



Original Article

# Ultrasound and computed tomography guided fine needle aspiration cytology in diagnosing intra-abdominal and intra-thoracic lesions

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Computed tomography;  
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## ABSTRACT

**Background:** Ultrasonography and computed tomography guided fine needle aspiration cytology has an important role in diagnosing intraabdominal and intrathoracic mass lesions. It has an accuracy of 70-90%, depending on the site under evaluation.

**Materials and Methods:** This retrospective study was done in the Department of Pathology, Kathmandu Model Hospital, between June 2006 and November 2010. The study included 53 abdominal and 47 thoracic masses. The cytological diagnosis was correlated with clinical and radiological data to arrive at a final diagnosis.

**Results:** Fine needle aspiration cytology was performed in various anatomic sites: liver (28 cases), pancreas (8 cases), lymph nodes (7 cases), ovary and gall bladder (3 cases each) and 2 cases each of gastrointestinal tract and omentum. Thoracic aspirations were done from the lung (44 cases) and mediastinum (3 cases). The most common malignancy encountered in the abdomen was hepatocellular carcinoma (12 cases). Non-small cell carcinoma was the most common diagnoses amongst the lung lesions (15 cases).

**Conclusion:** Ultrasonography and computed tomography guided fine needle aspiration cytology had a high sensitivity and specificity in diagnosing deep seated lesions.

## INTRODUCTION

With the increased sophistication of radiologic imaging techniques, the sensitivity of detecting non-palpable, deep-seated lesions has greatly improved.<sup>1</sup>

Single or multiple space occupying lesions demonstrated by Ultrasonography (USG), Computed tomography (CT) scan and Magnetic Resonant Imaging (MRI) constitute the main

indications for fine needle aspiration cytology (FNAC).<sup>2</sup> Imaging techniques do not always distinguish between malignant and benign lesions morphologically. A confirmed tissue diagnosis is essential for both treatment and staging of cancers.<sup>3</sup> FNAC is a well-established method of diagnosing neoplastic and inflammatory conditions of both the thorax and the abdomen.

The procedure's low complication rate is an additional advantage which allows FNAC to be performed as an out-patient procedure. It is also a suitable procedure when patients are debilitated or have multiple lesions.<sup>4</sup>

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Complications that have been reported are hemorrhage, septicemia, biliary peritonitis, acute pancreatitis, and pneumothorax. Needle tract tumor implantation after FNAC has been reported but the survival outcome of these patients has not been studied in detail.<sup>5-6</sup> Another concern is that preoperative FNAC may cause local tissue changes, which could render subsequent histological diagnosis difficult.<sup>7</sup> The objective of this study was to evaluate the usefulness of USG and CT-guided FNAC in the diagnosis of intra-abdominal and intra-thoracic lesions.

## MATERIALS AND METHODS

This was a retrospective study done in the department of pathology, Kathmandu Model Hospital for a period of 4.5 years (June 2006 - November 2011). All patients who were clinically and radiologically diagnosed with intra-abdominal and intra-thoracic lesions were included in the study. The aspirations were done by the radiologist or in conjunction with a pathologist. A total of 1304 aspirations were performed. One hundred and forty one (10.81%) procedures were done under image-guidance. The aspirates were obtained from various anatomic sites such as the liver,

**Table 1: Cytological diagnosis of intra-abdominal lesions**

	INFLAMMATORY	No. of Cases	%	NEOPLASTIC	No. of Cases	%
1. LIVER (30 cases)	Abscess	4	7.55%	Hepatocellular carcinoma	12	22.64%
	Hydatid cyst	1	1.89%	Metastatic adenocarcinoma	4	7.55%
				Metastatic squamous cell carcinoma	1	1.89%
				Poorly differentiated carcinoma	2	3.77%
				Cholangiocarcinoma	2	3.77%
				Malignant lymphoma	2	3.77%
				Bile duct adenoma	1	1.89%
				Focal nodular hyperplasia	1	1.89%
2. GALL BLADDER (3 cases)				Poorly differentiated carcinoma	2	3.77%
				Adenosquamous carcinoma	1	1.89%
3. LYMPHNODE (7 cases)	Granulomatous lesion suggestive of tuberculosis	2	3.77%	Metastatic adenocarcinoma	2	3.77%
				Non-Hodgkin's Lymphoma	3	5.66%
4. GASTROINTESTINAL TRACT (2 cases)	Inflammatory- TB abscess	1	1.89%	Malignant tumour, adenocarcinoma	1	1.89%
5. OVARY (3 cases)				Serous cystadenocarcinoma	2	3.77%
				Mucinous cystadenocarcinoma	1	1.89%
6. PANCREAS (6 cases)				Well-differentiated adenocarcinoma	2	3.77%
				Poorly-differentiated adenocarcinoma	3	5.66%
				Benign cystic neoplasm	1	1.89%
7. OMENTUM (2 cases)				Metastatic adenocarcinoma	2	3.77%
<b>Total</b>		<b>8</b>	<b>15.09%</b>		<b>45</b>	<b>84.91%</b>

**Table 2: Cytological diagnosis of intra-thoracic lesions**

	INFLAMMATORY	No. of Cases	%	NEOPLASTIC	No. of Cases	%
1. LUNG (43 cases)	Abscess	3	6.38%	Non-small cell carcinoma	15	31.91%
	Tuberculosis	4	8.51%	Small cell carcinoma	7	14.89%
				Squamous cell carcinoma	5	10.64%
				Poorly-differentiated carcinoma	4	8.51%
				Bronchioloalveolar carcinoma	2	4.26%
				Metastatic carcinoma	2	4.26%
				Hemangioma	1	2.13%
2. Para-hilar mass (1 case)				Malignant lesion, Thymocarcinoma	1	2.13%
3. Paratracheal LN (3 cases)	Tuberculosis	2	4.26%	Non-Hodgkin's lymphoma	1	2.13%
<b>Total</b>		<b>9</b>	<b>19.15%</b>		<b>38</b>	<b>80.85%</b>

lungs, lymph nodes, gastrointestinal tract, pancreas, ovary, omentum, and gallbladder. Rare sites like the parahilar mass and paratracheal lymph node were also included. Forty-one of the 141 aspirations were excluded from the study as they were unsatisfactory as per our study criteria. The air dried and 95% alcohol fixed smears were prepared for Giemsa and Papanicolaou stains, respectively. 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. Acellular and inconclusive smears were excluded from the study. The original negative smears, smears with an unusual diagnoses or non-specified malignancies were reviewed by all the authors together to arrive at a final cytological diagnosis.

## RESULTS

Out of 1304 FNACs done from June 2006 to November 2010, 141 cases (10.81%) were done under image guidance. The numbers of intra-thoracic and intra-abdominal lesions were 47 and 53 respectively, out of which, intra abdominal

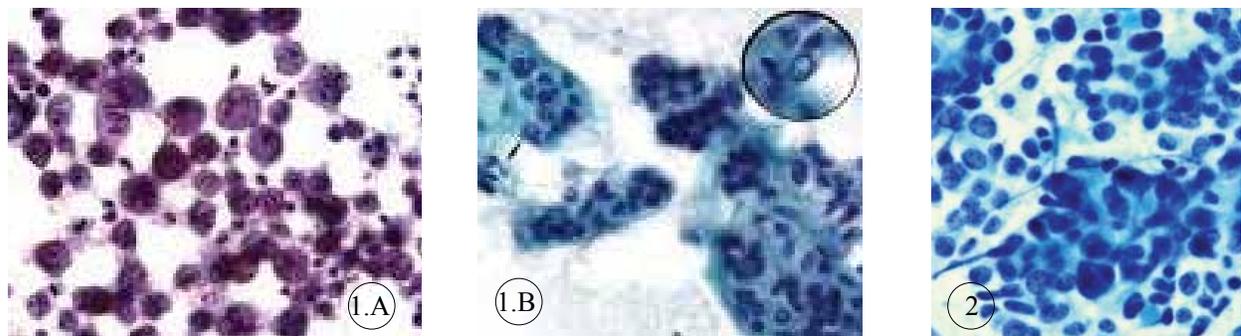
inflammatory lesion was 8 and intra thoracic 9, benign conditions were 3 and 1 respectively. Largest numbers of malignant cases were seen in intra-abdominal with 42 cases and 37 in intra-thoracic.

Largest numbers of malignant cases in both intra-abdominal and intra-thoracic lesions were seen in the age group of 61-70 years.

The cytological diagnoses of intrathoracic and intraabdominal lesion are given in Table 1 and Table 2 respectively.

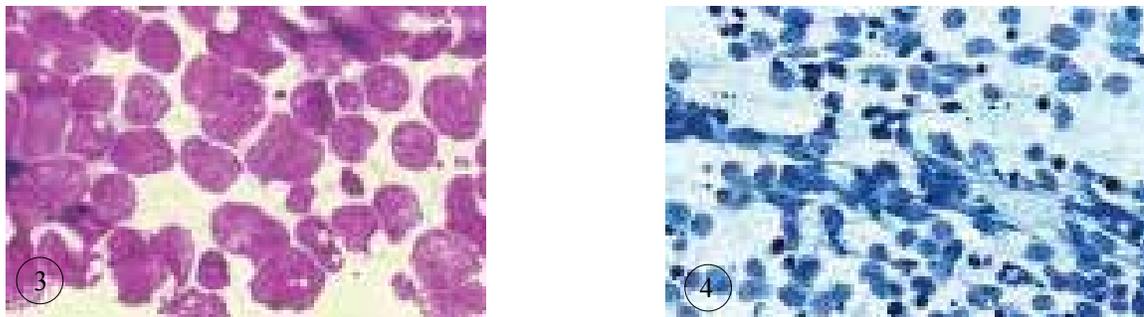
The most common malignancy encountered in abdomen was hepatocellular carcinoma (fig.1 A, B) followed by metastatic carcinoma in liver (fig. 2). Benign neoplasms included bile duct adenoma, focal nodular hyperplasia of liver and benign cystic neoplasm of liver.

The most common malignancy in the lung was Non-small cell carcinoma (fig. 3) followed by small cell carcinoma (fig. 4). There was 1 case of hemangioma of the lung.



**Figure 1:** (A, B) FNAC smears of hepatocellular carcinoma inset showing intranuclear inclusion. (Papanicolaou stain, X 40)

**Figure 2:** FNAC smears of metastatic adenocarcinoma of liver (Papanicolaou stain, X40). The neoplastic cells are pleomorphic having fine granular chromatin and occasionally small or prominent nucleoli. Rare single benign hepatocytes are present in the background. (Papanicolaou stain, X 40)



**Figure 3:** FNAC smears of non-small cell carcinoma of the lung (May Grunwald Giemsa Stain, X40)

**Figure 4:** FNAC smears of small cell carcinoma of the lung showing smearing artifacts (Papanicolaou Stain, X10)

## DISCUSSION

Image guided FNAC has facilitated easy collection of cellular material with greater accuracy.<sup>8</sup> Previously inaccessible sites, like the intra-thoracic and intra-abdominal lesions can be safely sampled and are now routinely aspirated under image guidance to yield cellular material.

When the procedure is jointly done by a pathologist and the radiologist, the accuracy rate of obtaining a good sample is very high. The immediate assessment of the specimen by the on-site cytopathologist, along with further passes when necessary, improves the adequacy rate of the technique.<sup>9</sup>

Liver and lungs were the common sites for FNAC in this study as shown in table I and II which is comparable to the studies done by Sheikh et al<sup>10</sup> and Adhikari RC.<sup>11</sup> Liver was also the most common site of aspiration performed in the abdomen in a study done by J Nobrega et al.<sup>8</sup>

The age range of our patients was 19-83 years. In the study by Tan KB et al<sup>12</sup>, the ages were between 11 and 82 years.

In our study, benign and malignant lesions were most common in the age group of 31-40 years and 61-70 years respectively. Mukherjee S et al<sup>13</sup> found the maximum incidence of malignant lesion in the age group of 40-70 years.

The most common malignancy encountered in the abdomen was hepatocellular carcinoma of the liver, 12 cases (22.6%) followed by metastatic carcinoma of liver, 7 cases (13.2%). The incidence of carcinoma gallbladder in our study was 3 cases (5.7%). In contrast to our findings, Zarger et al<sup>14</sup> found the most common malignancy as carcinoma gallbladder followed by hepatocellular carcinoma (9.6%). RC Adhikari<sup>11</sup> found metastatic tumor of the liver as the most common malignancy encountered in the abdomen (38.4%) followed by hepatocellular carcinoma (24.8%). There were 8 cases (15%) of pancreatic lesions in our study. Sheikh et al<sup>10</sup> found 6 pancreatic lesions amongst the 120 cases.

Amongst the lung lesions; non-small cell carcinoma (15 cases) was the most common in our study, similar to the findings by Mukherjee S et al<sup>13</sup>.

Amongst the intra-abdominal lymph node aspirates in our study; out of the 7 cases, 2 cases were diagnosed as granulomatous lesion suggestive of tuberculosis and 5 cases were diagnosed as malignant lesions; 2 metastatic adenocarcinoma and 3 Non-Hodgkin's lymphoma. Porter B et al<sup>15</sup> found 58.9% inflammatory lesions and 41.7% malignant lesions. Similar findings were reported by Das and Pant.<sup>16</sup>

In this study, FNAC has diagnosed not only benign and malignant neoplasm, but also non-neoplastic diseases like

tuberculosis, hydatid cyst and abscess.

Twenty nine cases of the cytologically malignant cases were followed up for metastases, progression of radiological lesions or response to therapy. Of these, 5 cases had metastatic sites that were biopsied. Histopathologically, these correlated with primary cytological diagnosis.

We found that the review was especially important in the cases diagnosed as negative for malignancy. We also found that the review of slides by a second and third expert followed by a consensus diagnosis increased the accuracy.

Clinico-radiological parameters showed no false positives but 3 false negative results. Three cases that were clinico-radiologically diagnosed as benign lesion was diagnosed as malignant on image-guided FNAC 1 case of hepatocellular carcinoma, 1 case of Non-Hodgkin's Lymphoma of the intra-abdominal lymph node and one case of small cell carcinoma lung. Tan KB et al<sup>12</sup> did clinico-radiological correlation with FNAC in 114 patients. Eight benign cases (7%) proved to be malignant in clinical pathological follow-up.

Therefore, USG and CT- guided FNAC should be used as a routine procedure in the study of abdominal and thoracic lesions due to high sensitivity and specificity rate and very low complication rate. Barrios et al and others<sup>17-20</sup> recommended that image guided FNAC should be used as routine procedure in the study of abdominal lesions and pulmonary lesions.<sup>21</sup>

## CONCLUSION

In this study 84.9% and 80.4% of neoplastic lesions of the intra-abdominal and intra-thoracic were diagnosed by this simple out patient procedure with the lowest cost to the patient as compared to higher cost, morbidity and lengthy hospital stay in surgical biopsies.

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