Nepalese Medical Journal, (2022) Vol. 5, 546 - 551

Original Article

Diagnostic Role of Image-Guided Fine Needle Aspiration Cytology

Palzum Sherpa[1,2], Sudhamsu Koirala[2]

[1]*Department of Pathology, Patan Academy of Health Sciences, Lalitpur, Nepal*

[2]*Department of Pathology, Om Hospital and Research Centre, Kathmandu, Nepal*

ABSTRACT

Introduction: With the aid of modern imaging procedures like ultrasonography and computed tomography, fine needle aspiration cytology of deeper structures, small and vaguely palpable swellings, and lesions that are in close proximity to major vasculature are feasible. This study aims to establish the prevalence of image-guided FNAC, evaluate its diagnostic utility, and assess the spectrum of disorders diagnosed with its usage.

Materials and Methods: A retrospective descriptive study was performed in the Pathology department, Om Hospital and Research Centre from May 2015 to November 2019. The study included all samples of image-guided FNACs which were received for cytological examination.

Results: Image-guided FNAC accounted for 13.03% of all FNACs done during the study period. Female predominance with a male to female ratio of 1:1.4 was noted. The age of the patients ranged from 13 to 85 years with a mean age of 53.6 years. The majority of the FNACs were performed under USG guidance. The lung was the most commonest site followed by lymph nodes and liver. Cytological diagnosis was made in 225 (88.93%) of the total cases. 7 (2.77%) cases were suspicious for malignancy and 21 (8.3%) were inconclusive. The majority of the lesions were categorized as malignant.

Conclusions: Image-guided FNAC has a good diagnostic yield for deeper structures and small and vaguely palpable swellings. A spectrum of lesions, both neoplastic and non-neoplastic can be diagnosed with its usage. The commonest site of aspiration was the lung followed by lymph nodes and liver.

Keywords: Computed tomography; Fine needle aspiration cytology; Ultrasonography

Correspondence:

Dr. Palzum Sherpa, MD
Assistant Professor, Department of Pathology
Patan Academy of Health Science, Lalitpur, Nepal
ORCID ID: 0000-0001-7613-8485
Email: palzumsherpa@pahs.edu.np

Submitted: 18th April 2022
Accepted: 20th June 2022

Source of Support: None
Conflict of Interest: None

Citation: Sherpa P, Koirala S. Diagnostic role of image-guided fine needle aspiration cytology. NMJ 2022;5(1):546-51. DOI 10.3126/nmj.v5i1.46803

INTRODUCTION

Fine needle aspiration cytology (FNAC) is an essential component of pretreatment or preoperative investigation of various pathological conditions. The technique is minimally invasive, inexpensive, can be performed on an outpatient basis, has a low risk of complications, and produces a rapid result. FNAC can provide a definitive diagnosis in many conditions. If a definitive diagnosis is not possible, it can offer a categorization of disease and provide differential possibilities. It should be the first line approach and core needle biopsy should be reserved for scenarios where information provided by cytology is or is likely to be insufficient or indecisive. With the assistance of modern imaging procedures, especially ultrasonography (USG) and computed

tomography (CT) percutaneous, transthoracic, and transperitoneal FNAC of deeper structures have been made feasible.[1] In addition, image-guided FNAC is performed in superficial lesions which are small and not readily palpable, with ill-defined swellings and lumps in close proximity to major vasculature.

Some studies analyzing the role of image-guided FNAC in diagnosing deep-seated thoracic and abdominal lesions have been conducted in Nepal.[2-4] However, there is a rarity of literature on its diagnostic value in general cytopathology practices for both superficials as well as deep-seated sites. This study aims to establish the prevalence of image-guided FNAC, evaluate the diagnostic utility, and assess the spectrum of disorders at different sites established with the usage of image-guided FNAC at the Pathology department of Om Hospital and Research Centre, Kathmandu, Nepal over a study period of four and half years. This study could help us gain an insight into the application of image-guided FNAC and its diagnostic role in the Nepalese context.

MATERIALS AND METHODS

This is a retrospective descriptive study conducted in the Department of Pathology at Om Hospital and Research Centre, Kathmandu, Nepal. The study included all samples of image-guided FNACs of different organs which were received at the cytopathology laboratory for examination over a period of four and half years from May 2015 to November 2019. The image-guided FNACs were done jointly by the radiologist and pathologist. All the relevant data were retrieved from the laboratory database and entered and coded in an excel sheet. The data variables were cytopathology number, age, gender, anatomical site, modality of imaging procedure, and diagnosis of the lesions. Analysis of the data was performed using SPSS version 17.0. The variables were summarized using mean, percentage, and range, and the data was represented with tables.

RESULTS

Image-guided FNAC accounted for 13.03% of all FNACs done during the study period. Out of the 253 cases, 102 (40.3%) were male and 151 (59.7%) female with a male to female ratio of 1:1.4. The age of the patients ranged from 13 to 85 years with a mean age of 53.6 years. 235 (92.9%) FNACs were performed under USG guidance and 18 (7.1%) under CT guidance. Amongst the CT-guided FNACs 15 were performed from the lung and one each from the liver, perinephric region, and non-specified site within the intra-abdominal cavity. The lung was the most common site (54 cases, 21.3%) followed by lymph nodes (41 cases, 16.2%) and liver (38 cases, 15%). (Table 1)

Table 1: Site-wise frequency of Image-guided FNAC

Site of FNAC	No. of cases (%)	Site of FNAC	No. of cases (%)
Lung	54 (21.3%)	**Pelvic region**	3 (1.2%)
Lymph nodes	41 (16.2%)	**Neck**	3 (1.2%)
Liver	38 (15%)	**Pleura**	2 (0.8%)
Breast	30 (11.8%)	**Chest wall**	2 (0.8%)
Thyroid	25 (9.9%)	**Flank**	2 (0.8%)
Gall bladder	12 (4.7%)	**Perinephric**	2 (0.8%)
Omentum	9 (3.5%)	**Mediastinum**	1 (0.4%)
Pancreas	6 (2.4%)	**Adrenal**	1 (0.4%)
Retroperitoneum	6 (2.4%)	**Rib**	1 (0.4%)
Ovary	5 (2%)	**Abdominal wall**	1 (0.4%)
Intraabdominal	4 (1.6%)	**Back**	1 (0.4%)
Salivary gland	3 (1.2%)	**Umbilical region**	1 (0.4%)

Cytological diagnosis was made in 225 (88.93%) of the total cases. The diagnostic yield of USG-guided FNAC was 92.8% and CT-guided FNAC was 77.8%. 7 (2.77%) cases were suspicious for malignancy and 21 (8.3%) yielded either suboptimal sample or non-representative aspirate and hence were inconclusive for any opinion. The majority of the lesions (132 cases, 58.67%) were categorized as malignant, followed by 82 cases (36.45%) of non-neoplastic and 8 cases (3.55%) of benign lesions. (Table 2) Amongst the malignant lesions, the lung was the commonest site constituting maximum cases of squamous cell carcinoma followed by adenocarcinoma and the liver was the next most common site with metastatic adenocarcinoma comprising the majority of the cases. Out of the 8 cases of benign neoplasms, 4 were fibroadenoma, 2 lipomas and hemangioma, and type A thymoma accounted for one case each. Colloid goiter, fibrocystic change, abscess at different sites, and reactive lymphadenitis were the most frequently encountered non-neoplastic lesions. (Table 3)

Table 2: Categories of lesions based on cytological morphology

Category of lesions		Number	Percentage
Diagnostic		**225**	**88.93%**
Non-neoplastic		82	36.45%
Neoplastic	**Benign**	8	3.55%
	Malignant	132	58.67%
	Inconclusive	3	1.33%
Suspicious for malignancy		7	2.77%
Inadequate		21	8.3%
Total		253	100%

Table 3: Spectrum of cytological diagnoses

Site	Neoplastic			Non-neoplastic	Suspicious	Inadequate
	Malignant	Benign	Inconclusive			
Lung (54)	Adenocarcinoma (13) Small cell carcinoma (1) Squamous cell carcinoma (20) Poorly differentiated Ca (6)	0	0	Granulomatous (2) Suppurative (2) Tuberculosis (1)	2	7
Lymph node (41)	Classical HL (2) Metastatic adenocarcinoma (3) Metastatic papillary Ca (1) Metastatic squamous cell Ca (1) Metastatic poorly diff. Ca (5)	0	0	Reactive (12) Granulomatous (2) Tubercular (7)	2	6
Liver (38)	Hepatocellular carcinoma (4) (fig.1) Cholangiocarcinoma (1) Poorly differentiated Ca (2) Metastatic adenoCa (22) Metastatic small cell Ca (2)	Hemangioma (1)	0	Inflammatory (2)	1	3
Breast (30)	Ductal carcinoma (5)	Fibroadenoma (4) Lipoma (1)	0	Abscess (5) Fibrocystic (14) Gynecomasta (1)	0	0
Thyroid (25)	Anaplastic (1) Medullary (1) Papillary (4)	0	Follicular neoplasm (2)	Colloid goiter (15) Hashimoto thyroiditis (1)	1	0
GB (12)	Adenocarcinoma (10)	0	0	Suppurative (1)	1	0
Omentum (9)	Metastatic adenocarcinoma (4)	0	0	Granulomatous (2)	0	3
Pancreas (6)	Adenocarcinoma (3) Neuroendocrine tumor (1) (fig.2) Pleomorphic giant cell Ca (1) Solid pseudopapillary neoplasm(1)	0	0	0	0	0
Retroperitoneum (6)	Small round cell tumor (1) Adenocarcinoma (1) Non-Hodgkin lymphoma (2)	0	Spindle cell neoplasm (1)	Cystic lesion (1)	0	0
Ovary (5)	Adenocarcinoma (3) Serous carcinoma (1) Mucinous carcinoma (1)	0	0	0	0	0
Intraabdominal, site not specified (4)	Adenocarcinoma (1) Poorly differentiated Ca (1)	0	0	Inflammatory (2)	0	0
Salivary gland (3)	0	0	0	Mucous retention cyst (1) Chronic sclerosing sialedenitis (1) Cystic lesion (1)	0	0
Pelvic (3)	Adenocarcinoma (2)	0	0	Abscess (1)	0	0
Neck (3)	0	0	0	Abscess (3)	0	0
Pleura (2)	Metastatic adenocarcinoma (1) Metastatic leiomyosarcoma (1)	0	0	0	0	0
Chest wall (2)	0	Lipoma (1)	0	Abscess (1)	0	0
Flank (2)	Poorly differentiated adenoCa (1)	0	0	0	0	1
Perinephric (2)	0	0	0	Abscess (1)	0	1
Mediastinum (1)	0	Type A thymoma (1)	0	0	0	0
Adrenal (1)	Metastatic adenocarcinoma (1)	0	0	0	0	0
Rib (1)	Plasma cell myeloma (1)	0	0	0	0	0
Abd. wall (1)	0	0	0	Abscess (1)	0	0
Back (1)	0	0	0	Cysticercosis (1)	0	0
Umbilicus (1)	0	0	0	Endometriosis (1)	0	0

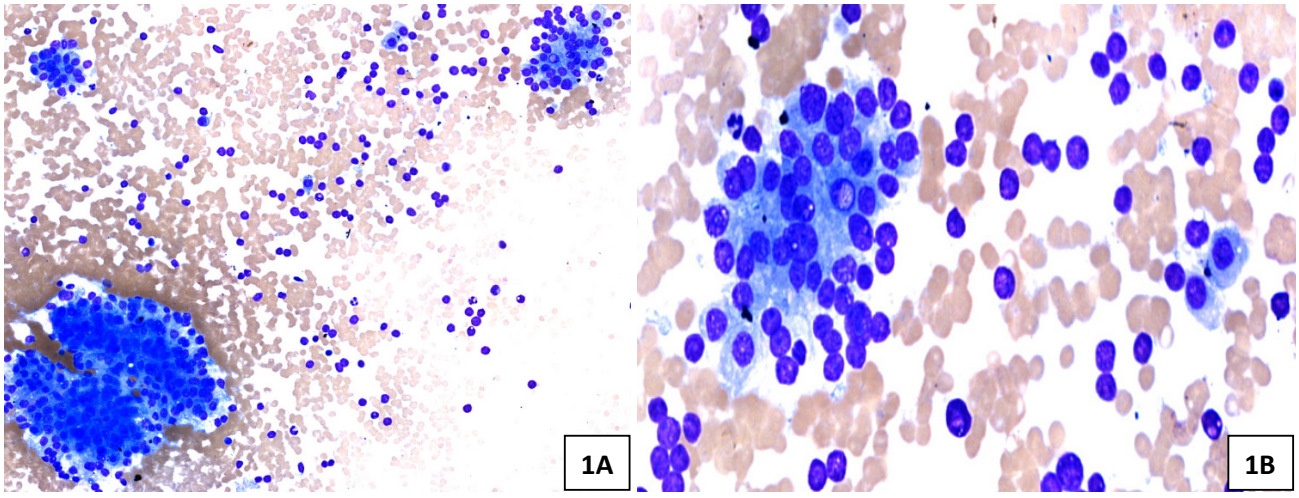

Figure 1: Hepatocellular carcinoma. A. Cellular aspirate showing sheets and acini of tumor cells with numerous atypical stripped nuclei in the background (Giemsa stain; X40). B: Higher power view showing polygonal tumor cells with abundant granular cytoplasm and central nucleus. An intranuclear inclusion is noted.

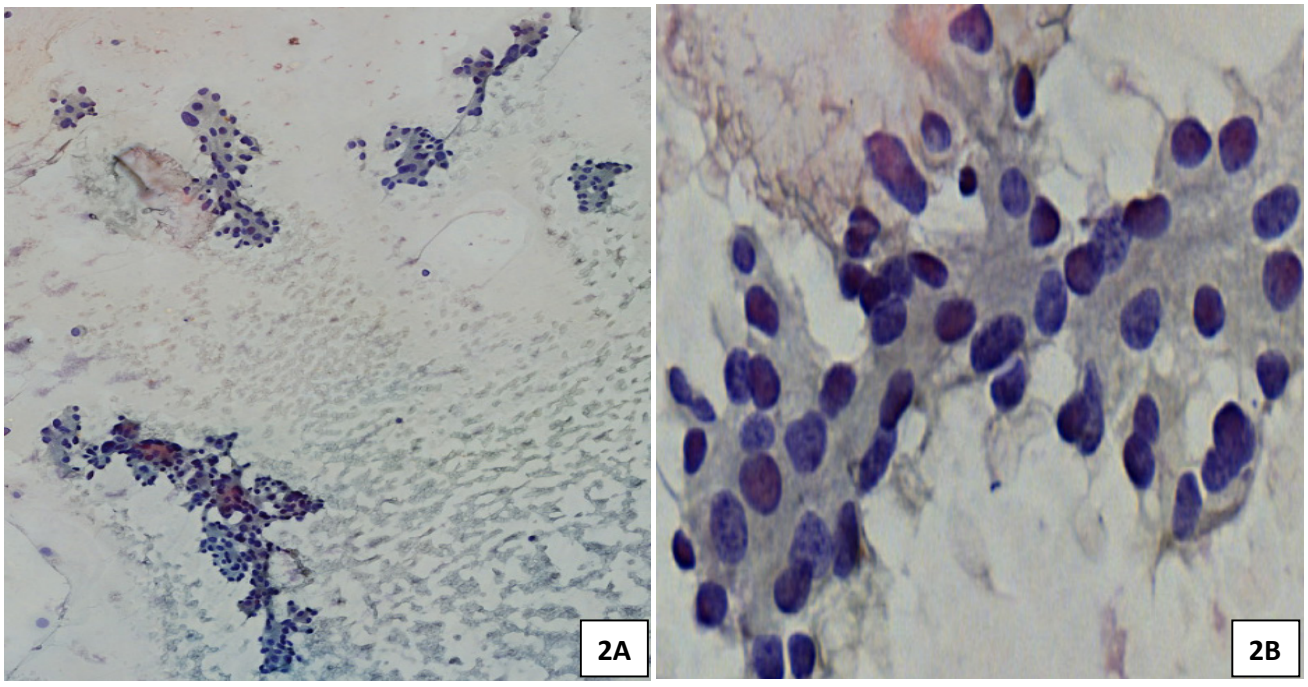

Figure 2: Neuroendocrine tumor of the pancreas. A: Cellular aspirate with loose aggregates of tumor cells with rosette formation (Papanicolaou stain; X40). B: Higher power view showing mild pleomorphic tumor cells with finely granular cytoplasm and stippled chromatin.

DISCUSSION

Image-guided FNAC accounted for 253 cases (13.03%) of the total 1941 FNACs done during the study period. In our study, 235 (92.9%) FNACs were performed under USG guidance and 18 (7.1%) under CT guidance. This is in agreement with studies done by Pujani et al (USG-85.2%, CT- 14.8%)[5], Warpe et al (USG- 86.15%, CT- 13.85%)[6], Mane et al (USG- 92.3%, CT- 7.69%)[7] and Suva et al (USG- 97%, CT- 3%)[8] which showed that USG was the predominantly used imaging modality for the assistance of FNAC. The usage of USG guidance is favored because it allows provision of sample collection under real-time monitoring, has low cost, quicker procedure, and no exposure to radiation.[9] Majority (15 cases, 83.3%) of CT-guided aspiration was performed from the lung. CT guidance is preferred in lesions that are obscured by aerated lungs in USG as well as small deep-seated and cavitary lesions.[1] Several studies conducted in Nepal[10] and India[11-13] have emphasized that CT-guided FNAC is the procedure of choice and elaborated its role in the diagnosis of mass lesions of the lung.

Our study showed female predominance with a male to female ratio of 1:1.4. Various studies were done by Warpe et al[6] and Mangla et al[14] had similar findings. Warpe et al attributed this to the fact that a maximum number of guided FNACs in their study was done from breast lesions which are more common in females.[6] In our study, the breast was the fourth most common

site comprising 30 (11.8%) cases. Male preponderance was noted in a study done by Pujani et al.[5] The age of the patients ranged from 13 to 85 years with a mean age of 53.6 years. The maximum number of patients was found to be in the age group 51-60 years which is in accordance with several studies.[8,15]

The lung was the commonest site (54 cases, 21.3%) followed by lymph nodes (41 cases, 16.2%) and liver (38 cases, 15%). This finding is consistent with that of studies performed in Nepal by Tuladhar et al[3] and Adhikari et al[4] who found lung, liver and lymph node as the three commonest site. Lung and liver were the commonest intrathoracic and intraabdominal sites respectively in a study conducted by Parajuli et al.[2] The site-wise distribution of the lymph nodes were as follows: cervical (13), mesenteric (9), supraclavicular (7), inguinal (3), axillary (2), periportal (2) and 1 each in intraparotid, para-aortic, perigastric, intraabdominal (site not specified) and retroperitoneal location. In decreasing order of frequency lesions from the breast, thyroid, gall bladder, omentum, peritoneum, retroperitoneum, intraabdominal location (site not specified), ovary, salivary gland, pelvic region, and neck constituted the remaining major bulk.

In 225 (88.93%) of the total cases, adequate cellular material was obtained and the cytological diagnosis was made corroborating data from several studies which showed adequate sampling in 87-92% of their patients.[3,6,7,16] 7 (2.77%) cases were suspicious for malignancy and 21 (8.3%) yielded suboptimal or non-representative aspirate and hence inconclusive for any opinion. The diagnostic yield of USG-guided FNAC was 92.8% and CT-guided FNAC was 77.8%. The majority of the lesions (132 cases, 58.67%) were categorized as malignant, followed by 82 cases (36.45%) of non-neoplastic and 8 cases (3.55%) of benign lesions. The rate of malignancy is variably reported in the literature. Studies on image-guided FNAC irrespective of sites have shown a lower frequency of malignant lesions ranging from 48.1% to 49.7%.[5,6] However, studies analyzing radiologically assisted FNAC in diagnosing intra-thoracic and intra-abdominal lesions demonstrated a higher prevalence of malignancy varying from 70% to 80%.[3,4,7] Amongst the malignant lesions, the lung was the commonest site with squamous cell carcinoma comprising 20 (50%) of the cases followed by 13 cases of adenocarcinoma, 6 poorly differentiated carcinoma, and one case of small cell carcinoma. This finding, however, is different from many studies which found adenocarcinoma to be most prevalent.[10,11,13] In studies by Parajuli et al[2] and Adhikari et al[4], squamous cell carcinoma was more common than adenocarcinoma. However, non-small cell carcinoma was the most frequent diagnostic category in both their studies. The surprisingly low incidence of small cell carcinoma in our study coincides with various studies.[4,17] Suchismita et al have attributed this under-representation to the fact that due to the presence of extrathoracic dissemination at presentation in most patients of small cell carcinoma, diagnosis is possible by aspiration from more accessible sites, like supraclavicular lymph nodes, hence precluding sampling from the lung.[17] Liver was the next most common site with metastatic adenocarcinoma comprising the majority of the cases which is comparable to many studies.[4,18] Metastatic carcinoma in lymph nodes, ductal carcinoma of the breast, papillary carcinoma of the thyroid, and adenocarcinoma in the gall bladder, pancreas, and ovary were other common malignancies noted in our study. Out of the 8 cases of benign neoplasms, 4 were fibroadenoma, 2 lipomas, and a single case each of type A thymoma and hemangioma. There were 3 cases, 2 follicular neoplasm of thyroid and 1 spindle cell neoplasm in retroperitoneal location which was classified as inconclusive for benign or malignant nature. Colloid goiter, fibrocystic change, abscess at different sites, and reactive lymphadenitis were the most frequently encountered non-neoplastic lesions. Abscess of liver and lung, pulmonary and nodal tuberculosis was the most common non-neoplastic conditions in a study done by Parajuli et al.[2]

CONCLUSIONS

Image-guided FNAC has a good diagnostic yield for deeper structures and small and vaguely palpable swellings. A spectrum of lesions, both neoplastic and non-neoplastic can be diagnosed with the usage of image-guided FNAC. The commonest site of aspiration was the lung followed by lymph nodes and liver.

REFERENCES

1. Orell SR, Sterrett GF, Whitakar D. Fine needle aspiration cytology. 4th ed. Elsevier: India; 2005. p2-3.
2. Parajuli S, Tuladhar A, Basnet R. Ultrasound and computed tomography guided fine needle aspiration cytology in diagnosing intra-abdominal and intra-thoracic lesions. J Pathol Nepal 2011;1:17-21. Crossref
3. Tuladhar AS, Adhikari RC, Shrestha S, Sharma SK, Pradhan S, Shrestha A, et al. Role of USG guided FNAC in diagnosis of abdominal and thoracic lesions. Nepal Med Coll J 2012;14:271-4. Website
4. Adhikari RC, Tuladhar A, Shrestha S, Sharma SK. Deep-seated thoracic and abdominal lesions: usefulness of ultrasound guided fine needle aspiration cytology, a 3 year experience. Nepal Med Coll J 2010;12:20-5. Website
5. Pujani M, Jetley S, Jairajpuri ZS, Khan S, Hassan MJ, Rana S, et al. A critical appraisal of the spectrum of image guided fine needle aspiration cytology: a three year experience from a tertiary care centre in delhi. Turkish J Pathol 2016;32:27-34. Crossref
6. Warpe SJ, Warpe BM, Mandre AR DR. Evaluation of various disorders diagnosed on guided FNACs in a rural tertiary care hospital, Konkan belt of Maharashtra, India. IOSR-JDMS 2018;17:5-12.
7. Mane A, Kanetkar SR, Saini S SN. Role of image guided fine needle aspiration cytology in cases of hepatic mass lesions. Int J Healthc Biomed Res 2015;3:149-55.
8. Chetal SM. Study of image guided FNAC in intra-abdominal mass lesion at tertiary care hospital, Jamnagar, Gujarat, India. Indian J Basic Appl Med Res. 2016;6:40-51.
9. Kalhan S, Sharma S, Ramakrishnan T, Sharma P, Dudani S, Chowdhry A. Evaluation of precision of guidance techniques in image guided fine needle aspiration cytology of thoracic mass lesions. J Cytol 2012;29:6. Crossref
10. Shrestha MK, Ghartimagar D, Ghosh A. Computed tomogram guided fine-needle aspiration cytology of lung and mediastinal masses with cytological correlation: a study of 257 cases in Western region of Nepal. Nepal Med Coll J 2014;16:80-3. Website

11. Chakrabarti I, Giri A, Gangopadhyay M, Ghosh N. Computed tomography guided fine needle aspiration cytology of mass lesions of lung: Our experience. Indian J Med Paediatr Oncol 2011;32:192. Crossref

12. Anila K, Nayak N, Venugopal M, Jayasree K. Role of rapid on-site evaluation in CT-guided fine needle aspiration cytology of lung nodules. J Cytol 2018;35:229. Crossref

13. Mondal S, Nag D, Osta M, Biswas P, Das R, Mandal P. Computed tomogram guided fine-needle aspiration cytology of lung mass with histological correlation: A study in Eastern India. South Asian J Cancer 2013;2:14. Crossref

14. Mangla G, Arora V, Singh N. Clinical audit of ultrasound guided fine needle aspiration in a general cytopathology service. J Cytol 2015;32:6. Crossref

15. Meena SP, Patangia P, Rai NN. Diagnostic utility of usg-guided fnac in hepatic lesions. J Evid Based Med Healthc 2016;3:2699-702. Crossref

16. Saha K, Sengupta M. Computed tomography guided fine needle aspiration cytology of pulmonary mass lesions in a tertiary care hospital: A two-year prospective study. Med J Dr DY Patil Univ 2014;7:177. Crossref

17. Suchismita, Singh GR, Gupta A, Gupta R, Agarwal P NS. C. T. guided fine needle aspiration cytology of localised lung lesions : cytological versus radiological correlation. Indian J Appl Res. 2017;7:64-8.

18. 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. Crossref