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UTILITY AND EFFICACY OF RAPID ON-SITE EVALUATION OF IMAGE GUIDED FINE NEEDLE ASPIRATION CYTOLOGY FROM HEPATIC LESIONS

Pathology

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ABSTRACT

Background: Fine Needle Aspiration Cytology (FNAC) is broadly accepted method for diagnostic evaluation of pathological lesions. Studies have shown that with the application of Rapid onsite evaluation (ROSE) of smears there was statistically significant increase in the diagnostic yield of image guided FNACs. **Methods:** A retrospective analysis of two different time periods wherein ROSE was performed for FNACs from 40 patients with hepatic lesions in the latter time period. The samples were stained with toluidine blue for checking adequacy and the cytological slides were later analysed after staining with May Grunwald Giemsa and Papanicolaou stains. The results were compared with those obtained from FNAC from previous time period without any onsite evaluation to study the efficacy of ROSE. **Result:** Of 59 cases (without ROSE), 12(20.3%) and of 40 cases (with ROSE), 1(2.5%) were nondiagnostic. A significant increase in the diagnostic yield of FNAC from 79.7% to 97.5% was noted (p=0.0016). **Conclusion:** ROSE with toluidine blue staining can significantly increase the diagnostic yield of FNACS of hepatic lesions and abolish the need of repeat procedure.

KEYWORDS

Hepatic smears, Fine Needle Aspiration, Toluidine Blue, Diagnostic yield.

INTRODUCTION

Worldwide rates of hepatic lesions have been increasing as a result of number of risk factors. Treatment of hepatic lesions may be more effective if detected early. Image guided fnac can easily access these lesions. FNAC serves as the first line of pathological investigation after radiological diagnosis is made. FNAC is well established, safe, non-invasive and widely accepted techniques for the evaluation of various lesions.

Appropiate clinical management requires accurate diagnosis and FNAC can help in evaluating the cases. It is very important to know the type of lesion whether primary or metastatic. Radiological guidance is must in performing the procedure so as to accurately hit the target lesion.

Radiology guided FNAC is now becoming the initial investigation of choice for various hepatobiliary lesions and can provide definitive diagnosis in most patients with minimum trauma and minimum trauma and minimum risk of complications.

This has however escalated the cost of radiologically guided FNACs due to increased requirements of trained technologists and cytopathologists. [1]

The availability of rapid onsite evaluation will further enhance the utility of this procedure by ensuring adequacy of samples so that, if inadequate, the procedure can be repeated immediately in the same setting to ensure adequacy and avoid delay in report or having to repeat the procedure at a later date.

ROSE using toluidine blue is easily available, cheap, cost effective. Suitable for both provisional diagnosis and adequacy testing.

It has been demonstrated that ROSE of the aspirate smears during FNAC procedures increases the procedure's sensitivity and diagnostic accuracy. The operator-dependent technique involves rapid staining of smears and a cytopathologist's evaluation to determine if the material is sufficient. This approach not only enhances diagnostic yield but also provides material for additional testing at the source. [5]

We compared the outcomes of fine-needle aspiration cytology (FNACs) performed on hepatic lesions at different times. The results indicated that FNACs performed later and with the application of rapid on-site evaluation (ROSE) had higher diagnostic accuracy than those conducted earlier without ROSE.

METHODS AND MATERIALS

This was a retrospective study of radiologically guided FNAC of hepatic lesions at our tertiary care institute over two separate time periods from January 2021 to June 2022 and from July 2022 to December 2023. Ethical clearance was taken from Institutional Ethics Committee(H).

All the patients who were suspected with hepatic lesions , clinically or radiologically, attending the cytopathological department of Assam Medical college and hospital, Dibrugarh were subjected to percutaneous FNAC under radiological guidance with a 22 gauge needle or Long length spinal needle attached to a 20 ml disposable syringe. Informed consent for the procedure as well as permission to use their Data for academic purposes was obtained.

Smears of the aspirate obtained from image guided FNAC procedure were subjected to ROSE by a pathologist to check for adequacy of the diagnostic material after staining with toluidine blue 1 % for 1 minute. The turnaround time of ROSE was less than 5 minutes. The adequacy of the material was checked under microscope and based upon this the decision was made by the pathologist and radiologist as to whether a repeat procedure was needed. If the sample was adequate in the first pass itself, as confirmed by ROSE, no further passes were done. Inadequate cases were subjected to a repeat procedure according to the discretion of radiologist i.e if no complication were there a repeat procedure was done immediately.

After the completion of the procedure, May Grunwald Giemsa (MGG) and Papanicolaou stains were conducted as per protocol and microscopical analysis were done. The results were compared with those obtained from FNAC from previous years without any onsite evaluation to study the efficacy of ROSE.

Statistical Analysis:

The diagnostic yield of FNACs in both the time period was compared using non parametric Chi square test with statistical software version

RESULTS

During the study period (from January 2021 to June 2022), the age of the cases at presentation range from 45 to 55 years and male to female ratio was 2:1. All the cases showed single or multiple hepatic lesions radiologically. Out of total 59 cases, 9 cases (15.25%) were benign and 38 cases (64.4%) were malignant. Nearly 12 cases (20.3%) were reported as non-diagnostic as shown in Table1. ROSE of the smears was not performed during this study period. The diagnostic yield of FNACs was 79.7%. Among the malignant lesions, metastatic adenocarcinoma was the most common cytomorphological diagnosis followed by hepatocellular carcinoma. Among benign, hepatic pyogenic abscess and regenerative nodules were reported. During the

study period (from July 2022 to December 2023), 40 cases of hepatic lesions were reported. ROSE was performed in all the smears of the aspirate of the hepatic lesions. Of these cases, 22 cases (55%) were malignant and 17 cases (42.5%) were benign and the number of non-diagnostic smears decreases to 1 (2.5%). as shown in table1. We found a significant difference in the number of non-diagnostic cases as reported from the previous study period.

With the application of ROSE, the diagnostic yield of hepatic FNACs significantly increased up to 97.5%.

Statistical Analysis

The diagnostic yield of FNACs in both the time period was compared using non parametric Chi square test with statistical software version 25, the Chi square statistic was12.86, with a p value 0f 0.0016. The result was statistically significant as p value was less than 0.05.

Table 1 Comparison Of The Diagnosis Hepatic Aspirates Between The Two Time Periods

Diagnosis	January 2021 to June 2022 (Without ROSE)	July 2022 to December 2023 (With ROSE)
BENIGN	9 (15.25%)	17 (42.5%)
MALIGNANT	38 (64.4 %)	22 (55%)
NON-DIAGNOSTIC	12 (20.3%)	1 (2.5%)
TOTAL	59 (100%)	40 100%)
P	0.0016 (statistically significant)	

DISCUSSION

Image Guided FNAC is a very useful procedure for the diagnosis of various neoplastic and non-neoplastic hepatic lesions. It is a minimal intervening procedure at low cost and without major complications.

Pavneet Kaur Selhi et al. (1) studied that only six of the 142 radiologically guided hepatic FNACs performed between 2015 and 2016 were non-diagnostic, compared to 22 of the 160 radiologically guided FNACs performed for hepatic lesions between 2011 and 2013. The diagnostic yield of hepatic FNACs increased statistically significantly from 86.25% to 95.8% (p=0.015) with the use of ROSE.

Whereas In our study, only 1 of the 40 image guided hepatic Fnac performed during the time period (with the use of ROSE) and 12 cases out of 59 during the time period (without ROSE) were reported as nondiagnostic. The diagnostic yield of hepatic FNACs increased statistically significant from 79.7% to 97.5% (p = 0.0016) with the use of ROSE. The capacity to gather sufficient cellular material during a procedure is necessary to make a pathologic diagnosis of either a benign or malignant tumor.

There is no need to justify the benefit of cytology as a minimally invasive process with a low rate of complications; however, the availability of sufficient material for cytological diagnosis may restrict its application [1].

Chandra et al.[5] studied that utilizing the ROSE approach to determine sample adequacy pre analytically has been beneficial in this regard only bleeding, necrosis, or mucoid material was present in 31.9% of the cases, which made the remaining 68.1% of cases insufficient for evaluation on ROSE in the first pass. After these instances were immediately re-aspirated (TBNA or FNAC) or brushed, the adequacy rate rose to 93.4%. This demonstrates how the straightforward, affordable ROSE approach may be very beneficial in lowering the sampling error and hence raising the accuracy of cytology in the diagnosis of lung lesions.

Saleh and Khatib (6) showed that when a pathologist evaluates FNAC on-site, it not only improves the diagnostic yield but also lowers medical costs by avoiding the necessity for an excisional sample. Direct feedback regarding the aspiration of viable cells is given to the radiologist by the cytopathologist after the aspirate smears are quickly stained with toluidine stain and examined under a light microscope. A repeat sampling during the same sitting is preferred over a subsequent sitting in the event of paucicellular yield or technical problems like clotting or obscuring artifacts. A subsequent sitting necessitates greater involvement from the treating physician and the operator, patient motivation and increased expenditure .[1]

Chang et al [4] reported a 100% rate of adequate specimens with the on-site evaluation of a cytopathologist during EUS-guided FNA. However, the absence of an on-site cytological evaluation resulted in 29% of patients requiring a second procedure to obtain an adequate specimen.

Erickson et al [2] also published a lower diagnostic accuracy of EUS-FNA (decreasing by 10%-15%) without the presence of an on-site cytopathologist. The only concerns were the prolonged procedure time and the potentially increased risk of complications from the need for multiple needle passes.

Klapman et al (3) demonstrated that an on-site cytopathologist evaluating the samples improved the diagnostic accuracy of EUS-FNA. In their study, they analysed the EUS-guided FNA results from two university hospitals. At Centre I, 108 patients underwent EUS-guided FNA in the presence of an on-site cytopathologist. At Centre II, the patients underwent EUS-guided FNA in the absence of cytopathologist. The Endo sonographer at both hospitals carried out every procedure. 78% of patients at Centre I and 52% of patients at Centre II received a definitive diagnosis of malignancy (P = 0.001); the percentage of patients with an unsatisfactory sample was 9% at Centre I and 20% at Centre II (P = 0.035).

Iglesias-Garcia et al [10] published their experience in a study including a total of 182 patients. An on-site cytopathologist was available in 95 cases (52.2%). A significantly higher number of needle passes was performed when ROSE was not available (P < 0.001). The presence of an on-site cytopathologist was associated with a significantly lower number of inadequate samples (1.0% vs 12.6%, P = 0.002), and significantly higher diagnostic sensitivity (P = 0.002) and overall accuracy (96.8% vs 86.2%; P = 0.013) for malignancy Erickson et al (2) studied that with limited no of passes, good diagnostic accuracy can be achieved for liver lesions. Sindhwani et al (7) studied that on application of ROSE in the transbronchial needle aspiration, 45% of cases were saved from repeat number of passes due to sample Inadequacy, thereby saving time and money. Iglesias Garcia j et al (10) studied that ROSE can reduce the need of repeat procedure by 10% - 30%. Saleh and Khatib et al (6) concluded that on site FNAC evaluation increases the diagnostic yield and also reduces the expenditure by reducing the number of repeats of the procedure. Collins et al. (9) studied how well cytotechnologists used ROSE to counter the logistical challenges associated with using a pathologist in terms of time expense. Accuracy of the material can also be checked by them with better training and experience.

Many studied about the role of ROSE in thyroid lesions (11), pancreatic masses, TBNA of mediastinal and lymph node. There are certain limitations of our study. Rose was used only to check the adequacy of the material and also prolong time is required for each FNAC Still ROSE decreases the repeats of the subsequent procedure and helps us to decide in the same setting whether further passes would be required based on the adequacy of the material assessed microscopically, thus reducing the cost of healthcare. ROSE is not used as a diagnostic method in our study. Final diagnosis was given only after the evaluation of MGG, Papanicolaou smears.

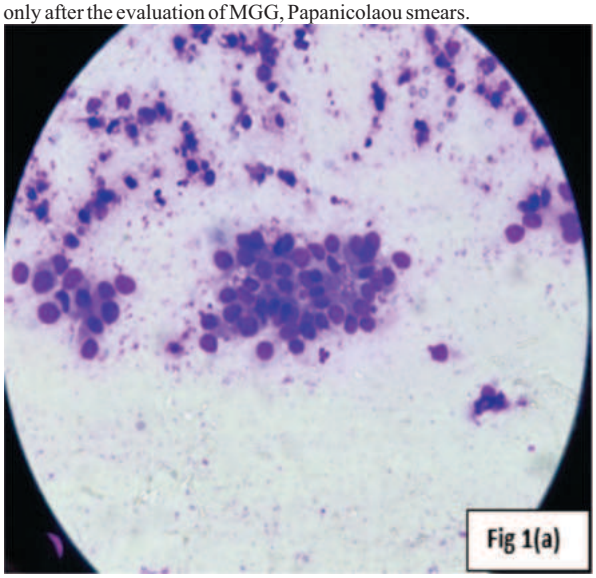
Fig 1(a)

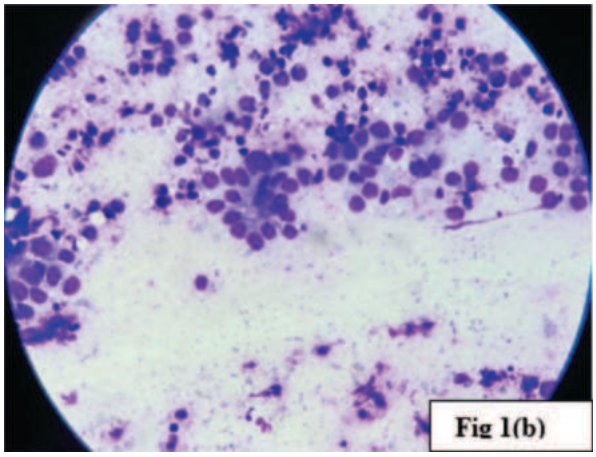

Fig 1(a,b). MGG smear shows clusters of pleomorphic cells with hyperchromatic nulcei and stippled chromatin in case of metastatic deposits from colonic adenocarcinoma

CONCLUSION

Rapid onsite evaluation has shown a significant increase in the diagnostic accuracy of the tumor lesions. Factors such as the site of the lesion, patient condition and cytologist experience all play a role in this improvement. Using ROSE as a means to check the adequacy of the material and reduce the number of needle passes can provide a strong economic incentive by enhancing the reliability of sampling in costly image guided procedures. This can lead to more efficient use of resources and improved patient outcomes. But this procedure is not routinely performed in our set up and in some institutions. However, its implementation could benefit clinicians, radiologists and pathologists by providing more accurate and faster diagnoses, ultimately improving patient outcomes and reducing morbidity. Advocating for the adoption of ROSE in such settings could lead to significant improvements in patient care and workflow efficiency.

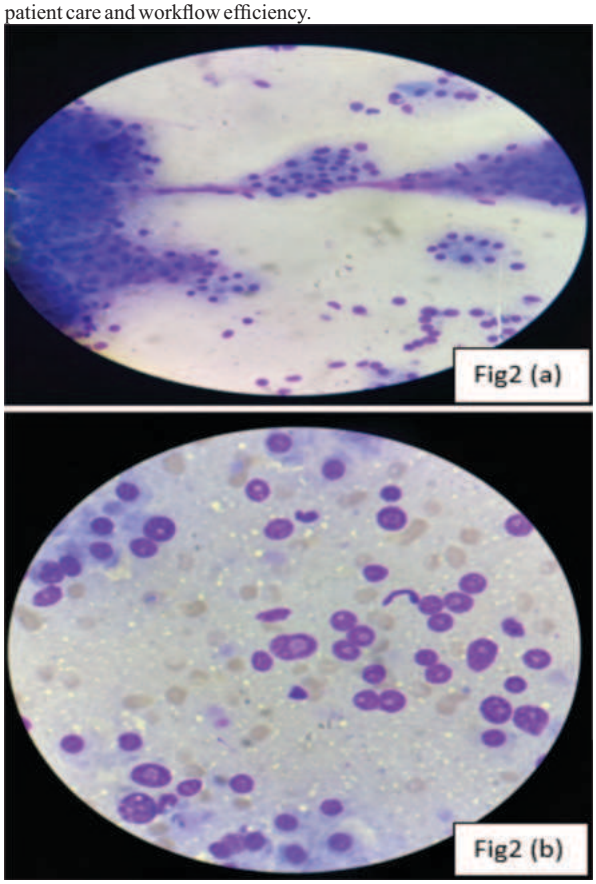

Fig 2(a, b) MGG stained smear of hepatocellular carcinoma shows (a)tumor cells displaying atypical stripped nuclei with macronucleoli seen in dispersed in the background. (40x) (b) Endothelial cells seen transgressing clusters of tumor cells.

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