International Journal of Research in Medical Sciences
Singh K et al. Int J Res Med Sci. 2016 Feb;4(2):512-518
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20160306

Research Article

Importance of image guided fine needle aspiration in diagnosis of benign and malignant lesions

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Received: 13 December 2015
Revised: 17 January 2016
Accepted 18 January 2016

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ABSTRACT

Background: Intrathoracic, intraabdominal and retroperitoneal tumors especially at inaccessible site pose difficulty in diagnosis. The present study was done to assess the utility of image guided FNAC in the diagnosis of intrathoracic, intra-abdominal and retroperitoneal lesions.
Methods: This retrospective study was done in Department of Pathology in collaboration with Department of Radiology for a period of three and half (31/2) years. A total of 5608 aspirations were performed. One hundred and seventy five (175) procedures were done under image-guidance. Air dried and wet fixed smears were stained with May Grunwald Giemsa (MGG) and Papanicolaou stain respectively and Acid Fast Bacilli (AFB) stain in case of suspected tubercular lesion.
Results: The number of intra-abdominal lesions were 104 (59.5%), intrathoracic lesions 32(18.2%), retroperitoneal lesions 21(12%) while lesions under miscellaneous category were 18(10.3%). Out of 109 malignant tumors, majority were intra-abdominal 72 cases (66.1%), with liver as the main contributor (35 cases), followed by intrathoracic 20 cases (18.3%), retroperitoneal 12cases (11%) and finally miscellaneous category constituted 5 cases (5.5%). Metastatic adenocarcinoma was the most common tumour (19 cases) in liver followed by 14 cases of adenocarcinoma each in GIT and gall bladder. Non-small cell carcinoma (9 cases) was common malignancy diagnosed in inrathoracic region while neuroblastoma (4 cases), Wilm's tumour (3 cases) and renal cell carcinoma (2 cases) were the commonly observed tumors among retroperitoneal lesions.
Conclusions: Percutaneous FNAC under image guidance surpass the diagnostic difficulties and facilitates the rapid management of the patient.

Keywords: Fine needle aspiration cytology, Image guidance, Intra-abdominal, Intra-thoracic, Retroperitoneum

INTRODUCTION

FNAC under image guidance has brought about revolution in the field of cytopathological diagnosis. Because of high degree of accuracy and minimum discomfort to the patient this technique permits the accurate localization of non palpable and deep seated lesions. Image guided FNAC is routinely done when single or multiple lesions at inaccessible site are detected by US (ultrasonography) or CT (computerized tomography) scan. However, image guidance does not always differentiate between malignant and benign lesions. It is very important to confirm the tissue diagnosis which is essential for both treatment as well as staging of cancer.[1] Image guided FNAC has a pivotal role in diagnosing inflammatory, benign and malignant lesions especially of thorax, abdomen and retroperitoneum.[2]

METHODS

The aim of this study was to evaluate the impact of US and CT guided FNAC in diagnosis of intrabdominal, intrathoracic and retroperitoneal lesions. This was retrospective study done in Department of Pathology for a period of three and half ($3^{1/2}$) years by using medical records and pathology reports. A total of 5608 aspirations were performed. One hundred and seventy five (175) procedures were done under image-guidance in collaboration with Department of Radiology. The aspirates were obtained from various anatomic sites such as the liver, lungs, lymph nodes, gastrointestinal tract, pancreas, omentum, gallbladder, ovary, testis, kidney, adrenal, peritoneal implants. Deep seated lesions in the sites like retroperitoneum and musculoskeleton were also included in the study. Complete clinical history, examination and details of relevant investigations and tumor markers like Alpha- fetoprotein (AFP), Cancer Antigen 125 (CA125), Vanillylmandelic Acid (VMA) and S-100 were recorded. The laboratory investigation i.e. Prothrombin Time Index was checked for every patient and the patient's consent was taken before performing the procedure .The mass to be aspirated was relocalized by US and or CT scanning and the aspiration was carried out by a trained pathology resident with the help of a cytotechnician and laboratory assistant. The site of puncture was marked on skin and the area was cleaned with antiseptic solution. The lumbar puncture needle of 20 gauge was inserted under image guidance into the lesion by rotatory movement and moved in 0.5- 1 cm increments back and forth in vertical plane several times before the suction was released .The aspirate was spread on glass slides, air dried and fixed in 90% alcohol, followed by staining with May Grunwald Giemsa (MGG) and Papanicolaou stain respectively and Acid Fast Bacilli (AFB) stain in case of suspected tubercular lesion. The cytological diagnoses were classified into five categories: (a) positive for malignant cells including determination of the type of malignancy (carcinoma, lymphoma, myeloma, etc.) and whether it was primary or metastatic; (b) suspicious for malignancy or neoplasia; (c) benign, or inflammatory lesions; and (d) descriptive/ negative for malignancy; (e) inadequate or less than optimal for evaluation. A diagnosis of 'suspicious for malignancy' was rendered when abnormal cells were observed, but the diagnostic material was limited for a definitive diagnosis of malignancy. Cases were reported as 'inadequate for opinion' when smears showed scant cellularity, poorly preserved cells or consisted of blood despite repeated aspiration.

RESULTS

Out of 5608 FNAC done from January 2013 to June 2015, 175 aspirations were done under image guidance. There were 92 males and 83 females in the study group. The number of intraabdominal lesions were 104 (59.4%), intrathoracic lesions 32 (18.2), retroperitoneal lesions 21 (12%) while lesions under miscellaneous category were 18 (10.3%). Largest number of malignant cases were seen in intraabdominal region with 72 cases (66.1%) and 20 cases (18.3%) in intrathoracic region followed by 12 cases (11%) in retroperitoneum and 5 cases (5.5%) in miscellaneous category. Of 109, malignant lesions predominated in both the sexes (males n=58; females n=51). The cytological diagnosis of intraabdominal lesions, intrathoracic lesions, retroperitoneal lesions, miscellaneous is given in the Table 1, Table 2, Table 3 and Table 4 respectively.

Among the five categories, malignancy comprised of 109 cases (62.3%), benign/ inflammatory lesions were 35 (20%), 3 cases (1.7%) were reported as suspicious for malignancy, 14 cases (8%) as descriptive/negative for malignancy and inadequate for opinion were 14 cases (8%). Majority of the aspirates were obtained from intraabdominal and intrathoracic lesions which accounted for 104 (59.4%) and 32 (18.2%) respectively. Out of 109 malignant tumors , 72 (66.1%) were from intraabdominal region, with metastatic tumour in liver (25 cases) as the most commonly observed neoplastic lesion followed by intrathoracic 20 cases (18.3%), retroperitoneum 12 (11%) and finally miscellaneous category constituted 5 cases (5.5%).

Intraabdominal lesions

This group comprised of 104 cases (59.4%) of which liver was the main contributor 40 cases followed by GIT and gall bladder each with 21 cases, lymph node 9 cases, ovary and omentum both 2 cases and peritoneum 1 case. Among the liver lesions, we had 25 cases of metastatic tumor of which metastatic adenocarcinoma was the most common tumour 19 cases followed by metastatic small cell carcinoma 4 cases and metastatic squamous cell carcinoma 2 cases. 10 cases of hepatocellular carcinoma were diagnosed. The significant finding was AFP level which were available in 3 cases of hepatocellular carcinoma and in all three cases, AFP level was elevated. The spectrum of 4 cases of benign/ inflammatory lesions included amoebic liver abscess 1 case, hydatid cyst 1 case, hepatocyte reactive change-1 case and liver cell dysplasia- 1 case.

In our study, 15 malignant lesions were observed in GIT of which adenocarcinoma was 14 in numbers and 1 case was diagnosed as malignant gastrointestinal stromal tumor (GIST). In gall bladder 14 cases of adenocarcinoma were observed. There were 9 patients with intraabdominal lymphadenopathy. On aspiration 3 cases were reported as Non-Hodgkin's lymphoma (NHL) and 3 cases were of tuberculosis/ suggestive of tuberculosis. One case of tuberculosis was strongly AFB positive. 2 cases were reported as descriptive/negative for malignancy and 1 case was inadequate for opinion. Out of the two ovarian mass aspirated, 1case was reported as malignant ovarian tumour and other was diagnosed as papillary adenocarcinoma with increased CA 125 level in both the cases.

Table 1: Cytological diagnosis of intraabdominal lesions.

	Benign/ Inflammatory	No of cases	Neoplastic	No of cases	Suscpicious of malignancy No of cases	Descriptive/ Negative for malignancy No of cases	Inadequate for opinion No of cases
Liver (48 cases)	Hydatid cyst	1	Metastatic adenocarcinoa	19	1	5	3
	Amoebic liver abscess	1	Metastatic squamous cell carcinoma	2			
	Liver cell dysplasia	1	Metastatic small cell carcinoma	4			
	Hepatocyte reactive change	1	Hepatocellular carcinoma	10			
Gall bladder (21 cases)			Adenocarcinoma	14	1	4	2
GIT (21 cases)	Acute inflammation	2	Adenocarcinoma	14		2	2
			GIST	1			
Lymph node (9 cases)	Tuberculosis	3	Non Hodgkin Lymphoma	3		2	1
Omentum (2 cases)			Metstatic adenocarcinoma	2			
Peritoneum (1 case)			Metastatic adenocarcinoma	1			
Ovary (2 cases)			Malignant ovarian tumor	1			
			Papillary adenocarcinoma	1			

Intrathoracic lesions

A total of 32 cases were seen in this group. Among lung lesions, 4 cases of poorly differentiated carcinoma were observed while 3 cases each of small cell carcinoma and adenocarcinoma were seen. Squamous cell carcinoma comprised 2 cases and relapse cases of NHL were reported in 3 patients. Tuberculosis was reported in 2 cases and 1 case each of inflammatory necrotic lesion and benign spindle cell lesion was observed.

Out of 7 mediastinal lesions, 1 case each of NHL and metastatic adenocarcinoma were seen. We had 1 case of benign mediastenal lesion suggestive of thymoma. Paraganglioma was seen in 1 case while 1 case each of lipoma and inflammatory inclusion cyst were observed. One patient with subpleural lesion was diagnosed as malignant neuroectodermal tumour and it was S-100 positive. In present study, two patients presented with pleural mass which were diagnosed as malignant mesothelioma in one case and metastatic adenoid cystic carcinoma in other case.

Retroperitoneal lesions

Majority of the lesions were from kidney. In kidney, Wilm's tumour was diagnosed in 3 children and 2 cases of renal cell carcinoma were seen. Under benign/ inflammatory category, 1 case each of renal cyst and metanephric adenofibroma were seen. Among adrenal lesions, 4 cases were reported as neuroblastoma while 1 case of adrenal cortical carcinoma was observed. One of the patients presented with headache, palpitation, sweating, and hypertension and on aspiration of the retroperitoneal mass, the diagnosis of pheochromocytoma was given. The VMA level was also significantly raised. 5 cases were from pancreas. Out of 5 cases, 2 were diagnosed as adenocarcinoma and remaining 3 were grouped under benign/ inflammatory category (1case of chronic pancreatitis and 2 cases of pancreatic pseudo cyst).

Table 2: Cytological diagnosis of intrathoracic lesions.

	Benign/ Inflammatory	No of cases	Neoplastic	No of cases	Suscpicious of malignancy No of cases	Descriptive/ Negative for malignancy No of cases	Inadequate for opinion No of cases
Lung (23 cases)	Tubeculosis	2	Small cell Ca	3	1		3
	Inflammatory necrotic lesion	1	Squamous cell Ca	2			
	Spindle cell lesion	1	Adenocarcinoma	3			
			Poorly differentiated ca	4			
			NHL (relapse)	3			
Medistinal mass (7cases)	Paraganglioma	1	NHL	1			
	Thymoma	1	Metastatic adenocarcinoma	1			
	Lipoma	1	Malignant neuroectodermal tumor	1			
	Inflammatory inclusion cyst	1					
Pleural mass (2 cases)			Malignant mesothelioma	1			
			Metastatic adenocarcinoma	1			

Table 3: Cytological diagnosis of retroperitoneal lesions.

	Benign/ Inflammatory	No of cases	Neoplastic	No of cases	Descriptive/Negative for malignancy No of cases	Inadequate for opinion No of cases
Kidney (9 cases)	Metanephric adenofibroma	1	Renal cell carcinoma	2	1	1
	Renal cyst	1	Wilm's tumor	3		
Adrenal gland (7 cases)	Pheochromocytoma	1	Neuroblastoma	4		1
			Adrenal cortical carcinoma	1		
Pancreas (5 cases)	Pancreatic cyst	1	Adenocarcinoma	2		
	Infected cyst	1				
	Chronic pancreatitis	1				

Miscellaneous

In this group, out of 18 cases, 7 cases were from soft tissue/ musculoskelton that were deep seated and non palpable. Abscess was reported in 3 cases while 2 cases of benign nerve sheath tumour and 1case each of haematoma and desmoid fibromatosis were also observed.

Out of 2 cases of vertebral lesions, 1 case of metastatic adenocarcinoma and 1 case of multiple myeloma were

diagnosed. One case presented as prevertebral mass at bifurcation of aorta and was reported as paraganglioma.

We had 7 patients presenting with thyroid nodule of which 2 were diagnosed as follicular neoplasm and 1 case was reported as papillary carcinoma. 2 cases were of colloid goitre while 1 case was inadequate for opinion. One patient presented with testicular mass which was diagnosed as benign cystic lesion.

Table 4: Miscellaneous.

	Benign/ Inflammatory	No of cases	Neoplastic	No of cases	Inadequate for opinion No of cases
Soft tissue/ musculosketon (7 cases)	Abscess	3			
	Desmoid fibromatosis	1			
	Benign nerve sheath tumor	2			
	Paraganglioma	1			
Vertebra (2 cases)			Muliple myeloma	1	
			Metastatic adenocarcinoma	1	
Thyroid (7 cases)	Colloid goitre	3	Papillary carcinoma	1	1
			Follicular neoplasm	2	
Testis (1 case)	Benign cystic lesion	1			

DISCUSSION

Being safe, cost effective, accurate and minimally invasive, percutaneous FNAC under image guidance facilitates immediate management of the patient presenting with intraabdominal, intrathoracic and retroperitoneal lesions that are deep seated and at inaccessible site. With this technique, probable diagnosis can be made before surgery and without subjecting patient to open biopsy and thus two staged surgical procedures can be avoided. For increasing the accuracy of sampling, CT/ US room should have a microscope so that the pathologist can look for the adequacy of the aspirated sample with the help of fast stain (Toludiene blue) and thus cytological specimen can be interpreted immediately.[3]

In present study no major complication was observed, however there was complaint of mild pain and discomfort at the puncture site for short duration. Possible complications which can occur are haemorrhage, haematoma, infection, pancreatitis, pneumothorax and rarely risk of tumour seeding along the needle track.[4,5] The age range of patient in our study was 3- 84 years . Tan KB et al and Parahjuli et al observed 11-82 age and 19-83 age spectrum respectively.[6,7] Maximum number of malignant lesions were observed in 40-70 years which was showing similar observation with Mukerji et al.[8] In our study , malignant lesions were observed maximum in Liver (35 cases) followed by GIT (14 cases), Gall bladder (14 cases) and Lung (15 cases). Similar findings were observed by Adhikari et al.[9] Mukherji et al found 15 cases of non small cell carcinoma while in our study we had 9 cases of non small cell carcinoma.[8] 3 cases each of NHL and tuberculosis were observed in patients with abdominal lymphadenopathy. Parahjuli et al found 3 NHL, 2 cases of metastatic adenocarcinoma and 2 cases of tuberculosis.[7] One case each of hydatid cyst and amoebic liver abscess was observed in our study which was in accordance with other study.[7]Among four cytological categories, inadequate for opinion comprised of 8.04%. Bel et al and Guo et al observed 13 % and 1 % inadequate for opinion respesctively.[10,11] For retroperitoneal masses, CT guidance is very useful especially in localization of small lesions.[12] In our study, 3 cases of renal cell carcinoma were reported while Mangla et al observed 12 cases of RCC among 32 renal lesions.[13] The aspiration of adrenal mass should be correlated with radiological findings and blood chemistry.[14] There were 3 cases of neuroblastoma , 1 case of pheochromocytoma and 1 case of adrenocortical carcinoma. Neuroblastoma is considered the 'prototypical' small round cell tumor of childhood.[15] Nguyen et al suggested that the pheochromocytoma should be differentiated from RCC, HCC and metastatic malignancy.[16] Wilms tumour is the most common renal malignancy of children.[17] In our study 3 cases of Wilms tumor were reported. There are published reports of uncommon complications i.e. pancreatitis and tumor seeding into peritoneal cavity by needle.[4,18,19] Adenocarcinoma was diagnosed in 2 patients presenting with pancreatic mass. Two vertebral masses (C6, L2) were reported as multiple myeloma and metastatic

adenocarcinoma respectively which is in accordance with study by.[20] US guidance is also of great value in aspiration of small and deep seated (intra/ intermuscular) tumour. US/CT can be helpful in finding viable tissue and avoiding cystic and necrotic areas in extensively necrotic /cystic tumors.[21,22] 3 cases of abscess and 1 case each of paraganglioma , benign nerve sheath tumour and desmoid fibromatosis were observed. Among thyroid lesions, there were 2 cases of thyroid nodule diagnosed as follicular neoplasm, 1 case was reported as papillary carcinoma while 3 cases of colloid goitre were observed. Either palpation or ultrasonography (US) may be used for guidance of FNAC of thyroid nodule, but US has several advantages over palpation. Real-time US permits visualization of the needle within the lesion, thereby facilitating accurate biopsy of small nonpalpable nodules.[23,24]

Limitations of study

As this study has been conducted in a hospital which is in a remote area of India. It is often difficult to provide ancillary techniques. However image guided FNAC plays a pivotal role in such condition helping in management of patients suffering from various tumours.

CONCLUSIONS

Image guided FNAC is a simple outpatient procedure and an effective technique for diagnosis of deep seated, inaccessible lesions and it obviates need for surgical procedure for reaching at a diagnosis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Singh K, Kotwal S. Importance of image guided fine needle aspiration in diagnosis of benign and malignant lesions. Int J Res Med Sci 2016;4:512-8.