Content available at: https://www.ipinnovative.com/open-access-journals

IP Archives of Cytology and Histopathology Research

Journal homepage: https://www.achr.co.in/

Original Research Article

Cytomorphological study of intraabdominal lesions by FNAC

Jahnavi N Vyas[1], Prashant R Patel[1,*], Krutika A Patel[1], Vasudha M Bhagat[1]

[1] *Dept. of Pathology, Government Medical College, Surat, Gujarat, India*

ARTICLE INFO

Article history:
Received 12-06-2021
Accepted 29-04-2022
Available online 29-06-2022

Keywords:
Cytomorphology
Guided FNAC
Intraabdominal lesions

ABSTRACT

Introduction: Fine Needle Aspiration Cytology (FNAC) is a simple, safe, low-cost and rapid procedure for diagnostic purpose which makes surgical intervention and exploratory laparotomy unnecessary. The deep seated organs like gall bladder, spleen, pancreas, retroperitoneum and ovary are sampled safely and routinely aspirated using the fine needle under radiological guidance.
Aims: To assess the utility of FNAC in the diagnosis of intraabdominal lesions, to study the cytomorphological features and to determine the reliability of ultrasonography guided FNAC in distinguishing neoplastic from non-neoplastic intraabdominal mass lesions.
Materials and Methods: The study included 48 intra-abdominal lesions which were detected clinically or radiologically. USG guided FNA was done whenever indicated. The smears were stained with Haematoxylin and eosin (H and E), May Grunwald Giemsa (MGG) and Papanicolaou's stains.
Results: Among 48 cases, 45 cases were usg-guided, 2 cases were blind and one case was intraoperative. The diagnostic yield of usg-guided FNAC was 84.4%.Majority of aspirations were done in the age group of 51-60 years with male:female ratio of 1:1.53. Most common organ subjected to FNA was Liver followed by ovary. Majority of the lesions were found to be malignant. The most common lesion encountered in the whole study was metastastatic carcinoma.
Conclusion: Fine needle aspiration cytology is a repeatable and rapid diagnostic procedure that has application in the evaluation of deep seated abdominal mass lesions. With the help of radiological guidance, diagnostic accuracy of FNAC of deep seated lesions dramatically increases.

1. Introduction

FNAC is a simple, safe and rapid procedure.[1] Imaging techniques, mainly ultasonography (USG) and Computerized Tomography (CT), has enabled the detection and location of lesions in sites which are not easily accessible to surgical biopsies.[2] The inaccessiblility of CT, higher incidence of advanced malignancy and scant resources require the USG – guided FNAC procedure for cancer management in developing countries like India.[3]

The deep seated organs are sampled safely and routinely aspirated using the fine needle under radiological guidance.[4] The cell blocks prepared from residual material are helpful in diagnosis and for ancillary techniques like histochemical stains and immunocytochemistry.[5]

The present study was concluded to assess the diagnostic utility of usg-guided FNAC in the diagnosis of deep seated intraabdominal lesions and to differentiate neoplastic from non-neoplastic intraabdominal mass lesions.

2. Materials and Methods

In present study all the patients referred for FNAC of intraabdominal lesions were studied prospectively for a

* *Corresponding author*.
E-mail address: drprashant_patel@yahoo.co.in (P. R. Patel).

https://doi.org/10.18231/j.achr.2022.022

period from June 2017 to July 2019 at Department of Pathology at tertiary care hospital affiliated with medical college. Detailed clinical history, physical examination findings and reports of relevant investigations which were conducted (routine and special) were recorded.

For the FNA procedure, patient was made to lie supine in such a position that makes the lesion more obvious. Ultrasound guided (USG) FNAC was carried out in each patients with use of 22–23 gauge needle and 10ml syringe. For deep seated lesions 20-22 gauge spinal needle of 9cm length was used for aspiration. Aspiration material was then deposited and smeared on clean labelled glass slides. One to two slides were fixed in 95% ethyl alcohol, stained by routine Hematoxylin and Eosin (H&E) stain and Papanicolaou (PAP) stains, while one to two slides were air dried and stained with, May-Grunwald-Giemsa (MGG) stain. From the residual material, additional slides and cell block were prepared. Additional slides were stained as per requirement. Special stains, immunohistochemistry (IHC) on formalin-fixed paraffin cell blocks and immunocytochemistry were used whenever required.

For preparation of cell block, the clotted residual aspirate was removed from 10% neutral buffered formalin and carefully wrapped in a filter paper and placed in a labeled tissue cassette. The specimen was then processed and embedded in the same way as that of routine biopsy specimens i.e in automatic tissue processor. After processing, the tissue was embedded and then paraffin blocks were made. Tissue sections each measuring 3–4μm in thickness, were cut from the cell blocks by rotary microtome. Sections were stained with Hematoxylin and Eosin for morphological evaluation. Results of FNAC and histological diagnosis from cell block were then correlated. Histopathological correlation was also carried out in patients who underwent surgical excision/biopsy of the lesion.

3. Results

A total of 48 indoor and outdoor cases of FNAC of intraabdominal organs were performed during the study period. Out of 48 cases, 45 lesions (93.8%) were usg-guided, 2 cases (4.2%) were such where FNA was performed blindly as the lesions were palpable and in 1 case (2%) FNAC was performed intraoperatively.

Out of 48 cases, 38 cases (79%) had adequate aspirations where conclusive cytologic diagnosis was possible, 7 cases (15%) had material aspirated but not enough to give a proper cytologic diagnosis and 3 cases (6%) had inadequate aspirations in which smears showed blood only.

As shown in Table 1, the highest number of aspirations were noted in age group 51-60 years having 15 cases, followed by age group 61-70 years having 10 cases. The youngest patient was 8 years old and the oldest patient was of 75 years.

In the present study, out of 48 cases, 19 (39.5%) patients were male and 29 (60.5%) were females. Thus there was preponderance of females in the study. The male:female ratio was 1:1.53.

In the present study maximum cases subjected to FNAC were of liver having 24 cases (63.2%) followed by ovary having 7 cases (18.5%), gall bladder with 4 cases (10.5%) and 1 case (2.6%) each from lymphnode (epigastric), stomach and non-specified (? Bowel, ? lymphnode).

In the present study, 21 cases (55.3%) were metastatic whereas 17 cases (44.7%) were of primary malignancy. Among all the primary lesions in the present study, ovary was the most common organ with 7 cases (41.2%) followed by liver and gall bladder both having 4 cases (23.5%) each.

In our study we found 21 metastatic carcinoma, 20 cases (95.2%) were of metastasis to liver and 1 case (4.8%) was of metastasis to epigastric lymphnode.

In present study 24 liver FNA cases, maximum lesions were seen in the female i.e 14 cases (58.4%) and males were affected in 10 cases (41.6%). Hence, the male to female ratio was 1:1.4.

Out of 14 metastatic adenocarcinoma cases of liver FNA, maximum cases 10 (42%) were seen in females and 4 cases (17%) were seen in males. Out of 4 hepatocellular Carcinoma cases of liver FNA, maximum cases 3 (12.3%) were seen in males.

Thus the most common age group involved in liver FNAC lesions was 51-60 years and maximum cases were seen in females.

In the present study, out of 24 liver FNA cases, 20 cases (83.4%) were metastatic whereas 4 cases (16.6%) were primary. Among metastatic lesions most common lesion was metastatic aenocarcinoma with 14 cases (58.3%). Out of 4 (16.7%) primary lesions of liver all 4 cases (16.7%) were of primary hepatocellular carcinoma.

Out of 7 ovary FNA cases, maximum lesions were seen in the age group 51 to 60 years with 3 cases (42.8%) followed by age group 41 to 50 years with 2 cases (28.6%).

Out of 7 ovary FNA cases, 3 cases (42.8%) were of adenocarcinoma, 1 (14.3%) of Borderline/ Malignant ovarian cystadenocarcinoma, 1 (14.3%) of Borderline / Malignant ovarian surface epithelial tumour-Borderline serous tumour / serous Adenocarcinoma, 1(14.3%) case of Undifferentiated carcinoma epithelial origin more likely and 1 (14.3%) case of cystic lesion of ovary.

Among FNAC from miscellaneous abdominal lumps, 4 cases (57.1%) were from gall bladder, all diagnosed as adenocarcinoma, 1 case was of FNA from pyloric mass which was diagnosed as adenocarcinoma, 1 case was of FNAC from left iliac fossa, where the organ could not be traced due to large size of lump, it was diagnosed as poorly differentiated malignancy- ? carcinoma and the fourth organ was lymphnode of epigastric region which was diagnosed as

Table 1: Age-gender distribution of all intraabdominal lesions

Age in years	Gender		Total
	Male	Female	
0 to 10	1 (5.2 %)	0	1 (2.0%)
11 to 20	1 (5.2 %)	1 (3.5%)	2 (4.0%)
21 to 30	1 (5.2 %)	1 (3.5%)	2 (4.0%)
31 to 40	3 (15.7%)	6 (20.6%)	9 (19%)
41 to 50	0 (0%)	6 (20.6%)	6 (12.5%)
51 to 60	4 (21%)	11 (38%)	15 (31.3%)
61 to 70	6 (32%)	4 (13.8%)	10 (20.9%)
71 onwards	3 (15.7%)	0 (0%)	3 (6.3%)
Total	19	29	48

Table 2: Organ Distribution of all intraabdominal lesions

Organ	Type of lesion	Type of lesion	No. of cases
Liver	Metastatic	1) Metastatic Adenocarcinoma	14 (37%)
		2) Metastatic Poorly Differentiated Carcinoma	1 (2.6%)
		3) Metastatic small round cell neoplasm	1 (2.6%)
		4) Carcinoma favouring adenocarcinoma with focal squamous differentiation	1 (2.6%)
		5) Metastatic Carcinoma probably Undifferentiated Carcinoma	1 (2.6%)
		6) Metastatic malignancy: a) Renal cell carcinoma b)Metastatic neuroendocrine Tumour	1 (2.6%)
		7) Metastatic Carcinoma with squamous differentiation	1 (2.6%)
	Primary	1) Hepatocellular Carcinoma	4 (10.6%)
Ovary	Primary	1) Adenocarcinoma	3 (8.0%)
		2) Borderline/ Malignant ovarian cystadenocarcinoma	1 (2.6%)
		3) Borderline / Malignant ovarian surface epithelial tumour-Borderline serous tumour / serous Adenocarcinoma	1 (2.6%)
		4)Undifferentiated carcinoma epithelial origin more likely	1 (2.6%)
		5) Cystic lesion of ovary	1 (2.6%)
Gall bladder	Primary	1)Adenocarcinoma	4 (10.6%)
Pyloric mass	Primary	1)Adenocarcinoma	1 (2.6%)
Left iliac fossa	Primary	1)Poorly differentiated malignancy-?carcinoma	1 (2.6%)
Lymphnode in abdomen (epigastric)	Metastatic	1)Metastatic poorly differentiated malignant neoplasm	1 (2.6%)
	Total		38

metastatic poorly differentiated malignant neoplasm.

4. Discussion

Intra-abdominal masses remain a riddle in surgical practice for both pathologists as well as clinicians. The documentary evidence of the nature of its pathology before the institution of therapy and also for prognosis is mandatory.[3]

Most of the intra-abdominal masses are deep-seated and hence the idea of their size, shape and extent of the lesioncould not be made out. Therefore, various imaging modalities like USG and CT can be used as a guide for needle aspiration.[3]

In the present study, the diagnostic yield of FNAC done under usg-guidance was 84.4%. Similar results were obtained by Nautiyal S et al study[6] (2004) where the diagnostic yield of usg-guided FNAC was 93.06% and of Shilpi Dosi et al study[7] (2016) was 92.7%.

In the present study, age of patients ranged from 8-75 years. Age distribution of the present study was comparable with Glaxon et al.[8] (2018) study in which age range was 14-90 years and Dr. Suva Chetal M[9] (2016) study in which the age range was 12-84 years.

Table 3: Comparative study of most common Age-group involved among all intraabdominal lesions

Study Series	Most common age group in years	Percentage (%)
Likhar et al.[10] (2009)	51-60	26.09
Ratan Konjengbam et al.[11] (2017)	30-69	22.6
Hari Kesh Yadav et.al.[12] (2018)	50-60	19.23
Present study	51-60	39.5

As shown in table, the highest number of aspirations were noted in age group 51-60 years in the present study. These results were similar to studies done by Likhar et al.[10] (2009), Ratan Konjengbam et al.[11] (2017), Hari Kesh Yadav et.al.[12] (2018).

The most common age group was 51-60 years. This age group was noted because all the cases were of malignancy which is almost always seen at a later age group.

The number of males in present study were 19 (40.5%) and the females were 29 (59.5%) with male to female ratio 1:1.53. Sex distribution was comparable with study carried out by Sanjay Kumar Nigam et al.[13] (2014), Dr. Suva Chetal M[9] (2016) and Hari Kesh Yadav et.al.[12] (2018) having male to female ratio 1:1.18, 1:1.12 and 1:1.16 respectively.

Overall all studies showed female preponderance, which may be attributed to inclusion of majority lesions of liver and ovaries. In liver, majority cases were of malignancy which were majority metastatic adenocarcinoma whose primary was gall bladder in majority of cases. Carcinoma of the gallbladder is more frequent in females than males (3–4 : 1 ratio),[14] and over 90% of the patients are 50 years of age or older at the time of diagnosis. Hence my study is in concordance with the other studies, showing female dominancy.

However study done by Glaxon et al.[8] (2018) showed male preponderance. This was because the study had HCC diagnosed in majority of lesions and HCC is more common in men than in women (M : F ratio is 2 : 1 to 5 :1).[15] Also ovarian FNA cases were less. So, the present study was discordant with the study done by Glaxon et al.[8] (2018).

In present study right hypochondrium was the most common site. The same was observed in studies carried out by Glaxon et al.[8] (2018), Ratan Konjengbam et al.[11] (2017) and Dr. Suva Chetal M[9] (2016) and where also right hypochondrium was the most common site.

This is because of maximum cases noted are of liver. Liver and gall bladder are located in right hypochondrium and hence the most common region for FNA in abdomen is hypochondrium.

The most common site of aspiration was liver in the present study. This was comparable with the studies carried out by Sanjay Kumar Nigam et al.[13] (2014), Dr. Suva Chetal M[9] (2016), Ratan Konjengbam et al.[11] 2017 and Glaxon et al.[8] (2018) where the most common site for FNAC was also liver.

This was because patient symptomatically presents earlier in cases of liver masses with complains of abdominal pain and abdominal mass.

The ovary was the second most common site for malignancy. Similar observation was made by Philipose et al.[16] (2018), Dr. Suva Chetal M[9] (2016) and Sidhalingreddy et al.[3] (2011) in their study.

In the present study, all the lesions were malignant. Similar observation was made by Philipose et al.[16] Glaxon et al.[8] and Sobha Rani G et al.[17] (2012) and Sidhalingreddy et al.[13] (2011) where malignant lesions constituted the most common diagnostic category.

Among the liver lesions, the most common malignancy was metastasis to the liver, Among the metastasis to the liver, metastatic adenocarcinoma was found to be the most common. This is similar to observation of study done Verma N et al.[18] (2017) and Barbhuiya, et al[19] (2014) where also the most common lesion of liver was metastatic adenocarcinoma. The present study was discordant with the study carried out by Asghar F et al[20] (2010) where hepatocellular carcinoma was the most commonly encountered lesion in liver.

In the present study, all the liver lesions were neoplastic malignant lesions. This is similar to study done by Sobha Rani G et al.[17] (2012) and Dr. Suva Chetal M[9] (2016).

The most commonly encountered malignancy in liver was metastatic adenocarcinoma whose primary lesion was gall bladder carcinoma in majority of cases, in the present study.

FNAC is less useful in the diagnosis of localized benign lesions in the liver, including benign neoplasms. A specific tissue diagnosis is not usually possible. Nevertheless, FNAC may be helpful in excluding a malignant process, which cannot be readily distinguished from a benign lesion radiologically.[20]

In the present study, the age group involved was 35-67 years. This was comparable with the study done by Ray et al.[21] (2014) where also the age group involved was 15-70 years.

In present study 4 cases of gall bladder lumps were subjected to FNAC and adequate material was obtained in all cases. Cytological diagnosis revealed all cases as adenocarcinoma.

Among the gall bladder lesions, adenocarcinoma was the sole diagnosis. This was comparable with the studies carried out by Hari Kesh Yadav et.al.[12] 2018 and Ratan Konjengbam et al.[11] 2017 which also showed adenocarcinoma to be the commonest lesion in gall bladder.

Table 4: Comparative study of organ-wise distribution of all intraabdominal lesions

Study Organ	Sanjay Kumar Nigam et al.[13] (2014)	Dr. Suva Chetal M[9] (2016)	Ratan Konjengbam et al.[11] (2017)	Glaxon et al.[8] (2018)	Present study
Liver	30.4%	62%	54.5%	46.97%	63.2%
Ovary	13.2%	20%	2.4%	4.55%	18.5%
Gall bladder	17.4%	2%	13.3%	1.51%	10.5%
GIT	21.7%	6%	14.8%	4.55%	2.6%
Lymphnode	10.8%	1%	9.4%	12.12%	2.6%
Pancreas	-	3%	0.8%	13.64%	-
Kidney	4.2%	2%	-	1.51%	-
Others	2.1%	4%	4.8%	15.15%	2.6%
Total	100%	100%	100%	100%	100%

Adenocarcinoma of the gall bladder represents 80%–95% of biliary tract cancers. Carcinoma of the gallbladder is more frequent in females than males (3–4 : 1 ratio), and over 90% of the patients are 50 years of age or older at the time of diagnosis.[14]

Histopathological correlation was possible in 5 cases, for rest of the cases, it was not possible, as the patients were referred to a cancer centre for further management.

Also, cell blocks were prepared in 17 cases. The cell blocks which were prepared from residual material had representative material in 11 out of 17 cases, which showed same features as that of conventional smears.

It was observed that, all intra-abdominal lesions could be localized by USG satisfactorily and USG guided FNAC had yielded adequate material. In cases where repeat aspiration was needed USG guided FNAC was preferred to the CT guidance, because it was less time consuming, there was less chance of radiation exposure and it was possible to repeat without much discomfort to patient. An attempt was also made to predict the primary source of the tumour on FNAC.

CT scan has an added advantage of greater accuracy and reliability during the aspiration of smaller lesions. Also very low density materials like 'gas in the bowel' can be easily identified during CT scan. However, in spite of limitations, USG guidance is considered to be a safe, inexpensive and relatively accurate modality for the aspiration of intra-abdominal lesions.

CT scan machine was not available at our institute at that time and CT scan is mostly preferred for biopsy rather than FNAC by the clinician, hence FNAC was mostly done under USG guidance in this study.

Fine-needle aspiration cytology for ovarian lesions had good patient compliance and very low complication rate. However, categorising the ovarian borderline tumours and false negative cytological analysis on FNAC due to low cellularity or secondary degenerative changes are its limitations.

5. Conclusion

The clinicopathological evaluation of intraabdominal lesions is often challenging and remains an enigma, both to the clinician as well as the pathologist. Histopathology is the gold standard for pathological diagnosis, however FNAC is being increasingly used as the method is found to be rapid, sensitive, inexpensive and reliable with less morbidity to the patient. It can be done on an outpatient basis and is also suitable for debilitated patients.

FNAC may replace surgical procedures in some cases, while in others it may help the surgeon in preoperative planning. It can be used as an adjunct to histopathological diagnosis. Also it has many advantages over trucut and core biopsy as it neither requires special instrument for processing nor it causes significant trauma to the patient.

With the help of radiological guidance, diagnostic accuracy of FNAC of deep seated lesions dramatically increase when interpreted by experienced cytopathologists having good communication with radiologists and clinicians.

In inoperable cases with contraindication for surgery with malignancy, FNAC can help guiding radiotherapy. It can also be used to detect local recurrence and metastasis in post-operative and post radiation follow up.

The accuracy of diagnosis can be enhanced and problems encountered regarding classification of tumours can be minimized by use of cell blocks prepared from residual material. Also immunohistochemistry on the cell block as well as immunocytochemistry on smeared slides aid in diagnosis of lesion.

Overall role of FNAC in intra-abdominal lumps is of great value and its use should be encouraged in the diagnosis of intra-abdominal lumps.

6. Conflict of Interest

The authors declare no relevant conflicts of interest.

7. Source of Funding

None.

References

1. Orell SR, Sterrett G. Orell and Sterrett's Fine Needle Aspiration Cytology. 5th Edn. Churchill Livingstone; 2012. doi:10.1016/C2009-

0-49532-1.
2. Hemalatha A, Sindhuram SV, Sushma S, Suma JK, Aditya A. Ultrasound Guided Fnac of Abdominal–Pelvic Masses-The Pathologists' Perspective. *J Clin Diagn Res*. 2013;7(2):273–7. doi:10.7860/JCDR/2013/4514.2745.
3. Sidhalingreddy, Andola SK. Fine Needle Aspiration Cytology of Intra-Abdominal Lesions. *J Clin Diagnostic Res*. 2011;5(3):551–8.
4. Article O, Amogh A, Namshiker N, Rocha PDS, Pinto R. Role of Fine Needle Aspiration Cytology in the Assessment of Intra-Abdominal and Retroperitoneal Lesions-A Comparative Study. *Natl J Lab Med*. 2016;5(3):PQ31–7. doi:10.7860/NJLM/2016/18812.2139.
5. Sumana BS, Muniyappa B. Ultrasonography guided fine needle aspiration cytology with preparation of cell blocks in the diagnosis of intra-abdominal masses. *J Clin Diagn Res*. 2015;9(12):EC08–12. doi:10.7860/JCDR/2015/16490.6869.
6. Nautiyal S, Mishra RK, Sharma SP. Routine and Ultrasound guided FNAC of intraabdominal lumps- A comparative study. *J Cytol*. 2004;21(3):129–32.
7. Dosi S, Gupta G, Kawatra M, Chakrabarti P, Agrawal P, Jain M, et al. Role of radiological-assisted cytology in intra-abdominal lesions: A 3 years' experience in a tertiary care center. *Int J Appl Basic Med Res*. 2016;6(2):101–5. doi:10.4103/2229-516X.179022.
8. Glaxon JA, Saldanha P, Vasudevan S. Utility of Usg-Guided Fine Needle Aspiration Cytology in The Diagnosis of Intra-Abdominal Masses. *Ann Pathol Lab Med*. 2018;5(5):349–53.
9. Chetal S. Study of Image Guided FNAC in Intra-abdominal Mass Lesions at tertiary care hospital, Jamnagar, Gujarat, India. *Indian J Basic Appl Med Res*. 2016;6(1):40–51.
10. Likhar KS, Sakhuja S, Sawke N, Likhar SK, Puja, Mishra MK, et al. Role of FNAC in diagnosis of intra-abdominal lump and its histological correlation. *Biomed Pharmacol J*. 2009;2(2):455–8.
11. 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 Healthc*. 2017;4(58):3518–22.
12. Yadav HK, Tripathi RK, Singh S, Dwivedi D. Dr Saurabh Singh DDD. Blind/Ultrasound Guided FNAC in Management of Intra Abdominal Lump. *Int J Res Rev*. 2018;5(12):312–9.
13. Nigam SK, Paliwal U, Nigam N. Role of fine needle aspiration cytology in the diagnosis of intraabdominal lumps. *J Evol Med Dent Sci*. 2014;3(9):2395–402. doi:10.14260/jemds/2014/2150.
14. Goldblum JR, Lamps LW, McKenney J, Myers JL. Rosai and Ackerman's Surgical Pathology. 11th Edn. vol. 2; 2018.
15. Sidawy MK, Ali SZ. Fine Needle Aspiration Cytology: A Volume in Foundations in Diagnostic Pathology. 1st Edn. Churchill Livingstone; 2007.
16. Philipose CS, Amin AN, J CS. Computed Tomography And Ultrasound Guided Fine Needle Aspiration Cytology In The Diagnosis Of Intraabdominal And Pelvic Lesions. *J Clin Diagn Res*. 2018;5(9):754–8. doi:10.21276/apalm.1865.
17. Zeisel J. Diagnostic Evaluation Studies. *Sociol Archit Des*. 2018;(1):39–46.
18. Verma N, Neetu, Sharma SP, Singh P, Kumar A. Role of ultrasound guided fine needle aspiration cytology of right hypochondrial masses. *Int J Res Med Sci*. 2017;5(12):5312. doi:10.18203/2320-6012.IJRMS20175447.
19. Barbhuiya M, Bhunia S, Kakkar M, Shrivastava B, Tiwari P, Gupta S, et al. Role of Fine Needle Aspiration Cytology in the Diagnosis of Intra-Abdominal Lumps". *Journal of Evolution of Medical and Dental Sciences*. 2014;3(1):20–24.
20. Asghar F, Riaz S. Diagnostic accuracy of percutaneous cytodiagnosis of hepatic masses, by ultrasound guided fine needle aspiration cytology. *Ann King Edward Med Univ*. 2010;16(3):184–8.
21. Ray S, Gangopadhyay M, Bandyopadhyay A, Majumdar K, Chaudhury N. USG guided FNAC of ovarian mass lesions: A cyto-histopathological correlation, with emphasis on its role in pre-operative management guidelines. *J Turk Ger Gynecol Assoc*. 2014;15(1):6–12. doi:10.5152/jtgga.2014.10179.

Author biography

Jahnavi N Vyas, Ex-Senior Resident

Prashant R Patel, Assistant Professor

Krutika A Patel, Ex-Senior Resident

Vasudha M Bhagat, Ex-Additional Professor

Cite this article: Vyas JN, Patel PR, Patel KA, Bhagat VM. Cytomorphological study of intraabdominal lesions by FNAC. *IP Arch Cytol Histopathology Res* 2022;7(2):105-110.