Original Research Article

Evaluation of diagnostic value of fine needle aspiration cytology (FNAC) in head and neck neoplasms with application of immunological markers in selected cases – A hospital based study to enhance early detection, diagnosis and management

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Abstract

Background: Fine needle aspiration cytology is a simple, quick, inexpensive and minimally invasive technique used to diagnosed head and neck neoplasms commonly originated from cervical lymph node, thyroid, parotid and other salivary glands. In this study a correlation was done between cytology and histopathology whenever surgical specimens are available along with application of immunological markers in problematic cases.

Aim: To assess the frequency of various benign and malignant neoplasms in different age group and to evaluate the diagnostic accuracy of fine needle aspiration cytology (FNAC) in head and neck neoplasms.

Materials and methods: The study was conducted between September 2011 to August 2014 and total 336 cases of head and neck neoplasms were analysed. Patients between 1 to 80 years were included in the study. Fine needle aspiration cytology (FNAC) diagnosis was correlated with histopathology whenever possible.

Results: Out of 336 head and neck neoplasms 164 (48.81%) were from cervical lymph node, 47 (13.99%) were from thyroid, 82 (24.40%) were from salivary glands, 5 (1.49%) were nasal mass and 38 (11.31%) were from other site (skin, soft tissue, orbit). M: F was 1.07: 1. Most commonly affected age group was 41- 60 years. Metastatic squamous cell carcinoma (SCC) was the most commonly encountered neoplastic lesion. Over all sensitivity, specificity, and diagnostic accuracy were 98.08%, 96.23%, 97.46% respectively. Cytologically and histologically consistent and inconsistent cases showed $t = 2.722$, $p < 0.05$. Few problematic cases 15(4.46%) needed immunohistochemical analysis for confirmation.

Conclusion: Fine needle aspiration cytology is a highly sensitive, specific and has a definite role in diagnosing most of the head and neck neoplasms.

Key words

Fine needle aspiration cytology, Head and neck, Malignant neoplasms, Histopathology, Primary screening.

Introduction

Fine needle aspiration cytology (FNAC) is a simple quick and cost effective method to sample superficial masses found in the head and neck [1]. Martin introduced this technique in the evaluation of head and neck lesion in 1930 and the procedure has since then become increasingly popular and is being frequently used in the evaluation of different swelling [2, 3].

Commonly presenting head and neck masses occur within lymph node, thyroid, parotid and other salivary glands. Fine needle aspiration cytology (FNAC) is particularly helpful in the workup of cervical masses and nodules because biopsy of cervical adenopathy should be avoided until all modalities have failed to establish a diagnosis [4]. Most common primary tumors metastasizing to cervical lymph node are cancer of oral cavity, larynx, hypopharynx, oesophagus etc. The high degree of diagnostic accuracy, low cost and minimally disruptive nature of the procedure makes fine needle aspiration cytology (FNAC) a highly desirable alternative to open biopsy for investigation of cervical lymphadenopathy. In case of salivary gland, FNAC has gained wide spread acceptance with reported sensitivity and specificity for diagnosing neoplasm almost more than 90% [5]. In case of thyroid gland many reports have documented the utility of fine needle aspiration cytology for separating patients into operative and non-operative groups. Published results claim a sensitivity and specificity of over 90% in evaluation of thyroid nodule [6, 7].

Head and neck neoplasia is a major form of cancer in India accounting for 23% of all cancer in male, 6% in female [8, 9]. India has also the dubious distinction of having the world's highest reported incidence of head and neck neoplasia in women [9]. Fine needle aspiration cytology (FNAC) is one of the most valuable tests available in the initial assessment of the patients who present with a mass in the head and neck region where a recurrence is suspected after previous treatment. However definitive diagnosis is based on histopathology. Correlation of cytological diagnosis with histopathological findings in the surgical specimens aids in developing a level of comfort with the Pathologist's cytological interpretation [10]. The aim of our study is to evaluate the diagnostic value of FNAC in head and neck neoplasms and

to observe the need and utility of immunohistochemistry in selected cases.

Materials and methods

This was a cross sectional study that provides cytomorphological analysis of head and neck neoplasms at Gauhati Medical College and Hospital Assam, India, from September 2011 to August 2014. Ethical clearance was obtained from hospital administration. All total 336 neoplastic lesions out of 1688 head and neck aspiration (both neoplastic and non neoplastic lesions) were analyzed. All cases within age group 0 to >60 years , both sexes having head and neck neoplastic lesions are included in the study and all non tumorous benign lesions and inconclusive aspirates were excluded from the study.

FNAC was performed using a 22 gauge needle. An average two passes was performed and minimum 4 slides were prepared. Two slides were air dried and stained by Giemsa stain, while the remaining two slides were fixed in equal parts of ether alcohol mixture and then stain with PAP (Papanicolau) stain. Smears showing enough cellular material to provide a diagnosis were considered satisfactory. The FNAC smears were viewed under light microscope and the morphology of the individual cell and their patterns in the smears were studied in detail. These smears were later reported as benign, negative for malignancy, suspicious for malignancy, positive for malignancy. In this study FNAC results were correlated with histological findings, whenever available and immunological marker analysis were done in problematic cases.

All data collected were thoroughly cleaned and entered in to MS- Excel spread sheet and analysis was carried out. Statistical analysis was done to find out the diagnostic accuracy of the FNAC. Association between the variables were calculated by students' exact test and "p" value of <0.05 was taken as being significant.

Results

A total of 1688 FNAC's from different sites of head and neck was performed. Of these 131 were inadequate smears. 1221 were non-neoplastic, 336 were neoplastic lesions. Out of 336 neoplastic lesions, 174 were male and 162 were female (M: F = 1.07: 1). Most commonly involved age group was 41-60 years. Site wise distribution of different neoplastic lesions revealed 164 (48.81%) from lymph node, 82 (24.40%) were salivary gland, 47 (13.99%) were from thyroid, 5 (1.49%) were from nasal cavity and 38 (11.31%) were skin, soft tissue and orbit. Lymph node is the most commonly involved organ in both males and females (**Table - 1**) and 41 to 60 years is the most commonly affected age group (**Table - 2**, **Figure - 1**).

Table – 1: Neoplastic lesions of different organ in male and female.

Neoplastic lesions of different organs		
Organs involved	**Male**	**Female**
Lymph node	92	72
Thyroid	09	38
Salivary	46	36
Nasal	04	01
Miscellaneous (Skin soft tissue etc)	23	15
SUM	**174**	**162**
Mean	**34.8**	**32.4**
SD	**±35.885**	**±26.931**
SEM	**±16.048**	**±12.043**

Lymph Node Neoplasms (Table - 3, Figure - 3)
Out of 164 lymph nodes neoplasms 142 (86.59%) were metastatic malignancies, 12 cases (7.32%) were Non Hodgkin Lymphoma (NHL) (**Figure - 11, 16**), 8 cases (4.88%) were Hodgkin Lymphoma (HL) 2 cases (1.22%) were LCH. Out of 142 metastatic malignancies 87 (61.27%) were SCC, 28(19.72%) were adenocarcinomas 22 (15.49%) were poorly difference Ca, 1 (0.70%) undifferentiated Ca 1 case(0.70%) metastatic mucoepidermoid carcinoma ,1 case (0.70%) papillary carcinoma thyroid, 2 cases

(1.41%) were leukemic deposite. Male: female ratio in case of neoplastic lesions of Lymph Nodes is 1.2: 1.

75 cases were available for HPE, 74 were consistent 1 inconsistent. Metastatic squamous cell carcinoma is the most common neoplasm of lymph node in both male and female (**Figure - 10**).

Salivary gland neoplasms (Table - 4, Figure - 4)

We encountered 82 salivary gland neoplasms. The Male: Female ratio was 1.2: 1. We had 49 (59.76%) cases of pleomorphic adenoma (**Figure - 14**), 5 cases (6.25%) myoepithelioma, 1 case (1.22%) of warthin tumor, 19 (23.17%) cases mucoepidermoid Ca (**Figure - 12**), 4 cases (4.88%) adenoid cystic carcinoma. 3 cases (3.66%) were acinic cell carcinoma and 1 case (1.22%) was carcinoma ex pleomorphic adenoma. Parotid gland (63.41%) was found to be the most frequently affected site. Maximum number of cases was found to be benign 55 (67.07%) tumors followed by 27 (32.93%) malignant tumors. Among benign tumors most of the cases were diagnosed as P.A. (89.09%) predominantly involving parotid gland. Among malignant tumors maximum numbers of cases were diagnosed as Mucoepidermoid carcinoma 19 (70.37%) followed by Adenoid cystic carcinoma (14.81%). Benign tumors are common in parotid gland malignant tumors are common in submandibular gland. HPE was available in 39 cases 37 were consistent 2 were inconsistent. Diagnostic accuracy was 94.87%. Parotid is the most commonly involved gland, Pleomorphic adenoma is the most common neoplasm.

Table – 2: Neoplastic lesions of different organ in different age group.

Number of cases in different age groups					
Age group in years	**Lymph node**	**Thyroid**	**Salivary**	**Nasal**	**Miscellaneous**
0 to 20	11	4	10	01	06
21 to 40	30	22	30	03	18
41 to 60	83	19	27	00	11
Above 60	40	02	15	01	03
SUM	**164**	**47**	**82**	**5**	**38**
Mean	**41**	**11.75**	**20.5**	**1.25**	**9.5**
SD	**±30.474**	**±10.210**	**±9.539**	**±1.258**	**±6.557**
SEM	**±15.237**	**±5.105**	**±4.769**	**±0.629**	**±3.278**

Thyroid neoplasms (Table - 5, Figures – 5, 6)

We encountered 47 cases of thyroid gland neoplasms out of total 336 cases. Male: female ratio was 1: 4.2 showing female predominance. We had 20 cases of follicular neoplasm (42.55%), 15 cases (31.91%) of papillary Ca (**Figure - 13, 15**). 5 cases (10.64%) were suspicious for malignancy, 2 (4.26%) cases of medullary carcinoma and 5 cases (10.64%) were anaplastic carcinoma. Cytologically it was difficult to differentiate follicular adenoma and follicular carcinoma. Histopathology was available in 20 cases, 19 cases were consistent and 1 case was inconsistent (FP). Diagnostic Accuracy was 95%. Follicular neoplasm was most common diagnosis, 21 to 40 years is the commonly involved age group.

Nasal Neoplasms (Figure - 7)

We encountered 5 nasal neoplasm out of 336 cases. Male: Female ratio was 4:1. Out of five cases one case was sqamous papilloma (20%), one spindle cell neoplasm (20%) (angiofibroma), one small round cell tumor, one (20%) mucosal melanoma and one case was squamous cell carcinoma (20%). Histopathology of all cases was consistent with cytological diagnosis. IHC was done to confirm the diagnosis of primary

mucosal melanoma (**Figure - 17, 19**) and small round cell tumor. SRCT was dignosed as RMS. Diagnostic accuracy was 100%.

Miscellaneous (Figure - 8)

We got 38 cases of miscellaneous neoplasms. M: F was 2.1: 1. Cytologically, out of 38 cases, maximum numbers of cases were found to be benign (89.47%) tumors followed by malignant tumor (10.53%) Among the benign tumor maximum numbers of cases were diagnosed as lipoma (77.14%) among malignant tumor Squamous cell carcinoma was common (66.66%). Histopathology was available in 18 cases and all cases were consistent with cytological diagnosis. Diagnostic Accuracy was 100%.

Table – 3: Cytological diagnosis of cervical lymph node neoplasms.

Different type of cervical lymph node malignancy in male and female		
Type of cervical lymph node neoplasm	**No. of cases**	
	Male	**Female**
Metastatic squamous cell carcinoma	47	40
Metastatic adenocarcinoma	10	18
Metastatic poorly differentiated carcinoma	16	6
Metastatic undifferentiated carcinoma	1	0
Metastatic Papillary carcinoma thyroid	0	1
Metastatic mucoepidermoid carcinoma	1	0
Leukemic deposite	2	0
Langerhan cell histiocytosis	1	1
Non hodgkins lymphoma	8	4
Hodgkins lymphoma	6	2
SUM	**92**	**72**
Mean	**9.200**	**7.200**
SD	**±14.242**	**±12.752**
SEM	**±4.503**	**±4.032**

Table – 4: Distribution of salivary gland neoplasms in different salivary glands.

Cytological diagnosis	**Various neoplasms involving different type of salivary glands**			
	Parotid	**Submandibular**	**Sublingual**	**Minor salivary gland**
Pleomorphic adenoma	34	11	01	03
Myoepithelioma	02	03	00	00
Warthin tumour	01	00	00	00
Mucoepidermoid carcinoma	09	10	00	00
Adenoid cystic carcinoma	03	00	00	01
Acinic cell carcinoma	02	01	00	00
Carcinoma ex pleomorphic adenoma	01	00	00	00
SUM	**52**	**25**	**1**	**4**
Mean	**7.429**	**3.571**	**0.143**	**0.571**
SD	**±12.040**	**±4.860**	**±0.378**	**±1.134**
SEM	**±4.550**	**±1.836**	**±0.142**	**±0.428**

Table - 5: Shows various thyroid neoplasms according to age group.

Cytodiagnosis	Age group					%
	0-20	21-40	41-60	>60	Total	
Follicular neoplasm	04	09	07	00	20	42.55
Suspicious for malignancy	00	02	03	00	05	10.64
Papillary carcinoma	00	11	04	00	15	31.91
Medullary carcinoma	00	00	02	00	02	4.26
Anaplastic carcinoma	00	00	03	02	05	10.64
Total	04	22	19	02	47	100

Table - 6: Shows cyto-histological correlation of head and neck neoplasms.

Neoplstic lesions	Cytohistological correlation of head and neck neoplasms			
	Total cytology	Total histology	consistent	Inconsistent
Lymph node	164	75	74	01
Thyroid	47	20	19	01
Salivary gland	82	39	37	02
Nasal	05	05	05	00
Miscellaneous (skin, soft tissue)	38	18	18	00
SUM	**336**	**157**	**153**	**4**
Mean	**67.2**	**31.4**	**30.6**	**0.8**
SD	**±60.661**	**±27.227**	**±26.801**	**±0.837**
SEM	**±24.764**	**±11.115**	**±10.941**	**±0.341**

Figure - 1: Numbers of neoplastic lesions of different organ of head and neck in males and females.

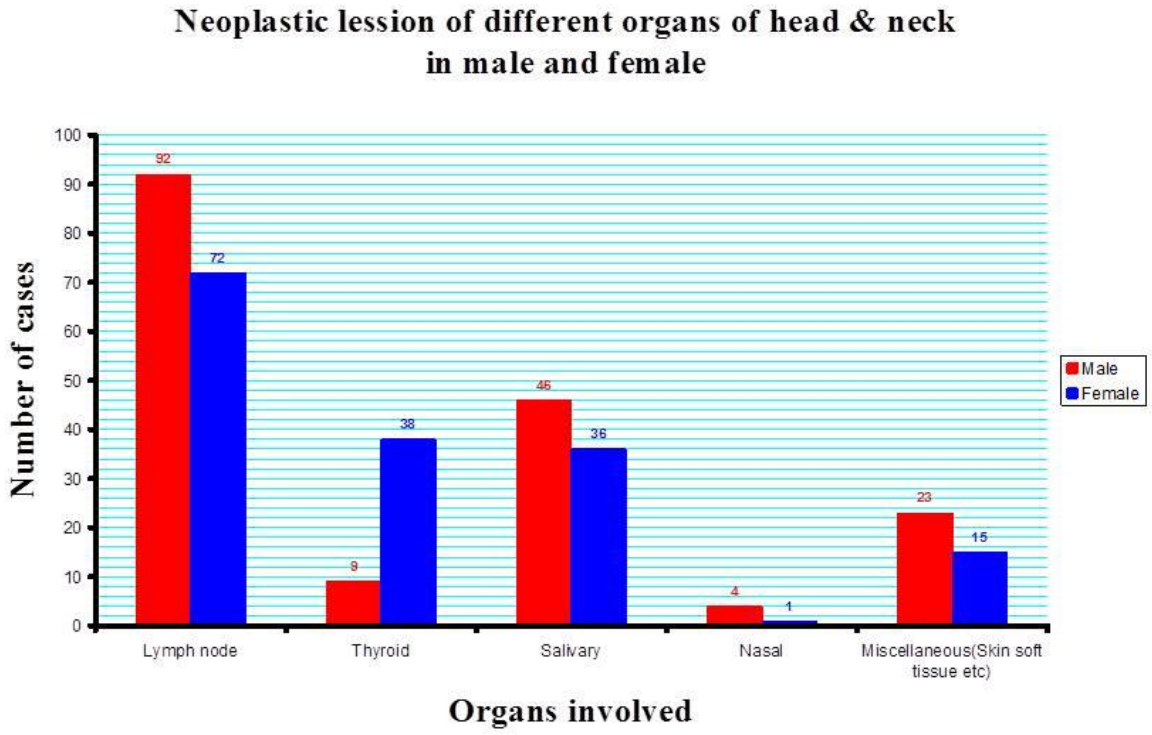


Figure - 2: Distribution of relative frequencies of head and neck neoplasms in different age group involving different organs.

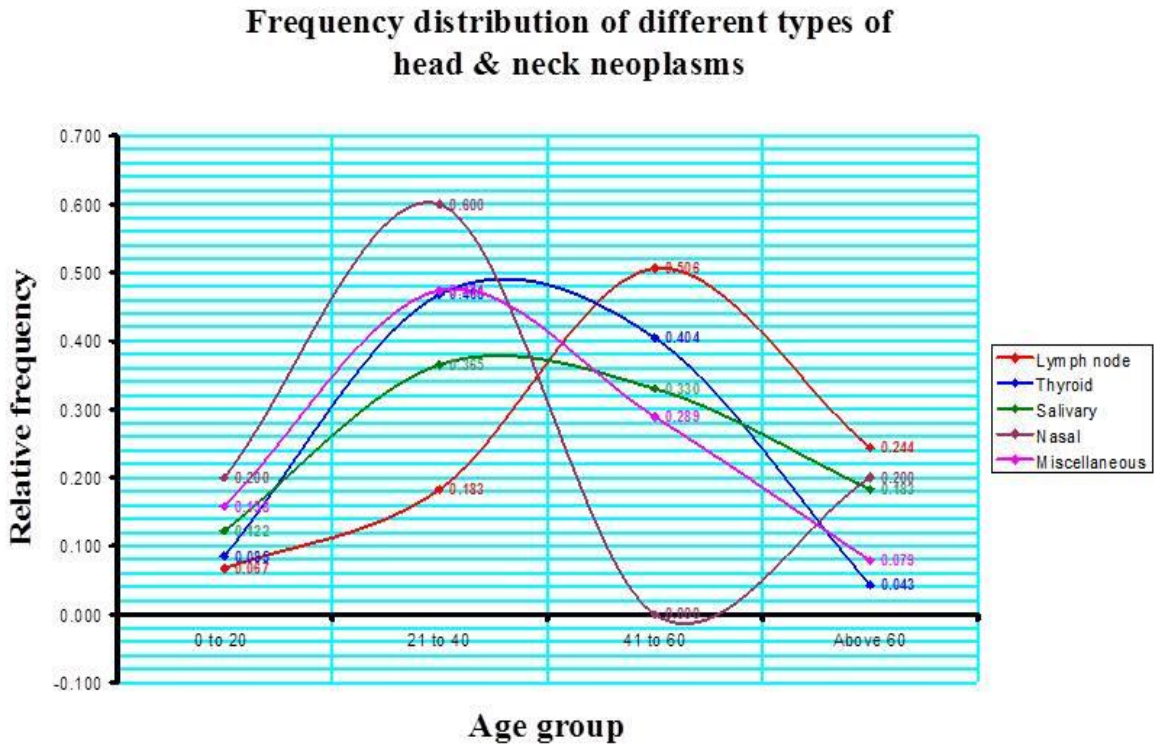


Figure - 3: Numbers of cases of different type of cervical lymph node neoplasms in male and female.

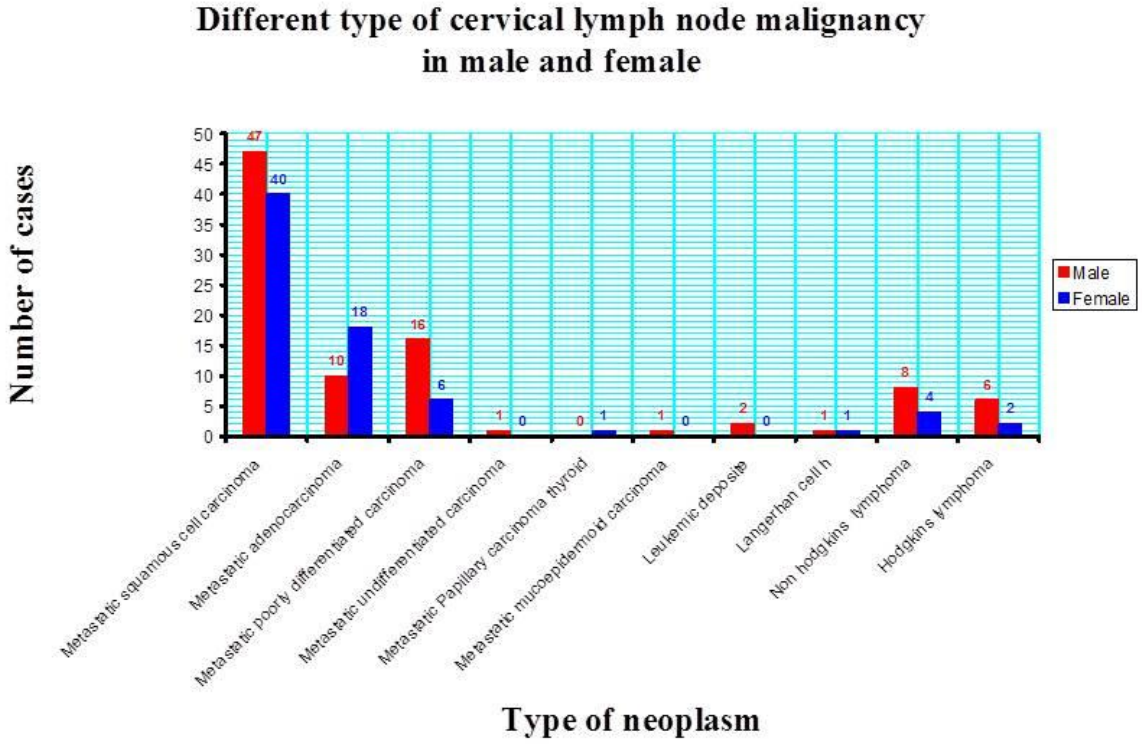


Figure - 4: Various types of neoplastic lesions involving different type of salivary gland.

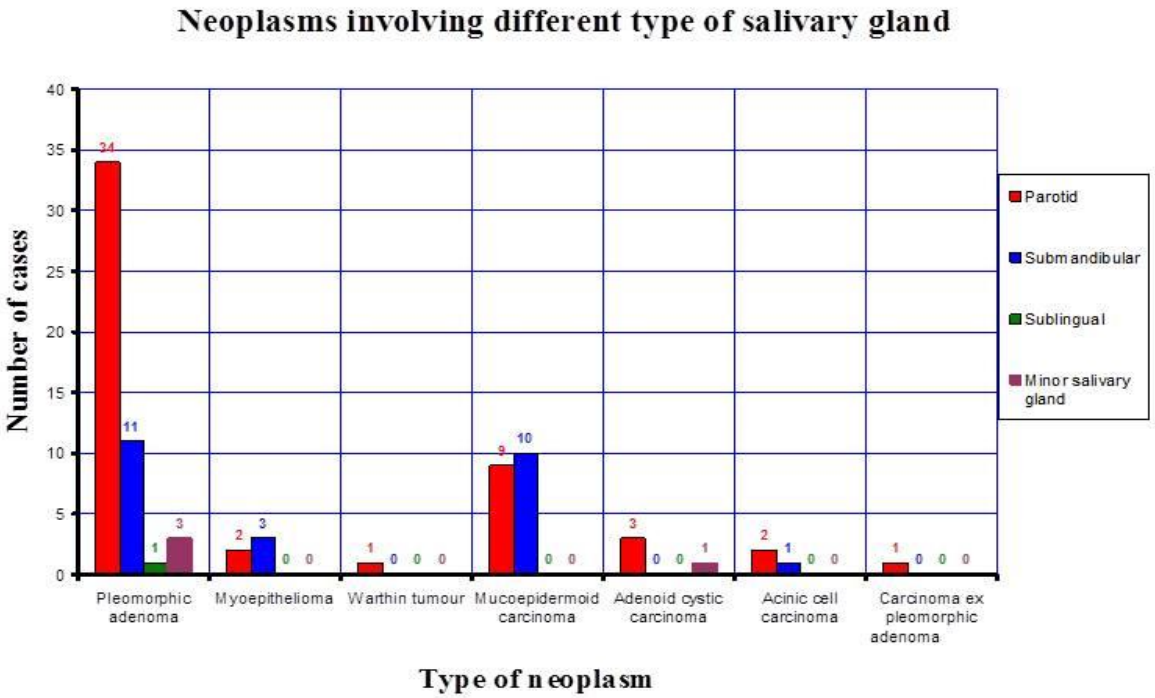
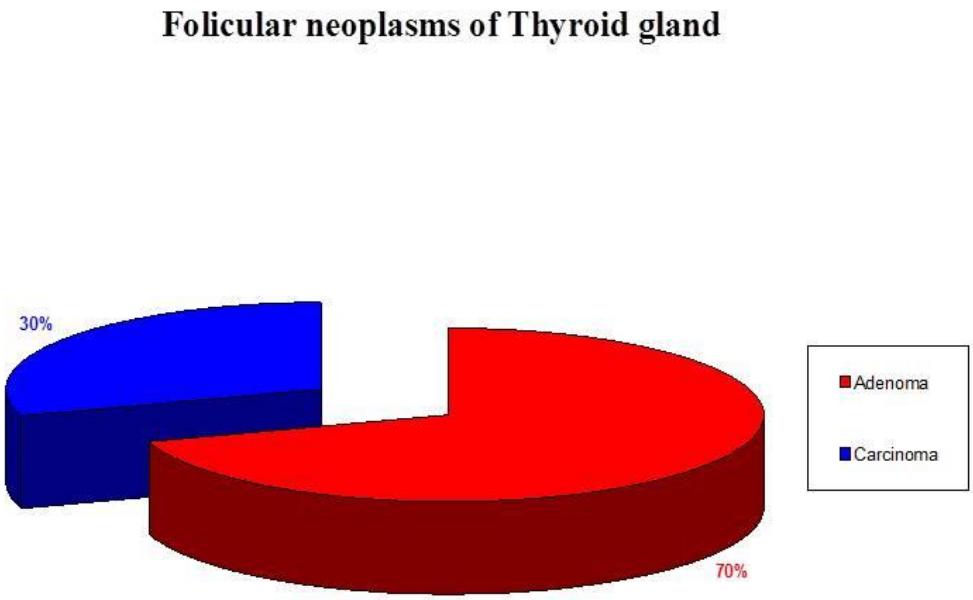


Figure - 5: Percentage of cases of follicular neoplasms of thyroid glands.

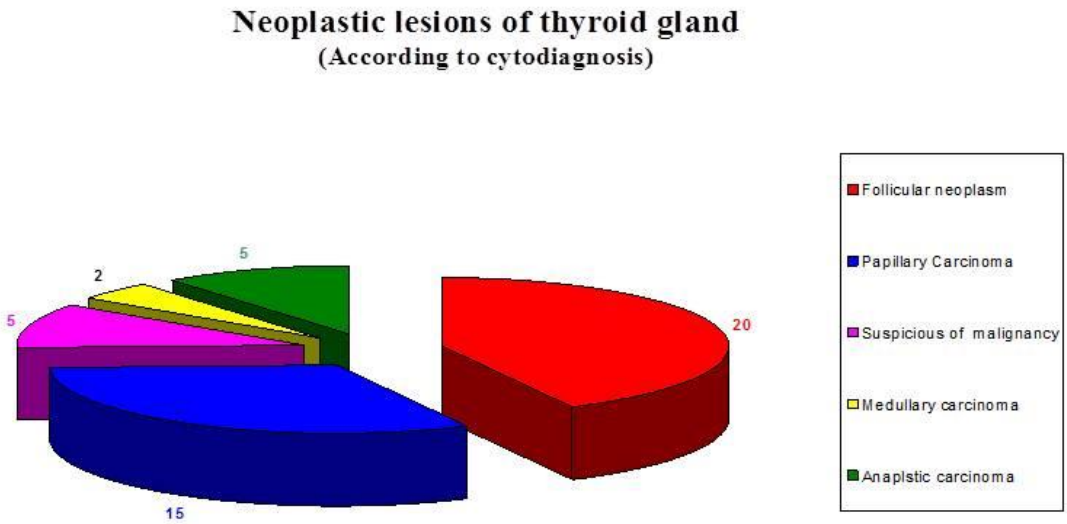


Immunohistochemistry (IHC) was done on 15 complicated cases (**Figure – 9**). Out of which 6 (40%) cases were NHL (**Figure - 18**), 5 (33.33%) cases HL, 1 case was small round we tumor (RMS) (6.66%), 1 case (1.66%) was mucosal melanoma and 2 cases (13.33%) were SCC. All cases were positive for respective IHC marker and gave confirmatory diagnosis with diagnostic accuracy of 100%.

Over all, out of 336 total head and neck neoplastic lesions histopathological examination HPE was available in 157 cases. Out of these 51 benign (TN) and 102 were malignant neoplasms

(TP). Cytological diagnosis after correlating with histopathological examination, found 2 false positive cases (1 case of NHL which on histology turned out as reactive lymphoid hyperplasia, 1 case of follicular neoplasm which was proved on histology as adenomatoid nodule) and 2 false negative cases (both were pleomorphic adenoma cytologically) 1 turned out as Ca ex PA and another one proved as adenoid cystic carcinoma histopathologically. Diagnostic accuracy was calculated in terms of sensitivity and specificity. In the present series sensitivity, specificity and diagnostic accuracy was found to be - sensitivity of 98.08%, specificity of 96.23% and diagnostic accuracy of 97.45%. Cytologically and histologically consistent and inconsistent cases showed - $t = 2.722$; $p < 0.05$. Hence the findings of the study were statistically significant (**Table - 6**).

Figure - 6: Numbers of different types of thyroid neoplasms.



Discussion

In this study we got 131 (7.7%) unsatisfactory aspirates. According to various studies unsatisfactory aspirate range from 9.3% to 15% [11, 12]. Tippu Eshar, et al. [13] and I Bagwan, et al. [14] reported 4.40% and 9% of unsatisfactory smears in their studies respectively. Unsatisfactory smears were from lymph node and thyroid swellings. In case of lymph node fibrous and cystic lesion and lesion less than 1.5 sized there was difficulty in aspiration and inadequate amount of material were aspirated. In case of thyroid swelling most of the time haemorrhagic material was aspirated. Lesions with necrotic degeneration and fibrosis, aspiration were unsatisfactory. Similar finding have been reported in literatures [13, 15, 16]. Therefore sufficient training and experience are required to ensure that the aspirate are of satisfactory quality and presence of a pathologist mandatory at the time of sample collection, as well as during staining for rapid interpretation and for providing a quality and conclusive report. In some tumors ultrasound guided FNA can improved sample acquisition and can reduce the sampling error. This will help to reduce the unsatisfactory aspirate/smears and there by minimizes the rate of inconclusive reports and repeat aspiration.

In the present study out of 336 neoplastic cases there were 174 (51.79%) male patients and 162 (48.21%) female patients. The male: female ratio was found to be 1.07: 1. Slight male predominance noted, and maximum cases observed in lymph node. This findings correlate with the findings reported by EI Hag, et al. (2003) [17], Maniyur U Amit, et al. (2013) [18] and Akinyele U Adisa, et al. (2010) [19]. Most commonly affected age group is 41 to 60 years. This findings correlates with the findings reported by Maniyur U Amit, et al. (2013) [18], U Jindal, et al. (2012) [20], Akinyel O Adisa, et al. (2010) [19].

Figure - 7: Different types of nasal neoplasms.

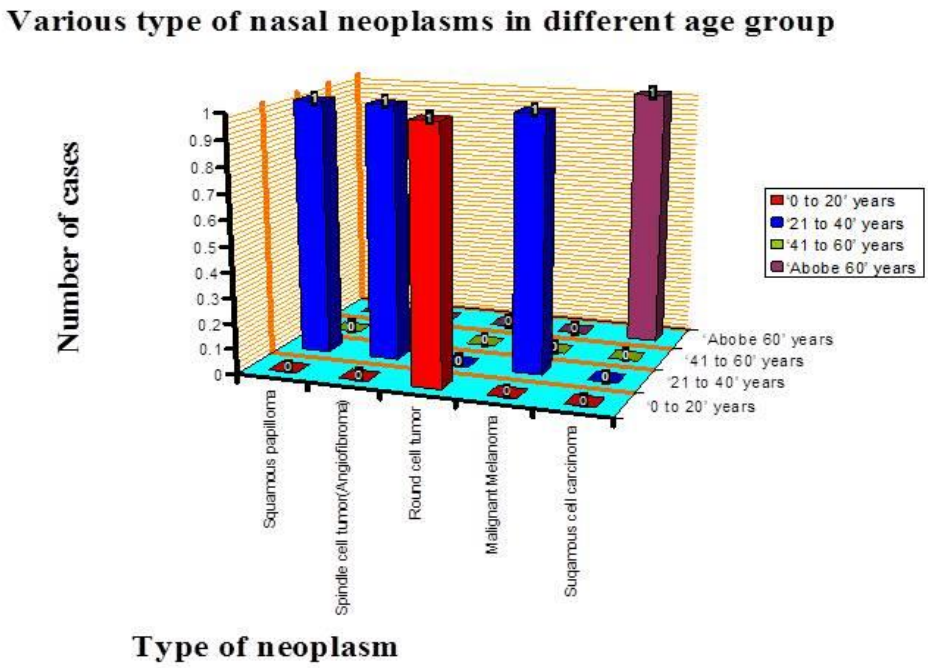


Figure - 8: Various neoplasms in miscellaneous category according to age.

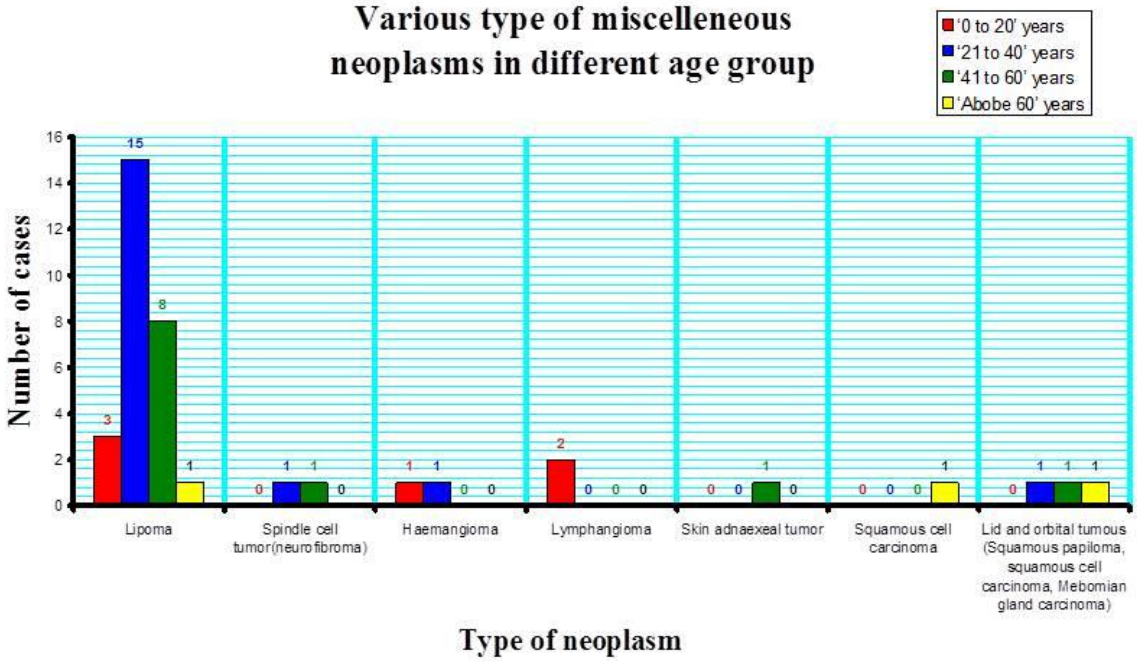


Figure - 9: Pai chart showing immunohistochemistry positive cases.

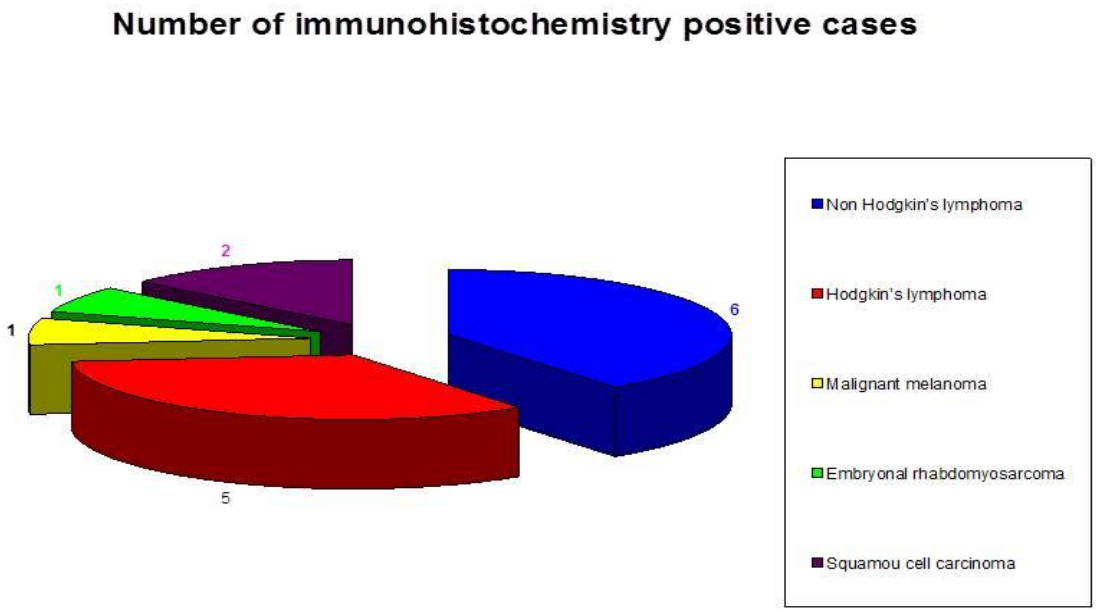
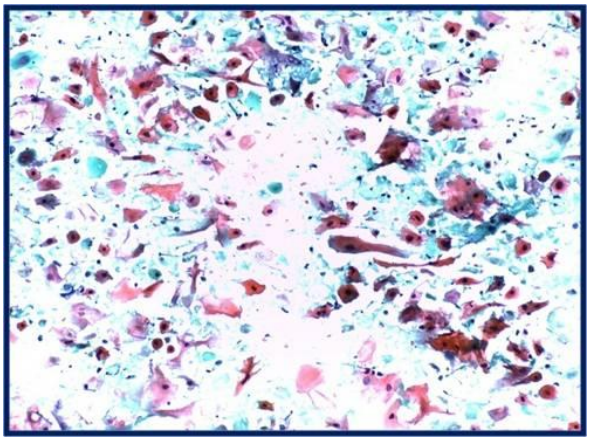


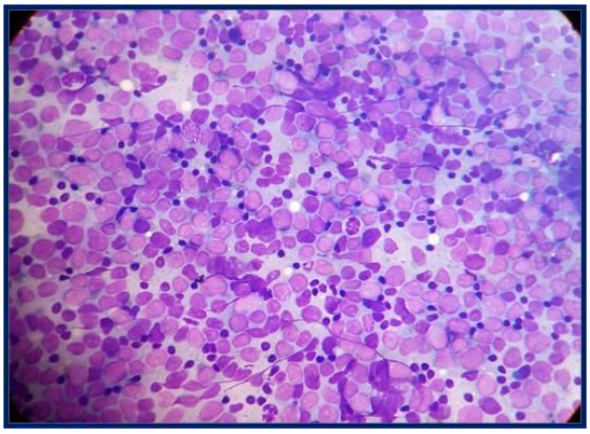
Figure - 10: Cytological smear of metastatic squamous cell carcinoma of lymph node (PAP, X100).



Among secondary neoplasm or metastatic neoplasms (86.59%) SCC (61.27%) is the most common neoplasm encountered (**Figure – 10**). Our findings are correlate well with different authors [18, 21, 22] but rate of SCC is slightly higher in comparison to some studies [14, 20, 23].

It may be because of increasing malignancies of oral cavity, pharynx esophagus, in our region, probably due to use of multiple tobacco product [24]. Which need proper scientific population based research to evaluate the actual etiological cause. Most of the cases had known primary detected in larynx, esophagus, oral cavity and nasopharynx. However in some cases primary was unknown.

Figure - 11: Cytological smear of Non Hodgkins lymphoma of lymph node (MGG, X100).



Cytologically in differentiated SCC tight clusters or loosely scattered single cells showing various degree of keratinization were seen. Most of the aspirated cells tend to be mature but a careful

search for hyper chromatic irregular nuclei showing more malignant features is important for a confident diagnosis. Because in rare occasions, the branchial and epidermal cyst aspirate with its content of mature squamous cells may closely mimic a differentiated metastatic carcinoma [22]. The less differentiated SCC are more difficult to diagnosed, but cells with abundant dense opaque cytoplasm arranged in sheet with occasional keratin pearl formation and giant cell reaction to keratin are useful diagnostic clue. Many metastatic nodes have superadded infection which on FNAC reveals nutrophils, histocytes, necrotic debris and individual scattered Keratinized cell. Differential diagnosis includes acute supportive pathology, infected branchial and epidermal cyst, necrotic SCC. In those cases re –aspiration from the edge of the mass rather than from the centre is more contributory [17, 22, 25].

Figure - 12: Cytological smear of mucoepidermoid carcinoma of salivary gland (MGG, X100).

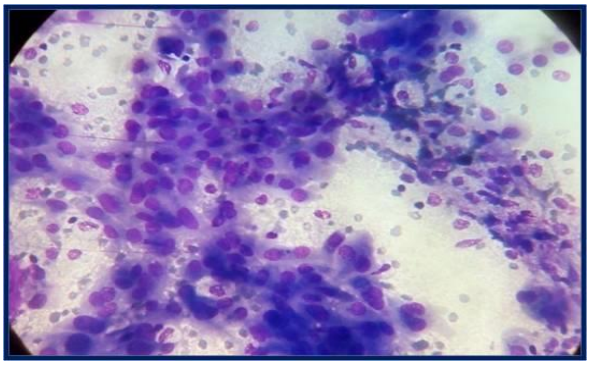


Figure - 13: Cytological smear of Papillary carcinoma thyroid (PAP, X100).

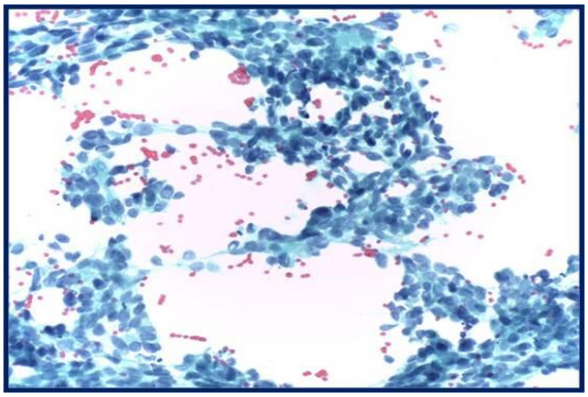


Figure - 14: Tissue section from pleomorphic adenoma of salivary gland (H &E, X400).

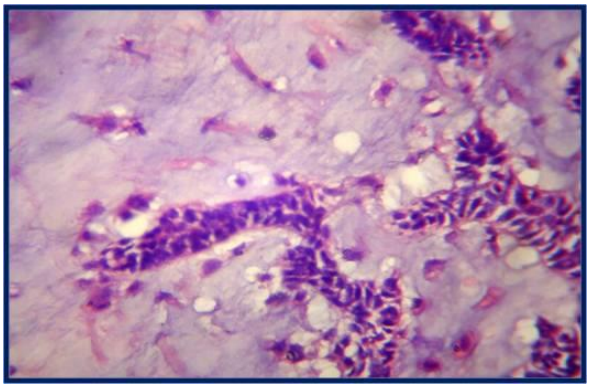


Figure - 15: Tissue section from Papillary carcinoma thyroid (H & E, X400).

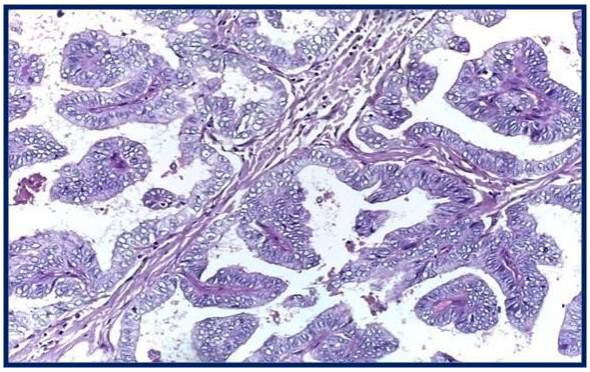
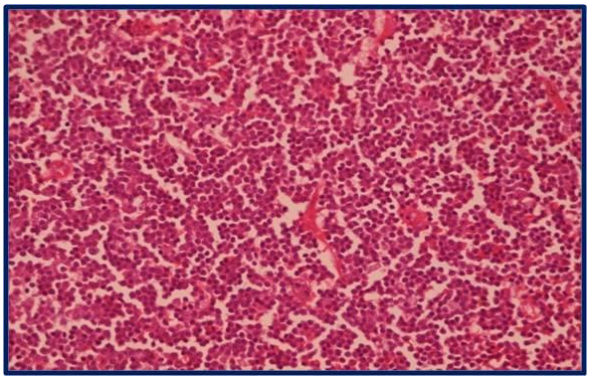


Figure - 16: Tissue section from NHL (SLL) of cervical lymph node (H&E, X400).



Immunohistochemistry (cytokeratin) was done in two poorly differentiated SCC for confirmation. We encountered total 20 cases of lymphoma (12.2%). Percentage of lymphoma in other studies ranged from 6.8% to 12.5% [17, 26, 27]. Patra, et al. [28] in their study have reported 75% lymphomas as non Hodgkins lymphoma and 25% of the cases as Hodgkins lymphoma (**Figure - 9**).

Figure - 17: Tissue section from Malignant melanoma of nasal cavity (H&E, X400).

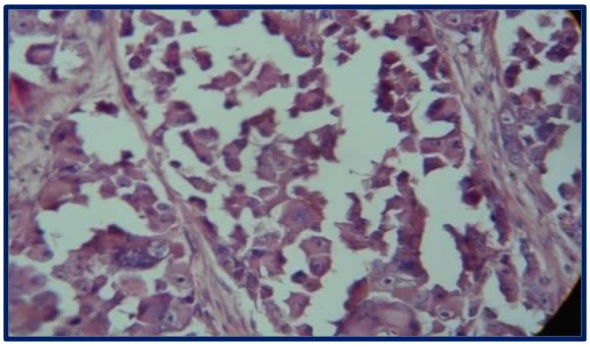


Figure - 18: Tissue section from NHL lymph node (DLBCL) CD20 positive (IHC, X400).

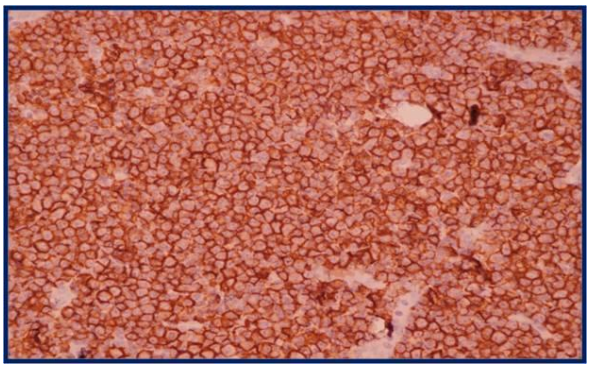
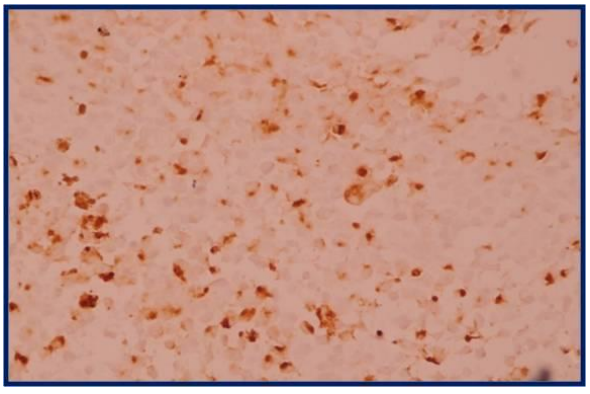


Figure - 19: Tissue section from Malignant Melanoma of nasal cavity S100 positive (IHC, X400).



El Hag, et al. [17] reported 66.66% cases of NHL and 33.33% cases of HL which is comparable to our findings. Out of 20 cases 13 were available for histopathology (8NHL, 5HL).

One false positive(FP) case which was cytologically diagnosed as NHL but on histopathology it came out as reactive hyperplasia of lymph node Some time it is difficult to differentiate reactive hyperplasia and NHL cytologically particularly when aspiration are from follicular centre. This difficulty is particularly problematic when less than pure monomorphic lymphocyte population exist (polymorphous population giving picture of reactive hyperplasia of lymph node) in the smears. Again a major disadvantage in the FNA smears is the inability to identify follicular growth pattern which is a major prognostic factor [29].

It is difficult to diagnosed B cells or T cells lymphoma cytologically. And subclassification of different type of NHL was problematic because of overlapping of cytological features. Therefore histopathological examination is compulsory. Even in histopathological ground subclassification of Lymphoma was difficult. For confirmatory diagnosis, selected immunohistochemical (IHC) markers (CD20, CD5, Bcl2,6) analysis on paraffin blocks sections was done. IHC gave confirmatory diagnosis in all histopositive cases (100% positivity).

Out of 7 histopositive NHL cases, 3 were diagnosed as SLL and other 3 as DLBCL with the help of IHC. One case, blocks were taken by the patient party and IHC was done outside our Hospital. All 5 histopositive cases of Hodgkins Lymphoma, were diagnosed as classical Hodgkins lymphoma with the help of Immunohistochemistry (CD30, CD15). The cornerstone of cytodiagnosis of HL is the findings of Reed-Sternberg/ Hodgkin's cell is an appropriate polymorphous cellular background [30]. In the present study although RS cells were found in all the cases categorized as HL, atypical monoclear cells with prominent nucleoli apparently outnumbered them and proved to be a better indicator in cytological evaluation.

In our study diagnostic accuracy for malignant neoplasm of lymph node is 98.66% false positive rate is 1.3%. Fernandes H [31] reported 100% diagnostic accuracy which is comparable to our study.

Salivary gland neoplasms

We had 82 (24.41%) salivary gland tumors out of 336 head and neck neoplasm. Out of 55 benign tumors, 49 (89.09%) were pleomorphic adenoma. Amongst 27 (32.93%) malignant tumor most common malignant diagnosis was mucoepidermoid carcinoma, {19 cases (70.37%)}. Benign: malignant ratio was 2.4:1. Findings are similar with Vaishali anand [32] and Shilpa H. Gandhi [33]. Out of 52 parotid tumors 37 (71.15%) were benign and 15 (28.85%) were malignant. Out of 25 submandibular tumors 14 (56%) were benign and 11 (44%) were malignant. Hence in our study we found that benign tumors are more common in parotid gland (71.15%) and malignant tumors are more common in submandibular gland (44%). This is comparable to study done by Wahidizzaman, et al. [34].

Considering all neoplastic lesions occurring in different salivary glands we found that parotid gland is the most frequently involved gland (63.41%) followed by submandibular (30.48%) and minor salivary gland (4.88%) which is similar to the studies done by Chetan Jain [35] (Parotid=54.28% submandibular=44.28%) and Vaishali H Anand, et al. [32] (parotid =74%) .

We got 2 false negative cases follicular neoplasias (F.N), (5.4%). One case of pleomorphic adenoma turned out as carcinoma ex pleomorphic adenoma in histopathology. Another case of pleomorphic adenoma turned out as adenoid cystic carcinoma on histopathology. No false positive cases were encountered in salivary glands tumors.

A cellular pleomorphic adenoma with squamous metaplasia and cellular atypia in FNAC needs to be differentiated from carcinoma ex pleomorphic adenoma and ME (Mucoepidermoid) carcinoma. In case of carcinoma ex pleomorphic adenoma history of rapid growing tumor of long standing and obvious nuclear atypia along with benign looking area may help in proper cytological diagnosis. Cellular pleomorphic adenoma with glandular cell predominance and abundance of hyaline material may be confused with adenoid cystic carcinoma. But careful history and malignant nuclear characteristics, hyaline globules stromal structure surrounded by epithelial cells can differentiate the malignant lesions from benign one.

For salivary gland diagnostic accuracy was found to be 94.87% with false negative rate (5.1%). Which are comparable with Vaishali Anand [32], DK Das, et al. [36], N. Tahoun [37].

Thyroid gland neoplasms

We recorded the diagnosis as per the criteria laid down in the standardized nomenclature of the Bethesda system. We got 42.55% cases of follicular neoplasms, 46.81% cases of malignant neoplasms and 10.64% cases of suspicious of malignancy. Santosh Mandal [38] (2013) reported out of 93 neoplastic lesions 38.71% follicular neoplasms (F.N), 12.90% suspicious for malignancy, 48.39% malignant neoplasms. E. A. Sinna [39] (2012) reported out of 121 neoplastic lesions of thyroid 40.5% follicular neoplasms (F.N), 24.79% suspicious for malignancy, 34.7% malignant neoplasms. Hyder Ali [40] (2012) reported 18.66% of suspicious for malignancy and 7.8% malignant neoplasms. Findings are correlated well with our study.

HPE were available in 20 tumors. Out of 11(55%) follicular neoplasms, seven cases (70%) were follicular adenoma and 3 cases (30%) were follicular carcinoma, one case (5%) cytological diagnosis was inconsistent and diagnosed as adenomatoid nodule on histopathology (5.0%FP rate) which is similar to other study which cite F.P. rate 0-9%. Eight (40%) cases were papillary carcinoma histopathologically. One case (5%), suspicious for malignancy proved as papillary carcinoma on histopathology. Medullary carcinoma and anaplastic carcinoma biopsy specimen were not available for HPE.

In the category of follicular neoplasm or suspicious for follicular neoplasm (F.N/SFN) percentage of malignancy risk was 27.27%. Only one case out of 5 cases of suspicious for malignancy was available for histopathology and it was turned out as papillary carcinoma giving malignancy risk 100% in this category. Eight cases were available for histopathological examination (HPE) in "malignant" category and all 8 tumors (100%) were malignant (papillary carcinoma) giving malignancy rate 100%.

Diagnostic accuracy of thyroid neoplasms were 95% with 5% F.P. rate. Diagnostic accuracy is comparable to Arup Sengupa, et al. [41], Heydar Ali [40], EA Sinna [39], Sunita Bamanikar [42].

It was noted that fine needle aspiration cytology of thyroid gland has certain limitations on account of an intermediate /suspicious diagnosis. Intermediate FNAC results and cytodiagnostic error are unavoidable due to overlapping cytological features, particularly among hyper plastic adenomatoid nodules, follicular neoplasms, and follicular variant of papillary carcinoma [43]. In the present study among the follicular neoplasms 3 cases were malignant (F.carcinoma) and 7 cases were follicular adenoma on histopathology. It was not possible to group them in either benign or malignant cytologically. This was mainly due to the limitation of thyroid cytology to distinguish follicular adenoma from follicular carcinoma. The diagnosis required a detailed histopathological examination for vascular and capsular invasion which is only possible in histopathology of biopsy specimens. As the risk of malignancy in intermediate /suspicious category is high, surgical removal of the thyroid swelling should be considered strongly in those cases.

Nasal neoplasms

In 5 nasal tumors, histopathology was available in all 5. IHC was done for confirmatory diagnosis in 2 cases (SRCT, mucosal melanoma). Because of the long list of small round cell tumor, IHC was mandatory. SRCT was positive for desmin and diagnosis was confirmed as rhabdomyosarcoma (RMS). Some time it is difficult to diagnose melanoma whether it is primary or secondary specifically when it is ulcerated. We need to see the junctional activity to diagnosed as primary. In our case junctional activity was present and it was positive for S100, HMB45 which confirmed the provisional diagnosis.

Miscellaneous neoplasm

Most commonly encountered neoplasm is lipoma (71.05%). Amongst malignant tumors SCC was common. Tumors of skin, soft tissue, orbit are less common in our study which is also supported by other authors. The diagnostic accuracy was found to be 100%.

Diagnostic accuracy

In the present series, histopathologic correlation was done whenever possible and diagnostic accuracy was calculated as 97.45%. Findings of our study are comparable with other authors [30, 44].

Limitation of study

All cases are not available for HPE, patients are not aware of their disease condition because most of the patients are from low socioeconomic background and uneducated.

Strength of the study

This study is novel because head and neck swellings are very common problem in our region and it is increasing day by day. We have done the study for 3 years period and sample collection was optimum. All age groups and both sexes are included in the study. Proper statistical analysis was done using standard statistical criteria.

Future plan

More detailed study on head and neck neoplastic lesions are required to evaluate the causes of different neoplasms. For accurate diagnosis

along with FNAC and HP we can go for IHC and molecular analysis of various tumors which can't be diagnosed simply with the help of FNAC.

Conclusion

FNAC is a sensitive, specific and accurate initial diagnostic test for evaluation of patients with head and neck swellings, data support that FNAC is invaluable test for initial assessment of suspected head and neck neoplastic lesions. Overlapping of cytomorphological features may occur in some cases but it can be avoided by giving special attention to the diagnostic pitfalls. Benign cases should be viewed with caution as few false negative (FN) cases do occur. However FNAC is complimentary to histopathology. Use of IHC greatly assists in identification of tumors which can't be accurately diagnosed on routine FNAC and HP. In those cases FNAC can speed up the investigation process by making preliminary diagnosis. However use of IHC is still limited in our region because it is costly. More detailed studies are necessary to evaluate the actual causes of increasing head and neck neoplasms in our region along with maximizing the use of IHC as an ancillary diagnostic tool and expand its utility.

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