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Study Of Diagnostic Adequacy And Utility Of The Procedure In Hepatic Lesions.

Rajshri Patil[1]*, Ravindra Karle[2], and Prafulla Jadhav[3].

[1]Department of Pathology, ACPM Medical College, Dhule, Maharashtra, India.
[2]Department of Pathology, DBVPRMC, PIMS (DU) Loni, Maharashtra, India.
3Department of Medicine, ACPM Medical College, Dhule

ABSTRACT

Hepatic lesions encompass a wide range of benign and malignant conditions, necessitating accurate diagnosis for effective management. Fine-needle aspiration cytology (FNAC), guided by imaging, is a minimally invasive diagnostic tool for evaluating these lesions. To assess the diagnostic adequacy and utility of FNAC in hepatic lesions, characterizing cytological findings and correlating them with histopathological results. This descriptive, cross-sectional, and prospective study was conducted over two years at Pravara Rural Hospital, Loni. Fifty-two patients with radiologically confirmed hepatic lesions underwent ultrasound or CT-guided FNAC. Smears were prepared using Papanicolaou and May-Grunwald-Giemsa staining and analyzed for cytological diagnosis. Histopathological correlation was performed for definitive evaluation. Of the 52 cases, 12 (23.07%) were benign, 36 (69.23%) were malignant, and 4 (7.70%) were inadequate for opinion. Pyogenic abscesses (41.67%) were the most common benign lesion, while metastatic adenocarcinoma (41.67%) predominated among malignant cases. Primary malignancies included hepatocellular carcinoma (33.33%) and cholangiocarcinoma (2.77%). The diagnostic adequacy rate was 92.3%, demonstrating FNAC's reliability. FNAC is a valuable diagnostic tool for hepatic lesions, offering high adequacy and accuracy. Its role is indispensable in distinguishing benign from malignant conditions, guiding clinical management.

Keywords: Hepatic lesions, fine-needle aspiration cytology, diagnostic adequacy

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Corresponding author

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INTRODUCTION

Hepatic lesions encompass a wide spectrum of pathologies, ranging from benign conditions like hemangiomas and hepatic adenomas to malignant entities such as hepatocellular carcinoma and metastatic deposits [1]. Accurate diagnosis and characterization of these lesions are crucial for guiding appropriate therapeutic interventions and improving patient outcomes [2]. Imaging modalities like ultrasonography (USG), computed tomography (CT), and magnetic resonance imaging (MRI) play a pivotal role in the non-invasive evaluation of hepatic lesions. However, their diagnostic accuracy may be limited in certain scenarios, necessitating tissue sampling for definitive diagnosis [3, 4].

Fine-needle aspiration cytology (FNAC) and core needle biopsy (CNB) are commonly employed diagnostic procedures for hepatic lesions, offering valuable insights into their histopathological nature. FNAC is minimally invasive, cost-effective, and yields rapid results, while CNB provides a larger tissue sample for more comprehensive histological analysis. Despite their advantages, these procedures carry potential risks, including bleeding and sampling errors, which can affect their utility and diagnostic adequacy [5-7].

This study aims to evaluate the diagnostic adequacy and utility of FNAC and CNB in hepatic lesions, assess their accuracy in differentiating benign from malignant lesions, and explore their role in guiding clinical management. Understanding these aspects will enhance the diagnostic algorithm for hepatic pathologies and optimize patient care.

STUDY METHODOLOGY

This descriptive, cross-sectional, and prospective study was conducted over a period of two years at Pravara Rural Hospital and Medical College, Loni. Fine-needle aspiration cytology (FNAC), guided radiologically by ultrasound or CT scan, was employed as the diagnostic tool for hepatic lesions. The study included 52 patients who were referred to the Department of Pathology with hepatic lesions confirmed through radiological evaluation. Informed consent was obtained from all participants after explaining the procedure, its limitations, and potential complications.

Inclusion criteria consisted of patients with radiologically confirmed hepatic lesions who consented to the procedure. Patients were excluded if they had prolonged prothrombin time (PT) or activated partial thromboplastin time (aPTT) exceeding one minute, bleeding or clotting disorders, hydatid cysts, skin infections at the aspiration site, or were uncooperative. A detailed clinical history was recorded for each patient prior to FNAC. The procedure was performed under aseptic conditions using lumbar puncture needles and syringes to aspirate material from the lesion. The aspirated samples were prepared as smears, with some fixed in 95% ethyl alcohol for Papanicolaou staining and others air-dried for May-Grunwald-Giemsa staining.

The cytological evaluation involved assessing the adequacy and representativeness of the aspirated material. Cytomorphological features, including overall cell population and predominant patterns, were examined under low power, while individual cell morphology was assessed under high power. Histopathological correlation was performed on biopsy specimens, which were fixed in 10% formalin, processed into paraffin blocks, and stained using hematoxylin and eosin (H&E). Thin sections were prepared and mounted with DPX, with final interpretations made based on both cytological and histopathological findings.

The Papanicolaou, May-Grunwald-Giemsa, and H&E staining protocols were meticulously followed. Each staining process involved specific steps for hydration, staining, and mounting to ensure optimal visualization of cellular and tissue morphology. The findings from FNAC were correlated with histopathological results to establish the diagnostic accuracy and reliability of FNAC in the evaluation of hepatic lesions.

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RESULTS

A total of 52 cases of hepatic lesions were included in the study.

Table 1: Age wise distribution of cases.

Age group	No. of cases	Percentage
31-40	2	3.85
41-50	9	17.31
51-60	19	36.54
61-70	13	25.00
71-80	8	15.38
81-90	1	1.92
Total	**52**	**100**

Age of the patient in the study ranged from 35 to 87 years of age with a mean of 60 years. Majority of patients fell in between 41-70 years of age group. Most common age group affected by hepatic lesion was 51-60 years (36.54%) followed by 61-70 years (25.00%).

Table 2: Gender wise distribution of cases.

Gender	No. of cases	Percentage
Male	24	46.15
Female	28	53.85
Total	**52**	**100**

Out of 52 cases, 24 cases (46.15%) were male and 28 cases (53.85%) were females. There was a slight female preponderance with male to female ratio of 1:1.16

Table 3: Distribution of all lesions according to cytological diagnosis.

Liver aspirates	No. of cases	Percentage
Benign	12	23.07
Malignant	36	69.23
Inadequate for opinion	4	7.70
Total	**52**	**100**

The lesions were cytomorphologically divided into 3 groups- benign, malignant and inadequate for opinion.

Out of 52 cases, the maximum cases were of malignant lesions, 36 (69.23%) cases, followed by 12 (23.07%) cases of benign lesions and 4 (7.70%) cases were inadequate for opinion. There was no case of benign tumour reported in the study.

Table 4: Distribution of benign lesions.

Cytological Diagnosis	No. of Cases	Percentage
Pyogenic abscess	5	41.67%
Benign cirrhotic nodule	4	33.33%
Simple cyst	2	16.67%
Non-specific hepatitis	1	8.33%
Total	**12**	**100**

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In the present study, 12 cases were of benign origin. The commonest amongst them were pyogenic abscess, 5 (41.67%) cases, followed by 4 (33.33%) cases of benign cirrhotic nodule, 2(16.67%) cases of simple cyst and

Table 5: Distribution of malignant lesions.

Cytological Diagnosis		No. of Cases	Percentage
Primary malignancy	Hepatocellular carcinoma	12	33.33
	Cholangiocarcinoma	1	2.77
Metastatic malignancy	Metastatic Adenocarcinoma	15	41.67
	Metastatic carcinoma from breast	2	5.56
	Metastatic squamous cell carcinoma	2	5.56
	Malignant Lymphoma	1	2.77
	Lymphoma/Leukemia infiltrate	1	2.77
	Poorly differentiated carcinoma	2	5.56
Total		**36**	**100**

Out of 36 malignant cases, metastatic lesions were more common than primary malignancies. Overall, metastatic adenocarcinoma was the commonest malignant tumour with 15 (41.67%) cases. It was followed by hepatocellular carcinoma with 12 (33.33%) cases. There were 2 (5.56%) cases each of metastatic carcinoma from breast, metastatic squamous cell carcinoma and poorly differentiated carcinoma. There was 1 (2.77%) case each of cholangiocarcinoma, malignant lymphoma and lymphoma/ leukaemia infiltrate respectively.

Table 6: Distribution of metastatic lesions.

Cytological diagnosis	No. of cases	Percentage
Metastatic Adenocarcinoma	15	65.23
Metastatic Carcinoma from breast	2	8.69
Metastatic Squamous cell carcinoma	2	8.69
Malignant Lymphoma	1	4.35
Lymphoma/ Leukemic infiltrate	1	4.35
Poorly differentiated carcinoma	2	8.69
Total	**23**	**100**

Out of 23 metastatic lesions, 15(65.23%) cases were of metastatic adenocarcinoma followed by 2 cases (8.69%) each of metastatic carcinoma from breast, metastatic squamous cell carcinoma and poorly differentiated carcinoma. There was 1(4.35%) case each of malignant lymphoma and lymphoma/ leukemia infiltrate respectively.

Table 7: HBsAg positivity in hepatocellular carcinoma.

HBsAg	No. of cases	Percentage
Positive	2	16.67
Negative	10	83.33
Total	**12**	**100**

Out of 12 cases of hepatocellular carcinoma, 2 (16.67%) cases were positive for HBsAg, while 10 (83.33%) cases were negative for HBsAg.\

Table 8 Grading of hepatocellular carcinoma.

Grades	No. of cases	Percentage
Well differentiated hepatocellular carcinoma (W-HCC)	2	16.67
Moderately differentiated hepatocellular carcinoma (M-HCC)	7	58.33
Poorly differentiated hepatocellular carcinoma (P-HCC)	3	25
Total	**12**	**100**

Based on cytological features described by Tao *et al* [31], HCC was differentiated into 3 grades: well differentiated, moderately differentiated and poorly differentiated HCC.

The maximum number of cases belonged to moderately differentiated HCC with 7 (58.33%) cases, followed by poorly differentiated HCC with 3 (25%) cases and 2 (16.67%) cases of well differentiated HCC.

DISCUSSION

The study aimed to evaluate the diagnostic adequacy and utility of fine-needle aspiration cytology (FNAC) in hepatic lesions and to characterize these lesions cytologically. FNAC, guided by ultrasound or CT scan, is a minimally invasive diagnostic tool for liver lesions, and this study provides a comprehensive assessment of its effectiveness.

Demographic and Gender Distribution

The age of patients in this study ranged from 35 to 87 years, with a mean age of 60 years. Most cases were concentrated in the age group of 51-60 years (36.54%), followed by 61-70 years (25%). This finding highlights that hepatic lesions predominantly affect middle-aged to elderly individuals, consistent with other studies, which indicate that hepatic lesions, both benign and malignant, are more common in older age groups due to cumulative risk factors like chronic liver disease, alcohol use, and metabolic disorders.

Gender-wise, there was a slight female preponderance (53.85% females vs. 46.15% males, with a male-to-female ratio of 1:1.16). This contrasts with some studies reporting a male predominance, particularly in cases of hepatocellular carcinoma. The increased number of female cases in this study could reflect differences in referral patterns, local population characteristics, or a higher incidence of benign conditions such as pyogenic abscesses in women.

Cytological Diagnosis of Lesions

The cytological evaluation categorized lesions into benign (23.07%), malignant (69.23%), and inadequate for opinion (7.7%). Malignant lesions were the most common, accounting for nearly 70% of cases. This predominance of malignancy underscores the critical role of FNAC in confirming cancer diagnosis in hepatic lesions. The inadequate samples may be attributed to factors such as the lesion's deep location, small size, or necrotic consistency, which can affect the retrieval of representative material.

Benign Lesions

Among the 12 benign cases, pyogenic abscess (41.67%) was the most common, followed by benign cirrhotic nodules (33.33%), simple cysts (16.67%), and non-specific hepatitis (8.33%). Pyogenic abscesses being the leading benign condition aligns with the global burden of hepatic abscesses, which is higher in regions where bacterial infections are prevalent. The identification of benign cirrhotic nodules highlights the importance of FNAC in differentiating benign regenerative changes from early malignancies, particularly in patients with underlying liver disease. The occurrence of simple cysts and non-specific hepatitis demonstrates the utility of FNAC in identifying a range of benign hepatic pathologies.

Malignant Lesions

Malignant lesions comprised 69.23% of the cases, reflecting the clinical significance of FNAC in diagnosing liver malignancies. Among these, metastatic lesions were more prevalent (63.89%) than primary liver malignancies (33.33%). This finding is consistent with existing literature, as the liver is a common site for metastases due to its dual blood supply and role in filtration.

Primary Malignancies

Hepatocellular carcinoma (HCC) was the predominant primary malignancy, comprising 33.33% of all malignant cases. Interestingly, only 16.67% of HCC cases were HBsAg positive, indicating a relatively low association with hepatitis B infection in this cohort. This could be due to regional epidemiological differences or underdiagnosis of hepatitis B infection. FNAC plays a pivotal role in the diagnosis of HCC by providing morphological details such as trabecular patterns and bile pigments, distinguishing it from metastatic lesions.

Cholangiocarcinoma was diagnosed in one case (2.77%), which is in line with its relatively low prevalence among hepatic malignancies. This rare biliary tract cancer underscores the diagnostic utility of FNAC, even for less common lesions.

Metastatic adenocarcinoma was the most common type of metastatic lesion (41.67%), followed by metastatic carcinoma from the breast (8.69%), metastatic squamous cell carcinoma (8.69%), and poorly differentiated carcinoma (8.69%). There was one case each of malignant lymphoma and lymphoma/leukemic infiltrate. These findings highlight the diverse origins of metastatic liver lesions and the importance of cytological evaluation in identifying the primary source. FNAC, when combined with immunocytochemistry, can aid in pinpointing the tissue of origin, especially in poorly differentiated carcinomas [8-11].

The high yield of cytologically adequate samples (92.3%) and the low proportion of inadequate cases (7.7%) reflect the efficacy of FNAC as a diagnostic tool for hepatic lesions. The procedure's ability to differentiate between benign and malignant lesions aids in timely clinical decision-making. Correlation with histopathology further validated the accuracy of FNAC, demonstrating its reliability in the evaluation of hepatic lesions [12, 13].

The limitations of FNAC in hepatic lesions include sampling errors, inadequate material in necrotic or fibrotic lesions, and difficulty in differentiating well-differentiated HCC from benign hepatocellular nodules. In this study, 7.7% of cases were classified as inadequate, which could be minimized with improved imaging guidance and needle techniques. Moreover, FNAC's role in differentiating subtypes of malignancy could be enhanced by adjunctive molecular and immunocytochemical techniques.

Our study emphasizes the clinical utility of FNAC in the diagnosis and management of hepatic lesions. For benign conditions, FNAC helps avoid unnecessary surgical interventions, while in malignant cases, it provides a rapid and minimally invasive method for initiating oncological treatment. The high prevalence of metastatic lesions underscores the importance of systemic evaluation in patients with hepatic masses.

CONCLUSION

This study reaffirms FNAC as a valuable diagnostic modality for hepatic lesions, offering high diagnostic adequacy and reliability. The findings provide insights into the epidemiology of hepatic lesions, with a predominance of metastatic malignancies and HCC among malignant cases. While FNAC has limitations, its benefits in the accurate diagnosis and management of hepatic lesions far outweigh its drawbacks, particularly when combined with advanced imaging and histopathological correlation.

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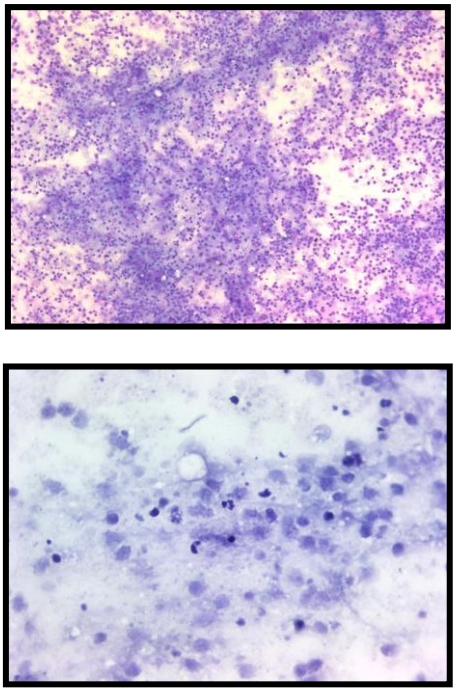

Figure 1: Pyogenic abscess.

Smear shows acute inflammatory cells, variable number of lymphocyte and cellular debris on a necrotic background [(a) MGGx100 (b) PAPx400].

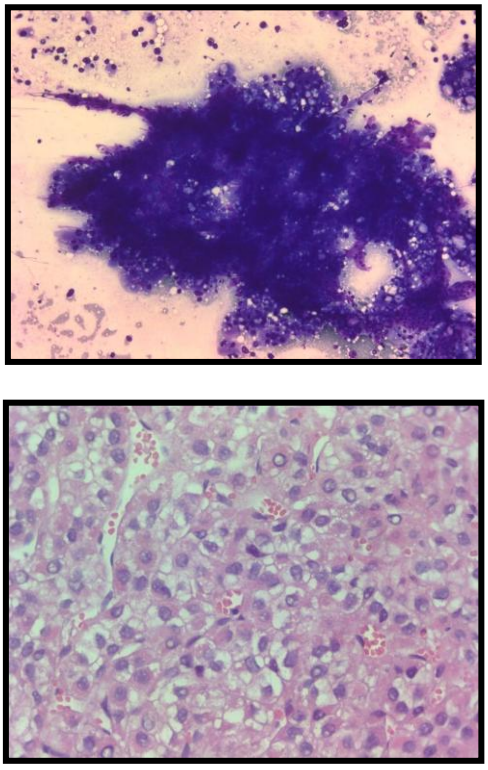

Figure 2: Well differentiated hepatocellular carcinoma.

(a) FNA: Smears showing enlarged cells resembling hepatocytes, with a transgressing capillary. [MGGx100]
(b) Biopsy: Hepatocytes show central nuclei, prominent nucleoli and granular cytoplasm cells show a predominant trabecular pattern (H&E x400)

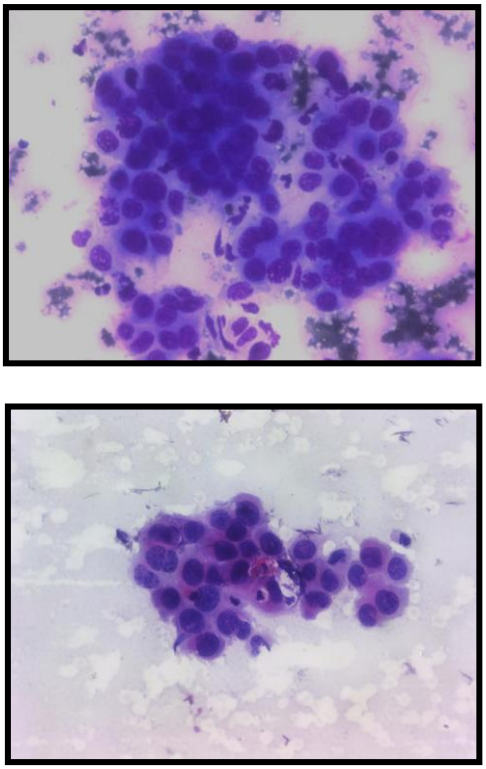

Figure 3: Metastatic Adenocarcinoma.

Smears showing clusters of pleomorphic cells, forming acini having abundant cytoplasm and pleomorphic nuclei [(a) MGG x400 (b) Pap x400]

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