the background of reactive lymphoid cells. These cells may be mistaken as few large atypical looking immunoblasts, and hence can be reported as Reactive lymphoid hyperplasia.

In present study total 90 (36%) aspirates were from thyroid gland, cytological diagnosis was classified into 6 groups based on standard 'BETHESDA SYSTEM' of reporting thyroid lesions. The commonest lesion encountered in this group was Colloid/Nodular Goitre (48-53.3%) followed by lymphocytic thyroiditis (22- 24.4%). 5 cases diagnosed as follicular neoplasm, 2 cases as suspicious for malignancy and 11 cases as malignant (Table-02). 29 cases were correlated with histological diagnosis. Histological findings were found to be consistent in 25 cases. 3 cases of cytologically diagnosed nodular goitre turned out to be papillary carcinoma on histopathology (False Negative -10.3%). Amatya B B et al[10], Richa Sharma et al[12] and J Ayub et al[18] , found incidence of false negative cases 5.4% 13.6% and 4.7%

respectively. Ashcraft and van Herle noted that false negative results varied in reported series from 2-50%[19].

One of the three cytologically false negative cases was due to the aspiration needle failing to hit the exact pathological site (Sampling error). Histopathology demonstrated the presence of Papillary microcarcinoma. It is extremely common incidental finding seen in more than 25% of thyroid removed for other lesions[10]. Yang et al[22] emphasized on the importance of USG guided FNAC in sampling micro carcinomas. Another two cytologically false negative cases were due to dual pathology (Papillary carcinoma co- existing with nodular goitre). Gagneten[23] stressed the importance of doing multiple aspirations in a large thyroid swelling in order to obtain representative material from different areas since the thyroid can be affected by more than one disease process simultaneously.

One case diagnosed as suspicious for papillary carcinoma on cytology turned out to be nodular goitre with papillary hyperplasia (False Positive - 3.4%) on histopathology. Other studies show False positive rates ranged from 0-8%[20,21].

In our case, based on high cellularity and presence of papillaroid configuration along with occasional nuclear clearing and grooving, it was suspected for papillary carcinoma on cytology, however histopathological examination showed nodular goitre with papillary hyperplasia. Overdiagnosis of neoplasia in case of adenomatous hyperplasia is well known on FNA smear[17] and only implies that unless classical nuclear features of papillary carcinoma are appreciated in the smear, the diagnosis of papillary carcinoma should not be considered on FNA.

Our study found 13 (5.2%) cases of salivary gland lesions, out of which 10 were benign and 3 malignant. Amongst benign cases, pleomorphic adenoma was the commonest lesion (46.2%) followed by sialadenitis (23%) and warthin's tumour (7.7%). Malignant cases include, 2 cases (15.4%) of mucoepidermoid carcinoma and 1case (7.7%) of adenocarcinoma NOS.

Histopathological examination of 7 cases showed sensitivity, specificity and diagnostic accuracy of 100%.

Amongst 12 (4.8%) cases of soft tissue lesions, numbers of benign and malignant cases were 11 and 1 respectively. Lipoma (58.4%) was the commonest lesion encountered in benign group followed by hemangioma (16.7%). Benign spindle cell lesion and Fibromyxoid tumour accounted for 1 case (8.3%) each. Malignant group included the one case of sarcoma (8.3%). Histopathological examination was done in 4 cases showed 100% accuracy.

In this study out of 250 cases, 64 cases of FNA were correlated with histopathology The overall sensitivity, specificity and diagnostic accuracy of FNAC, for palpable lesions of head and neck were found 88%, 94.8% and 92.1% respectively. Results of present study correlated well with those of Tilak et al[1] (2002) studied FNAC 154 cases of the palpable region of the head and neck region, 55 cases were available for histopathological correlation. Overall diagnostic accuracy was found 92.73% with sensitivity 90.91% and specificity 93.18 %

Conclusion

Our study found that FNAC is a simple, quick, inexpensive, and minimally invasive technique to diagnose different types of head and neck swellings. It could differentiate the infective process from neoplastic one and avoids unnecessary surgeries. It also helps the surgeon to select, guide, and modify surgical planning in patients requiring surgery. Statistical analysis of various benign and malignant head and neck lesions, show strong co- relation between cytological and histological diagnosis. Hence, FNAC can be considered highly efficacious in distinguishing between benign and malignant head and neck lesions. A team work between a cytopathologist, radiologist and clinician maximises the diagnostic utility of FNAC.

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