



**ORIGINAL RESEARCH PAPER**

**Pathology**

**A RETROSPECTIVE STUDY OF USG and CT-GUIDED FINE NEEDLE ASPIRATION CYTOLOGY IN A TERTIARY HEALTH CARE CENTER**

**KEY WORDS:** Fine Needle Aspiration Cytology (FNAC), CT guided, Low cost.

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**ABSTRACT**  
**Background:** Ultrasonography and computed tomography guided fine needle aspiration cytology has emerged as an important diagnostic tool for deep-seated and non-palpable lesions. It has high accuracy and efficacy. **Aim:** To study the spectrum of USG and CT-guided aspirations. Most common site aspirated, age & sex distribution was presented in our result. **Materials and Methods:** We did retrospective study of 248 guided aspirates received in the department of pathology, Gajraraja Medical College for a period of 1.4 years from January 2021 to April 2022. Cytological diagnosis was correlated with clinical and radiological data to arrive at a final diagnosis. **Results:** The most common organ aspirated was liver (47 cases). Adenocarcinoma (69 cases, 39.4%) was the most common malignancy diagnosed with maximum cases in Lungs (20, 11.42%). In breast lesions, fibroadenoma was more common as a benign lesion and ductal cell carcinoma as malignancy. In lymph nodes, granulomatous lymphadenitis and metastasis of squamous cell carcinoma were commonest inflammatory and malignant conditions respectively. In thyroid lesions, follicular neoplasm was common. CT guided aspiration from spine showed 9 cases of pott's spine and 5 cases of plasmacytoma. Some rare and deep seated pathologies like benign histiocytic tumor of breast, GIST, Chondroma of sacral region and neuroendocrine tumor of lung were also reported. **Conclusion:** Ultrasonography and computed tomography guided fine needle aspiration is effective in final diagnosis of various benign and malignant deep-seated lesions.

**INTRODUCTION**

Fine needle aspiration cytology (FNAC) has been used as a primary modality for evaluation of all the palpable lumps in the body for a long time. However, its application is limited in cases with deep seated lumps, smaller sized lesions which are not readily palpable or if a small swelling is present in a crucial location, adjacent to major vessels.

In such case scenarios, FNAC coupled with diagnostic imaging techniques such as ultrasound (USG) or computed tomography (CT) can improve the diagnostic yield and a definite diagnosis can be reached in most of the cases.

Image guided FNAC is a widely accepted diagnostic technique nowadays, and the applications are growing day by day. The technique is safe, simple, rapid, cost effective and accurate in the evaluation of deep seated lumps which are unapproachable by blind FNAC. Many studies over the years have evaluated the role of USG guided FNAC of various sites 1-8.

Image guided FNAC (both USG and CT guided) has a special role to play in abdominal, pelvic and intrathoracic masses. The relatively newer locations which are being explored include the thyroid 9,10. The most significant advantage of USG guidance is that while performing the FNAC, one can visualize simultaneously whether the needle tip is within the target lesion.

The aim of this study was to analyze the spectrum of cytological diagnoses in various lesions among the various guided FNACs performed in our hospital.

A critical analysis of the utility of image guided FNAC in the deep seated and otherwise inaccessible mass lesions was carried out. The most common site aspirated, the indications for a guided aspiration, and the spectrum of diagnosis was presented as our result.

**MATERIAL AND METHODS**

This was a retrospective study done in the department of pathology, Gajraraja Medical College for a period of 1.4

years from January 2021 to april 2022 . All patients who were clinically and radiologically diagnosed with lesions were included in the study.

The aspirations were done by the radiologist or in conjunction with a pathologist. 364 procedures were done under image-guidance. The aspirates were obtained from various anatomic sites such as intraabdominal, intrathoracic, lymph nodes, thyroid, breast, vertebrae, salivary glands, and soft tissues. Rare sites like tibia, iliopsoas muscle, sacral mass were also included. 116 aspirations were excluded from the study as they were acellular and inconclusive in diagnosis. The air dried and 95% alcohol fixed smears were prepared for Giemsa and Papanicolaou staining.

Clinical and radiological data were obtained from the medical records. The FNAC diagnosis was correlated with clinical and radiological information. The lesions were divided into inflammatory, benign or malignant categories.

**RESULTS**

Out of 3010 FNACs done from 1 January 2021 to 30 April 2022, 248 (8.23%) were done under image guidance and reported. Out of this 122 (49.6%) patients were males , 126 (50.4%) were females.

The most common age group in our study was 41 -60 years. among the guided modality used, usg guided procedures 139(56%) were more common . Total 175 ( 70.6%) malignant , benign 21 ( 8.4 %) and 52 (21.6 %) inflammatory cases were reported .

More common reason for doing image guided fnac was the lesion being deep seated and being proximal to vasculature in 193 cases(77.8%)

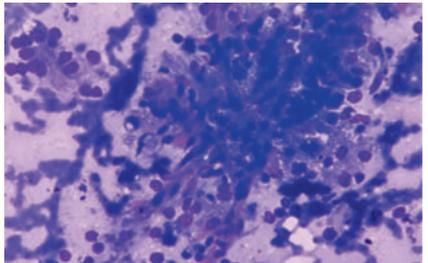
The cases were grouped according to findings as 1. intra abdominal lesions(87 cases), 2.intrathoracic lesions (45 cases), 3.lymph nodes ( 37 cases) , 4.oral cavity ,muscle,head and neck region ( 24 cases), 5. bone, soft tissue and other lesions ( 55 cases) .The cytological diagnoses are given in Table 2,3,4 ,5,6 respectively.

No	Characteristic	Categories	No. of cases	Percentage
1	Gender	Male	122	49.6%
		Female	126	50.4%
2	Age	<20	9	3.6%
		21-40	52	20.9%
		41-60	118	47.0%
		61-80	66	26.7%
		>81	3	1.2%
3	Image Guidance	USG guided FNAC	139	56%
		CT guided FNAC	109	44%
4	Reason for guided FNAC	Deep seated location and proximity to vasculature	193	77.8%
		Small sized lesion (for localization)	55	22.2%

Out of the 87 guided fnac done in abdomen, the most common malignancy encountered in the abdomen was Adenocarcinoma of Gallbladder 18 cases ( 7.2%) (fig.1 A, B) followed by metastatic adenocarcinoma in the liver ,14 cases (5.6%) (fig. 2). Benign neoplasms included two cases, one case( 0.4%) each of cystadenoma of adrenal gland and benign cystic lesion of pancreatic mass respectively. Guided fnac from abdominal lymphnodes shows 3 cases of inflammatory origin, 2 cases ( 0.8%) as granumatus lymphadentis and 3 cases of malignancy which consist of two cases(0.8%) of metastatic adenoarcinom and one case (0.4%) of Non hodgkins lymphoma.

**TABLE 1: Cytological diagnosis of Intra-abdominal lesions**

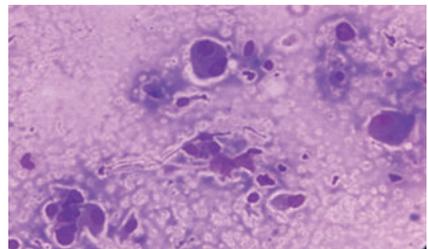
Inflammatory	No. of Cases	%	Benign Lesion	No. of Cases	%	Neoplastic	No. of Cases	%
Gall Bladder (26)						Adenocarcinoma	18	7.2%
						Positive for Malignancy	08	3.0%
Liver (47)						Metastatic deposits of Malignancy	14	4.0%
						Adenocarcinoma	13	3.2%
						Metastatic Adenocarcinoma	14	4.4%
						Papillary Adenocarcinoma	02	0.4%
						Squamous Cell Carcinoma	03	1.2%
						Positive for not specified	03	1.2%
Peritoneary (2)			Cystadenoma	01	0.4%	Adenocarcinoma	03	0.8%
Adrenal Mass (1)						Adenocarcinoma	01	0.4%
Adrenal Mass (1)						Adenocarcinoma	01	0.4%
Abdominal Lymph Node (1)	Tubercular Lymphadenitis	02	0.4%			Metastatic Adenocarcinoma	02	0.4%
	Reactive Lymphadenitis	08	0.4%			Non Hodgkin's Lymphoma	01	0.4%
Pancreatic Mass (1)			Benign Cyst Lesion	01	0.4%			
TOTAL	1		TOTAL	40		TOTAL	62	



**Figure Hepatocellular Carcinoma (Liver) MGG stain (400x)**

**TABLE 3: Cytological diagnosis of Thoracic lesions**

Inflammatory	No. of Cases	%	Benign Lesion	No. of Cases	%	Neoplastic	No. of Cases	%
Lung (39)						Adenocarcinoma	20	8.0%
						Small Cell Carcinoma	02	0.4%
						Positive for Malignancy	06	2.4%
						Adenocarcinoma large Cell Type	01	0.4%
						Non Small Cell Carcinoma	01	1.2%
						Small Cell Neuroendocrine	01	0.4%
						Squamous cell Carcinoma	06	2.4%
Mediastinal Lymph Node (2)						Papillary Adenocarcinoma	01	0.4%
						Positive for Malignancy	01	0.4%
Esophagus (1)						Malignant Lesion	01	0.4%
Pleural Mass (2)	Tubercular Abscess	02	0.4%					
Pleural Lesion (1)						Metastatic Adenocarcinoma	01	0.4%
TOTAL	7					TOTAL	41	

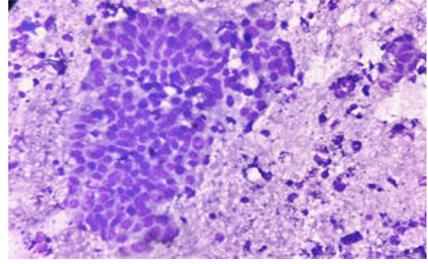


**Figure: Adenocarcinoma of Liver MGG stain (400x)**

**TABLE 4: Cytological diagnosis of Lymph node lesions**

No	Inflammatory	No. of Cases	%	Benign Lesion	No. of Cases	%	Neoplastic Lesion	No. of Cases	%
1	Cervical Lymph Node (11)	Chronic Lymphadenitis	08	1.4%			Hodgkin's Lymphoma	01	0.4%
		Reactive Lymphadenitis	07	2.4%			Non-Hodgkin's Lymphoma	02	0.8%
		Lymphadenitis	09	3.4%			Adenocarcinoma	01	0.4%
		Tubercular Lymphadenitis	04	1.4%			Keratinized Squamous Cell Carcinoma	03	1.2%
		Granulomatous Lymphadenitis	01	0.4%					
2	Axillary Lymph Node (1)	Reactive Lymphadenitis	01	0.4%					
		Tubercular Lymphadenitis	01	0.4%					
3	Inguinal Lymph Node (4)	Chronic Lymphadenitis	01	0.4%					
		Reactive Lymphadenitis	01	0.4%					
4	Supraclavicular Lymph Node (1)	Chronic Lymphadenitis	01	0.4%			Lymphoma	01	0.4%
		Reactive Lymphadenitis	01	0.4%					
TOTAL		29				TOTAL	9		

Among 45 cases of thorax, 39 cases were lung lesions in which the most common malignancy encountered in our study was Adenocarcinoma of the lung (20 cases , 8.0 %) followed by squamous cell carcinoma(6 cases ,2.4 %) were reported . Small cell carcinoma ( 2 cases ,0.8%) and non small cell carcinoma ( 3 cases , 1.2% ) were also seen. Out of two mediastinal lymph nodes aspirated one lymph node showed metastasis of papillary Adenocarcinoma and other was reported as positive for malignancy. One case in which smears were obtained from esophagus showed malignancy but could not be specified . Inflammatory lesions included two cases(0.8%) of tubercular abscess.



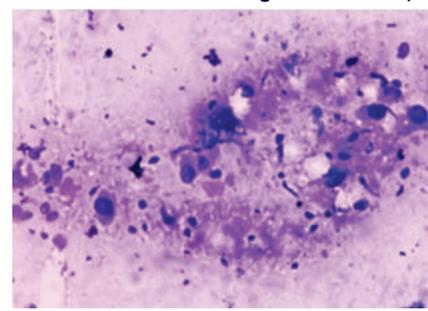
**Squamous Cell Carcinoma of Lungs MGG stain (400x)**

**TABLE 5: Cytological diagnosis of Oral cavity, muscle, head and neck lesions**

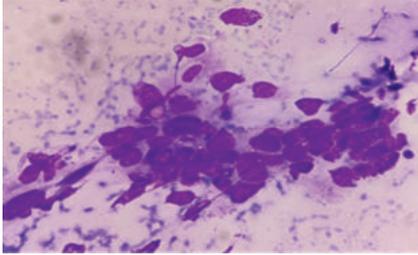
No	Inflammatory	No. of Cases	%	Benign Lesion	No. of Cases	%	Neoplastic Lesion	No. of Cases	%	
1	Thyroid (26)	Histiocytic Thyroiditis	04	1.4%	Colloid Cyst	04	1.4%	Follicular Neoplasm	07	3.2%
		Thyroid Cyst	03	1.2%						
		Thyroid Adenoma	01	0.4%						
		Tubercular Thyroiditis	01	0.4%						
		Follicular Neoplasm	01	0.4%						
2	Submandibular Gland (3)						Positive for Malignancy	02	0.8%	
							Well differentiated squamous cell carcinoma	01	0.4%	
Parietal Gland (1)	Acute Parotitis	01	0.4%							
TOTAL	1			TOTAL	9		TOTAL	10		

**TABLE 6: Cytological Diagnosis of Bone, soft tissue and other lesions**

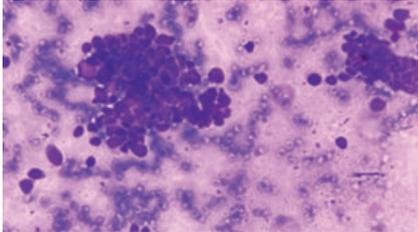
No	Inflammatory	No. of Cases	%	Benign Lesion	No. of Cases	%	Neoplastic Lesion	No. of Cases	%
1	Pituitary Mass (1)						Adenocarcinoma of Pituitary	01	0.4%
							Small Cell Cell Tumor	01	0.4%
2	Adrenal Mass (2)						Non-Hodgkin's Lymphoma	01	0.4%
							Adenocarcinoma	01	0.4%
3	Ovarian Mass (2)						Endometrioid Ovarian Tumor	01	0.4%
							Non-Hodgkin's Lymphoma	01	0.4%
4	Head Lesion (2)						Chondroma	01	0.4%
							Adenocarcinoma	01	0.4%
5	Cervical (26)						Metastatic Lesion	01	0.4%
							Non-Hodgkin's Lymphoma	01	0.4%
6	Soft Tissue (2)						Soft Tissue Sarcoma	01	0.4%
							Positive for Malignancy	01	0.4%
7	Blow Tumor (1)						Positive for Malignancy	01	0.4%
							Ductal Cell Carcinoma	01	0.4%
8	Breast (1)						Metastatic Lesion	01	0.4%
							Metastatic Lesion	01	0.4%
9	Prostate (1)						Metastatic Lesion	01	0.4%
							Metastatic Lesion	01	0.4%
10	Cervical Swelling (2)						Acute Inflammation	01	0.4%
							Metastatic Lesion	01	0.4%
11	Inguinal Mass (2)						Acute Inflammation	01	0.4%
							Metastatic Lesion	01	0.4%
12	Blow Tumor (1)						Metastatic Lesion	01	0.4%
							Metastatic Lesion	01	0.4%
TOTAL	11			TOTAL	34		TOTAL	34	



**Figure: Non Small Cell Carcinoma of Lungs MGG stain (400x)**

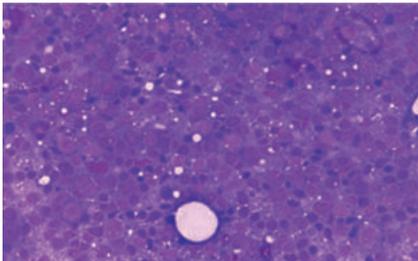


**Figure: Squamous Cell Carcinoma of Lung Mass on MGG stain (400x)**

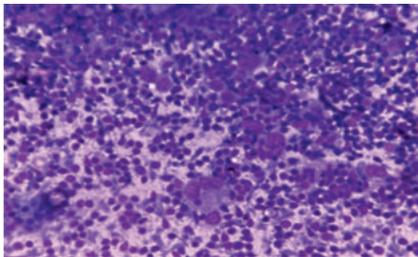


**Figure: Small Cell Carcinoma of Lungs MGG stain (400x)**

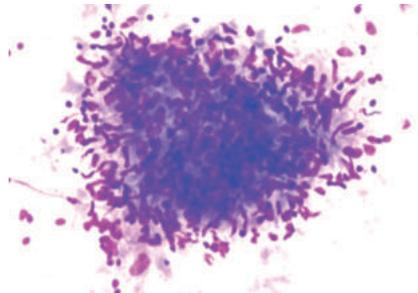
Among 45 aspirates from lymph nodes including abdominal (6) and mediastinal(2), 32 (71.1 %) were inflammatory in origin, most common being granulomatous lymphadenitis suggestive of tubercular etiology. Among primary malignancies , there were 2 cases of non hodgkins lymphoma ,one case of hodgkins lymphoma and one case of lymphoma which could not be specified. In metastatic lesions , most common was keratinizing squamous cell carcinoma ( 3 cases ) followed by adenocarcinoma.



**Figure: Non-Hodgkin Lymphoma on MGG stain (400x)**



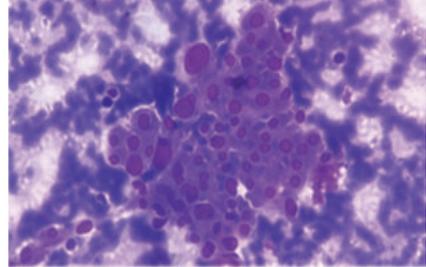
**Figure: Hodgkins Lymphoma on MGG stain (400x)**



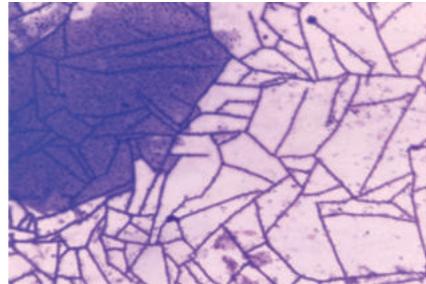
**Figure: Granulomatous Lymphadenitis MGG stain (400x)**

In thyroid smears , out of 20 lesions seven cases (35%) were malignant, 9( 45%) were benign and 4 (20%) were inflammatory. All cases in our study in thyroid neoplasm are follicular neoplasms of the thyroid. In Benign lesions most

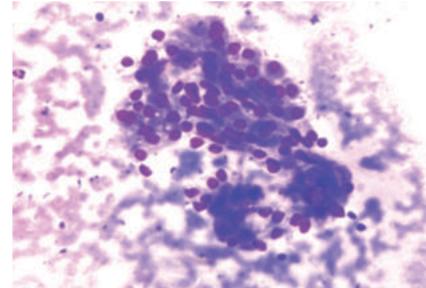
common was colloid goiter. One case each of thyroid Adenoma, benign follicular neoplasm and thyroid cysts were reported. Four cases of Hashimoto thyroiditis were reported which turned out to be the most common inflammatory lesion.



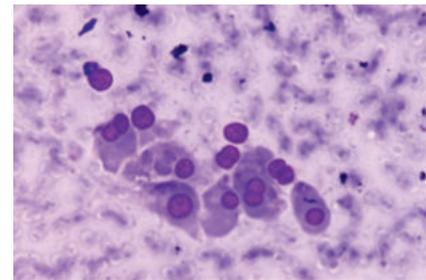
**Figure: Follicular Neoplasm of Thyroid MGG stain (400x)**



**Figure: Colloid Goiter MGG stain (400x)**

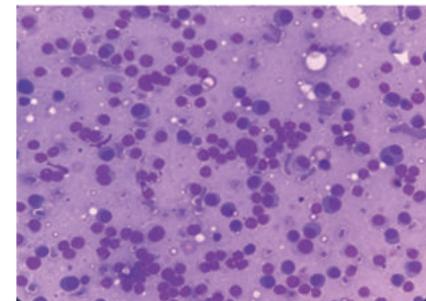


**Figure: Hashimoto Thyroiditis MGG stain (400x)**

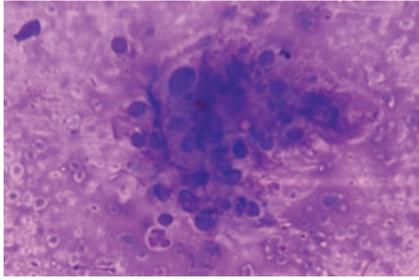


**Figure: Hurtle Cell Changes in Hashimotos Thyroiditis MGG stain (400x)**

Among salivary gland lesions ,three guided fnacs were done from submandibular region and one from parotid region out of which one could be specified as metastasis of well differentiated squamous cell carcinoma. One case of acute parotitis was also seen.



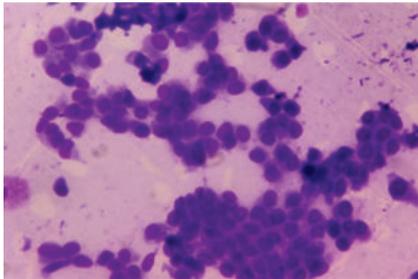
**Figure: Plasmacytoma MGG stain (400x)**



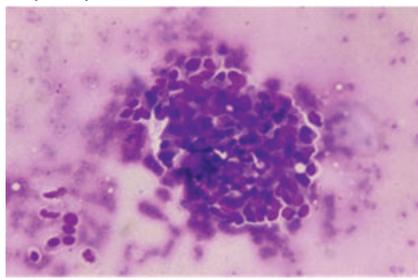
**Figure: Chordoma of Sacral Bone MGG stain (400x)**

In bone lesions 20 aspirates were done from vertebrae . Out of these 10 cases were of inflammatory origin out of which 9 could be specified as potts spine. In malignant lesions there were four cases of plasmacytoma followed by three cases of metastatic adenocarcinoma and individual cases of Non hodgkins lymphoma .2 ases could not be specified . One case of Chondroma of sacral bone was also reported . One case of Non Hodgkins lymphoma was also reported from gluteal mass. Also from fnac done from pelvic mass , we found serous adenocarcinoma of ovary. In one case , we also reported malignancy of prostate.

In breast lesions among 15 cases, 7 cases were malignant and reported as ductal cell carcinoma of breast. Among 8 benign cases, 5 cases were reported as fibroadenoma, two as abscess and single case as benign histiocytic disorder.

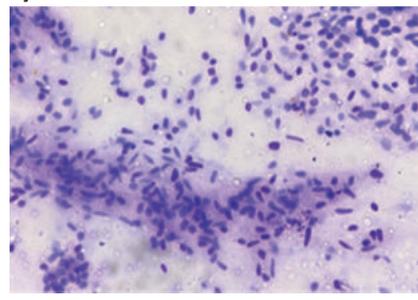


**Figure: Infiltrating Ductal Cell Carcinoma of Breast MGG stain (400x)**

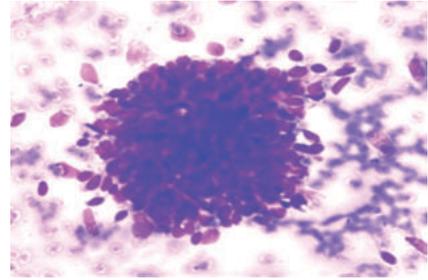


**Figure: Serous Cystadenocarcinoma of Ovary MGG stain (400x)**

In Soft tissue tumors, we reported two cases of lipoma, single cases of small round cell tumor , benign spindle cell tumor, soft tissue sarcoma and Gastrointestinal stromal tumor respectively .



**Figure: Gastrointestinal Stromal Tumour MGG stain (400x)**



**Figure: Spindle Cell Sarcoma MGG stain (400x)**

**Inadequacy of smears**

The inadequacy rates for guided FNAC have a very wide range from 2.8% to 33.6%. The factors which influence this include:

1. Facility for on site adequacy evaluation,
2. Number of passes done, and
3. The expertise of the pathologist and guiding radiologist.

In the present study, the inadequacy rate was 116 cases ( 31.86%) on account of using 2-3 passes per patient and all FNAC being performed by either consultants or senior residents. Ghosh et al. analyzed the spectrum of cytological diagnosis and clinicoradiological correlation of guided FNAC over a period of 10 years.10 The cases included 234 CT guided and 266 USG guided FNAC. Adequacy ranged from 87.6% in CT guided FNAC to 91.7% in USG guided FNAC. They observed that an increased number of inadequate aspirates were obtained from very small sized (<2cm) and deeper lesions (>10cm).

**DISCUSSION**

Liver and lungs were the common sites for FNAC in this study similar to the studies done by Sheikh et al 1 and Adhikari RC. 2 and by JNobrega et al. 3

The age range of our patients was 9- 97 years comparable to Tan KB et al 4 where age range was 11 -82 years.

In our study, benign and malignant lesions were most common in the age group of 5 - 67 years and 45- 55 years respectively. Mukherjee S et al 5 found the maximum incidence of malignant lesions in the age group of 40-70 years.

The most common malignancy encountered in the abdomen was adenocarcinoma of gallbladder, 18 cases (7.2%) followed by metastatic adenocarcinoma of liver, 16 cases (6.4%). Zarger et al 6 found the most common malignancy as carcinoma gallbladder followed by hepatocellular carcinoma (9.6%). RC Adhikari 2 found metastatic tumor of the liver as the most common malignancy encountered in the abdomen (38.4%) followed by hepatocellular carcinoma (24.8%).

Amongst the lung lesions; adenocarcinoma (20 cases, 8%) was the most common in our study, in contrast to the findings by Mukherjee S et al [5] in which it was small cell carcinoma of lungs.

Amongst the intra-abdominal lymph node aspirates in our study; out of the 6 cases, 2 cases were diagnosed as granulomatous lesion suggestive of tuberculosis, one reactive lymphadenitis .Three cases were diagnosed as malignant lesions; 2 metastatic adenocarcinoma, one was Non-Hodgkin's lymphoma. Porter B et al 7 found 58.9% inflammatory lesions and 41.7% malignant lesions. Similar findings were reported by Das and Pant. 8

Among 45 aspirates from lymph node most common inflammatory lesion granulomatous lymphadenitis suggestive of tubercular etiology. Among primary malignancies, there were 2 cases of non hodgkin's lymphoma

,one case of hodgkin's lymphoma and one case of lymphoma which could not be specified. In metastatic lesions, most common was keratinizing squamous cell carcinoma followed by adenocarcinoma. Compared to this in a study Anne R. Wilkinson et al of the 50 cases 45 (90%) were metastatic tumors and five were lymphomas (10%). 11 Most common metastatic lesion was squamous cell carcinoma similar to our study.

In thyroid smears ,out of 20 lesions seven cases were malignant, 9 were benign and 4 were inflammatory. All cases in our study in thyroid neoplasm are follicular neoplasms of the thyroid. In Benign lesions most common was colloid goiter. Few cases of thyroid Adenoma,benign follicular neoplasm and thyroid cysts were reported. Four cases of Hashimoto thyroiditis were reported which turned out to be the most common inflammatory lesion.

In search of the literature, we came across few studies on USG guided FNAC of thyroid. Guided FNAC for thyroid lesions is usually recommended for lesions which are difficult to palpate or following a non-contributory palpation guided FNAC. However, any thyroid lesion with suspicious features on sonography like local invasion, microcalcifications, solid component, marked hypoechogenicity, increased vascularity, lymph node metastasis, etc. should be considered for USG guided FNAC. 5,6 Kim et al. in their review of USG guided FNAC of thyroid nodules concluded that this technique is useful for the diagnosis of palpable as well as non palpable nodules. 9 The distribution of the thyroid cases is a bit unusual, and this could be due to the fact that we considered only guided FNACs for which non-guided FNAC was either noncontributory or could not be performed (due to small size or deep seated location).

In breast the most common benign condition was fibroadenoma and malignancy was ductal cell carcinoma of breast.

In bone lesions , inflammatory conditions like Potts' spine and malignant conditions like plasmacytoma ( Tibia and vertebrae ) were reported in maximum cases .

In Soft tissue tumors, we reported two cases of lipoma, single case of small round cell tumor , benign spindle cell tumor, soft tissue sarcoma and Gastrointestinal stromatolites tumor respectively. This could not be compared to previous studies because of less number of cases.

**CONCLUSION**

Total 175 ( 70.6%) malignant , benign 21 cases ( 8.4 %), 52(21%) inflammatory cases were reported from various sites.

In this study as we could report a wide spectrum of neoplastic, benign, malignant lesions by this simple outpatient procedure with cost efficacy and minimal discomfort to the patient.

We can conclude Image guided FNAC has facilitated easy collection of cellular material with greater accuracy. Previously inaccessible and deep seated lesion can be safely sampled and are now routinely aspirated under image guidance to yield cellular material.

However , incorporation of the immediate assessment of the specimen by the on-site cytopathologist, along with further passes when necessary, can improve the success rate of the technique .

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