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Original Research Article

A study of ultrasound- guided FNAC in abdominal masses

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Abstract

Aims and Objectives: The present study was undertaken to assess accuracy, feasibility and safety of radiologically guided FNAC of intra-abdominal and retroperitoneal masses.
Methods: This prospective study was conducted in the Department of Pathology, in collaboration with the Department of Radiology, at Government Medical College, Nagpur. Ultrasound-guided percutaneous FNAC were performed on 273 patients, for pathologic confirmation of a suspected tumor, secondary metastasis or an infective etiology.
Results: The liver was most predominant site (35.53%) of abdominal masses. Of total 217 (79.48%) adequate smears, malignancy was reported in 179 (82.4%) cases, benign in 7 (3.2%) cases and inflammatory in 19 (8.8%) cases. 12 (5.6%) cases were suspicious of malignancy. Secondary metastasis in liver was commonly detected lesion comprised of 16.2% of total malignant abdominal masses followed by hepatocellular carcinoma 15%. A correlation between clinic-radiologic impression and cytologic diagnosis was obtained in 213 cases. FNAC changed clinic-radiologic diagnosis in 4 cases. A cyto-histopathologic correlation was obtained in 58 cases. An overall accuracy of 98.3% was achieved by ultrasound guided FNAC, with a sensitivity of 98% and a specificity of 100%. Predictive value for positive and negative was found to be 100% and 87.50% respectively. No more than 2 cases were made into any lesion.
Conclusion: Ultrasound guided percutaneous FNAC is a very valuable diagnostic tool in terms of higher degree of both accuracy and adequacy with low incidence of complications. In addition, it has a high sensitivity and specificity contributing to a more efficient diagnosis and treatment planning of the patient.
Keywords: Ultrasound guided FNAC, Tumor, Metastasis, Abdominal masses, Hepatocellular carcinoma, Cyto-histopathology, Predictive value.

1. Introduction

Cytopathology is a major diagnostic technique and there has been an increase in the number of FNABs performed during the last 15 years, since it was first instituted by Martin and Ellis in 1930 [1]. Percutaneous FNA has been utilized to assess both neoplastic and inflammatory disease processes in a number of internal organs, particularly the liver, lungs and kidney. With recent sophistication of radiologic imaging techniques, the availability of thin needles for aspiration and improvements of cytologic techniques, FNAB provides a reliable cost effective, rapid, minimum risk, highly sensitive and specific diagnostic tool [2].

The adequate treatment of neoplastic disease depends on a specific pathologic diagnosis. Compared to an open biopsy, which has the disadvantage of being a lengthy procedure with a high risk of complication, FNAC is advantageous in terms of accuracy, rapidity, safety and convenience. It can be performed as an OPD procedure with a diagnosis obtained within 24 hours. FNAC of abdominal masses is a well established diagnostic technique, but its potential is yet to be exploited completely due to difficulty in accessing the lesion and limited knowledge of cytomorphological details. Using radiologic guidance for needle placement, this technique is an effective way to obtain diagnostic material for rapid and accurate diagnosis [3-6]. Ultrasound guided fine needle aspiration cytology is a rapid, economical and safe diagnostic procedure without any radiation hazard[7]. Keeping all the above facts in mind, the present study was

undertaken to evaluate the accuracy of Ultrasound guided fine needle aspiration cytology in the diagnosis of intra-abdominal lesions.

2. Materials and Methods

This prospective study was conducted in the Department of Pathology, in collaboration with the Department of Radiology, at Government Medical College and Hospital, Nagpur. The patients admitted in the Department of surgery, medicine, pediatrics and obstetrics & gynaecology were included in the study. Also the patients admitted with complaints of a lump or pain in the abdomen, patients with non-palpable masses, which were detected only on radiologic investigation, female patients who on clinical and gynaecological examination were suspected of having an ovarian tumor were selected for the study. Written informed consent of the patient was obtained. Ultrasound-guided percutaneous FNAC were performed on 273 patients, for pathologic confirmation of a suspected tumor, secondary metastasis or an infective etiology. The bleeding time and clotting time were evaluated in all patients prior to aspiration. All patients were premedicated with atropine 0.6 mg IM. Patients to be aspirated were asked to lie down in the supine position on examination table. After reviewing the history and clinical findings, the mass, if palpable, was carefully palpated once again and then mass was imaged with USG by radiologist, so as to determine its location in relation to the surrounding structures, estimation of its depth, and assessment of optimal direction for approach by needle and its accurate placement. The skin overlying the mass selected for needle aspiration cytology was cleaned with spirit and then tincture iodine to make it thoroughly sterile. No local anesthesia was used. The patient was asked to hold his/her breath during the aspiration.

The 10 ml syringe was mounted in the pistol grip aspiration Cameco syringe. Holding this apparatus in right hand, the left hand free to steady the mass between thumb and forefinger, Lumber puncture needle [21/22G] was fitted in the syringe and piston was withdrawn to the 5 ml mark. This amount of air was used as the air cushion. The needle was then introduced to appropriated depth and at an angle determined by previous USG examination. When point of needle was observed (on USG screen) as well as felt, to enter the mass, the piston was withdrawn further to 10 ml mark to apply negative pressure. The mass was then probed in several directions, as well as back and forth, and piston was allowed to return to its original position and needle withdrawn slowly. The aspirated material in the syringe and needle was forcibly expelled on to glass slides by first detaching needle, re-filling the syringe with air and ejected material on the slides. On an average 4-6 smears were made by spreading the aspirates by sliding another slide at right-angle to the one having material on it. 3 slides were air-dried smears, while 3 were immediately fixed in 95% ethyl alcohol.

Smears were stained with hematoxylin-eosin stain, papanicolaou, may-grunwald-giemsa, zeihl-nielson stain for acid-fast bacilli. The stained slides were mounted with DPX and examined with a light microscope, under low power, high power and oil immersion lenses. The aspirates were categorized as malignant-primary or secondary, benign, inflammatory, suspicious of malignancy, inadequate- on account of blood or necrotic material obscuring cell morphology.

3. Observations and results

Total 273 cases with intra-abdominal lesions were included in this study of which 158 (57.87%) were males and 115 (42.12%) were females. The age of the patients was ranging from 20 days to 85years. The maximum number of patients belonged to age group 41-60 years, comprising 43.9%. The distribution of age of the patients was shown in Table 1.

Table 1: Distribution of the age of the patients

Age group in years	Frequency	Percentage
0-10	22	8.05
11-20	21	7.67
21-30	34	12.45
31-40	34	12.45
41-50	63	23.07
51-60	57	20.87
61-70	38	13.91
71-80	3	1.09
81-90	1	0.36

Table 2 show the distribution of patients according to clinical complaints. The most common clinical complaints with intra-abdominal masses were a lump in abdomen (78.78%), pain in abdomen (64.46%) and increase in size of lump (47.9%).

Table 2: Shows the clinical complaints with intra-abdominal masses

Clinical complaints	Frequency	Percentage
Lump in abdomen	215	78.78
Pain in abdomen	176	64.46
Increase in size of lump	131	47.9
Weight loss and malaise	112	41.02
Fever	97	35.53
Yellowness of eyes	36	13.18
Malena	37	13.55
Vomiting	38	13.91
Hematuria	21	7.69
Lymphadenopathy	2	0.73

Liver was the most predominant site (35.53%) of the abdominal masses followed by ovaries (15.75%) and retroperitoneum (15.38%). Distribution of the site of abdominal lesions was shown in Table 3.

Table 3: Distribution of site of abdominal lesions

Organ of origin	Frequency	Percentage
Liver	97	35.53
Bowel	30	10.98
Ovary	43	15.75
Kidney	26	9.52
Retroperitoneum	42	15.38
Pancreas	5	1.83
Gall bladder	11	4.02
Spleen	6	2.19
Urinary bladder	13	4.76

The abdominal masses were divided into anechoic, hypoechoic and masses with mixed echogenicity on ultrasound depending upon the echo patterns obtained during imaging. The mixed echogenic masses were the most common echo pattern as visualized by ultrasound (49.08%) followed by hypoechoic (44.68%) and anechoic (6.22%). Adequate material for cytologic interpretation was obtained in 217 out of 273 guided aspirates (79.48%). Of these 217 adequate smears, malignancy was reported in 179 (82.4%) cases, benign in 7 (3.2%) cases and inflammatory in 19 (8.8%) cases. 12 (5.6%) cases were suspicious of malignancy. Secondary metastasis in liver was the commonly detected lesion in the study comprised of 16.2% of total malignant abdominal masses followed by hepatocellular carcinoma 15%.

The correlation between clinico-radiologic impression and cytologic diagnosis was obtained in 213 (98.15%) cases. FNAC changed the clinico-radiologic diagnosis in 4 (1.85%) cases (Table 4).

Table 4: Correlation between clinic-radiologic diagnosis and cytologic diagnosis

Organ	Total No. of cases	No. of cases consistent	No. of inconsistent cases
Liver	74	72	2
Retroperitoneum	36	36	0p
Bowel	24	23	1
Gall bladder	10	10	0
Kidney	24	23	1
Ovary	29	29	0
Urinary bladder	11	11	0
Spleen	4	4	0
Pancreas	5	5	0

A cyto-histopathologic correlation was obtained in 58 cases. An overall accuracy of 98.3% was achieved by ultrasound guided FNAC, with a sensitivity of 98% and a specificity of 100%. Predictive value for positive and negative was found to be 100% and 87.50% respectively. No more than 2 cases were made into any lesion. No major complications occurred during the study.

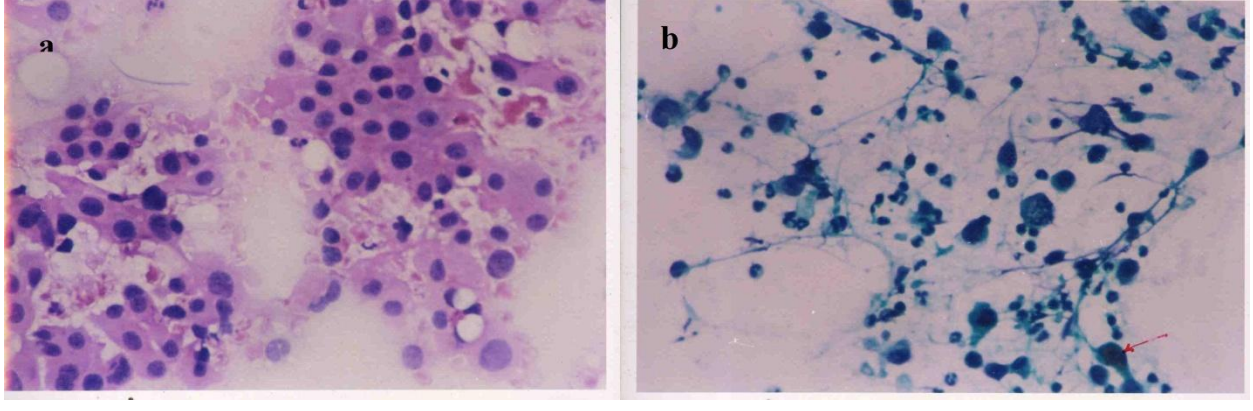
4. Discussion

In the present study, maximum number of patients belonged to age group 41-60 years (43.9%), this increased incidence above the age of 40 years, owes to the fact that suspected metastasis, forming the major indication of FNAC was more common in an older age group. The FNAC of abdominal organs such as stomach, liver, gall bladder, pancreas, kidney, retroperitoneum and ovary were performed in our study, as similar to the several previous studies [8-10]. The adequate sample for cytologic interpretation was obtained in 79.48% cases; this was lower to the adequacy of cytologic smears obtained by previous studies [6,8,10-12].

Inadequate smears were obtained in 20.5% cases and were due to blood and necrotic material obscuring cellular details. These causes of inadequacy were also reported by other authors [10,13]. Out of 217 cases, 179 (82.45%) were reported as malignant, 7 (3.2%) benign, 19 (8.8%) inflammatory and 12 (5.6%) suspicious of malignancy and this was comparable to other studies [6,9,10,12,13].

The maximum numbers of guided aspirations were from the liver, accounting for 97 (35.53%) cases. Of these 74 were adequate for interpretation, 27 were hepatocellular carcinoma, 29 were secondary metastasis, 1 was a hepatoblastoma, 1 was hydatid cyst and 2 were liver abscesses. Remaining 14 were undifferentiated malignancies. This was correlated with different studies [14-16]. 27 cases of hepatocellular carcinoma were encountered constituting 15% of all malignant abdominal tumors and 38% of liver malignancies.

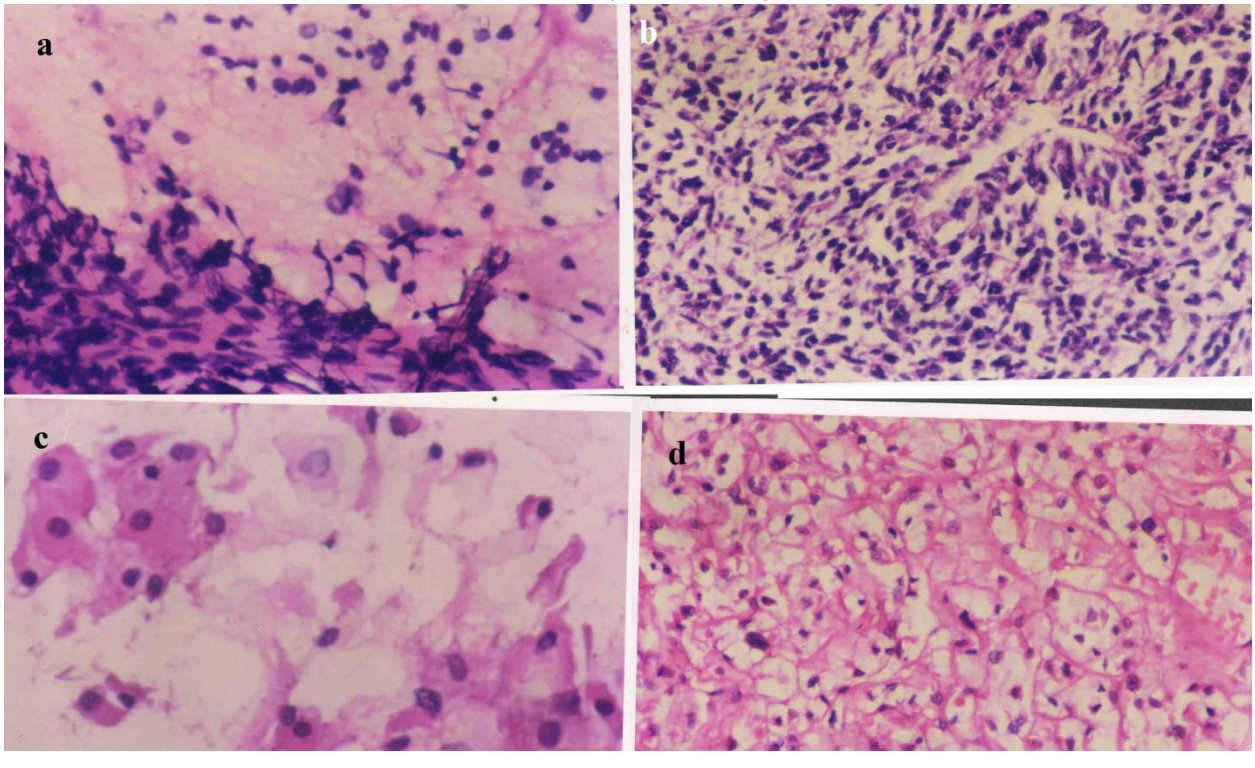
Figure 1 a) Microphotograph of aspirate from hepatocellular carcinoma (H and E×400), b) Aspirate from hepatocellular carcinoma showing intracellular bile pigment



The cytological diagnosis was made on the basis of typical morphological features given in various textbooks. One case of hepatoblastoma was observed in present study. Diagnosis was made considering the age of patients, ultrasound findings and cytomorphology. Microscopically, round cells with cytologic features of malignancy in clusters and scattered singly were observed. In our study, 29 metastatic liver tumors were encountered. In 17 (58.6%) cases, the primary site could be detected of these sites, 9 were from adenocarcinoma bowel, 1 from carcinoid ileum, 2 from SCC urinary bladder and 1 each from adenocarcinoma pancreas, intra-ductal carcinoma breast, adenocarcinoma lung, pheochromocytoma and squamous cell carcinoma rectum. In 9 cases cytomorphology of the secondaries gave a definitive clue to the site of primary tumor, thus, FNAC awarded a more efficient diagnosis in these cases, not only confirming liver metastasis but also providing a vital clue to primary site. In remaining 8 cases, the primary was determined either by clinico-radiologic investigations or by surgical biopsy. In 12 (41.3%) cases, the primary could not be determined, all 12 were adenocarcinomas. A comparison of metastatic liver tumors reported by various studies [9,10,17,18].

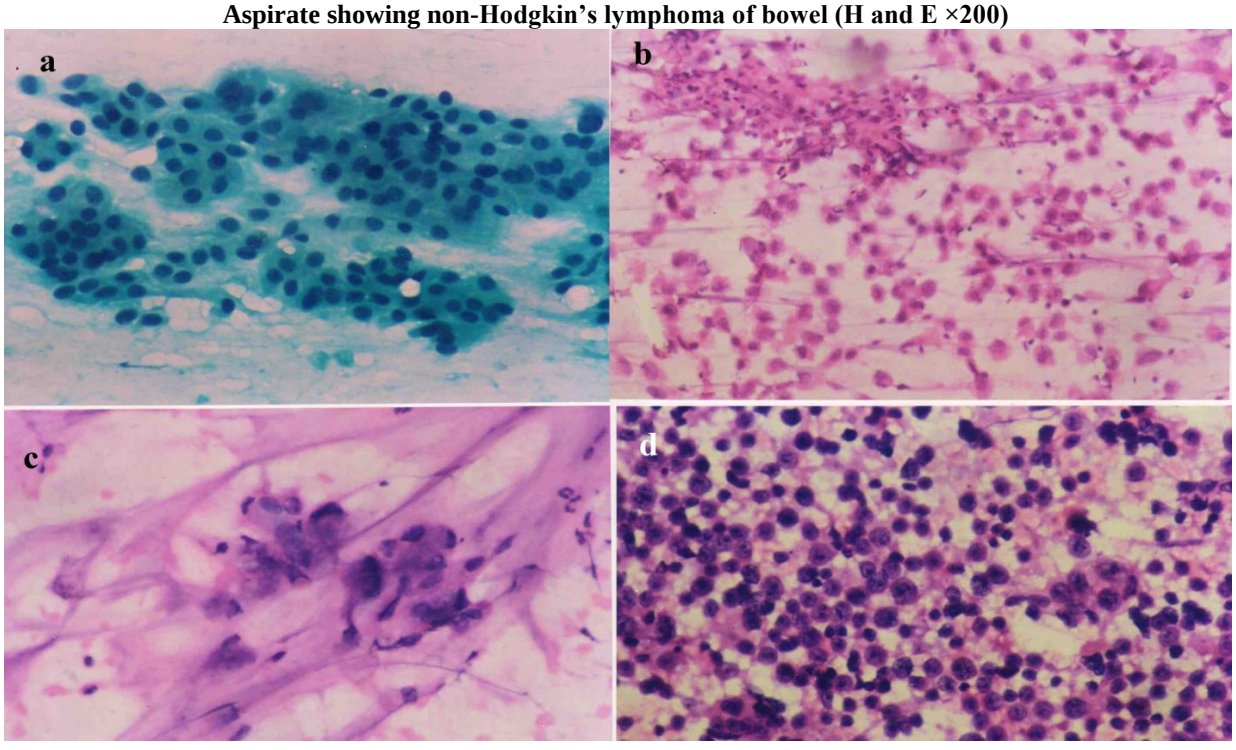
Total 26 cases of kidney lumps were encountered, out of which 24 were adequate, 7 were Wilm's tumors, 9 renal cell carcinomas, 1pheochromocytoma and 1 adenocortical tumor. One showed anaplastic cells and was labeled as undifferentiated malignancy. In 5 cases, differentiation between Wilm's tumor and neuroblastoma was not possible cytologically and labeled as round cell tumor. One case of renal cell carcinoma radiologically labeled as hydatid was later on confirmed on histopathology as cystic variant of renal cell carcinoma. The gross specimen showed multiple cystic spaces and was reason for erroneous radiologic impression. In rest of all cases, cytology confirmed the clinic-radiologic impression of malignancy. A comparable diagnostic accuracy was observed with that of Droese *et al* [13] and Deckmezian *et al* [19].

Figure 2: a) Aspirate from Wilms' tumor (H and E×200), b) Histology of Wilms' tumor (H and E×200), c) Aspirate from renal cell carcinoma showing eosinophillic granular cytoplasm ((H and E×400), d) Histology of renal cell carcinoma (H and E×200)



The ovarian lumps were seen in 43 cases. 29 were adequate out of which 24 were malignant and 5 were benign, this was compared with the study of Tsodikova *et al* [10]. 42 cases of retroperitoneal lumps were encountered, 6 were inadequate (14.2%). Of the 36 adequate cases, 26 (72.2%) were malignant and 10 (27.7%) were inflammatory. Of the malignant 26 cases, 12 were germ cell tumors, 4 were non Hodgkin's lymphoma, 3 were malignant mesenchymal tumors and 1 was undifferentiated malignancy and 6 were secondary to retroperitoneal lymph nodes. 10 cases of inflammatory lesions were also seen. These results were correlated with other studies [10,13,20].

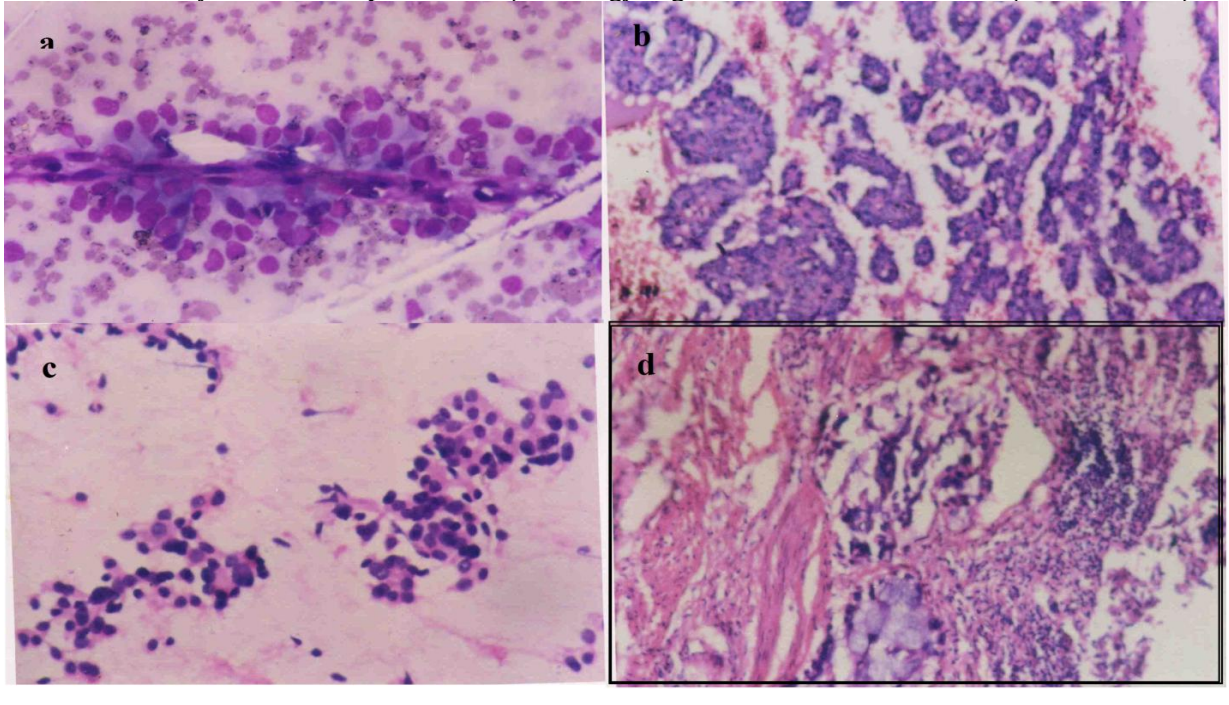
Figure 3: a) Serous cystadenoma ovary (borderline malignancy) Aspirate shows cell with moderate nuclear pleomorphism, b) Dysgerminoma ovary- smear showing monomorphicneoplastic cells with lymphocytes (H and E ×200), c) Aspirate from mucin secreting adenocarcinoma of bowel showing signet ring cells (H and E ×200), d) Aspirate showing non-Hodgkin's lymphoma of bowel (H and E ×200)



Pancreatic carcinoma were seen in 5 cases and allcases yielded adequate aspirate (100%), out of which 3 were found to be adenocarcinoma and 1 was suspicious of malignancy. One was rare solid cystic papillary tumor of pancreas, diagnosis which by FNA has been shown in past studies [21,22].

10 adequate smears of 11 cases of gall bladder masses, 9 were malignant and 1 inflammatory. 9 cases of gall bladder carcinoma were reported in this study. A malignant mass in the gall bladder along with calculi were well visualized with ultrasound. Comparative study was carried out by Shukla *et al* [23].

Figure 4: a) Papillary solid cystic tumor of pancreas-Aspirate showing papilla with fibrovascular core, b) Histology of papillary solid cystic tumor of pancreas (H and E×100), c) Aspirate fromadenocarcinoma gall bladder showing loosely clustered neoplstic cells, d) Histology of gall bladder adenocarcinoma (H and E × 100)



However the number of cases being very small in this study, comment and comparison of diagnostic accuracy in FNAC of these organs, with that of other authors was not mentioned. Total 8 cases of tuberculosis were encountered and in all cases the age of patient and clinical symptoms of fever, systemic tuberculosis contributed to clinical diagnosis. On cytology, caseation necrosis, epithelioid cells and langhan's as well as foreign body giant cells were seen. 4 cases were found to be AFB positive. A histological correlation was obtained in 59 (27.1%) out of 217 adequate aspirates. This figure was lower than that quoted by other authors [6,10,13].

No serious complications were encountered in the present study. However, in 1 patient suspected of hepatocellularcarcinoma, bleeding developed which was promptly controlled by reinsertion of the stylet and local compression for 10 minutes. Further follow up of patient did not reveal hematoma formation. The only minor complication observed in the study was pain and tenderness at the site of aspiration for more than 24 hours in 10 patients, which promptly subsided with administration of an analgesic.

The overall accuracy of radiologically guided FNAC was evaluated to be 98.3% with a sensitivity of 98% and a specificity of 100%. The predictive value of positive and negative results was 100% and 87.50% respectively. These results were similar to other studies [8,9,24].

Thus from present study it is evident that radiologically guided FNAC is a technique with a high degree of accuracy, sensitivity and specificity. With this technique, a higher yield of diagnostically adequate smears was obtained. It also has a good predictive value for both positive and negative results.

5. Conclusion

Ultrasound guided percutaneous FNAC is a very valuable diagnostic tool in terms of higher degree of both accuracy and adequacy with low incidence of complications. This technique in addition, has a high sensitivity and specificity contributing to a more efficient diagnosis and treatment planning of the patient. Considering these merits, ultrasound guided FNAC, should be used increasingly in cytology. It is recommended that ultrasound guided FNAC should be used routinely in deep seated and non palpable abdominal masses. To avoid inadequate aspirations and to ensure proper needle placement FNAC should be performed by skilled cyto-pathologist.

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