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ORIGINAL RESEARCH

Study of fine needle aspiration cytology and histopathological correlation of non-neoplastic and neoplastic lesions of head, neck and face

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ABSTRACT

Background: The head and neck pathology are very important as diverse diseases occur in various organs located in close proximity to each other between base of skull and thoracic aperture. Present study was aimed to study fine needle aspiration cytology and histopathological correlation of non-neoplastic and neoplastic lesions of head, neck and face. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in specimens of the head, neck and face region received at tertiary care center. All slides were reported by senior pathologists. **Results:** A cytohistopathological study of 130 cases of head, neck & face region was carried out Maximum incidence was seen in the age group of 21-30 years (32 %) followed by 31-40 years (26 %). Females (78 cases) outnumbered males (52 cases) contributing 60% and 40% respectively with M:F ratio of (1:1.5). Frequency of distribution of head, neck & face lesions was maximum in thyroid cases 45(35%), followed by soft tissue cases 38(29%), lymph node cases 27(21%) and salivary gland 20(15%) cases respectively. The overall diagnostic accuracy of FNAC was (93.60%). Sensitivity of fine needle aspiration cytology for presence of malignancy was (76%) and specificity of fine needle aspiration cytology for absence of malignancy was (98%). The overall Positive Predictive Value was 90.47 % and Negative Predictive Value was 94.23%. The diagnostic accuracy for thyroid, soft tissues, lymph nodes & salivary gland was 97.72%, 97.22%, 92.30% & 84.21% respectively. The overall discordancy rate is 24.61%. The highest discordant cases were in thyroid (33.3%) & lymph nodes (33.3%), followed by salivary gland (20%) and lastly soft tissues (10.5%). **Conclusion:** Fine needle aspiration cytology is simple, rapid and safe procedure with diagnostic accuracy of 93.60 % for non-neoplastic and neoplastic lesions of head, neck and face.

Keywords: fine needle aspiration cytology, histopathological correlation, benign, neoplastic lesions, lesions of head, neck and face.

INTRODUCTION

The head and neck pathology are very important as diverse diseases occur in various organs located in close proximity to each other between base of skull and thoracic aperture. FNAC is useful for diagnosing common benign and inflammatory lesions in the head, neck, and face region, including cysts, swellings, and inflammatory conditions. Head and neck neoplasms are a significant form of cancer in India, accounting for 23% of male and 6% of female cancer cases.[1,2]

Regional metastasis plays a crucial role in the prognosis and treatment of head and neck squamous cell cancer (HNSCC), significantly affecting patient survival.[3] Interestingly, the size of a benign tumour doesn't always determine its potential for malignancy.[4] The World Health Organization (WHO) has classified tumours of the head and neck in their "Blue Book" series, providing a standardized classification system.[5]

The head, neck, and face region encompass diverse structures, each with its own distinct classification framework.[5] Lesions in this area are a common occurrence in clinical practice, frequently presenting in surgical settings.[6] Present study was aimed to study

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fine needle aspiration cytology and histopathological correlation of non-neoplastic and neoplastic lesions of head, neck and face.

MATERIAL AND METHODS

Present study was single-center, prospective, observational study, conducted at Department of Pathology, SRTR GMCH Ambajogai, India. Study duration was of 2 years (October 2022 to September 2024). Study was approved by institutional ethical committee.

Inclusion criteria

- All the specimens of the head, neck and face region received at tertiary care centre during study period are included.

Exclusion criteria

- Autolysed specimens.
- Specimens received before and after study period.
- Patients who underwent FNAC but did not have subsequent histopathological examination

The patients were briefly explained about the procedure and the possible outcomes. Written consent of all the patients was taken.

Fine Needle Aspiration Technique

- Taking aseptic measures, the mass was fixed.
- A 5/10 ml disposable syringe with an attached needle of 21-23 gauge was placed inside the mass.
- Suction was applied to the syringe which was maintained while multiple passes in different directions were made within the lesion. The negative pressure on the syringe was then released, and the needle was withdrawn. The specimen was then forcibly ejected onto the glass slide.
- USG guidance was used only in infrequent cases to assist the procedure of FNAC.
- Variable number of slides was prepared. The slides were fixed for 10 minutes in methanol filled Coplin jars and dried for further staining. If fluid was aspirated, it was centrifuged & sediment was used for preparing the slides.

Slides underwent

- Papanicolaou's Staining procedure:
- May Grunwald Giemsa staining procedure:
- Periodic acid Schiff staining procedure:
- Ziehl Nielsen staining procedure:
- Histopathological procedure:

All specimens were fixed in 10% formalin. Gross examination was done after complete fixation of the specimens. The sections were prepared after processing the tissue and the slides thus prepared were stained with Hematoxylin and eosin.

All slides were reported by senior pathologists (experience more than 10 years). Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS

A total of 4561 patients came for FNAC during the study period. Out of this 2873(63%) patients had swelling in the head and neck region. From these 130 (2.8%) cases where histological correlation could be obtained were included in the study. There were 5(3.8%) cases where an unsatisfactory/blood mixed smear was obtained hence a definitive cytological diagnosis could not be given. Histological correlation could be obtained in 14%of thyroid, 6.3% of salivary aspirate, 5.1% of soft tissue, & 1.8 % of lymph node aspirates.

Table 1: Comparison of FNAC cases with and without histopathological Correlation:

	Salivary Gland	Thyroid	Soft Tissue	Lymph Node	Total
Cytohistopathological Correlation	20	45	38	27	130
Cytology only	316	321	736	1500	2873

The study had 45(35%) thyroid cases, 38(29%) soft tissue cases, 27(21%) lymph node cases and 20(15%) salivary gland cases. Age of the patients ranged from 1 year to 70 years with mean age of 35 years. Maximum incidence was seen in the age group of 21-30 years followed by 31-40 and 41-50 years. No patient was above the age of 70 years. Least incidence was seen in the age group of 1-10 years. There were 52 male and 78 female patients. The male to female ratio was 1:1.5. There was female preponderance. Thyroid swellings showed marked female predilection whereas lymph node, salivary gland as well as soft tissue swellings showed mild male preponderance.

Table 2: Age and gender distribution:

Age range	Thyroid (n=45)	Soft tissue (n=38)	Lymph Node (n=27)	Salivary gland (n=20)	Total (n=130)
1-10	00	03	02	00	05(4%)
11-20	02	07	03	02	14(11%)
21-30	18	10	07	06	41(32%)

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31-40	12	09	05	08	34(26%)
41-50	07	05	04	02	18(14%)
51-60	04	03	03	01	11(8%)
61-70	02	01	03	01	07(5%)
Gender					
Male	0	22	17	11	55
Female	45	16	10	09	75

72 (56%) aspirations were nonneoplastic, 38 (29%) swellings were benign and 20 (15%) malignant. Maximum incidence of nonneoplastic pathology, benign neoplasm and malignant neoplasm were seen in soft tissue, salivary and lymph node aspiration respectively.

Table 3: Etiological distribution of cases:

	Non-neoplastic	Benign	Malignant	Total
Thyroid	25	11	09	45
Salivary gland	07	11	02	20
Lymph node	20	00	07	27
Soft tissue	20	16	02	38
Total	72	38	20	130

The female patients had more nonneoplastic pathology as compared to male. 67% of total nonneoplastic pathologies were seen in female patients. Malignant etiologies were common in male patients. 59% of total malignant pathologies were seen in male patients. No particular sex predilection was seen in case of benign neoplasms.

Table 4: Nonneoplastic, benign and malignant lesions in male & female patients:

	NONNEOPLASTIC	BENIGN	MALIGNANT
AGE RANGE			
<20 YEARS	10	07	02
20-50 YEARS	56	27	10
>50 YEARS	06	04	08
Gender			
MALE	23	13	16
FEMALE	46	21	11

Considering those cases where histopathological correlation was available (n= 130); goiter (12%) and epidermal cyst (8%) were the commonest diagnosis. Pleomorphic adenoma (8%) was the commonest benign neoplasm and Papillary carcinoma thyroid (3%) was the commonest malignant neoplasm. In thyroid aspirates; the commonest cytopathological non-neoplastic lesion was goiter followed by colloid nodule. Other nonneoplastic lesions like Hashimoto's thyroiditis and benign follicular lesion showed 5% and 4% incidence. Follicular adenoma was the commonest benign neoplasm amounting to 3% of cases. The commonest malignant neoplasm was papillary carcinoma (2%). Other neoplasms like medullary carcinoma, follicular carcinoma was infrequently noted.

Table 5: Incidence of various cytological diagnoses of Thyroid swellings:

DIAGNOSIS	NO. OF CASES	PERCENTAGE
Goiter	175	55%
Colloid nodule	90	28%
Hashimoto's thyroiditis	16	05%
Benign follicular Lesion	12	04%
Follicular adenoma	10	03%
Hurthle cell adenoma	09	03%
Papillary carcinoma	06	02%
Follicular carcinoma	02	0.1%
Medullary carcinoma	01	0.1%

44% aspirations were nonneoplastic, 34% were benign and 22% malignant. The commonest neoplastic pathology in thyroid was follicular adenoma, followed by papillary carcinoma (5 cases). Cyto-histocorrelation was achieved in 31 cases out of 45 cases. Goiter is the commonest nonneoplastic

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diagnosis and papillary carcinoma the commonest malignancy. 10 cases of goiter were correctly identified. 8 cases of colloid nodule were correctly diagnosed. 4 cases of papillary carcinoma were correctly diagnosed on cytology.

Table 6: Correlation of Cytological & Histopathological Diagnosis:

Cytological Diagnosis	Corroborative h/p Diagnosis	Other h/p diagnosis	
		Benign	Malignant
Goiter (15)	10	Fa (5)	-
Colloid nodule (10)	08	Goiter (2)	-
Fa (8)	05	Nodular Hyperplasia (2)	Follicular Carcinoma (1)
Hurthle cell Adenoma (3)	02	Fa (1)	-
Papillary Carcinoma (6)	04	-	Follicular Carcinoma (2)
Follicular carcinoma (3)	01	-	Papillary carcinoma (1) medullary Carcinoma (1)

Sialadenitis was the commonest inflammatory lesion in salivary gland. Pleomorphic adenoma was the commonest benign neoplasm and mucoepidermoid carcinoma was the commonest malignant tumour.

Table 7: Incidence of various cytological diagnoses of salivary swellings:

DIAGNOSIS	TOTAL	PERCENTAGE
Chronic sialadenitis	140	44%
Simple cystic lesion	85	27%
Pleomorphic adenoma	80	25%
Mucoepidermoid carcinoma	03	01%
Inadequate	08	03%

Most common site of aspiration was parotid region. In salivary gland 6 aspirations (30%) were non-neoplastic, 11 cases (55%) were benign and 3 cases (10%) were malignant. Chronic sialadenitis was the commonest inflammatory pathology. Pleomorphic adenoma was the most frequent benign neoplasm. Mucoepidermoid carcinoma was the commonest malignant tumor. Cyto-histocorrelation could be achieved in 16 cases out of 20 cases. Cytology of 9 cases of pleomorphic adenoma was concordant with histopathology. One case of mucocele was correctly identified. One smear was unsatisfactory.

Table 8: Correlation of Cytological & Histopathological Diagnosis:

Cytological diagnosis	Corroborative h/p diagnosis	Other h/p diagnosis	
		Benign	Malignant
Chronic Sialadenitis (5)	05	-	-
Mucocele (1)	01	-	-
No opinion (1)	-	Pleomorphic Adenoma (1)	-
Pleomorphic Adenoma (11)	09	-	Mucoepidermoid Carcinoma (2)
Mucoepidermoid Carcinoma (2)	01	Pleomorphic Adenoma (1)	-

Abscess and keratinous cyst were common cytological diagnosis in soft tissues of head and neck. Lipoma was the commonest benign neoplasm.

Table 9: Incidence of various cytological diagnoses of soft tissue swellings:

Diagnosis	NO. OF CASES	PERCENTAGE
Epidermal cyst	250	34%
Lipoma	235	32%
Abscess	206	28%
Benign adnexal tumous	15	02%
Benign spindle cell lesion	14	02%
Sebaceous carcinoma	03	0.5%
SCC	02	0.5%
Inadequate	11	01%

Most of the swellings were well defined and soft in consistency. 53% swellings were inflammatory, 39% were benign neoplasms & 8% were malignant. Epidermal cyst (8 cases) was the most common

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diagnosis. Most common site of occurrence for keratinous cyst was on cheek and around auricular region. The material of aspirate in all the case was dirty, whitish; characteristic of the cyst. Three malignant cases were noted. Cyto-histocorrelation could be achieved in 34 cases out of 38 cases. 3 cases of Thyroglossal cyst were correctly diagnosed; the swelling was in the midline & moved with deglutition.

Table 10: Correlation of Cytological & Histopathological Diagnosis:

Cytological diagnosis	Corroborative H/p diagnosis	Other h/p diagnosis	
		Benign	Malignant
Epidermal cyst(10)	08	Abscess(1) Trichilemmal cyst(1)	-
Thyroglossal cyst(3)	03	-	-
Abscess(7)	06	Descriptive (1)	-
Hemangioma/ Vascular lesion(1)	01	-	-
Lipoma (8)	07	-	Liposarcoma (1)
Cystic lesion (6)	06	-	-
Schwannoma(1)	01	-	-
SCC (1)	01	-	-
Sebaceous Carcinoma (1)	01	-	-

Reactive lymphadenitis followed by chronic nonspecific lymphadenitis was common in occurrence in lymph node. Metastatic squamous cell carcinoma was the commonest malignancy.

Table 11: Incidence of various cytological diagnoses of lymph node Swellings:

Diagnosis	Total	Percentage
Reactive lymphadenitis	580	39%
Chronic nonspecific lymphadenitis	360	24%
Granulomatous lymphadenitis	240	16%
Abscess	140	09%
TB lymphadenitis	107	07%
Lymphoproliferative disorder	40	03%
Metastatic SCC	15	01%
Metastatic adenocarcinoma	08	0.5%
Inadequate	10	01%

In lymph nodes 70% were inflammatory and 30% cases were malignant. Reactive lymphadenitis (7 cases) was the commonest nonneoplastic pathology and lymphoma (4 cases) was the commonest malignancy. Cyto-histocorrelation could be achieved in 18 cases out of 27 cases. 7 cases of reactive lymphadenitis and 3 cases of granulomatous lymphadenitis were correctly identified.

Table 12: Correlation of Cytological & Histopathological Diagnosis:

Cytological diagnosis	Corroborative h/p diagnosis	Other h/p diagnosis	
		Benign	Malignant
Reactive lymphadenitis(9)	07	Abscess(1) Chronic nonspecific lymphadenitis (1)	-
Granulomatous Lymphadenitis(4)	03	Tuberculous lymphadenitis(1)	-
Chronic nonspecific Lymphadenitis (6)	04	Granulomatous lymphadenitis(1)	HL (1)
Abscess (1)	01	-	-
Lymphoproliferative disorder(4)	-	Chronic nonspecific lymphadenitis (1)	HL (2) NHL (1)
Metastatic SCC(3)	03	-	-

The overall diagnostic accuracy of FNAC was (93.60%). Sensitivity of fine needle aspiration cytology for presence of malignancy was (76%) and specificity of fine needle aspiration cytology for absence of malignancy was (98%). The overall Positive Predictive Value was 90.47 % and Negative Predictive Value was 94.23%. The diagnostic accuracy for thyroid, soft tissues, lymph nodes & salivary gland was 97.72%, 97.22%, 92.30% & 84.21% respectively.

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Table 13: Organ wise comparison of statistical results:

	Sensitivity	Specificity	PPV	NPV	Accuracy
Thyroid	90%	100%	100%	97.14%	97.72%
Salivary	33.33%	93.75%	50%	88.23%	84.21%
Lymph node	87.50%	94.44%	87.50%	94.44%	92.30%
Soft tissue	66.66%	100%	100%	97.05%	97.22%
Overall	76%	98%	90.47%	94.23%	93.60%

The cases wherein the cytological and histopathological results did not match, smear was of inadequate cellularity and instead of definitive diagnosis differential diagnosis was given on cytology were all considered as discordant cases. The overall discordancy rate is 24.61%. The highest discordant cases were in thyroid (33.3%) & lymph nodes (33.3%), followed by salivary gland (20%) and lastly soft tissues (10.5%)

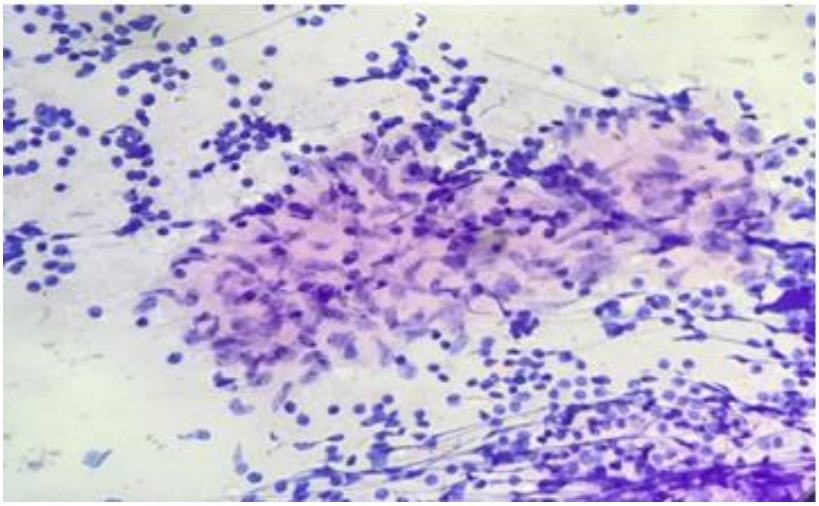

Fig. 1: Granulomatous Lymphadenitis of cervical lymph node: Smear showing aggregates of epithelioid cells with plenty of lymphocytes. (PAP:40X)

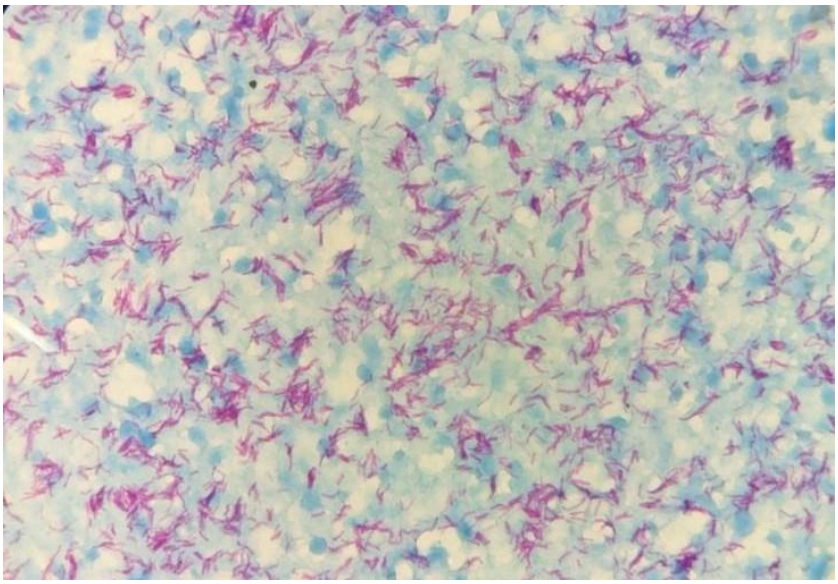

Fig. 2: Tuberculous Lymphadenitis: Section showing ZN staining positive for Acid fast bacilli (ZN: 100X)

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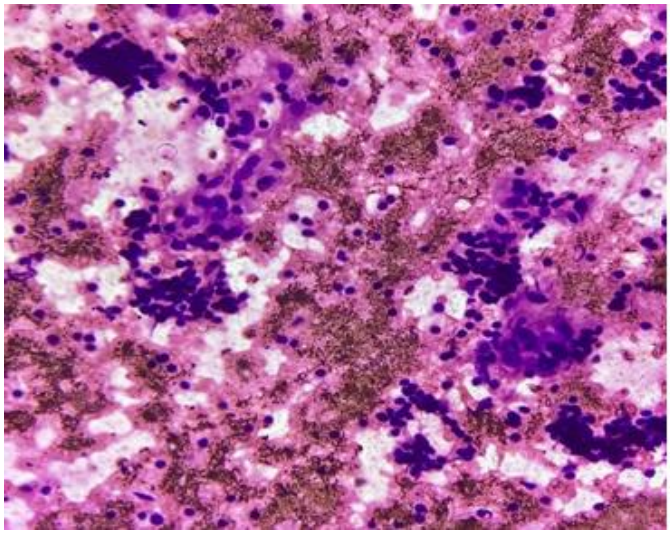

Fig. 3: Hashimoto Thyroiditis: Smear showing aggregates of oncocytic cells with chronic inflammatory infiltrate and scanty colloid. (PAP:40X)

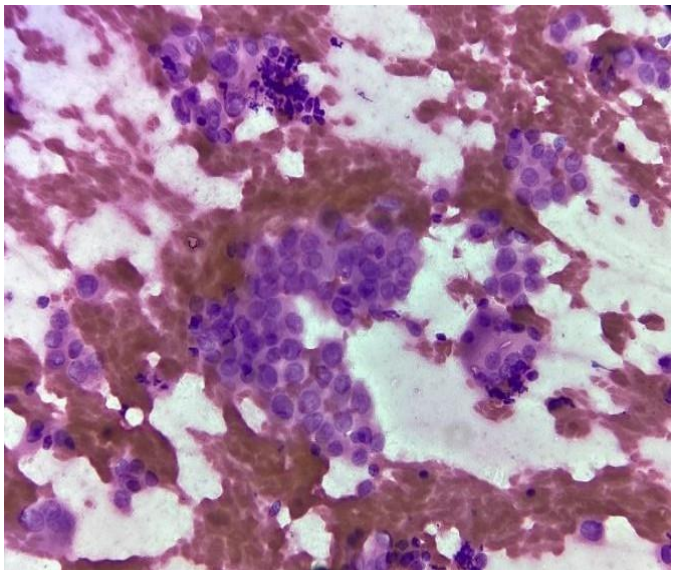

Fig. 4: Papillary carcinoma of thyroid: Cellular smear showing groups of cells having enlarged overlapping nuclei with clear chromatin. (PAP:40X)

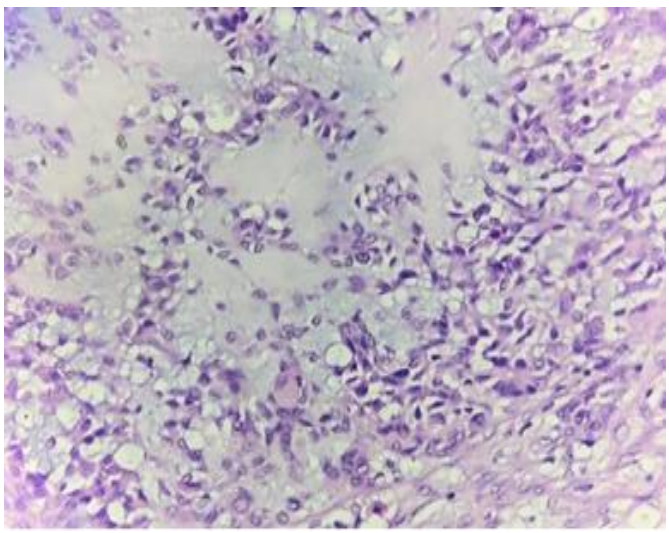

Fig. 5: Pleomorphic Adenoma of parotid gland: section shows epithelial, myoepithelial and stromal component. Stroma is chondromyxoid. (H&E: 40X)

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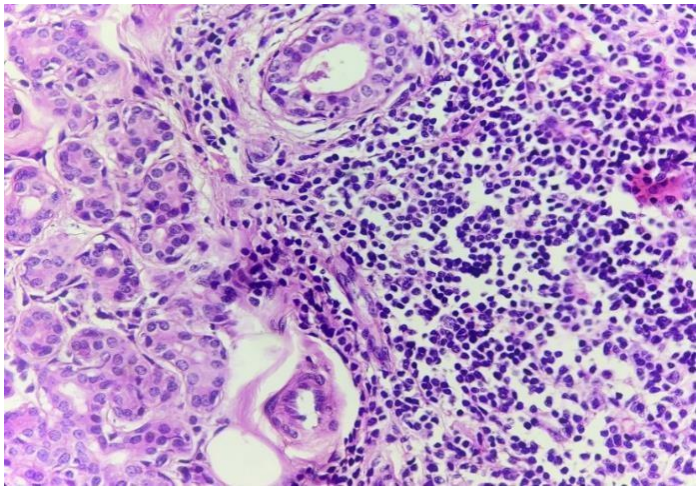

Fig. 6: Chronic Sialadenitis of parotid gland: section shows atrophic acini infiltrated by Chronic inflammatory cells with fibrosis. (H&E: 40X)

DISCUSSION

This comparative study was conducted and analysed at the Department of Pathology. The subjects of the study were patients referred by the clinician for Fine needle aspiration having swelling in the head and neck region. Total outcome was evaluated in 130 patients having subsequent histopathological correlation.

Mean age of our study subjects was 35 years with minimum age of 1 year and maximum age of 70 years. Amatya et al.,[7] noted a mean age of 40 years with a range of 9-82 years. Solanki et al.,[8] noted maximum incidence in the group of 11-20 years and 41-50 years.

The male to female ratio in our study was 1:1.5 (male n=52; females n=78). Female patients showed preponderance of thyroid swellings. However salivary gland, lymph nodes and soft tissue masses showed slight male preponderance. Fernandes et al.,[9] reported male to female ratio of 1:4.41. Their study had significant number of thyroid cases common in female patients. The female patients had more of nonneoplastic (35.3%) & benign (16.15%) pathology, whereas male patients had more of malignant etiologies (12.3%), This observation is similar to that noted by Amatya et al.,[7]

The study showed maximum incidence of thyroid (34.6%), followed by soft tissue cases (29.2%), lymph node (20.7%) and salivary gland (15.3%). In a study of 59 patients by Soni et al.,[10] 47.45% were of neck nodes, 23.72% were of thyroid, 22.03% were of salivary gland masses and 6.11% were from other types of neck masses. Solanki et al.,[11] noted incidence of 63.3% in lymph nodes, 20.4% in soft tissues, 10.2% in thyroid and 6.1% in salivary gland.

Etiologically the swellings were broadly divided into nonneoplastic & neoplastic; sub classified as benign & malignant. Nonneoplastic pathologies were the commonest swellings amounting to 53.07% followed by benign (26.15%) and lastly malignant (20.76%) pathology. In a study by Solanki et al.,[11] nonneoplastic, benign and malignant pathology amounted to 49%, 36% and 15 % of cases. Amatya et al.,[7] noted 36% inflammatory lesions, 42.6%) benign lesions, 16.2%) malignant lesions and 5.1% of indeterminate follicular neoplasms.

In 5 cases the cytological smears were inadequate in cellularity or heavily blood mixed even after repeated aspiration. Thus nondiagnostic/ unsatisfactory smear rate was 3.8% in our study. Tatomirovic[12] noted a nondiagnostic aspirate rate of 9.75%. The main causes of the wrong diagnoses in their study were sampling errors, inexperience and misinterpretation.

In a study by Manjula K et al.,[13] inadequacy was attributed to firm small swellings and uncooperative patients. Nazma et al.,[14] found 0.64% aspirates inadequate. Unsatisfactory aspirates were the result of poor handling of the aspirated material, lack of trained cytopathologists and small size of the lesions. The inadequacy rate in a study on thyroid swelling by Harshmohan et al.,[15] was 5.06%. This was comparable to our study.

The sensitivity of Fine Needle Aspiration for detecting malignancy was 76%, specificity was 98% and diagnostic accuracy was 93.6%. The positive predictive value was 90.47% and negative predictive value was 94.23%. The diagnostic accuracy of the study is 93.6%. This is comparable to the study of Tilak Vetal[16]

The age range of patients with thyroid swelling was between 20-65 years with a mean age of 36.5 years. Male to female ratio was 1:9.6. Maximum incidence was seen in the age group of 20-50 years. In a study of 170 cases by Nazma et al.,[17] age ranged from 16-78 years & male to female ratio was 1:2.54.

In thyroid FNAC 20 cases (44%) were non-neoplastic, 15 cases (34%) were benign and 10 cases (22%) were malignant. The sensitivity &specificity of diagnosis was 81.81% & 100% respectively, which is comparable to other studies. (Agarwal et al.,[18] Harsh Mohan et al.,[15] Nazma Afroze et al.,[17] & Morgan JL et al.,[19]) The accuracy of diagnosis, PPV & NPV for thyroid swellings was 97.72%, 100% & 97.14% respectively.

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Amongst the salivary glands, the parotid was the most commonly involved gland. This observation is in concordance with study by Cristallinni EG et al.,[20]

The age range of patients with salivary gland lesions was from 14-65 years with mean age of 38 years & male to female ratio of 1.1:1. This was comparable to the finding of Tahoun et al.,[21] where the median age was 42 years & male to female ratio was 1.4:1. Maximum incidence was seen in the age group of 20-40 years. In salivary gland 6 aspirations (30%) were non-neoplastic, 11 cases (55%) were benign and 3 cases (10%) were malignant. Pleomorphic adenoma was the most frequent benign neoplasm similar to the observation in a study by Khandekar et al.,[22] Mucoepidermoid carcinoma was the commonest malignant tumour similar to the study by Simsek G et al.,[23]

Mean age of the patient with lymph node swelling was 34 years. The patient's age ranged between 3 months to 60 years. The patients ranged in age from 1 to 90 years in a study by Steel et al.,[24] Male to female ratio were 1.5:1. Considering histopathological correlated cases; 20(70%) cases were inflammatory and 7(30%), cases were malignant. Reactive lymphadenitis (7 cases) was the commonest nonneoplastic pathology and lymphoma (4 cases) was the commonest malignancy.

In soft tissue, 20 aspirations (53%) were nonneoplastic, 15 cases (39%) were benign and 3 cases (8%) were malignant. Epidermal cyst (8 cases) was the most common diagnosis.

Jaseem Hasan[25] in their study noted lipomatous lesion, spindle cell lesion, round cell lesion and vascular lesion in the head and neck region. Lipoma, Hemangioma, Cystic Hygroma, Schwannoma, Fibroma, Alveolar Rhabdomyosarcoma, Basal Cell Carcinoma were the various soft tissue lesions in a study by Tippu Ishar et al.,[25]

The sensitivity, specificity and accuracy of diagnosis were 66.66%, 100%, and 97.22% respectively. The PPV and NPV was 100% & 97.05% respectively. ln a study of 105 cases by Roy S et al.,[26] the accuracy rate was 90.6%.

CONCLUSION

Frequency of distribution of head, neck & face lesions was maximum in thyroid cases 45(35%), followed by soft tissue cases 38(29%), lymph node cases 27(21%) and salivary gland 20(15%) cases respectively. Goiter (12%) and epidermal cyst (8%) were the commonest diagnosis. Pleomorphic adenoma (8%) was the commonest benign neoplasm and Papillary carcinoma thyroid (3%) was the commonest malignant neoplasm. Fine needle aspiration cytology is simple, rapid and safe procedure with diagnostic accuracy of 93.60 % for non-neoplastic and neoplastic lesions of head, neck and face. Fine needle aspiration cytology is suitable for the 1st line investigation in lesions of head, neck and face.

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