



Original article

Efficiency of ultrasound guided aspiration cytology in deep seated lesions - a diagnostic evaluation

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ABSTRACT:

BACKGROUND: Deep seated lesions, in the body are always a source of confusion and chaos in clinical surgical practice. Accuracy of guided Fine Needle Aspiration Cytology is potentially efficient, when it is carried out by the experienced practitioner, and approach to the diagnosis is made easy, by – by passing surgical procedures like diagnostic laparotomy and excision.

AIMS: To assess the feasibility of guided fine Needle Aspiration Cytology in deep seated lesions.

OBJECTIVES: To study the cytological features in accordance with lesions in different organs of body, correlating with age and sex distribution, categorizing the behavior of lesions and studying the statistical structure of various lesions.

MATERIALS AND METHODS: Study includes 100 Deep seated lesions, detected clinically and radiologically, divided into palpable and non-palpable lesions and appropriate radiological investigations were carried out. A classification was done according to organ involved. Smears were made, routine and special stains were used wherever necessary and cytomorphological features were studied.

RESULTS: Maximum number of patients in the study was in 5th decade, Male: Female – 3:1; Most of the lesions were malignant and majority of lesions are observed in Liver (30%). Secondary deposits (metastatic lesions) in Liver were the most common lesion noted. Sensitivity -90%; Specificity – 100%; Positive Predictive Value is 100%; Negative Predictive Value – 60%.

CONCLUSION: Guided Fine Needle Aspiration is safe, simple and efficient procedure to reach the door step of accurate diagnosis. Its potential to diagnose the deep seated lesions is evident by its high rates of Sensitivity; Specificity; Diagnostic Accuracy and Positive Predictive Value. Thus, it can be utilized as a standard technique for pre-operative technique for majority of Deep seated lesions.

Key words: Deep seated lesions; FNAC/FNAB; Pre-operative evaluation; Ultrasound guidance; Pre-operative evaluation; Ultrasound guidance

INTRODUCTION:

Fine Needle Aspiration cytology is the study of cells obtained by vacuum. In cytology cell morphology is the preserved element of study, rest all the tissue elements are exhausted. But, the accuracy of Fine Needle Aspiration Cytology when applied by experienced and well trained practitioners can approach that of Histopathological Examination in providing an unequivocal diagnosis [1].

The factors governing the accuracy are – representativeness and adequacy of sample of preparation. Fine Needle Aspiration Cytology is thus, a very simple and economical outpatient procedure, which provides swift, precise and merely accurate results with a possibility of immediate repetition, in case of any diagnostic challenges. As a tool of investigation, the advent of Fine Needle Aspiration Cytology is a boon to almost all patients with swellings over or inside the body. It establishes a preliminary pre-operative diagnosis and helps the practitioner to tailor the path of management.

Fine Needle Aspiration Cytology has taken a path of ascent after the entry of newer imaging modalities which has given birth to guided techniques of aspiration for deep seated lesions. The use of imaging techniques combined with the use of thin needles has revolutionized the approach of percutaneous aspiration diagnosis of space occupying lesions of the chest and abdomen. It provides precise anatomic imaging and targeting of lesions and permits the planning of safe access route there by reducing the risk of complications. Various modalities of imaging like X-ray, Ultrasound, CT and MRI are being routinely used now days. But ultrasound is the most commonly used imaging technique because of its greater scanning flexibility, speed and absence of radiation exposure. But a disadvantage of Ultrasound is poor needle visibility. A CT scan provides accurate

localization and excellent needle visibility, but is time consuming, costly and risk of radiation exposure is present.

History of cytology, the science of cells, is closely linked to the development of the microscope and the perfection of biochemical stains. The first sustaining work with the microscope was done by Robert Hooke[2] (1665) in England. Johannes Muller[3] (1838) founder of clinical cytology described in detail the appearance of Cancer cells. Kun[4] (1847), described needle aspiration as ‘new instrument for diagnosis of tumors’. Leydon[5] (1883) used needles to isolate pneumonic microorganisms; later Menetrier [5] used the technique to diagnose pulmonary carcinoma. Griegg and Grey[6] diagnosed trypanosomiasis in lymph node aspirates from patients with sleeping sickness (1904). Dudgeon and Patrick[7] (1927) proposed needle aspiration of tumors as a means of rapid microscopic diagnosis. Hayes E Martin and Ellis[8] (1930) instituted a system of tumor diagnosis using a syringe with large caliber needle. Joseph Zajicek[9] (1950) among the first of pathologists to embrace Fine Needle Aspiration cytology in collaboration with Franzen at Karolinska hospital applied the requisite to define precise the diagnostic criteria and to determine diagnostic accuracy in a variety of conditions. In 1970, the Indian academy of cytologists was established with the advent of radiological techniques like the ultrasound, CT scan etc.

Blady[10] (1939) carried out aspiration cytology using imaging techniques. Lindblom and Edholm[11] (1952) reported on Roentgen television the guided needle puncture examination of renal cysts and tumors. Holm H, Pedersen JF[12] (1975) used percutaneous needle biopsy under CT and Ultrasound guidance.

CT scan and MRI may fail to diagnose malignant and benign lesions on the basis of morphological patterns alone[13]. Because of high accuracy and low complication rate. Fine Needle Aspiration Cytology has been considered to be the initial evaluation method of choice for abdominal and thoracic lesions[14]. In view of reduced risk, relatively low cost, made ultrasound the preferred tool for guided Fine Needle Aspiration Cytology of the present era. With these imaging techniques Fine Needle Aspiration Cytology can be done in almost every mass lesion where the etiology is unclear. So, with this concept the study of Fine Needle Aspiration Cytology of deep seated lesions were taken up under Ultrasound guidance.

MATERIALS AND METHODS:

The present study was undertaken in Department of Pathology, S.V. Medical College, Tirupati during the period of August 2010 to August 2011. Total number of 100 cases of Deep seated lesions suspected to be of inflammatory or neoplastic origin were subjected for F.N.A.C. 88 cases were done under Ultrasound guidance and Bone lesions were done following the X-ray images. A thorough clinical and radiological evaluation is performed in all the patients.

Inclusion criteria – Patients with fairly palpable or Non-palpable swellings in the deeper viscera or deep compartments of the body.

Exclusion criteria – All the superficial well defined swellings, pulsatile swellings and swellings with surface ailments (ulceration, pigmentation etc.)

The radiological assessment is done and consent is taken from the patient for the procedure. Anatomical location of the lesion is marked accurately by the radiologist; in the meantime, the surface area of 8-10

cms diameter over the marked area is sterilized. The puncture site is anesthetized with 5% Xylocaine. Depth of lesion is noted and a 21-23 gauge needle is attached to 10 cc syringe. In case, if the depth is more 26 gauge Lumbar Puncture needle is used. Under Ultrasound guidance, the needle is gently pushed inside and checked over the monitor, at the instance, the needle is found inside the lesion, aspiration is done with multiple slow and swift to and fro reciprocal movements. The suction is now released and the needle is removed, the area of puncture is swabbed and covered with pad and adhesive tape is put over. The material obtained on aspiration is expressed over a glass slide and thin neat smears are made by opposition technique, the slides are marked and left for fixation in 70-90% alcohol for about 15-30 min. If any excess material is obtained this is fixed in 10% Formalin for cell block preparation. Respective staining procedures are run over depending upon the need. Commonly used stains are Hematoxylin and Eosin, Papanicolou, Giemsa (MGG) etc.,

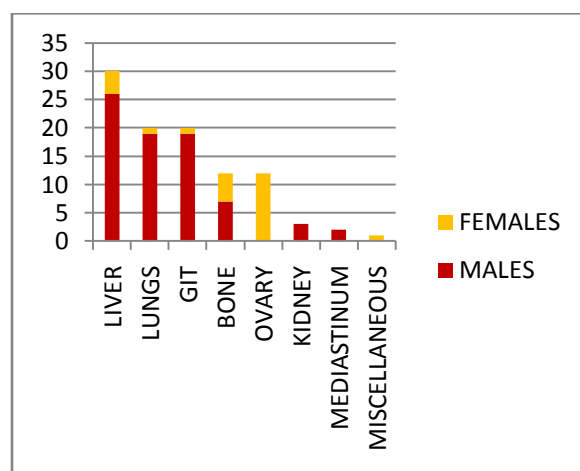
RESULTS:

1583 cases were analyzed by F.N.A.C. in the study period, of which 100 (6.31%) were deep seated lesions. Among 100 cases, 88 were done under Ultrasound guidance, and rests were Bone lesions, which were done by evaluating X-ray features. The majority of lesions were of Liver (30%); Lung and Gastro Intestinal Tract lesions amount 20% each. Ovary and Bone lesions are 12% each, 3% of cases were Kidney lesions; 2% of Mediastinal lesions and 1% miscellaneous lesion. Maximum patients showed the age distribution of 41-50 years i.e., 5th decade (45%), more number of male patients were observed [M: F = 3:1].

Table: 1. AGE AND SEX WISE DISTRIBUTION OF DEEP SEATED LESIONS IN VARIOUS ORGANS

SL. NO	ORGAN	TYPE OF LESION	0-10		11-20		21-30		31-40		41-50		51-60		>61		TOTAL		GRAND TOTAL (%)
			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1.	Liver	Secondaries Liver	-	-	-	-	-	-	1	-	5	3	5	-	-	-	11	3	14 (46.66)
		Hepatoma	-	-	-	-	-	-	1	-	3	1	4	-	-	-	8	1	9 (30)
		Hepatoblastoma	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1 (3.33)
		Inconclusive	-	-	-	-	-	-	-	-	6	-	-	-	-	-	6	-	6 (20.01)
																			30 (100)
2.	Lung	Squamous cell carcinoma	-	-	-	-	-	-	-	-	10	2	5	-	1	-	16	2	18 (90)
		Adenocarcinoma	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1 (5)
		Large cell Carcinoma	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1 (5)
																			20 (100)
3.	GIT	Carcinoma Colon	-	-	-	-	-	-	-	-	4	1	8	-	1	-	13	1	14 (70)
		TB Intestine	-	-	-	-	-	-	3	-	1	1	-	-	-	-	4	1	5 (25)
		Carcinoma Stomach	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1 (5)
																			20 (100)
4.	Bone	Osteoclastoma	-	-	1	1	1	-	-	-	-	-	-	-	-	-	2	1	3 (25)
		Osteosarcoma	-	-	-	-	-	-	-	-	2	-	1	-	-	-	3	-	3 (25)
		Ewing's Sarcoma	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	1	2 (16.66)
		Inflammatory	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1	1	2 (16.66)
		Inconclusive	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2	2 (16.66)
																			12 (100)
5.	Ovary	Papillary cystadenocarcinoma	-	-	-	-	-	-	-	-	-	1	-	4	-	2	-	7	7 (58.3)
		Papillary cystadenoma	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	3	3 (25)
		Inconclusive	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	2	2 (16.6)
																			12 (100)
6.	Kidney	Neuroblastoma	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1 (33.3)
		Lymphoma (NHL)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1 (33.3)
		Wilms' Tumor	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1 (33.3)
																			3 (100)
7.	Mediastinum	Thymoma	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1 (50)
		Bronchogenic Carcinoma	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1 (50)
		Secondaries																	2 (100)
8.	Miscellaneous	Mass Right Iliac fossa (Lymphoma)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	1 (100)
																			1 (100)
	TOTAL		5	-	3	2	1	-	5	4	32	13	27	4	2	2	75	25	100
	GRAND TOTAL		5		5		1		9		45		31		4		100		

Sex wise incidence of deep seated lesions (fig: 1)



Malignant lesions were the most commonly observed lesions (78%), followed by unsatisfactory and inconclusive smears (10%). There were very less amount of Benign (5%) and Inflammatory lesions (7%)

Liver:

Among 30 cases all were Neoplastic. 14 (47%) were Metastatic; 9 (30%) were Hepatoma; 1 (3.3%) was Hepatoblastoma. Among secondaries predominant lesion was Metastatic Adenocarcinoma. The maximum number of cases was in 5th decade and M: F – 6.5:1. With focus over the primary lesion, Hepatoma was found to be predominant primary lesion with cytological findings of Trabecular pattern in 2 cases; Endothelial covering in 2 cases; Intracellular inclusion, Acinar pattern and Bile plug each in one case. Well differentiated tumor was predominant lesion.

Lung:

Among 20 cases – all were primary neoplastic tumors. Majority were Squamous cell carcinomas – 18 (90%); Large cell carcinoma 1 (5%); Adenocarcinoma 1 (5%). The age and

sex distribution observed was, 5th decade and M:F – 9:1 respectively.

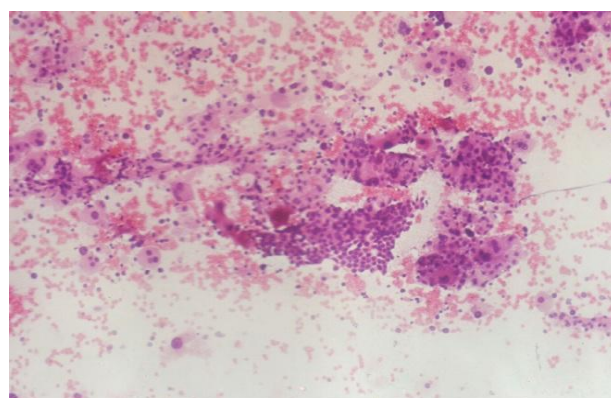
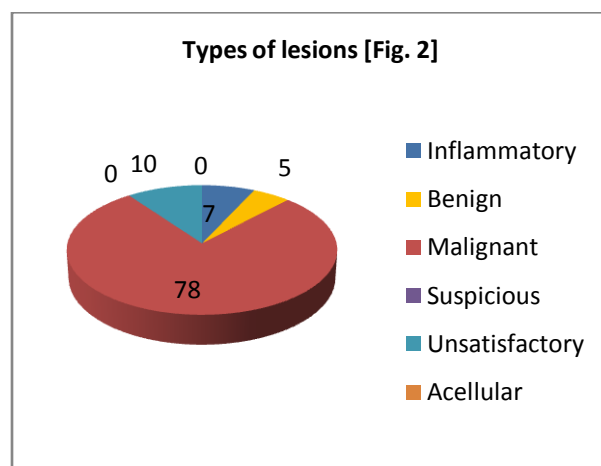


Fig. 3. Secondaries Liver - Normal Hepatocytes admixed with atypical cells (10x).

Gastro Intestinal Tract:-

Out of 20 cases, 14 (70%) showed Carcinoma colon; 5 (25%) – Tuberculosis intestine and 1 (5%) – Carcinoma Stomach. Maximum number of cases were found in 6th decade and M: F – 9:1.

Bone:-

Even though, role of F.N.A.C in bone tumors/lesions is controversial, in bone feasible cases with the aid of X-ray pictures, F.N.A.C. was carried out.

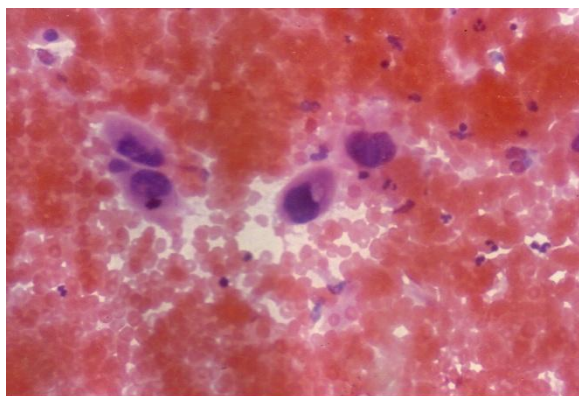


Fig. 4. Dispersed individual keratinising malignant cells showing Squamous differentiation - Squamous cell carcinoma of Lung (40x).

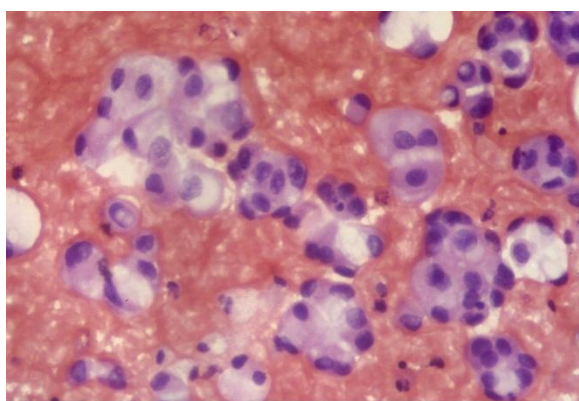


Fig. 5. Signet ring cell clusters; Adenocarcinoma Stomach (40x)

Among 12 cases, 8 (66.6%) – primary neoplastic lesions and 2 (44.4%) inflammatory lesions were seen. Osteoclastoma and Osteosarcoma - 25% each; Ewing's - 16.6%; Non-neoplastic -16.6% and rest 16.6% show a negative result with poor yield. 2nd decade is common age and M:F – 1.4:1.

Ovary:-

Among 12 cases, 7 (58.3%) were Coelomic epithelial malignant tumors (papillary cystadenocarcinoma), 3(25%) were Benign coelomic epithelial tumors, 2 (16.6%) yielded poor cellularity due to abundant mucinous fluid. There is even distribution of cases in 3rd, 4th and 5th decades.

Kidney:-

In 3 cases noted, A 5 year old male showed features of Neuroblastoma; a 7 year old male showed features of Lymphoma (NHL) and a 3 year old male showed features of Wilms' tumor.

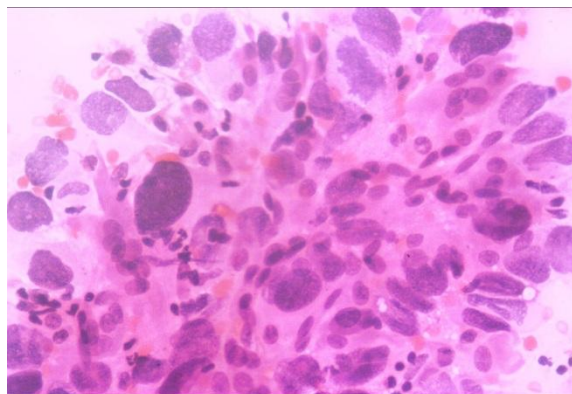


Fig. 6. Round to Oval malignant cells and Malignant Spindle cells with pink interspersed osteoid material - Osteosarcoma (40x).

Mediastinum:

Among 2 mediastinal lesions, a 60 year old male diagnosed as Bronchogenic carcinoma secondary deposit; a 10 year old male diagnosed as Thymoma.

Miscellaneous:

This group consists of Mass lesion in which the organ of origin is in doubt. A single case of 50 year old male; with Right Iliac fossa mass, showed features of Lymphocytoid cells and is diagnosed as Lymphoma.

In the present study, the statistical analysis were made and showed the results as True Positive – 20; True Negative – 3; False Positive – 0; False Negative – 2; Diagnostic accuracy – 92%; Sensitivity – 90%; Specificity – 100%; Positive predictive value – 100%; Negative Predictive value – 60%.

DISCUSSION

In the present era, F.N.A.C. is now considered as a proved technique for the diagnostic evaluation in all the non-palpable and deep seated lesions. The diagnostic accuracy of F.N.A.C. by ultrasound is 92%. Nautiyal S et al[15] (2004) found out the diagnostic accuracy of – 93.06%. RC Adhikari et al[16] (2010) – 82.5%; Sidhalingreddy et al[17] (2011) - 92.7% by ultrasound. Thus, the present study has found out to have more Diagnostic yield and accuracy by ultrasound. The majority of cases was in age group of 41-50 years (52%). The incidence of malignancy increased after 50 years of age in both males and females. The same observations were made by Shamshad et al[18] (2006), Zawar MP et al[19] (2007); and Sidhalingreddy et Al[17] (2011).

The M:F ratio of 3:1 was found in our study, the same male predominance is observed in studies done by Ennis & Mac Erlean[20] (1990); Govind Krishna et al[21] (1993); Aftab A Khan et al[22] (1996) and Zawar MP et al[19] (2007). Where as in other studies done by Shamshad et al[18] (2006) and Sidhalingareddy et al[17] (2011) showed female predominance.

The majority of lesions were Malignant (78%) which was a similar observation in all the studies done with respect to deep seated lesions.

The most common organ which was involved in the present study was, Liver and all were neoplastic lesions (30%). Similar observation was made by Biradar et al[23] (1994); Joao Nobrega et al[24] (1994); Nyman et al[25] (1995); Aftab A Khan et al[22] (1996); Sheikh et al[26] (2000); Stewart et al[27] (2002); Nautiyal et al[15] (2004); Zawar MP et al[19] (2007); RC Adhikari et al[16] (2010); Sidhalingareddy et al[17] (2011).

Out of 30 cases, the majority of cases were Metastatic Adenocarcinoma (46.6%) which is a similar observation in a study done by Caroline B et al[28] (1988) with 57.14% and RC Adhikari et al[16] (2010) with 38.4% of Metastatic Adenocarcinoma cases.

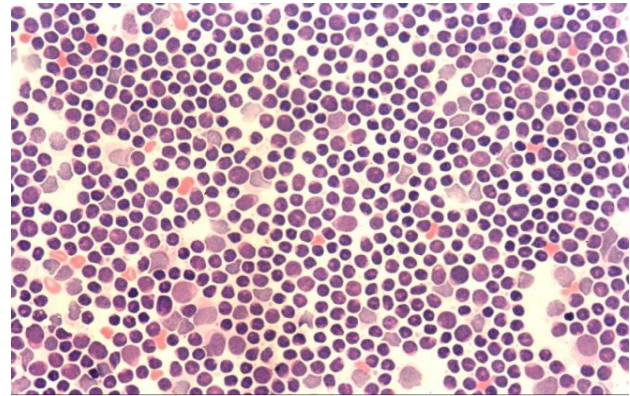


Fig. 7. Monotonous population of small lymphoid cells with round nuclei and coarse granular nuclear chromatin in sheets - NHL (40x).

Type of Lesion	Biradar et al ²³ (1994) (%)	Aftab A Khan et al ²² (1995) (%)	Shamshad et al ¹⁸ (2006) (%)	RC Adhikari et al ¹⁶ (2010) (%)	Sidhalingreddy et al ¹⁷ (2011) (%)	Present study (%)
Inflammatory	32	6		9.4	10.2	7
Benign	2	0	30.5	3.1	22.4	5
Malignant	52	88	57.5	70	60.3	78
Suspicious	0	0	5.5	4.4	0.6	0
Unsatisfactory	14	6	6.5	6.3	6.5	10
Acellular smears	0	0	0	6.8	0	0

Organ	Biradar et al ²³ (1994) (%)	Zawar MP et al ¹⁹ (2007) (%)	RC Adhikari et al ¹⁶ (2010) (%)	Sidhalingreddy et al ¹⁷ (2011) (%)	Present study (%)
Liver	36	45	39	38	30
Lung	-	-	25.3	-	20
GIT	Large bowel	17.5	0.6	1.3	19
	Stomach	5	-	0.9	1
Bone	-	-	-	-	12
Ovary	-	-	-	21.1	12
Kidney	6	20	3.2	5.2	3
Mediastinum	-	-	2.5	-	2
Miscellaneous (Iliac fossa mass)	-	-	1.3	-	1

The next common site was Lungs and Gastro Intestinal Tract lesions each accounting 20% which is a similar observation in a study performed by Sheikh et al[26] (2000) and RC Adhikari et al[16] (2010) regarding lungs. All the lesions in the lung are of primary origin, with 18 cases (90%) of Squamous cell carcinoma followed by Adenocarcinoma 5%; Large cell carcinoma 5%. The varied distribution of cases is due to differences in environment, habits and habitat. The present study has correlated with a study done by Krishnamurthy [29] TMH Mumbai (1991).

Among the lesions of GIT 70% show Colonic masses; this is same as the observation made out by Krishnamurthy [29] (1991). In contrast with the study done by Muzaffar Ahmad Zargar et al[30] (1998), where lesions of the stomach are commoner than the colonic lesions.

In present study 20% of Bone lesions are Inflammatory; 30% are benign tumors and 50% are malignant tumors. In a study done by Mercejorda et al[31] (2000), 21% of inflammatory lesions and 24% of Benign and 29% of Primary malignant tumors are observed. Thus, the bone tumor does not have even distribution due to its varied presentation and behavior. Anyhow, both the studies show primary malignant tumors as majority cases, and thus, primary malignant tumors, can be more commonly diagnosed by F.N.A.C.

Among the ovarian lesions, 58.3% were malignant lesions and are more common; a similar observation is made out in a study done by Pranabdey et al[32] (2001), with 87.5% of malignant lesions, in his study. RC Adhikari et al[16] (2010) reported 35.7% of malignant tumors in their study. Ovarian lesions show a variable degree of sampling errors. In our study 2 cases of Papillary cystadenocarcinoma were reported as Papillary cystadenoma by F.N.A.C. constituting a False negative rate of 20%,

whereas, it was 10% in a study by Kjellgren O et al[33] (1971).

Among Renal lesions 1 (33.3%), Wilms' tumor; 1 (33.3%) Neuroblastoma; 1 (33.3%) Undifferentiated Carcinoma. In contrast to similar studies done by Sidhalingreddy et al¹⁷ and RC Adhikari et al[16] where majority of Renal neoplasms were Renal cell carcinomas.

In, the series of Mediastinal lesions, there was a single case of metastatic Bronchogenic carcinoma and one case of Thymoma. Bronchogenic carcinoma secondaries are a common lesion reported, in a studies done by Gianluca et al[34] (1988) and Weisbrod et al[35] (1994). According to RC Adhikari et al[16] Thymoma is the most common lesion.

The sensitivity of Ultrasound guided F.N.A.C. in the present study is 90%, which is a very close correlated value in all the other similar studies. The specificity is 100%, which is observed equally in all the other studies. The Diagnostic accuracy in the present study is 92%, whereas the range of Diagnostic accuracy in other studies is 77.5-100%.

Table: 4. Statistical results – Comparative Analysis				
Study	No. of FNACS	Sensitivity (%)	Specificity (%)	Diagnostic Accuracy (%)
Govind Krishna et al21 (1993)	500	71.4	55.6	77.5
Joao Nobrega et al24 (1994)	236	87	100	100
Aftab A. Khan et al22 (1995)	50	94	100	94
NautiyalS et al15 (2004)	72	-	-	87.5
Shamshad et al18 (2006)	200	94.11	100	95.7
Zawar MP et al19 (2007)	40	-	-	90
Sidhalingreddy et al17 (2011)	245	94.1	100	96.5
Present study	100	90	100	92

CONCLUSION:

Ultrasound guided F.N.A.C. in deep seated lesions is a relatively simple, swift, cost effective, efficient and safe procedure for acquiring a provisional pre-operative diagnosis. Even though, a final accurate

diagnosis cannot be obtained in some of the lesions, it aids in categorizing and classifying various inflammatory, benign and malignant lesions. Keeping in view, its high values of sensitivity, specificity, positive predictive value and diagnostic accuracy, it can be considered as a standard technique of pre-operative evaluation, which lets the practitioner to tailor appropriate Stiches of management for the deep seated lesions.

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