Original Research Article

Role of USG and CT Guided FNAC in Intra Abdominal Lump and Thoracic Lesions in Bundelkhand Region

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Abstract

Background: The introduction of modern diagnostic imaging techniques, mainly USG and CT scan now has enabled the detection and location of lesions in sites which are not easily accessible to surgical biopsies, besides offering vast opportunities for fine needle aspiration of the deeper structures. *Aims & Objective:* study the cytomorphilogical features of intra abdominal mass and thoracic lesions, categorise them organ wise and also as inflammatory, benign and malignant lesions and correlate histopathologically whenever possible. *Material and Methods:* present study conducted on total 114 guided aspirations under ultrasound/CT scan in radiology department and cytologically evaluated in Department of Pathology, Maharani Laxmi Bai Medical College, Jhansi between august 2016 to august 2018. *Results:* Adequacy rate was 95.61%. maximum no. of cases-36 (31.57%) were of liver masses, followed by 24 (21.05%) cases of gall bladder masses and 17 (14.91%) of lymphadenopathies. Among the thoracic region, lung tumors comprises maximum no. of cases 19 (16.66%). Rest of the cases were from the ovary 6 (5.26%), 04 (3.50%) cases GIT, 4 (3.50%) from each from CBD and kidney, 1 (0.88%) from intra-abdominal testis and 3 (2.63%) cases were grouped as miscellaneous. 96 cases were subjected to histopathological examination.There is overall sensitivity was 91.80%, specificity 97.37% and diagnostic accuracy was found to be 94.9%. Conclusion - guided FNA is a rapid, accurate, economical and safe diagnostic procedure for deep-seated mass and post procedure complications are few.

Keywords: Ultrasound; Computer tomography; Fine needle aspiration cytology.

Introduction

The pre-operative evaluation of deep, abdomino-pelvic masses and thoracic region lumps is often difficult and always remain as an enigma in surgical practice. Most of the intra abdominal and thoracic-region masses are non-palpable and even if they are palpable, the idea of their size, shape and the extent of the lesion is not possible and the distinction between malignant and nonmalignant lesions and particularly inflammatory lesions is also necessary. The introduction of modern diagnostic imaging techniques, mainly ultrasonography (USG) and CT scan now has enabled the detection

and location of lesions in sites which are not easily accessible to surgical biopsies, besides offering vast opportunities for fine needle aspiration of the deeper structures. Fine needle aspiration cytology (FNAC) is nowadays a widely used tool for the diagnosis of superficially palpable lesions, as well as deep seated lesions of the abdomen [1]. The technique is relatively painless and reliable, produces speedy results and is cheap [2]. The techniques of image guided FNAC not only permit precise anatomical imaging and targeting of lesions, but also allow planning of a safe access route, with constant visualization of the needle tip during insertion, thereby reducing the risk of complications [3]. CT was used before the FNAC to measure the density of the lesion, to accurately localise it and to plan the approach [4].

Therefore, various imaging modalities like fluoroscopy, Computed tomography (CT) and Ultrasonography (USG) are used as a guide for fine needle aspiration [5]. Ultrasound guided FNA is a rapid, accurate, economical and safe diagnostic procedure in which any structure visualized can be reached quickly and precisely by a fine needle in any desired plane with constant visualization of needle tip during insertion [6]. On the other hand, post procedure complications are fewer except for pneumothorax, pulmonary hemorrhage, and heamoptysis in a small percentage of cases [7].

The present study was undertaken with the aim of evaluating the overall utility of ultrasound and CT guided FNAC in the diagnosis of intra-abdominal lesions and thoracic region lumps in Bundelkhand area of Uttar Pradesh.

Materials and Methods

The cross sectional study conducted on total 114 patients in Department of Pathology, Maharani Laxmi Bai Medical College, Jhansi between august 2016 to august 2018.

Mass to be aspirated was localized by ultrasound/CT scan and 22 gauge lumbar puncture needle attached to tightly fitting 20 cc glass syringe (with piston closed) was taken. The needle was then disconnected and needle contents were placed on one or more microscopic glass slides and spread. For wet fixation slides were immediately immersed in 95% alcohol + Diethyl Ether in 1:1 ratio by volume.

Staining of Smear: Stain with May-Grunwald-Giemsa (MGG) and alcohol fixation, followed by staining with Papanicolaou.

Result and Discussion

114 ultrasound and CT-guided fine needle aspirates from various intra-abdominal and thoracic region lumps were performed and evaluated cytologically. Aspirates were sampled from liver, gall bladder, lymph nodes, ovary, kidney, gastrointestinal tract, intraabdominal testis and lungs.

Maximum number of cases in the study group were of elderly age i.e. > 60 yrs (39.47%) and minimum number of cases were seen in age group 0-10 yrs (1.75%). Age of the patients under study ranges from 6 yrs to 75 yrs. This is correlated well as malignancies are more common in elderly age group. Number of male patients (55.26%) were more than female patients (44.74%). (Table 1).

Table 1: Sex Distribution of cases

Gender	No. of cases	Percentage
Male	63	55.26%
Female	51	44.74%
Total	114	100.00

Table 2: Age Distribution of cases

Age group (in yrs)	No. of cases	Percentage
0–10	02	1.75%
11–20	03	2.63%
21–30	06	5.26%
31–40	08	7.01%
41–50	14	12.28%
51–60	36	31.5%
>60	45	39.47%
Total	114	100.00%

Out of 114 cases, 36 (31.57%) were of liver masses, constituting for the single largest group, followed by 24 (21.05%) cases of gall bladder masses and 17 (14.91%) of lymphadenopathies. among the thoracic region, lung tumors comprises maximum no. of cases 19 (16.66%). rest of the cases were from the ovary 6 (5.26%), 04 (3.50%) cases git, 4 (3.50%) from each from cbd and kidney, 1 (0.88%) from intra-abdominal testis and 3 (2.63%) cases were grouped as miscellaneous where exact diagnosis of organ was difficult (Table 2).

In previous studies where all intraabdominal organs were considered, liver constituted the single largest group subjected to FNAC, Bharti M Jha *et al.* (2000)[8].

In our study adequate aspirates were obtained in 109 cases (95.61%) and inadequate aspirates in 5 cases (4.39%) (Table 3).

Table 3: Comparison of adequacy of material on ultrasound, CT guided FNAC by various workers and present study

S. No.	Workers	Adequacy rate
1.	Shukla VK *et al.* (1997) [9]	95.00%
2.	Ratan Konjengbam *et al.* (2017) [10]	99.21%
3.	Present study (2018)	95.61%

Liver

The present study includes 36 patients of liver lumps, who presented with right hypochondrial/epigastric mass. Diagnostic aspirates were obtained in 34 cases with adequacy of 94.44%. Most of the lesions of liver were benign 20 (58.82%) cases out of which 10 (29.41%) were diagnosed as pyogenic abscess and 5 (14.71%) as hydatid cyst and 3 (8.82%) as granulomatous lesion, 2 (5.8850) as non specific benign lesion. 14 (41.18%) lesions were malignant consisting 10 (29.41%) cases as metastatic carcinoma and 4 (11.76%) as hepatocellular carcinoma.

Histopathology was done in 29 cases, one case was found to be false negative and the overall accuracy of FNAC in liver lumps was found to be 96.55%.

Table 4: Diagnostic accuracy by various workers in Hepatic lesions

S. No.	Workers	Adequacy rate
1.	Kanica Jha *et al.* (2018) [11]	94.74%
2.	C.V. Reddy *et al.* (2011) [12]	92.8%
3.	Present study (2018)	96.55%

Results of present study is in accordance with Kanica Jha *et al.* (2018) [11] (Table 4).

Gall bladder

In present study 24 cases of gall bladder lump were subjected to FNAC, adequate material was obtained in 23 cases (95.83%).

Cytodiagnosis revealed all the cases as malignant (adenocarcinoma). Histopathological correlation was done in all 23 cases and one false positive result was obtained. So, overall accuracy of gall bladder lumps in our study was 95.65%.

Table 5: Diagnostic accuracy of various workers in GB lumps

S. No.	Workers	Adequacy rate
1.	Nikhilesh Kumar *et al.* (2015) [13]	95.3%
2.	Paresh Singhal *et al.* (2015) [14]	95.3%
4.	Present study (2018)	95.65%

Diagnostic accuracy in present study is in accordance with the results of Nikhilesh Kumar *et al.* (2015) [13] study (Table 5).

Intraabdominal and MediastinaL lymph nodes

In the present study 17 cases of intraabdominal and mediastinal enlarged lymph nodes were subjected to FNAC, adequate material was obtained in 16 cases (94.12%).

On cytodiagnosis, 3 (18.75%) cases were tubercular, 7 (43.75%) reactive hyperplasia, 1 (6.25%) non hodgkin lymphoma, 1 (6.25%) Hodgkin lymphoma and 4 (25.0%) metastatic adenocarcinoma.

Histopathological examination was done in all cases to confirm FNAC findings. One false negative result was obtained. So, overall accuracy for intra-abdominal and mediastinal enlarged lymph nodes in our study was 93.75%.

Table 6: Diagnostic accuracy of various workers in LN Masses

S. No.	Workers	Adequacy rate
2.	Bohle and Zoller (2013) [15]	92%
3.	Present study (2018)	93.75%

Diagnostic accuracy in our study is in accordance with the results of Bohle and Zoller (2013)[15] study (Table 6).

LUNG

In the present study 19 cases of lung masses were subjected to FNAC, adequate material was obtained in all cases (100%).

On cytodiagnosis, 2 (10.53%) cases were found to be non-specifically benign conditions and 17 (89.47%) were malignant. Out of 17 malignant cases, 11 (57.90%) cases were diagnosed as adenocarcinoma lung, 5 (23.31%) were as squamous cell carcinoma and 1 (5.23%) case as small cell carcinoma of lung.

Histopathological examination was done in 12 cases to confirm FNAC findings. One false negative result was obtained. So, overall accuracy for lung masses in our study was 91.67%.

Table 7: Diagnostic accuracy of various workers in LUNG Masses

S. No.	Workers	Accuracy rate
1.	Sumana Mukherjee *et al.* (2010)[4]	95%
2.	S.K. Mondal *et al.* (2013)[16]	95%
3.	Present study (2018)	91.67%

Diagnostic accuracy in our study is in accordance with the results of Sumana Mukherjee et al. (2010) [4] and S.K. Mondal *et al.* (2013)[16] study (Table 7).

Ovary

Total 6 cases were presented with ovarian masses and FNAC was performed in all cases of them. Smears were prepared directly and from cytocentrifuged deposits. Adequate material was obtained in 5 cases (83.33%). On cytodiagnosis 2 cases (40.00%) were serous cystadenoma, 1 (20.0%) mucinous cystadenoma. 1 (20.00%) TB salphingo-oophritis and 1 (20.00%) papillary serous cyst adenocarcinoma. Histopathology was done in all of them. There was one false negative case. So, overall accuracy for ovarian masses in our study was 80.00%.

Table 8: Diagnostic accuracy of various workers in Ovarian masses

S. No.	Workers	Adequacy rate
2.	Gajender Singh *et al.* (2016)[17]	84.2%
3.	Present study (2018)	80.00%

Diagnostic accuracy in our present study is inaccordance with the results of Gajender Singh *et al.* (2016) [17] study (Table 8).

Kidney

In present study 2 cases of renal masses were subjected to FNAC, out of which 1 (50%) renal cell carcinoma and 1 (50%) was an inflammatory lesion. Histopathological correlation was done in all 2 cases and no false negative results were obtained. Thus, the overall accuracy of renal masses in our study was 100%.

Table 9: Diagnostic accuracy of various workers in Renal masses

S. No.	Workers	Adequacy rate
2.	Garcio Solano *et al.* (2008) [18]	100.00%
3.	Present study (2018)	100.00%

In present study higher accuracy may be due to small number of cases and better localization of renal lumps in patients due to advanced stage of the disease (Table 9).

GIT

4 cases of GIT lumps were subjected to FNAC, out of which 2 (50%) were benign lesions of inflammatory etiology, 1 (25%) adenocarcinoma colon and 1 (25%) adenocarcinoma esophagous. Overall accuracy was found to be 100% on HP correlation.

Table 10: Diagnostic accuracy of various workers in GIT lesions

S. No.	Workers	Adequacy rate
2.	Harshna V. Vadval *et al.* (2017) [19]	99.5%
3.	Present study (2018)	100%

In our study accuracy is higher, which may be due to small sample size and better localization of lump (Table 10).

CBD

In present study 2 cases of CBD masses were subjected to FNAC, out of which 1 (50%) cholangiocarcinoma and 1 (50%) was non-specific inflammatory lesion. Histopathological correlation was done in all 2 cases and no false negative results were obtained. Thus, the overall accuracy of CBD masses in our study was 100%.

Table 11: Diagnostic accuracy of various workers in CBD

S. No.	Workers	Adequacy rate
1.	Saori Onda *et al.* (2016)[20]	87.00%
2.	Present study (2018)	100.00%

In present study higher accuracy may be due to small number of cases and better localization of lumps.

Intraabdominal testis

One case of intraabdominal testis was subjected to FNAC and was diagnosed as embryonal cell carcinoma. The histopathological correlation confirmed the diagnosis, thus rendering accuracy rate to be 100%.

In our study accuracy is higher, which may be due to small sample size.

Miscellaneous

3 cases kept in miscellaneous group were subjected to FNAC, out of which 1 case was metastatic adenocarcinoma (peritoneal), 1 was periampullary carcinoma and 1 case was non-specific inflammatory lesion on cytodiagnosis. Histopathological correlation was done in all the 3 cases. One false negative case was obtained. Thus, the diagnostic accuracy for miscellaneous group in our study was 66.67%.

It was concluded that percutaneous transabdominal and transthoracic fine needle aspiration cytology under ultrasound guidance is a safe and highly reliable method, particularly for malignant lesions. It is highly accurate, yielding few false negative results and it is relatively painless,

inexpensive and easily repeated and no serious complications occur after the procedure.

Overall 114 patients were subjected to FNAC, out of which 109 aspirates were adequate. So, adequacy rate in our study was 95.61%. 96 cases were subjected to histopathological examination. Amongst these,

5 cases were found to be false negative and 1 case was false positive. There is overall sensitivity was 91.80%, specificity 97.37%. The positive predictive value came out to be 98.25% and negative predictive value 88.10%. The overall diagnostic accuracy of fine needle aspiration cytology in the present study was found to be 94.9% (Table 12).

Table 2: The Diagnostic accuracy of FNAC in Intraabdominal & intrathoracic Masses

| S.no.	Site of lesion	Total		Adequate FNAC		Inadequate FNAC		Histo-pathological correlation	True positive	False positive	False negative	Diagnostic accuracy (validity)
		No.	%	No.	%	No.	%					
1.	Liver	36	31.58%	34	94.44%	02	5.56%	28	09	00	01	96.56%
2.	Gall bladder	24	21.05%	23	95.83%	01	4.17%-	23	22	01	00	95.65%
3.	Lymph node	17	14.92%	16	94.12%	01	5.88%	16	06	00	01	93.75%
4.	Lung	19	16.67%	19	100	00	-	12	11	00	01	91.67%
5.	Ovary	06	5.26%	05	83.33%	01	16.67%	05	01	00	01	80%
6.	GIT	04	3.51%	04	100	00	-	04	02	00	00	100
7.	Kidney	02	1.75%	02	100	00	-	02	01	00	00	100
8.	CBD	02	1.75%	02	100	00	-	02	01	00	00	100
9.	Testis	01	0.88%	01	100	00	-	01	01	00	00	100
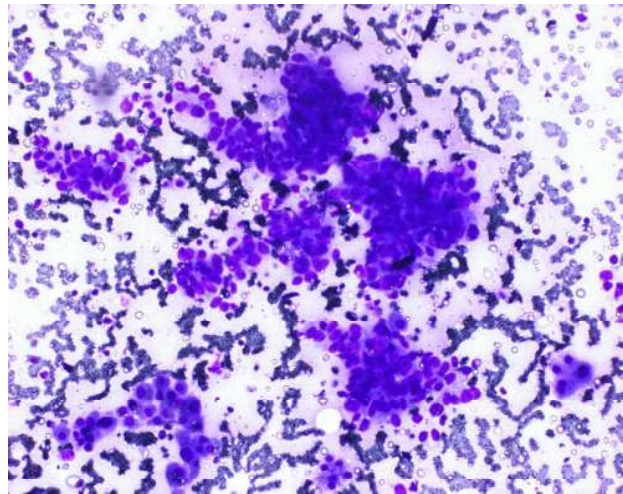
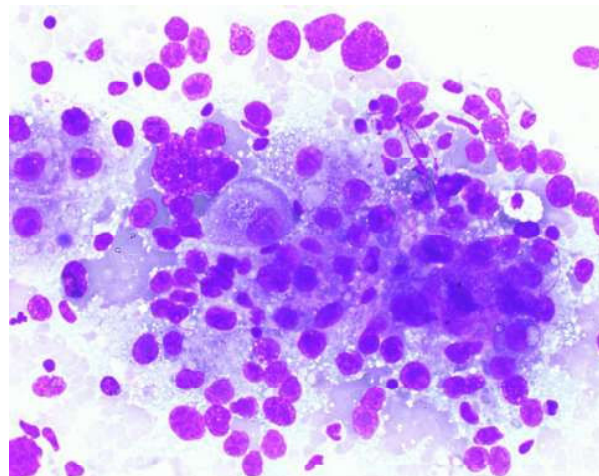**Fig. 1:** Cytology; Adenocarcinoma Liver (MGG, 10x)

Fig. 2: Hepatocellular Carcinoma (MGG, 40x)
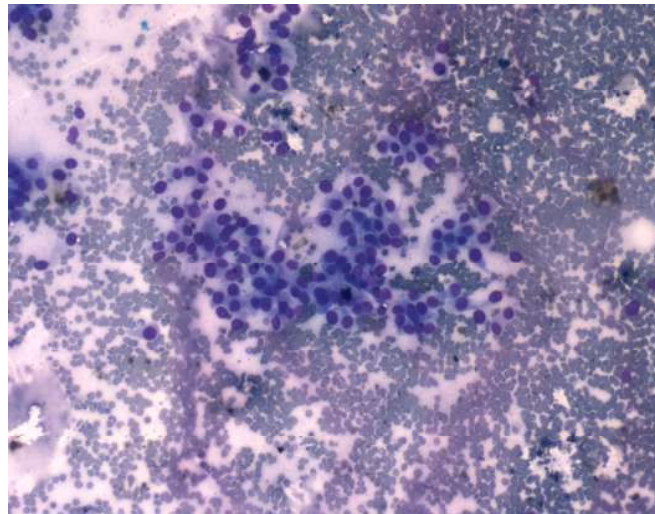
Fig. 3: Cytology: Adenocarcinoma Gallbladder (MGG, 10x)
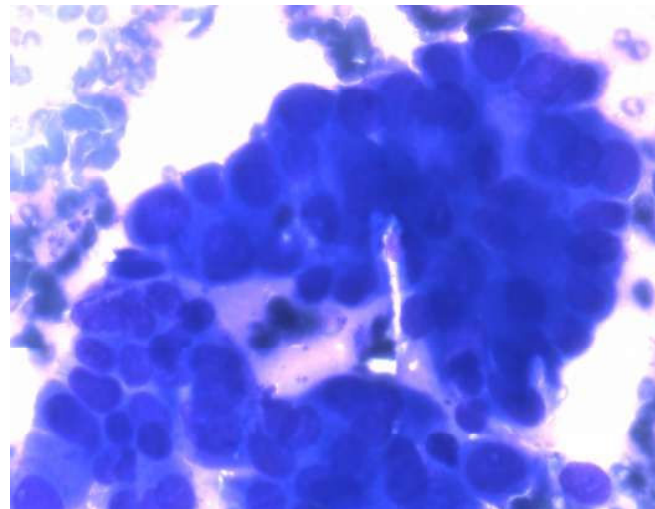

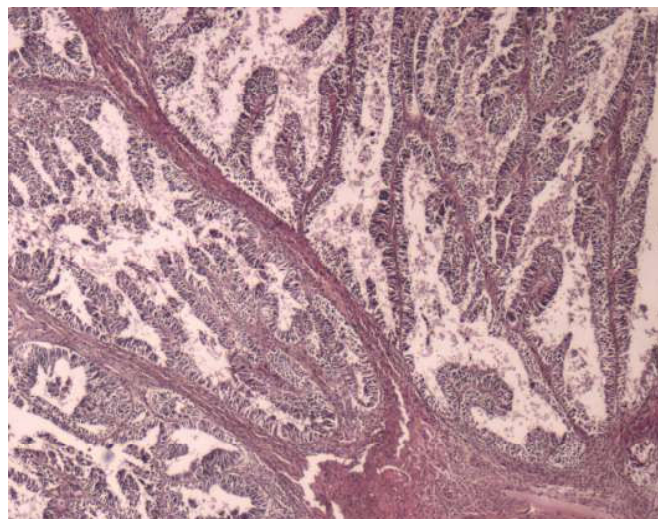**Fig. 4:** Cytology; Adenocarcinoma Lung (MGG, 40x)

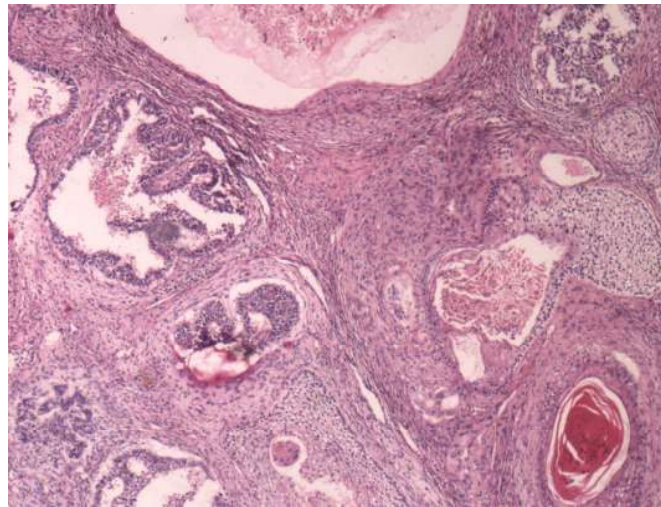**Fig. 5:** Photomicrograph of Ovary, Serous Cyst Adenocarcinoma (H & E,10x)

Fig. 6: Photomicrograph of Testis, Mixed Germ Cell Tumor (H&E, 10x)

Summary and Conclusion

The present study was conducted on 114 patients of intrabdominal and intrathoracic masses attending OPD/wards of Maharani Laxmi Bai Medical College Hospital, Jhansi. The diagnostic accuracy and efficacy of fine needle aspiration cytology were compared with histopathology wherever possible and following conclusion were drawn:

1. FNAC is a safe, OPD procedure, which can be used as a diagnostic tool for intraabdominal an intrathoracic masses.

2. Procedure is easily acceptable by the patient.

3. It is a rapid diagnostic procedure; the average time taken to establish the diagnosis is 1 hr, so the treatment can be started at the earliest.

4. Problem of hospitalization and unnecessary surgery for diagnostic purposes are reduced.

5. Procedure can be repeated without any ill effect where initial smears were inconclusive.

6. Ultrasound/CT guidance of FNAC increases the diagnostic yield in significantly higher number of cases and reduces repetitions, especially of deeper organs.

7. FNAC of intra abdominal lumps was conducted on patients belonging to all age group from 6 years old child to a 75 years old.

8. In our study group number of male patients (55.26%) were more than female patients (44.74%).

9. Cytodiagnosis revealed that malignancy was more common lesion in patients of elderly age group.

10. Frequency of organ involvement in this study was maximum with liver (31.57%) followed by gall bladder (21.05%), lymph nodes (14.91%), lung (16.66%) and ovary (5.26%). However, samples were also obtained from kidney, GIT, CBD and intraabdominal testis.

11. The adequacy of material in the study was 95.61%.

12. The overall diagnostic accuracy (validity) of the study was 94.9%.

13. The sensitivity of the study was 91.80% and specificity 97.37%.

14. The positive predictive value of the present study was 98.25% while the negative predictive value was 88.10%.

15. Pre-operative confirmation of malignancy and planning type of surgery accordingly could be done with the help of FNAC.

16. Inoperable cases with contraindication for surgery with malignancy, FNAC can help in guiding radiotherapy and other modalities of treatment.

17. FNAC can also be used to detect local recurrence and metastasis in post operative and post radiation follow up cases.

18. The aspirated material can be subjected to other modalities of study like immunological cytogenetics and microbiological depending

as per need of the cases, which add to diagnostic accuracy of FNAC.

19. Cytological features following FNAC can very accurately differentiate between primary and secondary tumors in liver. High yield of accuracy can also be seen in cases of renal and GIT lesion.

20. Few drawbacks were faced when inadequate sample was obtained in some cases.

To conclude in our study, ultrasound/CT guided FNACs proved to be a simple, safe, quick, cost effective and a very reliable method of evaluating intraabdominal and intrathoracic masses with a very high adequacy, sensitivity as well as accuracy in distinguishing benign lesions from malignant neoplasms and rendering a diagnosis in a short span of time thus proving to be a patient friendly investigation.

References

1. Hemalatha A.L. Ultrasound Guided Fnac of Abdominal–Pelvic Masses-The Pathologists' Perspective. J Clin Diagn Res. 2013 Feb;7(2):273–77. Published online 2013 Feb 1. doi: 10.7860/ JCDR/2013/4514.2745 PMCID: PMC3592291 PMID: 23542397.

2. Blady JV. Aspiration biopsy of tumors in obscure or difficult locations under roentgenoscopic guidance. AJR. 1939;42:515–24.

3. Sobha Rani G, Md K Faheem N, Sai Prasad BV, Sudhakar Reddy E. Efficiency of ultrasound guided aspiration cytology in deep seated lesions - a diagnostic evaluation. Int J Med Health Sci; 2012;1 Suppl 1:1-12.

4. Mukherjee S. Computed tomography-guided fine needle aspiration cytology of solitary pulmonary nodules suspected to be bronchogenic carcinoma: Experience of a general hospital. J Cytol. 2010 Jan;27(1):8–11. doi: 10.4103/0970-9371.66691 PMCID: PMC2964851 PMID: 21042527.

5. Khosla R. Ultrasound-guided versus computed tomography-scan guided biopsy of pleural-based lung lesions. Lung India. 2016 Sep-Oct;33(5): 487–92. doi: 10.4103/0970-2113.188961 PMCID: PMC5006326 PMID: 27625440.

6. Pederson JF. Percutaneous puncture guided by ultrasonic multitransducer scanning. J Clin Ultra 1977;5:175–77.

7. Sing JP, Garg L, Setia V. Compared tomography (CT) guided transthoracic needle aspiration cytology in difficult thoracic mass lesions – not approachable by USG. Indian J Radiol Imaging. 2004;14:395–400.

8. Jha BM, Shah R, Patel J. Effectiveness of image guided fine needle aspiration cytology in cases of deep seated lesions. Open Access. Int J Med Sci Public Health. 2013;2(2):439–442. doi: 10.5455/ ijmsph.2013.2.465–468.

9. Shukla VK, Pandey M, Kumar M, Sood BP, Gupta A, Aryya NC, Shukla RC, Verma DN. Ultrasound-guided fine needle aspiration cytology of malignant gallbladder masses. Acta Cytol. 1997 Nov-Dec;41(6):1654–8. PubMed PMID: 9390120.

10. Konjengbam R, Huidrom N, Akoijam NJ, Sorokhaibam BD. Ultrasonography and Computed Tomography Guided Fine Needle Aspiration Cytology in Diagnosing Intra-Abdominal Lesions-A 6-Year Retrospective Study in a Tertiary Care Hospital in Manipur. J. Evid. Based Med. Health. 2017 Jul 20;4(58).

11. Jha K, Gupta A, Pangarkar M, Kumbhalkar DT, Raut WK. Guided FNAC of nodular lesions in liver. IP Archives of Cytology and Histopathology Research. 2018 Oct-Dec;3(4):166-72.

12. Reddy CV, Goud YGB, Poornima R, Deshmane V, Madhusudhana BA, Gayathridevi M. Role of FNAC in Hepatic lesions: Risk of track metastases. 2015;4(1):35–37.

13. Kumar N, Singhal P, Agarwal A, and Khan MA. Cytopathological diagnosis of gallbladder mass and mural thickening based on imaging findings: A prospective study of 51 cases. J Cytol. 2015 Oct-Dec;32(4): 234–37.

14. Singhal P. Cytopathological diagnosis of gallbladder mass and mural thickening based on imaging findings: A prospective study of 51 cases.Journal of Cytology. 2015 Oct;32(4):234.

15. Bohle W, Meier C, Zoller WG. [Validity of endoscopic ultrasonography-guided fine needle aspiration of mediastinal and abdominal lymph nodes in daily clinical practice]. Dtsch Med Wochenschr. 2013 Mar;138(9):412–7. doi: 10.1055/s-0032-1332961. Epub 2013 Feb 19. German. PubMed PMID: 23423936.

16. Mondal SK, Nag D, Das R, Mandal PK, Biswas PK, Osta M. Computed tomogram guided fine-needle aspiration cytology of lung mass with histological correlation: A study in Eastern India. 2013;2(1):14–18.

17. Singh G, Brar K, Ralli M, Kalra R, Chhabra S, Sant Kataria P, Kalya S. Epidermal inclusion cyst of breast diagnosed on fine needle aspiration cytology: a retrospective study. International Journal of Research in Medical Sciences Singh G *et al*. Int J Res Med Sci. 2016 Aug;4(8):3601–05.

18. García-Solano J, Acosta-Ortega J, Pérez-Guillermo M, Benedicto-Orovitg JM, Jiménez-Penick FJ. Solid renal masses in adults: Image-guided fine-needle aspiration cytology and imaging techniques - "Two heads better than one?" Diagn Cytopathol. 2008;36:8–12.

19. Harshna VV, Vanessa FF *et al*. Image-Guided Percutaneous Omental and Mesenteric Biopsy:

Assessment of Technical Success Rate and Diagnostic Yield. JVIR. 2017 Nov;28(11):1569–76.

20. Onda S, Ogura T, Kurisu Y. EUS-guided FNA for biliary disease as first-line modality to obtain histological evidence. Therap Adv Gastroenterol. 2016 May;9(3):302–12. Published online 2016 Feb 11. doi: 10.1177/1756283X15625584.