Fine Needle Aspiration Cytology with the Assistance of Radiological Tools in the Diagnosis of Deep-Seated Lesions

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ABSTRACT

Background

Fine needle aspiration (FNA) with radiological assisted tools such as ultrasonography (USG) and computed tomography (CT) are effective in obtaining high yield aspiration of tissues located in technically difficult places such as deep-seated. It is a simple outpatient procedure with low cost as compared to surgical biopsies.

Objective

To study the cytomorphological features of deep-seated lesions according to the site of occurrence, and to categorize them with respect to age, sex and behavior of lesions.

Method

This was a descriptive cross-sectional study of 125 patients who underwent image-guided fine needle aspiration cytology of deep-seated lesions. The study was conducted in the Department of Pathology and Department of Radiodiagnosis, Dhulikhel Hospital- Kathmandu University Hospital, between January 2017 and December 2018. Under radiological guidance, aspiration was performed under negative pressure, and adequate material was obtained. Smears were stained with Giemsa and Papanicolaou stain. The prepared slides were examined under a microscope.

Result

Of the 125 patients who underwent USG and CT-guided fine needle aspiration cytology (FNAC), 68(54.4%) were female and 57(45.6%) were male. The age of the patients ranged from 13 to 84 years. The maximum number of patients was above 50 years. The nature of lesions was categorized as malignant 78(62.4%), followed by 23(18.4%) inflammatory and benign 1(0.8%).

Conclusion

Image-guided fine needle aspiration cytology is a safe diagnostic procedure, as it provides real-time visualization of tip insertion in anatomical structures. It provides high yield and a better representation of the samples.

KEY WORDS

Computed tomography, Fine needle aspiration, Ultrasonography

INTRODUCTION

Deep-seated lesions in the body often become a source of confusion. However, the development of image guided FNA techniques has revolutionized in obtaining aspiration of deep-seated lesions such as intra-abdominal, intrathoracic and retroperitoneal lesions, which are considered to be technically difficult. Image guided FNA has both low complication rates and a high success rate. Hence, it helps to provide a diagnosis of lesions efficiently and helps to avoid unnecessary surgical intervention. Besides, the cytomorphological patterns, it also adds some clues in the diagnosis and helps in further planning and for the benefits of patients.[1,2]

FNA with radiological assisted tools (USG, CT) is effective and safe for detecting superficially palpable lesions as well as deep-seated lesions.[3] It not only helps to differentiate neoplastic from non-neoplastic lesions but also categorizes the various forms of malignancy. Accurate morphological diagnosis and differentiating between benign, malignant, and inflammatory lesions remains essential for patient management.[4] Besides, the imaging technique also differentiates solid or cystic lesions and hemorrhagic or necrotic lesions.[1] Hence, unnecessary sampling can be avoided.

The image-guided FNA technique is highly reliable, cost-effective and yields quick results, low complications with less pain, and a better way to obtain samples for the correct diagnosis. The objectives of this study were to study the cytomorphological features of deep-seated lesions according to the site of occurrence, and to categorize them with respect to age, sex and behavior of lesions.

METHODS

This was a descriptive cross-sectional study conducted in the Department of Pathology and the Department of Radiodiagnosis, Dhulikhel Hospital, Kathmandu University Hospital, after obtaining ethical approval from the Institutional Review Committee (IRC). All patients, clinically or radiologically detected deep-seated lesions between January 2017 and December 2018 were included in the study. All aspirations were performed under image guidance, such as USG or CT. The puncture site was marked. Under aseptic precautions, lumbar puncture needle of 22-23G thickness for deep-seated lesions was fitted with a 10 ml syringe. Under radiological guidance, aspiration was performed under negative pressure. On average, two to three needle passes were made to obtain adequate material. The samples were spread onto slides and then samples were air-dried and stained with Giemsa. The smears were also subjected to Papanicolaou staining. The prepared slides were examined under a microscope. The cases were analyzed by experienced pathologists. Definitive diagnosis was achieved by correlating clinical and radiological findings. In some cases, if required, cell blocks were also prepared for immunocytochemistry.

RESULTS

Of the 125 patients who underwent USG or CT-guided FNAC, 68(54.4%) were female and 57(45.6%) were male. The age of the patients ranged from 13 to 84 years. More than 2/3rd of patients were > 50 years (Table 1).

Table 1. Age-wise distribution of cases

Age groups (in yrs)	Number (%)
10-19	4(3.2)
20-29	10(8.0)
30-39	10(8.0)
40-49	12(9.6)
50-59	34(27.2)
60-69	25(20.0)
70-79	25(20.0)
80 and above	5(4.0)
Total	**125(100)**

Adequate material for cytological diagnosis was obtained in 102(81.6%) patients, while the aspirate material was non-representative in 23(18.4%) patients. Among the representative samples, the most common nature of lesions was malignant 78(62.4%), followed by 23(18.4%) inflammatory lesions and benign 1(0.8%) (Table 2).

Table 2. Distribution of nature of lesion

Nature of lesion	Number of cases (%)
Malignant	78 (62.4)
Inflammatory/Non-neoplastic	23 (18.4)
Unsatisfactory	23 (18.4)
Benign	1 (0.8)
Total	**125 (100)**

The most common site from which FNAC was performed was the lung 41(32.8%), followed by the liver and the gall bladder in the second position with 20 (16%) of each.

Adenocarcinoma was commonly encountered in the lung 23(18.4%), gall bladder 11(8.8%), pancreatic ampullary region7 (5.6%), and gastrointestinal tract 6(4.8%), whereas metastatic carcinoma 10(8%) was the most common lesion in the liver. In the bone, a single case of metastatic follicular carcinoma of the thyroid 1(0.8%) was seen. A single case of Non-Hodgkin's Lymphoma 1(0.8%) was diagnosed in the mediastinum. A single case of plasmacytoma 1(0.8%) was seen in the chest wall. The most common lesion in the abdominal lymph node was reactive lymphadenitis 6(4.8%), followed by acute suppurative lymphadenitis 5(4%), and metastatic adenocarcinoma 2(1.6%) (Table 3).

Table 3. Distribution of cases according to site

Site	Diagnosis	Number of cases	(%)
Lung	Adenocarcinoma	23	18.4
	Squamous cell carcinoma	10	8
	Unsatisfactory	5	4
	Small cell carcinoma	3	2.4
Gall bladder	Adenocarcinoma	11	8.8
	Inflammatory lesion	6	4.8
	Unsatisfactory	3	2.4
Liver	Metastatic adenocarcinoma	10	8
	Unsatisfactory	5	4
	Hepatocellular carcinoma	4	3.2
	Inflammatory lesion	1	0.8
Abdominal lymph nodes	Reactive lymphadenitis	6	4.8
	Acute suppurative lymph-adenitis	5	4
	Metastatic adenocarcinoma	2	1.6
	Unsatisfactory	2	1.6
Pancreatic ampullary region	Adenocarcinoma	7	5.6
	Unsatisfactory	4	3.2
	Cyst	1	0.8
	Inflammatory lesion	1	0.8
Gastrointestinal tract	Adenocarcinoma	6	4.8
	Unsatisfactory	4	3.2
	Inflammatory lesion	3	2.4
Bone	Metastatic follicular carcinoma of thyroid	1	0.8
Chest wall	Plasmacytoma	1	0.8
Mediastinum	Non-Hodgkin's Lymphoma	1	0.8
Total		**125**	**100%**

A total of 78 malignant lesions, the most common were adenocarcinoma 47(60.3%), followed by 12(15.4%) metastatic adenocarcinoma, 10(12.8%) squamous cell carcinoma, 4(5.1%) hepatocellular carcinoma, 3(3.8%) small cell carcinoma, and 1(1.3%) case of Non-Hodgkin's Lymphoma and 1(1.3%) case of metastatic follicular carcinoma of thyroid (Table 4).

Table 4. Distribution of malignant lesions

Malignant Lesion	Number of cases (%)
Adenocarcinoma	47(60.3)
Metastatic adenocarcinoma	12(15.4)
Squamous cell carcinoma	10(12.8)
Hepatocellular carcinoma	4(5.1)
Small cell carcinoma	3(3.8)
Non-Hodgkin's Lymphoma	1(1.3)
Metastatic follicular carcinoma of thyroid	1(1.3)
Total	**78(100)**

Table 5. Gender-wise distribution of malignant lesions

Lesion/Sex	Male	Female	Total
Adenocarcinoma	22	25	47
Metastatic Adenocarcinoma	7	5	12
Squamous cell carcinoma	4	6	10
Hepatocellular carcinoma	1	3	4
Small cell carcinoma	2	1	3
Non-Hodgkin's Lymphoma	1	-	1
Metastatic follicular carcinoma of thyroid	-	1	1
Total	**37**	**41**	**78**

Among the malignant lesions, adenocarcinoma was the most common in both sexes (Table 5).

DISCUSSION

Image-guided FNAC is a safe and useful diagnostic tool for suspicious deep-seated as well as superficial lesions.[5] Aspiration cytology is one of the weapons used to hit the diagnostic target and has been routinely used as a preoperative diagnostic tool.[6] Previous studies recommend that image-guided FNAC should be used as a routine procedure in the study of abdominal lesions as well as pulmonary lesions.[7-10]

The present study shows that the ratio of having deep-seated lesions is higher in females (male to female ratio 1:1.2). This result is in accordance with the observations of Sidhalingreddy et al. (male-to-female ratio of 1:1.3).[11]

Age is an important factor for the occurrence of deep-seated lesions, and its prevalence varies with age. The age of the patients, in our study ranged from 13 to 84 years, where the maximum number of patients falls in the age group of 50-59 years, which is similar to the study conducted by Dosi et al.[12] They reported ages ranging from 12-90 years, and the maximum number of cases was in age group of 51-60 years. Similar results were obtained in the study by Rasania et al. Yasin et al. and Meena et al.[13-15]

Theoretically, the yield of samples should be high in image-guided FNA in deep-seated lesions because sampling is performed under direct vision. In the present study, representative samples obtained through image-guided FNA were 81.6%. This finding is in concordance with the findings of Islam et al. (87.7%) and Nautiyal et al. (93.06%).[16,17]

The present study found that the majority (62.4%) of the deep-seated lesions were malignant, which was comparable to the study conducted by Adhikari et al. (70%).[18] In the present study, the most common site for image-guided aspiration was the lung (32.8%), followed by the liver (16%), and the gall bladder (16%) in the second position. This result is consistent with a study conducted by Neupane et al. who also observed that the most common site was the lung (47.5%) followed by the liver

(22.5%).[19] However, in contrast to our findings, Neupane et al. observed that the gall bladder in the third position was 5%.[19] Thus, further studies with larger sample sizes are needed to determine the disparity.

Adenocarcinoma was the most common lesion in both sexes. This finding was comparable to the findings of a study carried out by Chowdhary et al.[1] Among intrathoracic lesions, adenocarcinoma (22.5%) was the most common lesion encountered in the lung in the study conducted by Neupane et al. which was similar to the present study (18.4%).[19] Among intrabdominal lesions, adenocarcinoma (55%) was the most common lesion in the gall bladder in the present study,which was similar to the study conducted by Tuladhar et al. (45.5%).[20] In the liver, metastatic adenocarcinoma (50%) was the most common lesion seen in the present study, which is parallel with the findings of Singh et al. (42.5%).[21] Similarly, among gastrointestinal tract lesions, adenocarcinoma was the most common lesion, which was in concordance with the study conducted by Singh et al.[21] Among the abdominal lymph nodes, reactive lymphadenitis (40%) was common in the present study. Similar observations were made in the study performed by Singh et al. (44.7%).[21] Among the pancreatic ampullary region, adenocarcinoma was the common lesion, which was similar to findings reported by Parajuli et al.[22]

One case of Non-Hodgkin's Lymphoma was diagnosed in the mediastinum in the present study, which was comparable to findings reported by Lokhande et al.[23] A single case of plasmacytoma was seen in the chest wall in the present study. However, the study of Kalhan et al.[24] observed plasmacytoma was detected when the thoracic vertebral mass was aspirated.

In the present study, no major complications were observed. Thus, image-guided FNA is a relatively safe method, as similar observations were made in studies done by Chowdhary et al. and Lokhande et al.[1,23]

In this study, FNAC was helpful and safe in diagnosing neoplastic and non-neoplastic lesions. It can be considered as the investigation of choice as imaging visualizes the deep-seated lesions, and with the morphological evaluation confirmation of early diagnosis of disease can be detected. Hence, invasive surgical intervention can be minimized.

This study was conducted in single center, thus further studies with larger sample sizes are required from different locations and hospitals.

CONCLUSION

Image-guided fine needle aspiration cytology has a high yield. It is a suitable procedure for obtaining samples for cytological examination of deep-seated lesions located in any region of the body. This technique is a simple and cost-effective outpatient procedure with few complications. Hence, it can be used as a routine procedure for inaccessible lesions.

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